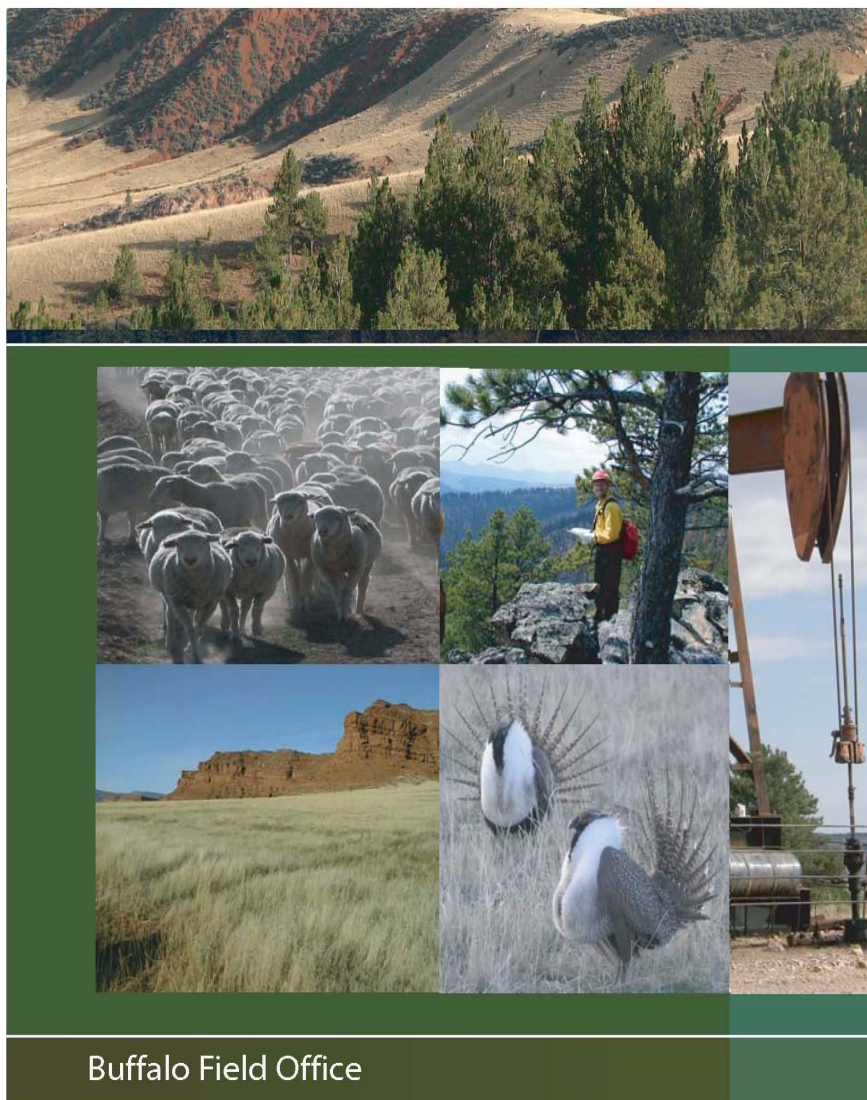


Proposed Resource Management Plan and Final Environmental Impact Statement for the Buffalo Field Office Planning Area



Volume 1 of 3
Chapters 1 - 3

May 2015

Buffalo Field Office



The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

Proposed Resource Management Plan and Final Environmental Impact Statement for the Buffalo Field Office Planning Area

Volume 1 of 3 Chapters 1 - 3

**U.S. Department of the Interior
Bureau of Land Management
Buffalo Field Office, Wyoming**

May 2015

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Letter to the Reader



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834



In reply refer to:
1610 (WY930)

Dear Reader:

Enclosed is the Proposed Resource Management Plan (PRMP) and Final Environmental Impact Statement (FEIS) for the Buffalo Field Office. The Bureau of Land Management (BLM) prepared the PRMP/FEIS in consultation with cooperating agencies, taking into account public comments received during this planning effort. The PRMP provides a framework for the future management direction and appropriate use of the Buffalo planning area, located in Campbell, Johnson, and Sheridan Counties, Wyoming. The document contains land use planning decisions to guide the BLM's management of the Buffalo planning area.

This PRMP/FEIS is one of fifteen sub-regional planning efforts being conducted as part of the BLM's National Greater Sage-Grouse Planning Strategy. The PRMP identifies conservation measures to conserve, enhance and/or restore Greater Sage-Grouse (GRSG) habitat in response to the US Fish and Wildlife Service's (USFWS) March 2010 "warranted, but precluded" Endangered Species Act listing petition. The USFWS found that the inadequacy of regulatory mechanisms was identified as a significant threat to GRSG in their finding on the petition to list the GRSG. RMP conservation measures were identified as the BLM's principal regulatory mechanism.

This PRMP and FEIS have been developed in accordance with the National Environmental Policy Act of 1969, as amended, and the Federal Land Policy and Management Act of 1976, as amended. The PRMP is largely based on Alternative D, the preferred alternative in the Draft Resource Management Plan/Environmental Impact Statement (DRMP/DEIS), which was released on June 28, 2013. The PRMP/FEIS contains the Proposed Plan, a summary of changes made between the DRMP/DEIS and PRMP/FEIS, impacts of the Proposed Plan, a summary of the written and verbal comments received during the public review period for the DRMP/DEIS, and responses to the comments.

Pursuant to BLM's planning regulations at 43 CFR 1610.5-2, any person who participated in the planning process for this PRMP and has an interest which is or may be adversely affected by the planning decisions may protest approval of the planning decisions within 30 days from date the Environmental Protection Agency (EPA) publishes the Notice of Availability of the FEIS in the Federal Register. For further information on filing a protest, please see the accompanying protest regulations in the pages that follow (labeled as Attachment # 1). The regulations specify the required elements of your protest. Take care to document all relevant facts. As much as possible, reference or cite the planning documents or available planning records (e.g., meeting minutes or summaries, correspondence, etc.).

Emailed protests will not be accepted as valid protests unless the protesting party also provides the original letter by either regular mail or overnight delivery postmarked by the close of the protest period. Under these conditions, the BLM will consider the emailed protest as an advance copy and will afford it full consideration. If you wish to provide the BLM with such advance notification, please direct emailed protests to: protest@blm.gov.

All protests must be in writing and mailed to one of the following addresses:

Regular Mail:

Director (210)
Attn: Protest Coordinator
P.O. Box 71383
Washington, D.C. 20024-1383

Overnight Delivery:

Director (210)
Attn: Protest Coordinator
20 M Street SE, Room 2134LM
Washington, D.C. 20003

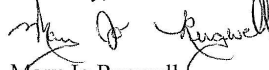
Before including your address, phone number, email address, or other personal identifying information in your protest, be advised that your entire protest – including your personal identifying information – may be made publicly available at any time. While you can ask us in your protest to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

The BLM Director will make every attempt to promptly render a decision on each protest. The decision will be in writing and will be sent to the protesting party by certified mail, return receipt requested. The decision of the BLM Director shall be the final decision of the Department of the Interior on each protest. Responses to protest issues will be compiled and formalized in a Director's Protest Resolution Report made available following issuance of the decisions.

Upon resolution of all land use plan protests, the BLM will issue an Approved RMP and Record of Decision (ROD). The Approved RMP and ROD will be mailed or made available electronically to all who participated in the planning process and will be available on the BLM website at <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo.html>.

Unlike land use planning decisions, implementation decisions included in this PRMP/FEIS are not subject to protest under the BLM planning regulations, but are subject to an administrative review process, through appeals to the Office of Hearings and Appeals (OHA), Interior Board of Land Appeals (IBLA) pursuant to 43 CFR, Part 4 Subpart E. Implementation decisions generally constitute the BLM's final approval allowing on-the-ground actions to proceed. Where implementation decisions are made as part of the land use planning process, they are still subject to the appeals process or other administrative review as prescribed by specific resource program regulations once the BLM resolves the protests to land use planning decisions and issues an Approved RMP and ROD. The Approved RMP and ROD will therefore identify the implementation decisions made in the plan that may be appealed to the Office of Hearing and Appeals.

Sincerely,



Mary Jo Rugwell
Acting State Director

Attachment 1

Protest Regulations

[CITE: 43CFR1610.5-2]

TITLE 43--PUBLIC LANDS: INTERIOR
CHAPTER II--BUREAU OF LAND MANAGEMENT, DEPARTMENT OF THE INTERIOR
PART 1600--PLANNING, PROGRAMMING, BUDGETING--Table of Contents
Subpart 1610--Resource Management Planning
Sec. 1610.5-2 Protest procedures.

- (a) Any person who participated in the planning process and has an interest which is or may be adversely affected by the approval or amendment of a resource management plan may protest such approval or amendment. A protest may raise only those issues which were submitted for the record during the planning process.
- (1) The protest shall be in writing and shall be filed with the Director. The protest shall be filed within 30 days of the date the Environmental Protection Agency published the notice of receipt of the final environmental impact statement containing the plan or amendment in the Federal Register. For an amendment not requiring the preparation of an environmental impact statement, the protest shall be filed within 30 days of the publication of the notice of its effective date.
- (2) The protest shall contain:
 - (i) The name, mailing address, telephone number and interest of the person filing the protest;
 - (ii) A statement of the issue or issues being protested;
 - (iii) A statement of the part or parts of the plan or amendment being protested;
 - (iv) A copy of all documents addressing the issue or issues that were submitted during the planning process by the protesting party or an indication of the date the issue or issues were discussed for the record; and
 - (v) A concise statement explaining why the State Director's decision is believed to be wrong.
- (3) The Director shall promptly render a decision on the protest.
- (b) The decision shall be in writing and shall set forth the reasons for the decision. The decision shall be sent to the protesting party by certified mail, return receipt requested. The decision of the Director shall be the final decision of the Department of the Interior.

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Abstract

Lead Agency: United States (U.S.) Department of the Interior, Bureau of Land Management (BLM)

Type of Action: Administrative (Final)

Jurisdiction: Portions of Campbell, Johnson, and Sheridan counties, Wyoming

Abstract: This Proposed Resource Management Plan (RMP) and Final Environmental Impact Statement (EIS) describes and analyzes alternatives for the planning and management of public lands and resources administered by the BLM, within the Buffalo planning area. The planning area is located in north-central Wyoming and consists of approximately 7.4 million acres of federal, state, and private land. Within the planning area, the BLM administers approximately 780,000 acres of surface lands and 4.8 million acres of federal mineral estate.

BLM-administered lands within the planning area are currently managed according to the 1985 Buffalo RMP as updated by the 2001 Buffalo RMP Update and amended by the 2003 RMP Amendment for the Powder River Basin Oil and Gas Project. When approved, this RMP and EIS will replace these existing plans. As part of the RMP revision process, the BLM conducted a scoping period to solicit input from the public and interested agencies on the nature and extent of issues and impacts to be addressed in the Draft RMP and EIS. Planning issues identified for this RMP revision focus on soils and watershed management, energy and minerals management, fire and fuels management, invasive species, wildlife and special status species habitat, cultural and paleontological resources, management of visual resources, land ownership adjustments, access to public lands and travel, recreation and visitor use, livestock grazing, special designations, and socioeconomic conditions.

The Draft RMP and EIS presented alternatives A through D. **Alternative A** is a continuation of current management (No Action Alternative). Under this alternative, use of public lands and resources would continue to be managed under the existing RMP, as amended. **Alternative B** emphasizes the greatest protection of physical, biological, and heritage resources, while providing for limited development. **Alternative C** emphasizes resource development, while limiting protection of physical, biological, and heritage resources. **Alternative D** balances protection of physical, biological, and heritage resources, while providing for sustainable development.

After careful consideration of both public and internal comments received on the Draft RMP and EIS, adjustments and clarifications have been made to the document, including Alternative D. As modified, Alternative D is now presented as the Proposed RMP in the Final EIS.

Protests: Protests must be postmarked or received no later than 30 days after publication of the U.S. Environmental Protection Agency Notice of Availability in the *Federal Register*.

Refer to the instructions in the letter preceding this abstract for additional information on how to protest. The close of the protest period will be announced in news releases, newsletters, and on the project website at <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo.html>.

For Further Information Contact:

Buffalo RMP and EIS
BLM Buffalo Field Office
1425 Fort Street
Buffalo, Wyoming 82834
Telephone: (307) 684-1133
Email: BRMP_Rev_WYMail@blm.gov.

Executive Summary

EXECUTIVE SUMMARY

ES.I INTRODUCTION

The Federal Land Policy and Management Act of 1976 (FLPMA) directs the United States (US) Department of the Interior (DOI), Bureau of Land Management (BLM) to develop and periodically revise or amend its resource management plans (RMPs), which guide management of BLM-administered lands. This RMP and Environmental Impact Statement (EIS) describes and analyzes alternatives for the future management of public lands and resources the BLM administers in the Buffalo Field Office (BFO) in north-central Wyoming.

The BLM Buffalo Proposed Plan provides a layered management approach that offers the highest level of protection for Greater Sage-Grouse (GRSG) in the most valuable habitat. Land use allocations in the Proposed Plan would limit or eliminate new surface disturbance in Priority Habitat Management Areas (PHMA), while minimizing disturbance in General Habitat Management Areas (GHMA).¹ In addition to establishing protective land use allocations, the Proposed Plan would implement a suite of management tools, such as disturbance limits, GRSG habitat objectives and monitoring, mitigation approaches, adaptive management triggers and responses, and other protective measures throughout the range. These overlapping and reinforcing conservation measures will work in concert to improve and restore GRSG habitat condition and provide consistency in how the BLM will manage activities in GRSG habitat in the planning area.

¹ For the Proposed RMP and Final EIS, Greater Sage Grouse habitat nomenclature has been changed from Core Areas to Priority Habitat Management Areas (PHMA) and Non-Core Sage Grouse Habitat to General Habitat Management Areas (GHMA).

ES.1.1 Rationale and Relationship to the Greater Sage-Grouse Planning Strategy

The Buffalo RMP addresses the March 2010 US Fish and Wildlife Service (USFWS) 12-Month Finding for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered (75 *Federal Register* 13910, March 23, 2010). In that finding, the USFWS concluded that GRSG was “warranted, but precluded” for listing as a threatened or endangered species. A “warranted, but precluded” determination is one of three results that may occur after a petition is filed by the public to list a species under the Endangered Species Act (ESA). This finding indicates that immediate publication of a proposed rule to list the species is precluded by higher-priority listing proposals; that is, a species should be listed based on the available science, but listing other species takes priority because they are more in need of protection.

The USFWS reviewed the status of and threats to the GRSG in relation to the five listing factors provided in Section 4(a)(1) of the ESA. Of the five listing factors reviewed, the USFWS determined that Factor A, “the present or threatened destruction, modification, or curtailment of the habitat or range of the GRSG,” and Factor D, “the inadequacy of existing regulatory mechanisms,” posed “a significant threat to the GRSG now and in the foreseeable future” (75 *Federal Register* 13910, March 23, 2010). The USFWS identified the principal regulatory mechanisms for the BLM as conservation measures in land use plans (LUPs).

The Buffalo RMP is one of the 15 LUP revisions and amendments and EISs being prepared by the BLM as part of the National Greater Sage-Grouse Planning Strategy (BLM 2011).² These documents provide a set of management alternatives focused on specific conservation measures across the range of the GRSG (see **Figure ES-1**, Greater Sage-Grouse Planning Strategy Boundaries).

Science-based decision making and collaboration with state and local partners are fundamental to the National Greater Sage-Grouse Planning Strategy. The 15 Greater Sage-grouse RMP/EISs address threats to GRSG identified by state fish and wildlife agencies, the BLM National Technical Team, and the USFWS in the context of its listing decision and the Conservation Objectives Team (COT) report. The COT report was prepared by wildlife biologists from state and federal agencies and provides a blueprint for the overall conservation approach set forth in the BLM GRSG LUP/EISs (USFWS 2013). Where consistent with conservation objectives, the GRSG LUP/EISs adopt unique state- and stakeholder-developed approaches and priorities. Additional science-based reviews by the US Geological Survey and related scientific literature provided further guidance on specific issues that arose in developing the final BLM and Forest Service GRSG LUP/EISs. In addition, regular meetings with the Western

² BLM (US Department of the Interior, Bureau of Land Management). 2011. Instruction Memorandum 2012-044, BLM National. Greater Sage-Grouse Land Use Planning Strategy. Washington, DC. December 27, 2011.

Governors Association Sage-Grouse Task Force provided additional opportunities for coordination with member states.³

Figure ES-1



ES.1.2 Description of the Planning Area and Habitat Management Areas

The planning area is the geographic area within which the BLM will make decisions during this planning effort. The planning area boundary includes all lands regardless of jurisdiction. The Buffalo RMP planning area covers approximately 7.4 million acres of federal, state, and private lands in 3 counties (Campbell, Johnson, and Sheridan). Of the total area, approximately 780,000 acres are BLM-administered surface lands and 4.8 million acres are federal mineral estate.

While the planning area consists of all lands regardless of ownership, decisions resulting from the Buffalo RMP/EIS would apply only to BLM-administered lands, including surface and split-estate lands with federal mineral estate. **Chapter 3, Affected Environment**, describes the current resource and resource use conditions in the planning area.

³ The Western Governors Association Sage-Grouse Task Force works to identify and implement high priority conservation actions and integrate ongoing actions necessary to preclude the need for the GRSG to be listed under the ESA. The Task Force includes designees from the 11 western states where GRSG is found as well as representatives from USFWS, BLM, Natural Resources Conservation Service, Forest Service, United States Geological Survey, and Department of the Interior.

As part of the National Greater Sage-Grouse Planning Strategy, GRSG habitat on BLM-administered lands in the decision area consists of lands allocated as PHMA and GHMA (**Figure ES-2**, Greater Sage-Grouse Habitat Management Areas – Buffalo RMP EIS, and **Table ES-1**, Habitat Management Areas in the Buffalo Planning Area). PHMA and GHMA are defined as follows:

- PHMA (137,400 acres): BLM-administered and National Forest System lands identified as having the highest value to maintaining sustainable GRSG populations. The boundaries and management strategies for PHMA are derived from and generally follow the Core Area boundaries identified in the Draft RMP/EIS. PHMA was identified in coordination with the State of Wyoming. Areas of PHMA largely coincide with areas identified as Priority Areas for Conservation in the COT report.
- GHMA (628,200 acres): BLM-administered lands that require some special management to sustain GRSG populations. GHMA was identified in coordination with the State of Wyoming.

The planning area includes other BLM-administered lands that are not allocated as habitat management areas for GRSG. These lands would be managed as described in **Chapter 2**.

Table ES-1
Habitat Management Areas in the Buffalo Planning Area

Habitat Management Area	Acres of BLM-administered Lands	Percent of BLM-administered Lands in Planning Area
PHMA	137,400	18
GHMA	628,200	80
Other BLM-administered lands	16,500	2

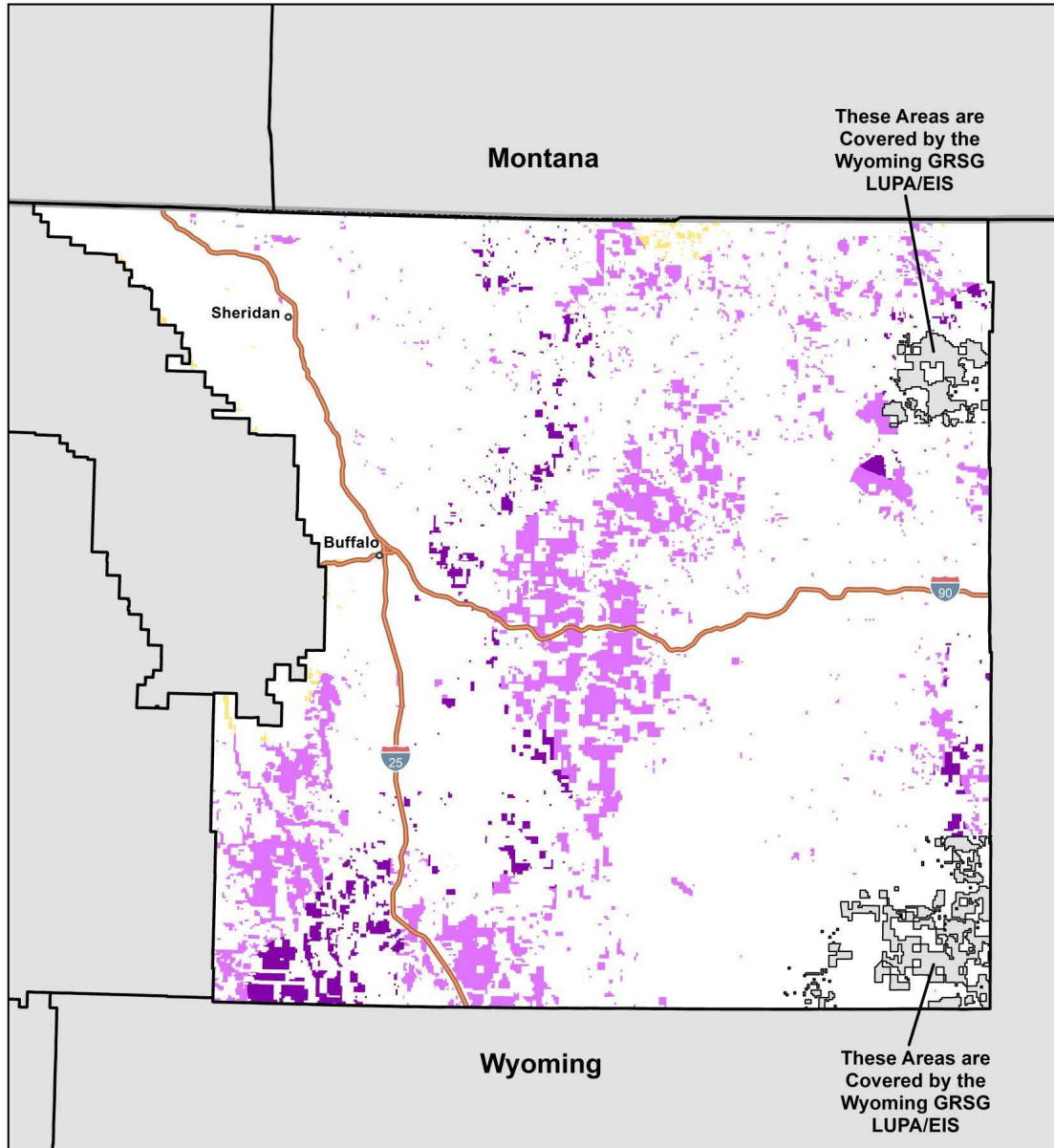
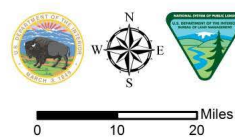


Figure ES-2

Greater Sage-Grouse Habitat Management Areas - Buffalo RMP/EIS

- BLM Priority Habitat Management Areas
- BLM General Habitat Management Areas
- Other BLM Lands
- Private, State, and Other Federal Lands
- EIS Boundary
- State Boundary



No warranty is made by the Bureau of Land Management (BLM) or the U.S. Forest Service (USFS). The accuracy, reliability, or completeness of these data for individual use or aggregate use with other data is not guaranteed.



ES.2 PURPOSE AND NEED

BLM-administered lands within the planning area are currently managed according to the 1985 Buffalo RMP as updated by the 2001 Buffalo RMP Update and amended by the 2003 Record of Decision (ROD) and RMP Amendment for the Powder River Basin Oil and Gas Project (existing plan). Since the ROD for the existing plan, new data have become available and laws, regulations, and policies regarding management of these public lands have changed. In addition, decisions in the existing plan do not satisfactorily address all new and emerging issues in the planning area. These changes and potential deficiencies created the need to revise the existing plans. The revised RMP will address the changing needs of the planning area and select a management strategy that best achieves a combination of the following elements:

- Employing a community-based planning approach to seek broadly supported solutions to issues, and collaborate with federal, state, and local cooperating agencies.
- Establishing goals and objectives for managing resources and resource uses in the approximately 780,000 surface acres and 4.2 million acres of federal mineral estate in the Planning Area administered by the BLM BFO in accordance with the principles of multiple use and sustained yield.
- Identifying land use plan decisions to guide future land management actions and subsequent site-specific implementation decisions.
- Identifying management actions and allowable uses anticipated to achieve the established goals and objectives and reach desired outcomes.
- Providing comprehensive management direction by making land use decisions for all appropriate resources and resource uses the BLM administers in the Planning Area.
- Providing for compliance with applicable tribal, federal, and state laws, standards, and implementation plans, and BLM policies and regulations.
- Recognizing the Nation's need for domestic sources of minerals, food, timber, and fiber.
- Retaining flexibility to adapt to new and emerging issues and opportunities and to provide for adjustments to decisions over time based on new information and monitoring.
- Striving to be compatible with the plans and policies of adjacent local, state, tribal, and federal agencies and consistent with federal laws, regulations, and BLM policies; and be flexible enough to adapt to future BLM policy and guidance updates.

- Identify and incorporate appropriate conservation measures to conserve, enhance, and restore GRSG habitat by reducing, minimizing, or eliminating threats to that habitat.

The BLM currently administers public lands in the Planning Area according to the Buffalo RMP (BLM 1985, as amended). Although this existing plan has been updated since the BLM adopted it, new data have become available, and laws, regulations, and policies regarding management of these public lands have changed. In addition, decisions in the existing plan do not satisfactorily address all new and emerging issues in the Planning Area. These changes and potential deficiencies created the need to revise the existing plan.

This RMP with associated EIS is needed to respond to the USFWS's March 2010 "warranted, but precluded" ESA listing petition decision (75 Federal Register 13910, March 23, 2010). The USFWS identified inadequacy of regulatory mechanisms as a significant factor in its finding on the petition to list the GRSG. In its listing decision, the USFWS noted that changes in management of GRSG habitats are necessary to avoid the continued decline of GRSG populations. Changes in land allocations and conservation measures in the BLM RMPs provide a means to implement regulatory mechanisms to address the inadequacy identified by the USFWS.

ES.3 PROPOSED ACTION

The proposed federal action is the Proposed Plan, which identifies resource management actions in accordance with the multiple-use and sustained-yield mandates of FLPMA. The proposed action is also intended to provide a consistent framework for managing GRSG and its habitat on BLM-administered land. The alternatives, including the Proposed Plan, comprise desired future outcomes and a range of management actions, allowable uses, and land use allocations that guide management on BLM-administered lands. The Proposed Plan (see **Section ES.6**, Greater Sage-Grouse Habitat Management Proposed Plan and Environmental Effects) represents the agency's approach for addressing the purpose and need.

ES.4 DEVELOPMENT OF THE RMP/EIS

ES.4.1 Scoping

A Notice of Intent (NOI) published in the Federal Register on November 14, 2008, formally announced the BLM's intent to revise the existing plan and prepare the associated EIS. Publication of the NOI initiated the scoping process and invited affected and interested agencies, organizations, and the general public to participate in determining the scope and issues to be addressed by alternatives and analyses in the EIS. The scoping period was from November 14, 2008 to January 5, 2009, during which time the BLM hosted five public meetings attended by 129 people. The scoping meetings provided the public an opportunity to learn about the project, ask questions, and provide their issues and concerns to the BLM. Information obtained by the BLM during scoping,

along with issues identified by the BLM and other agencies, was used to form the scope of the EIS. The BLM also held two open house meetings in December 2009 in Buffalo and Gillette, Wyoming. Similar to the public scoping meetings, the open house meetings provided the public an opportunity to ask questions of BLM staff and learn about the progress of the project. The final Scoping Summary Report, available online at <http://www.blm.gov/wol/st/en/prog/more/sagegrouse.html>, prepared in conjunction with all the GRSG LUPAs, summarizes the scoping and issue-identification process and describes 13 broad issue categories identified during the scoping process.

ES.4.2 Cooperating Agency Collaboration

The BLM invited local, state, federal, and tribal representatives to participate as cooperating agencies on the Buffalo RMP/EIS. The BLM invited these entities to participate because they have jurisdiction by law or because they could offer special expertise. The State of Wyoming, other federal agencies, Campbell, Crook, Johnson, and Sheridan County Commissions, three local conservation districts, and the Northern Cheyenne Tribe agreed to participate as cooperating agencies in the RMP revision. Cooperating agencies participated in a series of alternative formulation workshops, reviewed draft information and documents, and periodically met with BLM management and resource specialists throughout the revision process to discuss planning issues and provide input to the process. Cooperating agencies helped the BLM develop the alternatives identified in this Proposed RMP and Final EIS.

Consultation with Native American tribes is part of the NEPA scoping process and a requirement of FLPMA. The BLM took multiple steps to contact the tribes and include them in the scoping process. The BLM sent letters to multiple tribes inviting them to be part of the planning process through consultation and public scoping meetings, as well as requesting information to be considered in the planning process.

ES.4.3 Development of the Draft RMP/EIS

Development of Management Alternatives

In accordance with NEPA and the Council on Environmental Quality (CEQ) implementing regulations (40 Code of Federal Regulation 1500), the planning team considered public input and developed a reasonable range of alternatives for the Draft RMP/EIS.

The planning team developed four unique alternatives, including one No Action Alternative and three action alternatives, which were subsequently analyzed in the Draft RMP/EIS. Each of the preliminary action alternatives was designed to:

- Address the 12 planning issues
- Fulfill the purpose and need for the RMP
- Meet the multiple-use and sustained-yield mandate of FLPMA

- Respond to USFWS-identified issues and threats to GRSG and its habitat, including specific threats identified in the COT report

Collectively, the three action alternatives (Alternatives B, C, and D) analyzed in the Draft RMP/EIS offered a range of possible management approaches for responding to the purpose and need as well as the planning issues and concerns identified through public scoping. While the overarching goal of the long-term conservation of GRSG and its habitat is the same across alternatives, each alternative contains a discrete set of objectives and management actions, which if selected as the final plan, would constitute a unique RMP.

Publication of Draft RMP/EIS

Public Comment Period

The Notice of Availability (NOA) for the Buffalo Draft RMP/EIS was published in the Federal Register on June 28, 2013, initiating the 90-day public comment period. The BLM held four public meetings in Buffalo, Gillette, Sheridan, and Kaycee, Wyoming in August 2013. Written public comments were reviewed and considered by the BLM.

Comment Analysis

During the public comment period, the BLM received comment letters by mail and email, which contained over 2,000 substantive comments. Comments covered a wide spectrum of thoughts, opinions, ideas, and concerns. The BLM considered all substantive comments received and revised the plan based on certain issues raised in the comments, as presented in this Proposed RMP and Final EIS. **Appendix C**, Coordination and **Appendix Y**, Comment Analysis, describe the comment analysis methodology and responses to the public comments, respectively.

ES.5 RMP/EIS ALTERNATIVES AND ENVIRONMENTAL EFFECTS

ES.5.1 Alternative A

The No Action Alternative represents continuation of current management and provides a baseline from which to identify potential environmental consequences when compared to the action alternatives. The No Action Alternative describes current resource and land management direction as represented in the Buffalo RMP (BLM 1985, as amended), and associated habitat management plans, maintenance actions, and updates. Current management identifies constraints on mineral leasing and other activities in the Planning Area to protect resource values. Current management does not include any Areas of Critical Environmental Concern (ACECs), National Scenic or Back Country Byways, or Wild and Scenic Rivers (WSRs). There are three WSAs and a segment of the Middle Fork Powder River that is eligible for WSR designation. The BLM considers Special Recreation Management Area (SRMA) on a case-by-case basis, generally manages the planning area as one Extensive Recreation Management Area (ERMA) under Alternative A, and allows livestock grazing on

all but 4,000 acres of BLM-administered lands in the Big Horn Mountains. Current management includes stipulations and seasonal restrictions for surface-disturbing and disruptive activities to protect sensitive wildlife areas and other values that are incompatible with mineral resources activity.

GRSG habitat would continue to be managed under current management direction.

ES.5.2 Alternative B

Alternative B is based on the conservation measures developed by the BLM National Technical Team (NTT) planning effort described in Instruction Memorandum (IM) No. WO-2012-044. As directed in the IM, the conservation measures developed by the NTT must be considered and analyzed, as appropriate, through the land use planning and NEPA processes by all BLM state and field offices that contain occupied GRSG habitat. Alternative B would emphasize conservation of physical, biological, heritage and visual resources, and lands with wilderness characteristics with constraints on resource uses. Alternative B would conserve large areas of land for physical, biological, and heritage resources; designates 8 ACECs; and places a number of restrictions on motorized vehicle use and mineral development. Alternative B would evaluate roads within the planning area for designation as National Back Country or Scenic Byways. All lands with wilderness characteristics under Alternative B would be specifically managed to preserve their wilderness characteristics. Alternative B also applies additional constraints on resource uses within the three VSAs in comparison to Alternative A. Resource use constraints would remain in the VSAs even if Congress decides not to designate those areas as Wilderness. The BLM would designate 8 SRMAs and 2 ERMA's under Alternative B, and prohibits livestock grazing where it has been determined to be incompatible with other uses. New transmission lines would only be allowed in designated corridors and would be required to be placed underground. The number of designated corridors under Alternative B is less than any other alternative.

This alternative would restore vegetation in GRSG habitat on BLM-administered lands. Restrictions on surface-disturbing and disruptive activities in sensitive wildlife habitats are generally more prohibitive under Alternative B than Alternative A, and the size of protective buffers is increased around areas of specific management concern such as occupied GRSG leks. Alternative B would also enlarge and enhance habitat areas and habitat for connectivity.

ES.5.3 Alternative C

Alternative C would emphasize resource uses and reduce constraints on resource uses to protect physical, biological, and heritage and visual resources. Compared to other alternatives, Alternative C would conserve the least land area for physical, biological, and heritage resources; designates six SRMAs; and does not designate any ACECs. Alternative C would be the least restrictive to

motorized vehicle use and ROW and mineral development. All areas would be managed as open to fluid, coal, and locatable mineral exploration and development subject to varying levels of constraints for fluid minerals. Renewable energy development and aboveground transmission lines would be allowed within the planning area consistent with other resource values. The BLM manages lands with wilderness characteristics consistent with other resource objectives and only prohibits livestock use where it is currently prohibited under Alternative A. Alternative C limits off-highway vehicle (OHV) use to designated roads and trails, closes 28,900 acres, and seasonally closes 723,500 acres in big game crucial winter range. The BLM would allow land disposals, which could fragment native plant communities.

The emphasis on resource uses under Alternative C would reduce the amount of habitat protection for GRSG and its habitat. Impacts on GRSG under Alternative C would be similar to Alternative A (current management).

ES.5.4 Alternative D (Proposed RMP)

Compared to the other alternatives, Alternative D would generally allow resource use if the activity could be conducted in a manner that would conserve physical, biological, and heritage and visual resources. Alternative D would designate the second most lands as SRMAs and ACECs, while emphasizing moderate constraints on resource uses to reduce impacts on resource values. Alternative D places few universal constraints on resource uses and instead allows activities if they meet certain requirements designed to mitigate impacts on resource values. Under Alternative D, mineral resource uses are subject to less extensive constraints than under Alternative B but more than either Alternatives A or C. Alternative D would emphasize the use of designated corridors for major above- and below-ground infrastructure and would manage fewer acres as ROW exclusion for renewable energy development compared with Alternative B. Alternative D would also designate two new ACECs. Lands with wilderness characteristics would be managed to protect wilderness characteristics and emphasize ecosystem health, natural values, and primitive recreational opportunities. Alternative D limits OHV use to designated roads and trails on 661,700 acres and seasonally closes 18,300 acres in wintering big game habitat.

Compared to current management (Alternative A), Alternative D generally applies greater restrictions on surface disturbance and disruptive activities to protect sensitive wildlife habitats, including occupied GRSG leks. Alternative D implements the State of Wyoming's Core Area Strategy. For GRSG, constraints on resource uses are greater within PHMA than outside PHMA. For example, the BLM would apply an NSO stipulation within 0.6 mile of GRSG leks within PHMA and within 0.25 mile of occupied GRSG leks outside of PHMA.

ES.6 GREATER SAGE-GROUSE HABITAT MANAGEMENT PROPOSED PLAN AND ENVIRONMENTAL EFFECTS

In consideration of public comments, best science, cooperating agency coordination, and internal review of the Draft RMP/EIS, the BLM developed this Proposed Plan for Greater Sage-Grouse Habitat Management (Proposed Plan). The Proposed Plan represents the BLM's proposed approach for meeting the purpose and need consistent with the agency's legal and policy mandates.

The BLM Proposed Plan addresses threats to GRSG and its habitat identified by the USFWS in the March 2010 listing decision that apply to the Buffalo planning area as well as threats described in the COT report. The Proposed Plan seeks to provide greater regulatory certainty for management actions intended to conserve the GRSG (see **Table ES-2**, Key Components of the Buffalo Proposed Plan Addressing COT Report Threats). In making its determination of whether the GRSG is warranted to be listed as threatened or endangered under the ESA, the USFWS will evaluate the degree to which land use planning decisions proposed in this RMP/EIS address threats to GRSG and its habitat.

The Proposed Plan would maintain and enhance GRSG populations and habitat. The Proposed Plan benefits GRSG populations by eliminating disturbance near leks and other key areas.

The Proposed Plan establishes conditions, subject to valid existing rights, for new anthropogenic activities to ensure a net conservation gain to GRSG in PHMA. The Proposed Plan would reduce habitat disturbance and fragmentation through limitations on surface-disturbing activities, while addressing changes in resource condition and use through monitoring and adaptive management. The Proposed Plan provides a framework for prioritizing areas in PHMA for wildfire, invasive annual grass, and conifer treatments, which will maintain and enhance GRSG habitat.

The Proposed Plan is built upon the foundation for GRSG management established by and complementary to the Governor's Executive Order 2011-05, Greater Sage Grouse Core Area Protection (Core Area Strategy) (Wyoming Office of the Governor 2011) by establishing similar conservation measures and focusing restoration efforts in the same key areas most valuable to the GRSG.

For a full description of the Proposed Plan, see **Chapter 2**.

Table ES-2
Key Components of the Buffalo Proposed Plan Addressing COT Report Threats

Threats to GRSG and its Habitat (from COT Report)	Key Component of the Buffalo Proposed Plan
All Threats	<ul style="list-style-type: none"> • Implement the Adaptive Management Plan, which provides regulatory assurance that unintended negative impacts to GRSG habitat will be addressed before consequences become severe or irreversible. • PHMA: Require and ensure mitigation that provides a net conservation gain to GRSG. • Monitor implementation and effectiveness of conservation measures in GRSG habitats according to the Habitat Assessment Framework. • Apply Required Design Features (RDF) when authorizing actions in GRSG habitat. • Prioritize the leasing and development of fluid mineral resources outside GRSG habitat.
All development threats, including mining, infrastructure, and energy development	<ul style="list-style-type: none"> • PHMA: Implement an anthropogenic disturbance cap of 5% at the project-area scale. With Core Areas of PHMA, limit disturbance to 1 energy or mining facility per 640 acres. • PHMA: Implement a density cap of an average of 1 energy and mining facility per 640 acres. • PHMA: Surface occupancy and surface-disturbing activities would be prohibited on or within a 0.6-mile radius of the perimeter of occupied GRSG leks. • GHMA: Surface occupancy and surface-disturbing activities would be prohibited on or within a 0.25-mile radius of the perimeter of occupied GRSG leks.
Energy Development—Fluid Minerals	<ul style="list-style-type: none"> • PHMA: Open to fluid mineral leasing subject to No Surface Occupancy (NSO) stipulation within 0.6 miles of an occupied lek, and Timing Limitation (TL) stipulation from March 15 to June 30. • GHMA: Open to fluid mineral leasing subject to NSO within 0.25 miles of an occupied lek and TL stipulations.
Energy Development—Wind Energy	<ul style="list-style-type: none"> • PHMA: Avoidance area (may be available for wind energy development with special stipulations)
Infrastructure – major Rights-of-Way (ROW)	<ul style="list-style-type: none"> • PHMA: Avoidance area (may be available for major ROWs with special stipulations)
Infrastructure – minor ROWs	<ul style="list-style-type: none"> • PHMA: Avoidance area (may be available for minor ROWs with special stipulations)
Mining—locatable minerals	<ul style="list-style-type: none"> • Apply RDFs to locatable minerals consistent with applicable law.
Mining—coal	<ul style="list-style-type: none"> • PHMA is essential habitat for GRSG for purposes of the suitability criteria set forth at 43 CFR 3461.5(o)(1).
Livestock Grazing	<ul style="list-style-type: none"> • Prioritize the review and processing of grazing permits/leases in PHMAs. • The NEPA analysis for renewals and modifications of grazing

Table ES-2
Key Components of the Buffalo Proposed Plan Addressing COT Report Threats

Threats to GRSG and its Habitat (from COT Report)	Key Component of the Buffalo Proposed Plan
	<p>permits/leases will include specific management thresholds, based on the GRSG Habitat Objectives Table, Land Health Standards, and ecological site potential, to allow adjustments to grazing that have already been subjected to NEPA analysis.</p> <ul style="list-style-type: none"> • Prioritize field checks in PHMAs to ensure compliance with the terms and conditions of grazing permits.
Free-Roaming Equid Management	<ul style="list-style-type: none"> • Not applicable to the planning area.
Range Management Structures	<ul style="list-style-type: none"> • Allow range improvements which do not impact GRSG, or which provide a conservation benefit to GRSG such as fences for protecting important seasonal habitats.
Recreation	<ul style="list-style-type: none"> • PHMA: Do not construct new recreation facilities.
Fire	<ul style="list-style-type: none"> • PHMA: Prioritize suppression immediately after life and property to conserve the habitat. • GHMA: Prioritize suppression where wildfires threaten PHMA.
Nonnative, Invasive Plants Species	<ul style="list-style-type: none"> • Improve GRSG habitat by treating annual grasses. • Treat sites in PHMA and GHMA that contain invasive species infestations through an integrated pest management approach.
Sagebrush Removal	<ul style="list-style-type: none"> • PHMA: Maintain a minimum of 70 percent of lands capable of producing sagebrush with 10 to 30 percent sagebrush canopy cover. • All BLM use authorizations will contain terms and conditions regarding the actions needed to meet or progress toward meeting the habitat objectives for GRSG.
Pinyon and/or Juniper Expansion	<ul style="list-style-type: none"> • Remove conifers encroaching into sagebrush habitats, prioritizing occupied GRSG habitat.
Agricultural Conversion and Ex-Urban Development	<ul style="list-style-type: none"> • Retain the majority of PHMA in federal management.

ES.7 SUMMARY

Since the release of the Draft Buffalo RMP/EIS, the BLM has continued to work closely with a broad range of governmental partners, including the United States Department of Agriculture Natural Resources Conservation Service, the USFWS and US Geological Survey in DOI, Indian tribes, governors, state agencies, and county commissioners. Through this cooperation, the BLM has developed the Proposed Plan that, in accordance with applicable law, achieves the long-term conservation of GRSG and its habitat.

Conservation of GRSG is a large-scale challenge that requires a landscape-scale solution that spans 11 western states. The Buffalo RMP/EIS would achieve the consistent, range-wide conservation objectives as outlined below. Additionally, the Buffalo RMP/EIS would align with the State of Wyoming's priorities and land management approaches.

Minimize additional surface disturbance. The most effective way to conserve the GRSG is to protect existing, intact habitat. The BLM would aim to reduce habitat fragmentation and protect key habitat areas. The Buffalo RMP/EIS would minimize surface disturbance on over 700,000 acres of BLM-administered lands by allocating lands as PHMA and GHMA with decisions that aim to conserve GRSG habitat.

The limitations on mineral and ROW development along with the disturbance cap, lek buffers, and adaptive management would result in a net conservation gain for GRSG. The Proposed Plan prioritizes oil and gas development outside of GRSG habitat and focuses on a landscape-scale approach to conserving GRSG habitat. In the context of the planning area, land use allocations under the Proposed Plan would limit or eliminate new surface disturbances in PHMA.

The BLM also updated the Proposed Plan to reflect new GRSG state conservation strategies, including recent State Executive Orders. The objectives of these documents are consistent with the State of Wyoming's Core Area Strategy, which is designed to protect GRSG and its habitat within core areas using a suite of tools and mechanisms that work in concert to conserve GRSG by reducing habitat loss and fragmentation through lek buffers, disturbance limits, excluding activities, and a sophisticated mapping utility to monitor the amount and density of disturbance.

Improve habitat condition. While restoring lost sagebrush habitat can be very difficult in the short term, particularly in the most arid areas, it is often possible to enhance habitat quality through purposeful management. The Buffalo RMP/EIS commits to management actions necessary to achieve science-based vegetation and GRSG habitat management objectives established in the Proposed Plan.

Habitat restoration and vegetation management actions would improve GRSG habitat and prioritize restoration to benefit PHMA. As a result, the restoration and management of vegetation actions would focus on GRSG. For mitigation, the BLM would coordinate with the Wyoming Sage Grouse Implementation Team for application of the "avoid, minimize, compensate" process to ensure anthropogenic activities result in a net conservation gain for GRSG habitat. The Proposed Plan also includes a process for monitoring and adapting to changing conditions on the landscape. Using monitoring data for population and sagebrush canopy cover, the adaptive management strategy would apply more restrictive management where there is a consistent downward trend. The cause

of the downward trend (e.g., anthropogenic disturbance, fire, disease, etc.) would be identified through monitoring data.

Reduce threat of rangeland fire to sage-grouse and sagebrush habitat

Rangeland fire can destroy sagebrush habitat and lead to the conversion of previously healthy habitat into landscapes dominated by invasive species. The Buffalo RMP/EIS incorporates Secretarial Order 3336 and sets forth protocols to improve the BLM's ability to protect GRSG habitat from damaging wildfire. Prescribed fire would only be used to improve or maintain habitat for GRSG and would be only be used to meet specific fuels objective standards.

Reader's Guide to this Document

Chapter 1. Purpose and Need for Action. This chapter introduces the Proposed Resource Management Plan (RMP) and Final Environmental Impact Statement (EIS), describes the purpose and need to which the Bureau of Land Management (BLM) is responding, provides an overview of the BLM planning process, identifies planning issues and criteria, summarizes consultation and coordination, and identifies topics not addressed by this RMP revision.

Chapter 2. Resource Management Alternatives. Chapter 2 describes how the four alternatives (A through D) were developed, the components and content of each alternative, and discusses the alternatives considered but eliminated from further consideration. It also presents a comparative summary of impacts of each alternative. Resource discussions in chapters 2, 3, and 4 are organized according to the following eight resource topics:

1000. Physical Resources – Air Quality, Geological Resources, Soil, Water Resources, and Cave and Karst Resources

2000. Mineral Resources – Locatable, Leasable, and Salable Minerals

3000. Fire and Fuels Management – Unplanned Fire (Wildfire), Planned Fire (Prescribed Fire), and Stabilization and Rehabilitation

4000. Biological Resources – Vegetation, Fish and Wildlife, and Special Status Species

5000. Heritage and Visual Resources – Cultural, Paleontological, and Visual

6000. Land Resources – Forest Products, Lands and Realty, Renewable Energy, Rights-of-Way and Corridors, Travel and Transportation Management, Recreation, Lands with Wilderness Characteristics, and Livestock Grazing Management

7000. Special Designations – Areas of Critical Environmental Concern, Scenic or Back Country Byways, Wild and Scenic Rivers, and Wilderness Study Areas

8000. Socioeconomic Resources – Social and Economic Conditions, Health and Safety, Environmental Justice, and Tribal Treaty Rights

Chapter 3. Affected Environment. This chapter describes the planning area and the existing environmental conditions that could be impacted by the alternatives.

Chapter 4. Environmental Consequences. Chapter 4 forms the scientific and analytic basis for comparing environmental impacts of each alternative. Impacts generally are described in terms of direct or indirect and short-term or long-term, when applicable. Potential cumulative and unavoidable impacts and irreversible and irretrievable commitments also are discussed in this chapter.

Chapter 5. References. This chapter provides full citation information for all references cited within the document.

Chapter 6. List of Preparers. This chapter provides a list of the names and project roles of the individuals involved in the preparation of this document.

Glossary. The glossary defines select terms used throughout this document.

Appendices. The appendices include documents that support existing resource conditions or situations, substantiate analyses, provide resource management guidance, explain processes, or provide information directly relevant or supporting conclusions in the Proposed RMP and Final EIS. Maps referenced in the Proposed RMP and Final EIS are included as a separate appendix. In hardcopy documents, maps are included at the end of Volume 3 and the other appendices can be found on a compact disk (CD) attached to the inside back cover of the document. For CD versions of the document, the maps and appendices are provided as separate files on the CD. Electronic versions of the maps and appendices are also available on the project website: <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo.html>. Twenty-five appendices are included.

Acronyms and Abbreviations

\$:
U.S. dollars

%:
percent

\leq :
less than or equal to

\geq :
greater than or equal to

°C:
Degrees Celsius

°F:
Degrees Fahrenheit

$\mu\text{eq/L}$:
microequivalents per Liter

$\mu\text{g/L}$:
micrograms per liter

$\mu\text{g/m}$:
micrograms per meter

$\mu\text{S/cm}$:
microSiemens per centimeter

AAQS:
Ambient Air Quality Standards

ACEC:
Area of Critical Environmental Concern

ADA:
Americans with Disabilities Act of 1990

AIRFA:
American Indian Religious Freedom Act

AML:
Abandoned Mine Land

AMP:
Allotment Management Plan

AMS:
Analysis of the Management Situation

ANC:
Acid Neutralizing Capacity

AOP:
Annual Operating Plan

APD:
Application for Permit to Drill

APHIS:
Animal and Plant Health Inspection Service

API:
American Petroleum Institute

APLIC:
Avian Power Line Interaction Committee

AQD:
Air Quality Division

AQRV:
Air Quality Related Value

ATV:
All-terrain Vehicle

AUM:
Animal Unit Month

BA:
Biological Assessment

BACT:
Best Available Control Technology

BAR:
Burned Area Rehabilitation

BBS:
Breeding Bird Survey

BCB:
Back Country Byway

BCC:
Bird of Conservation Concern

BEA:
Bureau of Economic Analysis

BFO:

Buffalo Field Office

BHMA:

Burnt Hollow Management Area

BLM:

Bureau of Land Management

BMP:

Best Management Practice

BR:

Biological Resources

BTU:

British Thermal Unit

CAA:

Clean Air Act

CASTNet:

Clean Air Status & Trends Network

CAZ:

Conflict Administration Zone

CBNG:

Coalbed Natural Gas

CCA:

Candidate Conservation Agreement

CCCD:

Campbell County Conservation District

CCS:

Carbon capture and storage

CD:

compact disk

CEQ:

Council on Environmental Quality

CERCLA:

Comprehensive Environmental Response, Compensation, and Liability Act

CFR:

Code of Federal Regulations

CFS:

Cubic Feet per Second

CH₄:
Methane

CO:
Carbon Monoxide

CO₂:
Carbon Dioxide

CO₂eq:
Carbon Dioxide Equivalents

COA:
Condition of Approval

CRM:
Coordinated Resource Management

CRMP:
Cultural Resource Management Plan

CRPP:
Cultural Resource Project Plan

CSU:
Controlled Surface Use

CUA:
Common Use Area

CWA:
Clean Water Act

CWP:
Citizens' Wilderness Proposal

CWPP:
Community Wildfire Protection Plan

dBA:
A-weighted decibels

DDCT:
Disturbance Density Calculation Tool

DEQ:
Department of Environmental Quality

DFC:
Desired Future Condition

DOE:
U.S. Department of Energy

DOI:

U.S. Department of the Interior

DPC:

Desired Plant Community

EA:

Environmental Assessment

EC:

Electrical Conductance

EEA:

Environmental Education Area

EGU:

electric generation unit

EIS:

Environmental Impact Statement

EO:

Executive Order

EOR:

Enhanced Oil Recovery

EPA:

Environmental Protection Agency

ERMA:

Extensive Recreation Management Area

ES&R:

Emergency Stabilization and Rehabilitation

ESA:

Endangered Species Act

ESD:

Ecological Site Description

FAMS:

Facility Asset Management System

FAN:

Final Abandonment Notice

FCLAA:

Federal Coal Leasing Amendment Act

FLAG:

Federal Land Manager's Working Group

FLPMA:

Federal Land Policy and Management Act

FLREA:

Federal Lands Recreation Enhancement Act

FM:

Fire and Fuels Management

FMP:

Fire Management Plan

FR:

Federal Register

FRCC:

Fire Regime Condition Class

FUP:

Free-use Permit

GAGMO:

Gillette Area Groundwater Monitoring Organization

GHG:

Greenhouse Gas

GHMA:

General Habitat Management Area

GIS:

Geographic Information System

GWP:

Global Warming Potential

H₂S:

Hydrogen sulfide

ha:

hectare

HAP:

Hazardous Air Pollutant

HFRA:

Healthy Forest Restoration Act

HMA:

Herd Management Area

HMP:

Habitat Management Plan

HR:

Heritage and Visual Resources

HUC:

Hydrologic Unit Code

IM:

Instruction Memorandum

IMP:

Interim Management Policy

IMPLAN:

Impact Analysis for Planning Model

IMPROVE:

Interagency Monitoring of Protected Visual Environments

IPCC:

Intergovernmental Panel on Climate Change

IPM:

Integrated Pest Management

ISR:

In Situ Recovery

KCLA:

Known Coal Leasing Area

kg:

kilogram

km:

kilometer

kV:

kilovolt

LAA:

likely to adversely affect

LAC:

Limit of Acceptable Change

LBA:

Lease By Application

LOC:

Level of Concern

LQD:

Land Quality Division

LR:
Land Resources

LRP:
Limited Reclamation Potential

LRR:
Land Resource Region

MACT:
Maximum Achievable Control Technology

MBTA:
Migratory Bird Treaty Act

mcf:
thousand cubic feet

mg/L:
milligram per Liter

mgd:
million gallons per day

MIM:
Multiple Indicator Monitoring

MLA:
Mineral Leasing Act

MLRA:
Major Land Resource Area

MMbf:
Million board feet

MMt:
Million Metric tons

MOU:
Memorandum of Understanding

MR:
Mineral Resources

MRB:
Missouri River Basin

MTP:
Master Title Plat

MZ:
Management Zone

N₂O:

Nitrous oxide

NAAQS:

National Ambient Air Quality Standards

NADP:

National Atmospheric Deposition Program

NAGPRA:

Native American Graves Protection and Repatriation Act

NAWMP:

North American Waterfowl Management Plan

NCA:

National Climate Assessment

NCSS:

National Cooperative Soil Survey

NE:

No Effect

NEI:

National Emission Inventory

NEPA:

National Environmental Policy Act

NFDRS:

National Fire Danger Rating System

NFPORS:

National Fire Plan Operating and Reporting System

NH₄:

Ammonium

NHPA:

National Historic Preservation Act

NLAA:

Not Likely to Adversely Affect

NO₂:

Nitrogen dioxide

NOA:

Notice of Availability

NOI:

Notice of Intent

NO_x:
Nitrogen Oxide

NPDES:
National Pollutant Discharge Elimination System

NRC:
Nuclear Regulatory Commission

NRCS:
Natural Resources Conservation Service

NREL:
National Renewable Energy Laboratory

NRHP:
National Register of Historic Places

NSCR:
Nonselective Catalytic Reduction

NSO:
No Surface Occupancy

NSS:
Native Species Status

NTT:
National Technical Team

O&G:
Oil and Gas

O₃:
ozone

OHV:
Off-highway Vehicle

ONRR:
Office of Natural Resource Revenue

ORV:
Outstandingly Remarkable Value

OSM:
Office of Surface Mining

pCi/L:
picocuries per Liter

PFC:
Proper Functioning Condition

PFYC:
Potential Fossil Yield Classification

PHMA:
Priority Habitat Management Area

PM₁₀:
Particulate Matter less than 10 microns

PM_{2.5}:
Particulate Matter less than 2.5 microns

POO:
Plan of Operation

ppb:
parts per billion

ppm:
parts per million

PR:
Physical Resources

PRB:
Powder River Basin

PRLA:
Preference Right Lease Application

PSD:
Prevention of Significant Deterioration

R&PP:
Recreation and Public Purpose

R&VS:
Recreation and Visitor Services

RAAT:
Reduced Agent Area Treatment

RAMP:
Recreation Area Management Plan

RCT:
Regional Coal Team

RDF:
Required Design Feature

REA:
Rapid Ecoregional Assessment

READ:

resource advisor

REE:

Rare Earth Elements

REL:

Reference Exposure Level

RFA:

Reasonable Foreseeable Action

RFD:

Reasonable Foreseeable Development

RMA:

Recreation Management Area

RMACC:

Rocky Mountain Area Coordination Center

RMP:

Resource Management Plan

RMZ:

Recreation Management Zone

ROD:

Record of Decision

ROW:

Right-of-Way

RSC:

Recreation Setting Characteristic

RVD:

Recreation Visitor Day

SAR:

Sodium Adsorption Ratio

SCR:

Selective Catalytic Reduction

SD:

Special Designations

SGCN:

Species of Greatest Conservation Need

SHPO:

State Historic Preservation Office

SIP:

State Implementation Plan

SLAMS:

State and Local Air Monitoring Station

SMA:

Surface Management Agency

SMU:

Soil Map Unit

SO₂:

Sulfur dioxide

SO₄:

Sulfate

SOP:

Standard Operating Procedure

SPM:

Special Purpose Monitoring

SR:

Socioeconomic Resources

SRMA:

Special Recreation Management Area

SRP:

Special Recreation Permit

SSS:

Special Status Species

SSURGO:

Soil Survey Geographic Database

STATSGO2:

State Soils Geographic Database

SVR:

Standard Visual Range

SWAP:

State Wildlife Action Plan

SWPPP:

Storm Water Pollutant Prevention Plan

T&E:

Threatened and Endangered

TCP:
Traditional Cultural Property

TDS:
Total Dissolved Solids

TLS:
Timing Limitation Stipulation

TMA:
Travel Management Area

TMDL:
Total Maximum Daily Load

TNC:
The Nature Conservancy

TSD:
Technical Support Document

TTM:
Travel and Transportation Management

U.S.:
United States

U.S.C.:
United States Code

U₃O₈:
Triuranium Octoxide

USDA:
U.S. Department of Agriculture

USFS:
U.S. Forest Service

USFWS:
U.S. Fish and Wildlife Service

USGS:
U.S. Geological Survey

VCR:
Visual Contrast Rating

VOC:
Volatile Organic Compound

VRI:
Visual Resource Inventory

VRM:
Visual Resource Management

WAAQS:
Wyoming Ambient Air Quality Standard

WAFWA:
Western Association of Fish and Wildlife Agencies

WAPA:
Western Area Power Administration

WARMS:
Wyoming Air Resource Monitoring System

WEG:
Wind Erodibility Group

WGFD:
Wyoming Game and Fish Department

WHMA:
Wildlife Habitat Management Area

WHPD:
Wyoming High Plains District

WMA:
Wyoming Mining Association

WNS:
white-nose syndrome

WNv:
West Nile Virus

WO:
Washington Office

WOGCC:
Wyoming Oil and Gas Conservation Commission

WQD:
Water Quality Division

WRAP:
Western Regional Air Partnership

WSA:
Wilderness Study Area

WSEO:
Wyoming State Engineer's Office

WSFD:

Wyoming State Forestry Division

WSGWG:

Wyoming Sage-Grouse Working Group

WSR:

Wild and Scenic River

WUI:

Wildland-urban Interface

WYNDD:

Wyoming Natural Diversity Database

Wyoming DEQ:

Wyoming Department of Environmental Quality

WYPDES:

Wyoming Pollutant Discharge Elimination System

WYSO:

Wyoming State Office

µg/m³:

micrograms per cubic meter

Chapter 1. Purpose and Need for Action

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1.1. Introduction and Background

This Proposed Resource Management Plan (RMP) and Final Environmental Impact Statement (EIS) describes and analyzes alternatives for the future management of public lands and resources administered by the United States Department of the Interior (DOI) Bureau of Land Management (BLM) within the Buffalo Field Office (BFO). Located in north-central Wyoming (Figure 1.1, “Buffalo Field Office Resource Management Plan Planning Area” (p. 3)), the planning area covers approximately 7.4 million acres of federal, state, and private land in three adjacent counties. Of the total area, approximately 780,000 acres are BLM-administered federal surface lands and 4.8 million acres are BLM-administered federal mineral estate.

BLM-administered lands within the planning area are currently managed according to the 1985 Buffalo RMP as updated by the 2001 Buffalo RMP Update and amended by the 2003 Record of Decision (ROD) for the Powder River Basin Oil and Gas Project and Decision Record for the 2011 Fortification Creek RMP Amendment/Environmental Assessment (EA) (BLM 2011c). Shaded text in this document identifies substantive changes between the Draft RMP and EIS and the Proposed RMP and Final EIS. The Buffalo RMP revision is anticipated to be completed by fall 2014.

1.1.1. Land Ownership within the Planning Area

As defined by Federal Land Policy and Management Act (FLPMA), “... public lands means any land and interest in land owned by the United States within the several states and administered by the Secretary of the Interior through the Bureau of Land Management ...” The BFO is responsible for managing public lands in Wyoming’s Campbell, Johnson, and Sheridan counties. County governments have land use planning responsibility for the private lands located within their jurisdictions.

BLM surface exists in scattered tracts throughout the planning area with the largest blocks of contiguous BLM-administered surface lands existing in the center and southwest portions of the planning area (Map 1). There are also large portions of the planning area with intermingled mineral ownerships.

The mineral estate under BLM surface in the planning area is generally federally owned. Mineral estate (shown on Map 2) is determined based on the content of patent documents. The following are common abbreviations used on BLM Master Title Plats (MTPs) to indicate the federal ownership of particular minerals for surface estate that is not federally owned: “All Min” (all minerals), “Coal” (only coal), “Coal OG” (only coal, oil, and gas), “OG” (only oil and gas), and “Coal OG Sod Pot” (only coal, oil, gas, sodium, and potassium). There may also be other abbreviations used to denote other federal mineral ownerships, but are much less common (see Chapter 3 — *Minerals*).

The federal government classifies minerals into locatables, leasables, and salables. The federal government owns all locatable minerals and salable minerals in lands with federal mineral ownership type “All Min.”

Leasable mineral estate can be held for a particular mineral or group of minerals. For example, federal coal includes ownership types “All Min,” “Coal,” “Coal OG,” and “Coal OG Sod Pot,” and federal oil and gas includes ownership types “All Min,” “Coal OG,” “OG,” and “Coal OG Sod Pot.” Leasable minerals other than coal and oil and gas are mentioned in Chapter 3 – *Minerals*.

Lands where the ownership of the surface estate and mineral estate differ are referred to as split estate. In these situations, mineral rights are considered the dominant estate, meaning they take precedence over other rights associated with the property, including those associated with owning the surface. The areas with scattered surface land ownership patterns and varied mineral ownerships, along with split estate lands, affect BLM management options. See Appendix X (p. 2661) for additional information.

Table 1.1, “Acreage of Surface Lands Within Each Jurisdiction of the Buffalo Planning Area” (p. 2) and Table 1.2, “Acreage of BLM-administered Mineral Estate within Each County in the Planning Area” (p. 2) provide summaries of the surface and mineral estate and administrative relationships for the planning area. The Approved RMP will not include planning and management decisions for lands or minerals administered by other federal agencies, privately owned, or owned by the State of Wyoming or local governments.

Table 1.1. Acreage of Surface Lands Within Each Jurisdiction of the Buffalo Planning Area

Agency	Campbell County	Johnson County	Sheridan County	Total
Bureau of Land Management	224,010	504,368	53,724	782,102
Department of Defense	0	0	4,166	4,166
Bighorn National Forest	0	328,220	389,228	717,447
Thunder Basin National Grasslands	144,640	0	0	144,640
Private	2,502,958	1,614,453	1,049,853	5,167,265
State	195,332	220,908	122,366	538,606
Water	0	2,148	0	2,148
Total	3,066,940	2,670,098	1,619,337	7,356,374

Source: BLM 2012f

Table 1.2. Acreage of BLM-administered Mineral Estate within Each County in the Planning Area

Mineral	Campbell County	Johnson County	Sheridan County	Total
Total ¹	2,418,761	1,682,668	701,848	4,803,277
Locatables	1,599,141	1,412,726	336,254	3,348,121
Leasable – Coal	2,411,562	1,663,142	700,432	4,775,136
Leasable – Fluids	1,611,915	1,434,092	340,523	3,386,530
Salables	1,599,141	1,412,726	336,254	3,348,121

Source: BLM 2012f

¹Acreage values are not cumulative. As described below, the federal government may manage multiple mineral resources on a given land parcel.

BLM Bureau of Land Management

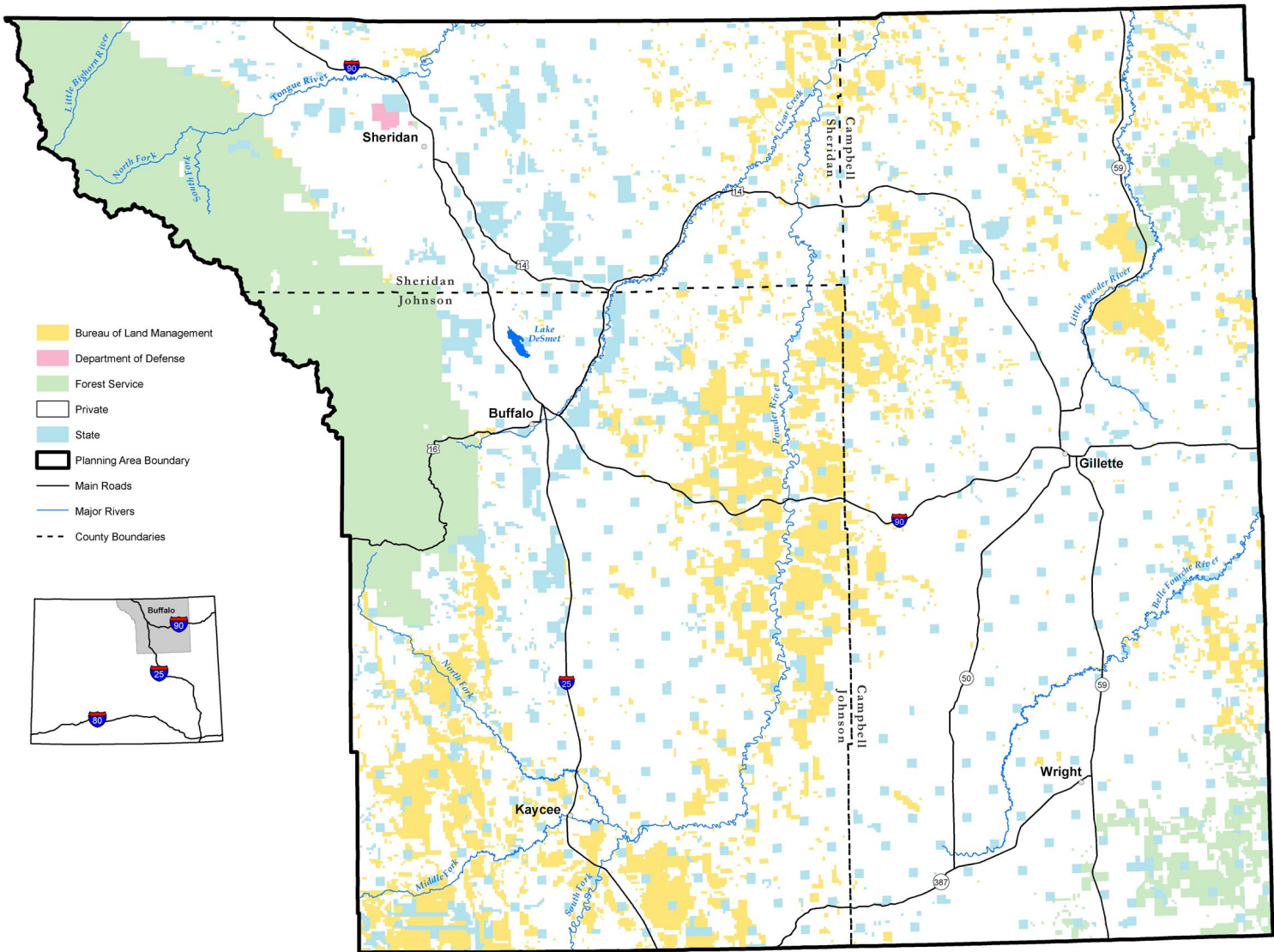


Figure 1.1. Buffalo Field Office Resource Management Plan Planning Area

1.2. Purpose and Need for the Resource Management Plan Revision

1.2.1. Purpose

An RMP is a land use plan that provides direction for managing public lands administered by the BLM in accordance with its multiple use mandate. The FLPMA directs the BLM to develop such land use plans to provide for appropriate uses of public land. Decisions in land use plans guide future land management actions and subsequent site-specific implementation decisions. The RMP establishes goals and objectives (desired outcomes) for resource management and the measures needed to achieve them. These measures are expressed as management actions and allowable uses (i.e., lands that are open or available for certain uses [including any applicable restrictions] and lands that are closed to certain uses). The purpose of revising the existing plan is to address conditions within the planning area that have changed and to evaluate new information in order to develop a management strategy that achieves a combination of the following:

- Employ a community-based planning approach to seek broadly supported solutions to issues, and collaborate with federal, state, and local cooperating agencies.
- Establish goals and objectives (desired outcomes) for management of resources and resource uses within the approximately 780,000 surface acres and 4.8 million acres of federal mineral estate in the planning area administered by the BLM in accordance with the principles of multiple use and sustained yield.
- Identify land use plan decisions to guide future land-management actions and subsequent site-specific implementation decisions.
- Identify management actions and allowable uses anticipated to achieve the established goals and objectives and reach desired outcomes.
- Provide comprehensive management direction by making land use decisions for all appropriate resources and resource uses administered by the BLM in the planning area or by updating existing decisions.
- Provide for compliance with applicable tribal, federal, and state laws, standards, implementation plans, and BLM policies and regulations.
- Recognize the Nation's needs for domestic sources of minerals, food, timber, and fiber, and incorporate requirements of the Energy Policy Act of 2005 (Pub. L. 2005).
- Retain flexibility to adapt to new and emerging issues and opportunities and to provide for adjustments to decisions over time based on new information and monitoring.
- Strive to be compatible with existing plans and policies of adjacent local, state, tribal, and federal agencies while complying with federal law, regulations, and BLM policy.

1.2.2. Need for Revising the Existing Plan

New data have become available, and laws, regulations, and policies regarding management of these public lands have changed. For example; the revised RMP will incorporate appropriate management actions and practices to conserve Greater Sage-Grouse and its habitat on BLM managed lands. In addition, the existing plan's decisions do not satisfactorily address all of the new and emerging issues in the planning area. These changes have resulted in the need to revise the existing plan. The BLM identified the need, or requirement, to revise the existing plan through a formal evaluation of the existing plan, consideration of the Analysis of the Management Situation (AMS) (BLM 2009h), examination of issues identified during the public involvement

process known as scoping, and through collaboration with cooperating local, state, and federal agencies.

New Data

Monitoring, availability of new information, and advances in science and technology provide new data to consider in the revision of the existing plan. Select new data can be found in the following documents and sources:

- BLM Assessing the Potential for Renewable Energy on Public Lands (BLM 2003a)
- Buffalo RMP Revision Analysis of the Management Situation (BLM 2009h)
- Buffalo Mineral Occurrence and Development Potential Report (BLM 2009c)
- BLM Wyoming Statewide Programmatic Endangered Species Act (ESA) Consultations:
 - Bald eagle – 2004 (BLM 2004a)
 - Black-footed ferret – 2006 (BLM 2006a)
 - Black-tailed prairie dog – 2008 (BLM 2008b)
 - Mountain plover – 2007 (BLM 2007l)
 - Ute ladies'-tresses orchid – 2007 (BLM 2007o)
- Cultural Class I Regional Overview (BLM 2010b)
- Energy Policy and Conservation Act of 2000 Scientific Inventory of Onshore Federal Lands Oil and Gas Resources and Reserves and the Extent and Nature of Restrictions or Impediments to their Development (DOI et al. 2003)
- Preliminary Reasonable Foreseeable Development (RFD) Scenario for Oil and Gas (Stilwell et al. 2012)
- Final Programmatic EIS on Wind Energy Development on BLM-Administered Lands in the Western United States (BLM 2005c)
- Executive Order (EO) 2011-5, 2013-3
- Washington Office (WO) Instruction Memorandum (IM)-2012-044
- Wyoming State Office IM 2012-019
- Conservation Buffer Distance Estimates for Greater Sage-Grouse - A Review (USGS 2014)
- Wyoming Greater Sage-Grouse Conservation Plan (WSG WG 2003)
- Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats (Connelly et al. 2004)
- Western Association of Fish and Wildlife Agencies (WAFWA) Greater Sage-Grouse Comprehensive Conservation Strategy (Stiver et al. 2006)
- Northeast Wyoming Sage-Grouse Conservation Plan (NWSGLWG 2006)
- Greater Sage-grouse (*Centrocercus urophasianus*) Conservation Objectives: Final Report. (USFWS 2013c)
- Final EIS for Vegetation on BLM in Seventeen Western States (BLM 2007h)
- Final Programmatic EIS for Geothermal Leasing in the Western United States (BLM 2008e)
- Powder River Basin Oil and Gas Project Final EIS and Plan Amendment (BLM 2003c)
- Fortification Creek RMP Amendment/EA (BLM 2011c)
- Energy Policy Act of 2005
- BLM Manual 6320 – Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process (BLM 2012b)
- DOI Order 3294 – Energy Management Reform (DOI 2010b)

New and Revised Policies

Numerous policies either have been revised or developed since the ROD for the existing plan was signed. A complete list of relevant policies, including new and revised policies, and their effective dates is identified in Appendix A (p. 1771).

The BLM released Handbook H-8320-1, Planning for Recreation and Visitor Services on August 22, 2014. The handbook assists BLM staff in the planning and management of recreation and visitor services on public land. The release of the handbook coincided with the final development of the Proposed RMP/Final EIS. Accordingly, not all recreation and visitor services decisions in this Proposed RMP/Final EIS follow the recommended format provided in the handbook. However, the Proposed RMP/Final EIS complies with the requirements for establishing desired conditions, allowable uses and actions related to the management of recreation and visitor services as discussed in Handbook H-8320-1.

Emerging Issues and Changing Circumstances

Emerging issues and changes in local, regional, and national circumstances to consider when revising the existing plan include the following:

- Increasing and conflicting demands on the planning area's resources
- Increasing complexity of resource management issues
- Changes in resource and resource condition monitoring tasks and the entities conducting monitoring
- Changes in the legal status of plants and wildlife occurring or potentially occurring in the planning area
- Increasing conflicts between resource uses and protection of specific wildlife and wildlife habitat
- Greater Sage-Grouse population viability
- Maintaining public access to public lands
- The spread of invasive plant and animal species on public lands
- Changing demand for energy and minerals development
- Increased interest in renewable energy development across the nation
- The management of riparian areas and water quality concerns
- Fire and fuels management practices and changes in national fire policy
- Changes in livestock grazing practices and rangeland conditions
- Changes in recreation and visitor use levels and locations
- The management and protection of recently discovered cultural and paleontological resources
- Addressing travel management, including increases in off-highway vehicle (OHV) use
- The appropriateness of certain withdrawals, land tenure adjustments, land use authorizations, and Rights-of-Way (ROWs) to include utility corridors ROWs
- Cumulative increase in surface disturbance due to mining and oil and gas activities
- Achieving reclamation success after mineral development activities
- Identification of unique or sensitive areas that meet the criteria for special designation
- Increasing air quality issues affecting human health and regulatory compliance
- Changes to visual resources classifications

Greater Sage-Grouse Management

In March, 2010 the U.S. Fish and Wildlife Service (USFWS) published its decision that listing of the Greater Sage-Grouse as a threatened or endangered species under the ESA was "Warranted but Precluded." Inadequacy of regulatory mechanisms was identified as a major threat in the USFWS finding on the petition to list the Greater Sage-Grouse. The USFWS has identified the

principal regulatory mechanism for the BLM as conservation measures in RMPs. Based on the identified threats to the Greater Sage-Grouse and the USFWS timeline for making a listing decision on this species, the BLM needs to incorporate objectives and adequate conservation measures into RMPs in order for the USFWS to constitute these RMP measures as adequate regulatory mechanisms that conserve the Greater Sage-Grouse, thus contributing to the avoidance of potentially listing the Greater Sage-Grouse.

On November 21, 2014 the U.S. Geological Survey (USGS) published “Conservation Buffer Distance Estimates for Greater Sage-Grouse – A Review” (Open File Report 2014-1239). The USGS review provided a compilation and summary of published scientific studies that evaluated the influence of anthropogenic activities and infrastructure on Greater Sage-Grouse populations. The BLM has reviewed this information and examined how lek buffer-distances were addressed through land use allocations and other management actions in the Draft Buffalo RMP/EIS. The State of Wyoming’s Core Population Area Strategy is designed to protect birds and habitat within core population areas using a suite of tools and mechanisms that work in concert to conserve Greater Sage-Grouse by reducing habitat loss and fragmentation through lek buffers, disturbance limits, excluded activities, and a sophisticated mapping utility to monitor the amount and density of disturbance. The USFWS has informed the BLM that the combined effect of these overlapping and reinforcing mechanisms give USFWS confidence that the lek buffer distances in the Core Population Area Strategy will be protective of breeding Greater Sage-Grouse.

This RMP revision incorporates specific management actions and conservation measures to conserve Greater Sage-Grouse and its habitats on public land.

1.3. Planning Process

The RMP provides basic program direction with the establishment of goals, objectives, and allowable uses. The RMP focuses on what resource conditions, uses, and visitor experiences should be achieved and maintained over time. Since this involves considering natural processes with long-term timeframes, the RMP must take a long-term view.

The planning process is the result of the FLPMA requirement to manage lands under comprehensive plans and the National Environmental Policy Act (NEPA) requirement to analyze alternatives in an EIS and evaluate and disclose impacts for all major federal actions with the potential to result in significant impacts. This EIS analyzes four alternatives, including the NEPA-required No Action Alternative.

1.3.1. BLM Planning Process

Figure 1.2, “BLM Planning Process” (p. 8) illustrates the planning process used to develop and revise RMPs as required by 43 Code of Federal Regulations (CFR) 1600 and planning program guidance in the BLM Handbook H-1601-1, Land Use Planning Handbook (BLM 2005b). The planning process is designed to help the BLM identify the uses of BLM-administered lands desired by the public and to consider these uses to the extent they are consistent with the laws established by Congress and the policies of the executive branch of the federal government.

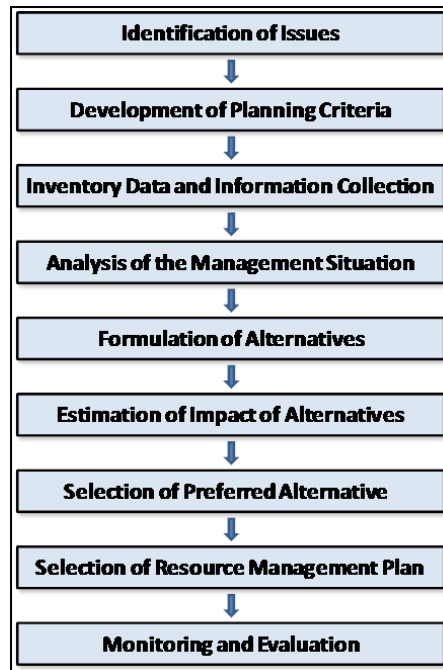


Figure 1.2. BLM Planning Process

The planning process is issue-driven. The BLM utilized the public scoping process to identify planning issues. The scoping process also was used to introduce the public to preliminary planning criteria, and define the scope of the RMP revision.

The BLM collected data to address planning issues and to fill data gaps identified during public scoping. Using this data, the planning issues, and the planning criteria, the BLM conducted an AMS to describe current management and identify management opportunities for addressing the planning issues. Current management reflects management under the existing RMP and management that would continue through selection of the No Action Alternative.

The first steps of the planning process clarified the purpose and need and identified key planning issues to be addressed by the RMP revision. Key planning issues reflect the focus of the RMP revision and are described in more detail in the *Planning Issues* section.

During alternative formulation, the BLM collaborated with cooperating agencies to identify goals and desired outcomes for resources and resource uses in the planning area. These desired outcomes addressed the key planning issues, were constrained by the planning criteria, and incorporated the management opportunities identified by the BLM.

The details of alternatives were filled in through the development of management actions and allowable uses anticipated to achieve the goals and objectives. The alternatives represent a reasonable range for managing resources and resource uses within the planning area. Chapter 2 of this document describes and summarizes the alternatives.

The BLM analyzed the impacts of each alternative in Chapter 4. With input from cooperating agencies and BLM specialists, and consideration of planning issues, planning criteria, and the impacts of alternatives, the BLM selected Alternative D as the Preferred Alternative and published the plan in the Draft RMP and EIS.

The Draft RMP and EIS was published on June 28, 2013, initiating the 90-day public comment period that closed on September 26, 2013. Following receipt and consideration of public comments on the Draft RMP and EIS, the BLM prepared this Proposed RMP and Final EIS.

The publication of the Notice of Availability in the FR for this Proposed RMP and Final EIS initiated a 30-day protest period and 60-day Governor's consistency review period. The BLM will resolve protests and the Governor's recommended changes and prepare a ROD and Approved RMP.

1.3.2. Resource Management Plan Implementation

After issuing the Approved RMP and ROD, an Implementation Strategy will be developed. The Implementation Strategy will include an annual coordination meeting between the BLM and the agencies cooperating in the RMP revision. The annual coordination meeting will include an update on implementation of the plan, foreseeable activities for the upcoming year, and opportunities for continued collaboration with the RMP cooperators. Additional coordination meetings could be held as needed.

Planning and decision making for the management of public lands is a hierarchal process. The hierarchy of documents that BLM decision-makers consider for planning and project implementation is:

- **Land Use Plans.** The highest level of decision-making specific to land use is the resource management plan (RMP). RMPs generally make land allocations and provide goals and objectives for managing specific areas of land. They provide the framework for managing all natural resources under BLM authority for the planning area. Plan decisions are based on a public NEPA disclosure process, usually an EIS.
- **Activity Plans.** Mid-level decisions are provided in activity plans. These plans contain more detailed management decisions than do RMPs. Activity plans address management of specific programs or areas. Examples include allotment management plans, recreation area management plans, and habitat management plans. An activity plan usually selects and applies best management practices to meet land use plan objectives. Decisions that cover major (often geographically widespread) proposals lead to coordinated activity plans that cover all programs in an integrated manner.
- **Project Plans.** The BLM analyzes individual projects proposed in a specific location for localized or site-specific effects. For example, the BLM would evaluate a range improvement proposal with a site-specific environmental analysis including NEPA, Endangered Species Act (ESA) consultation, and National Historic Preservation Act (NHPA) consultation.

1.4. Decision Framework

As described in the previous section, identifying the planning issues and developing planning criteria (discussed in detail below) are the first steps in defining the scope of the RMP revision. The planning issues and planning criteria provide the framework in which RMP decisions are made. RMP decisions refer to what is established or determined by the final RMP. For example, the BLM received nominations (issues) for Areas of Critical Environmental Concern (ACECs). These issues fall within one of the planning criteria (see *Planning Criteria* section), the need to identify and analyze areas potentially suitable for ACEC designation. The RMP revision

will establish (decide) whether any ACEC will be designated within the planning area. In this example, the land use planning decision is referred to as a special designation. The RMP provides guidance for land use planning decisions according to the following categories:

- Physical, biological, and heritage resources
- Resource uses and support
- Special designations

In the context of these categories, the planning team develops management strategies aimed at providing viable options for addressing planning issues. The management strategies provide the building blocks from which general management scenarios and, eventually, the more detailed resource management alternatives, are developed. The resource management alternatives reflect a reasonable range of management options that fall within the planning criteria. The following sections describe the planning issues and planning criteria used to revise the existing plan.

1.4.1. Planning Issues

The BLM conducted public scoping to determine the issues to be addressed in this RMP EIS. As part of the scoping process, the BLM solicited comments and issues from the public, organizations, tribal governments, and federal, state, and local agencies, as well as from BLM specialists. The BLM's Land Use Planning Handbook (BLM 2005b) defines planning issues as "...disputes or controversies about existing and potential land and resource allocations, levels of resource use, production, and related management practices." Issues identified during the scoping and RMP revision process for this EIS comprise two categories:

- Issues within the scope of the EIS and used to develop alternatives or otherwise addressed in the EIS.
- Issues outside the scope of the EIS or that could require policy, regulatory, or administrative actions.

Issues determined to be within the scope of the EIS were used to develop one or more of the alternatives or are addressed in other parts of the EIS. For example, as planning issues were refined, the BLM collaborated with cooperating agencies to develop a reasonable range of alternatives designed to address or resolve key planning issues, such as what areas are suitable for energy and mineral resource development. A reasonable range of alternatives provides various management approaches for how the BLM and cooperating agencies can address this and other key planning issues, including the management of resources and resource uses in the planning area. In other words, key planning issues serve as the rationale for alternative development. The preliminary key planning issues identified from scoping are presented below.

Air Quality and Climate Change

- How can the BLM manage activities occurring on public lands to ensure they do not contribute to air quality-related impacts to human health or resource values?
- How should the BLM incorporate consideration of climate change into its land management practices?

Water Quality and Riparian/Wetlands Areas

- How should the BLM manage the use and development of public lands to ensure surface and groundwater resources are available and of sufficient quality for public, wildlife, and other uses?

- How can BLM-administered lands be managed to protect wetland and riparian areas?

Mineral and Energy Resources

- Which areas should be open to mineral and energy development and how will the BLM address issues related to split estate lands?
- What management and leasing actions are needed for mineral and energy developments to protect natural, biological, and cultural resources?

Biological Resources: Vegetation, Fish, Wildlife, and Special Status Species

- What management actions or development actions are needed to protect, improve, or restore terrestrial and aquatic habitats for fish, wildlife, and special status species?
- How can BLM management sustain ecosystem health while providing for multiple uses?
- In March 2010, the USFWS determined that the Greater Sage-Grouse warranted protection under the ESA, but that listing the species was precluded by the need to address other, higher-priority species first (75 Federal Register [FR] 13910, March 23, 2010). One reason for the USFWS decision was an identified need for “improved regulatory mechanisms” to ensure species conservation. The principal regulatory mechanisms for the BLM are RMPs, therefore, the BLM is using this opportunity to develop long-term and effective management for the species on BLM-administered lands (WO IM No. 2012-044).

Invasive Species and Pest Management

- What development stipulations and management actions are appropriate to control and prevent the spread of noxious weeds, pests, and invasive species?

Cultural and Paleontological Resources and Tribal Concerns

- How can the BLM protect paleontological resources, cultural and heritage sites, and traditional cultural properties?
- How can the BLM effectively involve Native Americans in BLM management and decision making?

Lands and Realty and Rights-Of-Way

- How can land tenure and management adjustments be used for access and development, while also protecting natural, biological, and cultural resource values?
- Which areas should be available for renewable energy development and how should this development be managed to protect other resource values and uses?

Travel and Transportation Management

- How should travel, including OHV use be managed for recreational and commercial access, while also protecting natural, biological, and cultural resources?

Recreation

- How should the BLM manage recreation on public lands to provide a full spectrum of recreational opportunities, while ensuring public safety and the protection of resources values?

Livestock Grazing Management

- How should the BLM manage livestock grazing on public lands to ensure the protection of natural, biological, and cultural resources while maintaining grazing-dependent socioeconomic and heritage values?

Special Designations

- What areas contain sensitive resources requiring special management and what, if any, special designations are appropriate to protect them?

Socioeconomic Resources

- How can the BLM protect natural, biological, and cultural resources while managing BLM-administered lands to support local economies and traditions tied to these lands?

In addition to key planning issues, other issues, themes, and positions were identified during the scoping process. Those issues determined to be outside the scope of the EIS or that would require policy, regulatory, or administrative actions to be addressed were not used to develop alternatives and were not carried forward in this Proposed RMP and EIS.

For a detailed description of all issues identified during scoping, please refer to the Buffalo RMP Revision Project Final Scoping Report (BLM 2009d). This scoping report describes the public involvement process and the issues identified by the public. The report is available on the Buffalo RMP Revision website, <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo.html>.

1.4.2. Planning Criteria

Planning criteria are the standards, rules, and guidelines that help to guide the RMP planning process. These criteria influence all aspects of the planning process, including inventory and data collection, developing issues to address, formulating alternatives, estimating impacts, and selecting the Preferred Alternative and the Proposed RMP. In conjunction with the planning issues, planning criteria ensure that the planning process is focused and incorporates appropriate analyses. Planning criteria are developed from appropriate laws, regulations, and policies. The criteria also help to guide the final plan selection and are used as a basis for evaluating the responsiveness of the planning options.

The planning criteria for this RMP revision are as follows:

- The proposed RMP will be in compliance with the FLPMA and all other applicable laws, regulations, and policies.
- Impacts from the management alternatives considered in the revised RMP will be analyzed in an EIS developed in accordance with regulations at 43 CFR 1610 and 40 CFR 1500.
- Lands covered in the RMP will be public land including split estate managed by the BLM. No decisions will be made relative to non-BLM-administered lands.

- The planning process will follow 10 stages of an EIS-level planning process: conducting scoping, development of an AMS report, formulation of alternatives, analysis of the alternatives' effects, selection of a preferred alternative, publication of a Draft RMP and EIS, providing a 90-day public comment period for the Draft RMP and EIS, preparation and publication of a Proposed RMP and Final EIS, providing a 30-day public protest period, and preparation of a ROD. For specific information, please see the Land Use Planning Handbook, H-1601-1.
- For program specific guidance of land use planning level decisions, the process will follow the Land Use Planning Manual 1601 and Handbook H-1601-1, Appendix C.
- Broad-based public participation will be an integral part of the planning and EIS process.
- Decisions in the plan will strive to be compatible with the existing plans and policies of adjacent local, state, federal, and tribal agencies to the extent those plans and policies are also consistent with the purposes, policies, and programs of federal law, and regulations applicable to public lands.
- The RMP will recognize the state's responsibility and authority to manage wildlife. The BLM will consult with the Wyoming Game and Fish Department (WGFD).
- The National Greater Sage-Grouse Habitat Conservation Strategy (BLM 2004b) requires that impacts to sagebrush habitat and sagebrush-dependent wildlife species (including Greater Sage-Grouse) be analyzed and considered in BLM land use planning efforts for the public lands with Greater Sage-Grouse sagebrush habitats.
- The BLM will utilize the WAFWA Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats (Connelly et al. 2004), and any other appropriate resources, to identify Greater Sage-Grouse habitat requirements and best management practices.
- The RMP will comply with WO IM-2012-044 and address public comments received during national scoping related to WO IM-2012-044 implementation.
- The RMP will recognize valid and existing rights.
- The RMP and EIS will incorporate management decisions brought forward from existing planning documents including but not limited to the 2003 Powder River Basin Oil and Gas Project Final EIS and RMP Amendment (BLM 2003c) and the 2011 Fortification Creek Planning Area Final RMP Amendment (BLM 2011c).
- The planning team will work cooperatively and collaboratively with cooperating agencies and all other interested groups, agencies, and individuals.
- The BLM and cooperating agencies will jointly develop alternatives for resolution of resource management issues and management concerns.
- The planning process will incorporate the Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the BLM in the State of Wyoming as goal statements.
- The BLM will identify lands with wilderness characteristics and analyze a range of management alternatives for this resource, pursuant to BLM Manuals 6310 and 6320.
- Areas with special environmental qualities will be designated as ACECs or other appropriate designations if necessary for their protection.
- Suitable segments of Wild and Scenic Rivers will be managed pursuant to Manual 6400 to protect or enhance the free-flowing condition, water quality, tentative classification, and any outstandingly remarkable values of suitable river segments until Congress designates the river or releases it for other uses. This RMP revision effort will analyze future management options should Congress release the suitable segment to other uses..
- Wilderness Study Areas (WSAs) will be managed pursuant to BLM Manual 6330 – Management of Wilderness Study Areas, which replaces the Interim Management Policy for Lands Under Wilderness Review, until Congress either designates all or portions of the WSA

as wilderness or releases the lands to other uses. This RMP revision effort will analyze future management options should Congress release any WSAs to other uses.

- Forest management strategies will be consistent with the Healthy Forests Restoration Act.
- The Wyoming High Plains District (WHPD) Fire Management Plan (FMP) will be updated to reflect objectives from this RMP, and will be implemented to address fire management on a landscape level.
- Geographic Information System (GIS) and metadata information will meet Federal Geographic Data Committee standards, as required by EO 12906. All other applicable BLM data standards will also be followed.
- The planning process will involve American Indian Tribal governments and will provide strategies for the protection of recognized traditional uses.
- All proposed management actions will be based upon current scientific information, research and technology, as well as existing inventory and monitoring information.
- The RMP will include adaptive management criteria and protocols to deal with future issues.
- The planning process will use the Wyoming BLM Mitigation Guidelines to develop management options and alternatives and analyze their impacts as well as part of the planning criteria for developing the options and alternatives and for determining mitigation requirements.
- A RFD scenario for fluid minerals will be developed.
- Planning and management direction will be focused on the relative values of resources and not the combination of uses that will give the greatest economic return or economic output.
- Coal screening was completed in 2001 for areas within the Buffalo planning area with coal development potential located in Campbell and Sheridan Counties of Wyoming. These coal screening decisions updated the Buffalo RMP and the Thunder Basin National Grasslands Land RMP. Based on the results for of our call for coal resource information, no additional coal planning decisions will be made for the Buffalo RMP, and the 2001 decisions identifying areas acceptable for further consideration for coal leasing, will be moved forward into the revised RMP.
- The RMP and EIS will address *Pennaco v. U.S.*, 377 F.3d 1147 (10th Cir. 2004) requiring analysis of coalbed natural gas development for fluid mineral leasing decisions in the Powder River Basin.

1.4.3. Major Statutes, Policies, and Regulations

Numerous federal and state laws and applicable regulations, policies, and actions affect the alternatives analyzed in this Proposed RMP and Final EIS. The FLPMA is the primary authority for the BLM's management of public lands. This law provides the overarching policy by which public lands are managed and establishes provisions for land use planning, land acquisition, administration, range management, ROW, designated management areas, and the repeal of certain laws and statutes. Sections 201 and 202 of the FLPMA establish the BLM's land use planning requirements. BLM Handbook H-1601-1, Land Use Planning Handbook, provides guidance for implementing the BLM land use planning requirements established by Sections 201 and 202 of the FLPMA and the land use planning regulations found in 43 CFR 1600 (BLM 2005b).

The NEPA stipulates the process through which public officials should make decisions that consider the environmental consequences of their actions and work to protect, restore, and enhance the human environment. NEPA provides for public input regarding issue identification and consideration of the environmental impacts of major federal actions that affect the quality of the human environment.

The NEPA also created the Council on Environmental Quality (CEQ), which has issued regulations (40 CFR 1500-1508) to ensure proper consideration of environmental concerns in federal decision making. The DOI and the BLM have in turn published their own regulations and guidance related to implementation of the NEPA process and CEQ Regulations (43 CFR Part 46, DOI DM Part 516 and BLM Handbook H-1790-1).

Many additional laws, regulations, and policies guide the management of public lands and are therefore relevant to this RMP revision. A list of these laws, regulations, and policies is provided in Appendix A (p. 1771).

1.4.4. Other Related Plans

The BLM is aware that there are specific state laws and local plans relevant to aspects of public land management that are discrete from, and independent of, federal law. However, BLM is bound by federal law. As a consequence, there may be inconsistencies that cannot be reconciled. The FLPMA and its implementing regulations require that BLM's land use plans be consistent with officially-approved state and local plans only if those plans are consistent with the purposes, policies, and programs of federal laws and regulations applicable to public lands. Where officially-approved state and local plans or policies and programs conflict with the purposes, policies, and programs of federal law applicable to public lands, there will be an inconsistency that cannot be resolved. With respect to officially-approved state and local policies and programs (as opposed to plans), this consistency provision only applies to the maximum extent practical. While county and federal planning processes, under FLPMA, are required to as integrated and consistent as practical, the federal agency planning process is not bound by or subject to state or county plans, planning processes, policies, or planning stipulations. Table 1.3, "Related Plans" (p. 16), identifies plans that are related to the management of land and resources considered in this RMP revision.

Table 1.3. Related Plans

Related Plans	
Bighorn National Forest Plan 2005 (USFS 2005)	Powder River Watersheds Water Quality Management Plan (Powder River Conservation District and Powder River Watersheds Steering Committee 2007)
Campbell County Community Wildfire Protection Plan, 2007 (Campbell County 2007a)	Sheridan County Comprehensive Plan (Sheridan County 2008)
Campbell County Conservation District: Long Range and Natural Resource Management Plan 2010-2015 (CCCD 2009)	Sheridan County Wildland Fire Mitigation Plan, September 2009 (Sheridan County 2009)
Campbell County Land Use Plan (Campbell County 2007b)	Thunder Basin National Grassland Land Use and Resource Management Plan (USFS 2002)
Donkey/Stonepile Creek Watershed Plan (CCCD and Donkey/Stonepile Creeks Watershed Steering Committee 2006)	United States EPA Region 8 Wyoming State Implementation Plans (EPA 1989 - 2004)
Gillette Fishing Lake Water Quality Improvement Plan (CCCD and City of Gillette 2005)	Wyoming Department of Agriculture Strategic Plan (Wyoming DOA 2008a)
Goose Creek Watershed Management Plan 2004 (Sheridan County Conservation District 2004)	Wyoming Sage-Grouse Conservation Plan (WSGWG 2003)
Johnson County Community Wildfire Protection Plan, Evaluation and Update, March 2010 (Johnson County 2010)	Wyoming Game and Fish Strategic Habitat Plan (WGFD 2001)
Johnson County Land Use Plan (Johnson County 2005)	Wyoming SHPO Comprehensive Statewide Historic Preservation Plan 2007-2015 (Wyoming SHPO 2007)
Lake DeSmet Conservation District Plan (Lake DeSmet Conservation District 2006)	Wyoming State Water Plan Northeast River Basins (Wyoming Water Development Commission 2002a)
Little Powder River Watershed Plan (CCCD and Little Powder River Watershed Steering Committee 2006)	Wyoming State Water Plan Powder/Tongue River Basins 2002 (Wyoming Water Development Commission 2002b)
National Fire Plan (USDA and DOI 2000)	Wyoming Statewide Comprehensive Outdoor Recreation Plan (Wyoming SPHS 2009)
Northeast Wyoming Sage-Grouse Conservation Plan (NWSGLWG 2006)	Wyoming Statewide Trails Plan 2004 (Wyoming SPCR 2004)
Powder River Conservation District Plan (Powder River Conservation District 2005)	BLM National Greater Sage-Grouse Planning Strategy Notice of Intent (BLM 2011f)
EPA Environmental Protection Agency SHPO State Historic Preservation Office USDA United States Department of Agriculture USFS U.S. Forest Service	

1.5. Collaboration

This section describes specific actions taken by the BLM to consult and coordinate with tribes, government agencies, and interest groups, and to involve the interested public during preparation of the Proposed RMP and Final EIS. A Notice of Intent (NOI) published in the FR on November 14, 2008, formally announced the intent of the BLM to revise the existing plan and prepare the associated EIS. Publication of the NOI initiated the scoping process and invited participation of affected and interested agencies, organizations, and the general public in determining the scope and issues to be addressed by alternatives and analyses in the EIS.

The Notice of Availability announcing the release of the Draft RMP and EIS was published in the FR on June 28, 2013, initiating the 90-day public comment period that ended on September 26, 2013. During the public comment period, the BLM hosted four public meetings in August 2013, in towns and cities throughout the planning area. During this time, the public was encouraged

to review the Draft RMP and EIS and provide comments. The BLM considered all substantive comments received and revised the plan based on certain issues raised in the comments, as presented in this Proposed RMP and Final EIS. The BLM prepared a Comment Analysis Report that summarizes all substantive comments received during the 90-day public comment period and the BLM's responses to those comments, including how the agency revised the RMP and EIS based on comments. The Comment Analysis Report is presented in Appendix Y (p. 2671).

Additional detail regarding actions taken by the BLM to involve the public and consult and coordinate with tribes, government agencies, and interest groups is provided in Appendix C (p. 1843).

1.5.1. Consultation and Coordination

This section documents the consultation and coordination efforts undertaken by the BLM throughout the process of revising the RMP and developing the Proposed RMP and Final EIS. Title II, Section 202, of FLPMA directs the BLM to coordinate inventory, planning, and management efforts with the land use planning and management programs of Native American tribes, other federal departments, and agencies of the state and local governments as part of its land use planning process, to the extent consistent with the laws governing the administration of the public lands. The BLM is also directed to integrate NEPA requirements with other environmental review and consultation requirements to reduce paperwork and delays (40 CFR 1500.4-5). The BLM accomplished coordination with other agencies and consistency with other plans through ongoing communications, meetings, and collaborative efforts with the Interdisciplinary Team, which includes BLM specialists and federal, state, and local agencies. A list of the cooperating agencies that have actively participated in cooperators' meetings leading up to the development of the Proposed RMP and Final EIS include the following:

Counties

- Campbell County Commission
- Crook County Commission
- Johnson County Commission
- Sheridan County Commission

Conservation Districts

- Campbell County Conservation District
- Lake DeSmet Conservation District
- Powder River Conservation District

Wyoming State Agencies

- Office of the Governor
- Department of Agriculture
- Department of Revenue
- State Geological Survey
- Office of State Lands and Investments
- Oil and Gas Conservation Commission
- State Historic Preservation Office
- State Engineer's Office
- State Forestry Division
- State Parks and Cultural Resources

- State Trails Program
- Travel and Tourism
- Water Development Commission
- Department of Environmental Quality
- Department of Transportation
- Game and Fish Department

Federal Agencies

- United States Environmental Protection Agency (EPA), Region 8
- U.S. DOI – Office of Surface Mining
- United States Forest Service – Medicine Bow-Routt National Forest, Thunder Basin National Grasslands

Native American Tribes

- Northern Cheyenne Tribe

The BLM formally invited the cooperating agencies to participate in developing RMP alternatives and providing existing data and other information relative to their agency responsibilities, goals, mandates, and expertise. Cooperating agencies provided input during the initial scoping process on issues of special expertise or legal jurisdiction. In addition, cooperating agencies participated in a series of alternative formulation workshops, reviewed draft information and documents, and periodically met with BLM management and resource specialists throughout the revision process to discuss planning issues and provide input to the process. Table 1.4, “Meetings with Cooperating Agencies” (p. 18) lists these meetings and workshops.

Table 1.4. Meetings with Cooperating Agencies

Date	Location	Type of Meeting
October 22 – 23, 2008	Buffalo, Wyoming	Cooperating Agency Training
October 22, 2008	Buffalo, Wyoming	Socioeconomic Workshop
May 20 – 22, 2009	Buffalo, Wyoming	Goals and Objectives Development Workshop
June 17 – 18, 2009	Buffalo, Wyoming	Range of Alternatives Development Workshop
July 15 – 16, 2009	Buffalo, Wyoming	Range of Alternatives Development Workshop
August 19 – 20, 2009	Buffalo, Wyoming	Range of Alternatives Development Workshop
September 16 – 17, 2009	Buffalo, Wyoming	Range of Alternatives Development Workshop
October 7 – 8, 2009	Buffalo, Wyoming	Range of Alternatives Development Workshop
April 27 – 29, 2010	Buffalo, Wyoming	Preferred Alternative Development Workshop

In addition, the following federal Congressional Offices participated in the meetings with Cooperating Agencies.

- United States Senator Michael Enzi’s Office
- United States Senator John Barrasso’s Office
- United States Representative Cynthia Lummis’ Office

Endangered Species Act Consultation

The USFWS provided the BFO with a list of species on August 15, 2008 to be considered when evaluating actions under the ESA of 1973. The species include: black-footed ferret, blowout penstemon, and Ute ladies'-tresses orchid. Scoping comments provided by the USFWS on January 5, 2009 confirmed the listed species for ESA evaluation and recommended the RMP consider additional species of concern. The USFWS provided an updated ESA species list on August 26, 2010. The August 2010 species list contains the following four species: blowout penstemon, Ute ladies'-tresses orchid, mountain plover and Greater Sage-Grouse. On May 12, 2011, the USFWS withdrew the proposal to list the mountain plover as a Threatened species. On June 30, 2011, the BLM BFO requested that the USFWS remove blowout penstemon from the BFO list after further data and site visits provided clarification that neither the flower nor potential habitat was present. The USFWS agreed that it is unlikely the BFO planning area contains suitable habitat and removed it from the list. Recently (May 2015), the northern long-eared bat was listed as Threatened under the ESA by the USFWS.

The list of species that the USFWS requested to be considered for the BFO planning area now contains three species: Ute ladies'-tresses orchid, a Threatened species, northern long-eared bat, a Threatened species, and Greater Sage-Grouse, a Candidate species.

The USFWS was provided opportunities to comment on the Draft RMP and EIS and Draft Biological Assessment. Consultation letters concerning the Buffalo RMP revision project are located in Appendix C (p. 1843). Consultation will continue through completion of the final biological opinion and final RMP. The Final Biological Assessment is included as Appendix I (p. 2025).

Native American Interests

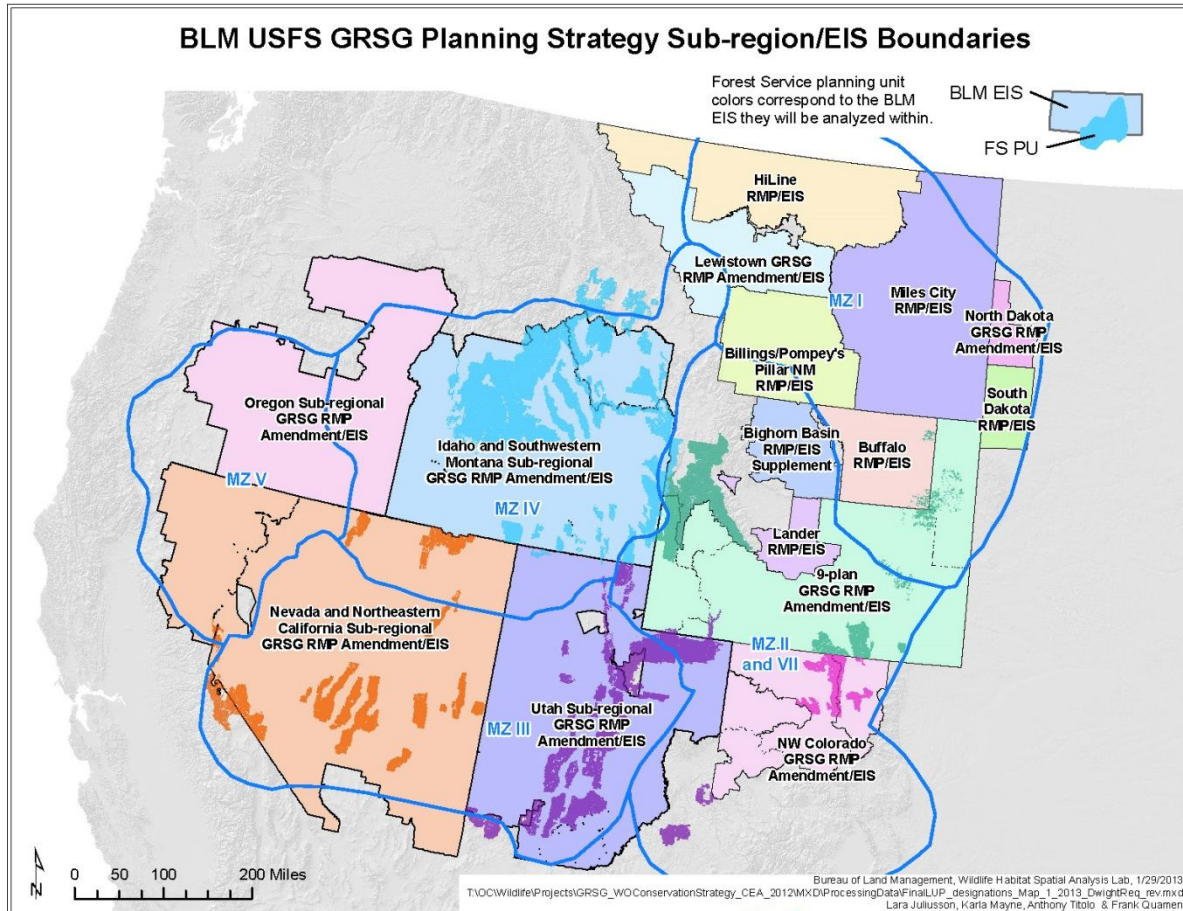
Consultation with Native American tribes is part of the NEPA scoping process and a requirement of FLPMA. The BLM took multiple steps to contact the tribes and include them in the scoping process. On September 19, 2008, the BLM sent letters to the following tribes inviting them to be part of the planning process through consultation and public scoping meetings, as well as requesting information to be considered in the planning process:

- Cheyenne River Sioux
- Crow
- Eastern Shoshone
- Ft. Peck/Assiniboine/Sioux
- Northern Arapahoe
- Northern Cheyenne
- Oglala Sioux
- Three Affiliated Tribes

1.6. National Greater Sage-Grouse Planning Strategy

On December 9, 2011, a Notice of Availability was published in the FR to initiate the BLM Greater Sage-Grouse Planning Strategy across nine western states, including California, Oregon, Nevada, Idaho, Utah, and Southwest Montana in the Great Basin Region and Northwest Colorado, Wyoming, Montana, South Dakota, and North Dakota in the Rocky Mountain Region. This Proposed RMP and Final EIS is one of fourteen separate EISs that are currently being conducted in conjunction with the U.S. Forest Service to analyze and incorporate specific conservation

measures across the range of the Greater Sage-Grouse, consistent with National BLM policy. Figure 1.3, “Greater Sage-Grouse Planning Strategy Subregion/EIS Boundaries” (p. 20) depicts the national Greater Sage-Grouse BLM and U.S. Forest Service planning subregions and EIS boundaries.



Source: BLM 2013m

*These areas will not have plan amendments, but statistics will be generated for them as they contain Preliminary General Habitat.

Note: U.S. Forest Service unit colors correspond to the region they will be analyzed within.

EIS Environmental Impact Statement
FO Field Office
GRSG Greater Sage-Grouse
MZ Management Zone
RMP Resource Management Plan

Figure 1.3. Greater Sage-Grouse Planning Strategy Subregion/EIS Boundaries

On December 27, 2011, the BLM WO released IM No. 2012-044, which directed all of the planning efforts across the Greater Sage-Grouse range to consider all applicable conservation measures when revising or amending its RMPs in Greater Sage-Grouse habitat, including the measures developed by the National Technical Team (NTT) that were presented in their December 2011 document – *A Report on National Greater Sage-Grouse Conservation Measures*.

IM-2012-044 directs all planning efforts associated with the national strategy to consider and analyze (as appropriate) the conservation measures presented in the report.

While energy development has been identified as the primary threat to the Greater Sage-Grouse within its eastern range, this area is not immune to the threat of wildfire. Within the Rocky Mountain Region wildfire was identified by the Conservation Objectives Team Final Report (2013) as a present and widespread threat in seven of thirteen priority areas of conservation and as a present but localized threat in the remaining priority areas of conservation. While fire is a naturally occurring disturbance in the sagebrush steppe, the incursion of non-native annual grasses is facilitating an increase in mean fire frequency which can preclude the opportunity for sagebrush to become re-established. As such the RMP includes requirements (referred to as Greater Sage-Grouse Wildfire and Invasive Species Habitat Assessment in appendices in Draft documents) that landscape scale Fire and Invasives Assessments be completed and updated regularly to more accurately define specific areas to be treated to address threats to sagebrush steppe habitat. Within the Rocky Mountain region, assessments have not yet been completed but will be scheduled based on the need to identify and address potential threats. Additionally, the Secretary of Interior issued Secretarial Order 3336 on January 5, 2015 which establishes the protection, conservation and restoration of “the health of the sagebrush-steppe ecosystem and, in particular, Greater Sage-Grouse habitat, while maintaining safe and efficient operations as a critical fire management priority for the Department”. The Secretarial Order will result in a final report of activities to be implemented prior to the 2016 Western fire season. This will include prioritization and allocation of fire resources and the integration of emerging science, enhancing existing tools to implement the RMP and improve our ability to protect sagebrush-steppe from damaging wildfires.

Along with the applicable measures that were outlined in the NTT Report, planning efforts associated with this National Greater Sage-Grouse Planning Strategy will also analyze applicable conservation measures that were submitted to the BLM from various state governments and from citizens during the public scoping process. It is the goal of the BLM to make a final decision on these plans by the end of 2015, so that adequate regulatory mechanisms are incorporated in place before the USFWS makes a listing decision.

Greater Sage-Grouse Conservation Objectives: Priority Areas for Conservation and How They Correlate with Priority and General Habitat Management Areas

In 2012, the Director of the USFWS asked the Conservation Objectives Team, consisting of state and USFWS representatives, to produce recommendations regarding the degree to which the threats need to be reduced or ameliorated to conserve greater sage-grouse so that it would no longer be in danger of extinction or likely to become in danger of extinction in the foreseeable future. The Conservation Objectives Team Report (USFWS 2013a) provides objectives based upon the best scientific and commercial data available at the time of its release. The BLM and USFS planning decisions analyzed in land use plans/EISs are intended to ameliorate threats identified in the Conservation Objectives Team Report and to reverse the trends in habitat condition. The Conservation Objectives Team Report can be viewed online at the following address: <http://www.fws.gov/mountain-prairie/species/birds/sagegrouse/COT/COT-Report-with-Deer-Interested-Reader-Letter.pdf>

*Chapter 1 Purpose and Need for Action
Greater Sage-Grouse Conservation Objectives:
Priority Areas for Conservation and How
They Correlate with Priority and General
Habitat Management Areas*

The highest level objective in the Conservation Objectives Team Report is identified as meeting the objectives of WAFWA's 2006 Greater Sage-grouse Comprehensive Strategy of "reversing negative population trends and achieving a neutral or positive population trend."

The Conservation Objectives Team Report provides a WAFWA Management Zone and Population Risk Assessment. The report identifies localized threats from sagebrush elimination, fire, conifer encroachment, weed and annual grass invasion, mining, free-roaming wild horses and burros, urbanization, and widespread threats from energy development, infrastructure, grazing, and recreation (USFWS 2013a, p. 18).

Key areas across the landscape that are considered "necessary to maintain redundant, representative, and resilient populations" are identified within the Conservation Objectives Team Report. The USFWS in concert with the respective state wildlife management agencies identified these key areas as priority areas for conservation.

Within the Buffalo RMP Revision Project Planning Area, the priority areas for conservation consist of a total 1,183,244 acres, regardless of ownership. Under the Proposed Plan, the Priority Areas for Conservation are comprised of 137,440 acres of Priority Habitat Management Areas managed by the BLM, 628,162 acres of General Habitat Management Areas managed by the BLM, and 16,500 acres of non-habitat managed by the BLM.

While energy development has been identified as the primary threat to the Greater Sage-Grouse within its eastern range, this area is not immune to the threat of wildfire. Within the Rocky Mountain Region wildfire was identified by the Conservation Objectives Team Final Report (2013) as a present and widespread threat in seven of thirteen priority areas of conservation and as a present but localized threat in the remaining priority areas for conservation. While fire is a naturally occurring disturbance in the sagebrush steppe, the incursion of non-native annual grasses is facilitating an increase in mean fire frequency which can preclude the opportunity for sagebrush to become re-established. As such the RMP includes requirements (referred to as Greater Sage-Grouse Wildfire and Invasive Species Habitat Assessment in appendices in Draft documents) that landscape scale Fire and Invasives Assessments be completed and updated regularly to more accurately define specific areas to be treated to address threats to sagebrush steppe habitat. Within the Rocky Mountain region, assessments have not yet been completed but will be scheduled based on the need to identify and address potential threats. Additionally, the Secretary of Interior issued Secretarial Order 3336 on January 5, 2015 which establishes the protection, conservation and restoration of "the health of the sagebrush-steppe ecosystem and, in particular, greater sage-grouse habitat, while maintaining safe and efficient operations as a critical fire management priority for the Department". The Secretarial Order will result in a final report of activities to be implemented prior to the 2016 Western fire season. This will include prioritization and allocation of fire resources and the integration of emerging science, enhancing existing tools to implement the RMP and improve our ability to protect sagebrush-steppe from damaging wildfires.

Habitat Delineation

The BLM and Forest Service have identified Greater Sage-Grouse habitat in coordination with the State of Wyoming. This habitat falls into one of the following categories:

- **Core Population Areas**—The boundaries of the Greater Sage-Grouse areas that were identified as having the highest conservation value to maintaining sustainable Greater Sage-Grouse populations per version 3 of the State of Wyoming EO Greater Sage-Grouse Core Area of

Protection (WY EO 2010-4) (Wyoming Office of the Governor 2010). These areas include breeding, late brood-rearing, winter concentration areas and migration or connectivity corridors and correspond to WO IM No. WO-2012-043 as Preliminary Priority Habitat.

- **Key Habitat Areas** – The boundaries of the Greater Sage-Grouse areas that were identified as having the highest conservation value to maintaining sustainable Greater Sage-Grouse populations per version 2 of the State of Wyoming EO Greater Sage-Grouse Core Area of Protection (WY EO 2008-2) (Wyoming Office of the Governor 2008). These areas include breeding, late brood-rearing, winter concentration areas and migration or connectivity corridors and correspond to WO IM No. WO-2012-043 as Preliminary Priority Habitat. Key Habitat Areas were replaced by Core Habitat Areas.
- **Connectivity Areas** – Connectivity Areas (as defined in WY EO 2011-5) are state-designated areas identified as - important for Greater Sage-Grouse migration and population connectivity. They correspond to one of two components of Priority Habitat Management Areas as defined in WO IM No. WO-2012-043.
- **Non-Core Sage Grouse Habitat** – Areas of occupied seasonal or year-round habitat not located within Core or Connectivity Habitat. These areas correspond to Preliminary General habitat as defined in WO IM No. WO-2012-043.

The Conservation Objectives Team Report identified priority areas for conservation based upon the data provided by State Fish and Game agencies. The State of Wyoming manages Greater Sage-Grouse and Greater Sage-Grouse habitats consistent with Governor's EO 2011-05, *Greater Sage-Grouse Core Area Protection* (Core Area Strategy), which establishes Core Areas.

In October 2014, the BLM updated the habitat category delineation. In the Proposed Land Use Plan Amendment/Final EIS Greater Sage-Grouse habitat nomenclature has been changed from Core and Connectivity Areas to priority habitat management area and Non-Core Sage Grouse Habitat to general habitat management area.

1.7. Topics Not Addressed in this Resource Management Plan Revision

Laws, regulations, policies, and EOs require specific resource topics be examined during the NEPA process. In some instances, initial evaluation reveals topics that are not relevant to the planning area or do not require further analysis. Examples of these topics are listed below.

- **Prime and Unique Farmlands** – In accordance with the Farmland Protection Policy Act, the BLM determined that no prime or unique farmlands or farmland of statewide or local importance occur on public lands in the planning area. None of the actions proposed in this RMP revision would disturb farmlands; therefore, impacts on prime and unique farmlands were not analyzed further in this RMP revision.
- **Wild Horses and Burros** – Herd areas are limited to areas of public land identified as being habitat used by wild horses and burros at the time of passage of the 1971 Wild Free-Roaming Horse and Burro Act. No wild horses are known to inhabit the planning area, and no herd areas have been identified. Therefore, impacts on wild horses and burros were not analyzed further in this RMP revision.

- **National Trails** – No National Scenic or Historic Trails currently exist within the planning area; therefore, impacts on National Scenic or Historic Trails were not analyzed further in this RMP revision.

Chapter 2. Resource Management Alternatives

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2.1. Resource Management Alternatives

Chapter 2 presents four alternative Resource Management Plans (RMPs) for managing the Buffalo planning area. The four alternative plans are identified by the letters A, B, C, and D. Alternative A, the No Action Alternative, represents the continuation of current management direction. Alternatives B and C represent the range of alternatives. The Bureau of Land Management (BLM) identified Alternative D as its Preferred Alternative in the Draft RMP and Environmental Impact Statement (EIS). Based on comments received during the public comment period on the Draft RMP and EIS, the BLM revised the Preferred Alternative. As modified, Alternative D is now presented as the Proposed RMP in the Final EIS. Each alternative provides a different emphasis for managing public lands and resources within the planning area, and represents a complete and reasonable land use plan that meets the purpose and need described in Chapter 1.

2.2. Summary of Changes Made Between the Draft RMP/EIS and the Proposed RMP/Final EIS

NEPA requires agencies to prepare a supplement to the draft EIS: 1) if the agency makes substantial changes in the proposed action that are relevant to environmental concerns; or 2) if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. A supplement is not necessary if a newly formulated alternative is a minor variation of one of the alternatives and is qualitatively within the spectrum of alternatives analyzed in the Draft EIS.

The Proposed RMP includes components of the alternatives analyzed in the Draft RMP/EIS. Taken together, these components present a suite of management decisions that present a minor variation of alternatives identified in the Draft RMP/EIS and are qualitatively within the spectrum of alternative analyzed. As such, the BLM has determined that the Proposed RMP is a minor variation and that the impacts of the Proposed RMP would not affect the human environment in a substantial manner or to a significant extent not already considered in the EIS. The impacts disclosed in the Proposed RMP and Final EIS are similar or identical to those described in the Draft RMP/EIS such that supplementation of the Buffalo RMP Final Draft EIS is not required. See 40 Code of Federal Regulations (CFR) 1502.9(c)(1).

Since publication of the Buffalo Draft EIS in June 2013, additional reports regarding Greater Sage-Grouse conservation have been published by United States Geological Survey (USGS) and U.S. Fish and Wildlife Service (USFWS); the BLM National Greater-Sage Grouse Land Use Planning Strategy has continued to make progress in the development of cumulative effects analysis based upon Western Association of Fish and Wildlife Agencies (WAFWA) management zones; and the Wyoming 9-Plan Draft RMP Amendment/Draft EIS (December 2013) and the Bighorn Basin Supplemental Draft RMP Revision/Draft EIS (July 2013) have been published. Upon review of each of these subsequent publications which have come out, none constitute “significant new information relevant to environmental concerns and bearing on the proposed action or its impacts” such that supplementation of the Buffalo RMP Final Draft EIS is required. See 40 CFR 1502.9(c)(1).

Greater Sage-Grouse related management changes made to the Proposed RMP/Final EIS from the preferred alternative (D) in Draft RMP/EIS are the following:

- An assessment of the Proposed RMP consistency with USFWS Conservation Objectives Team (COT) Report was completed, and a summary comparison of alleviated threats to Greater Sage-Grouse was also prepared (see Table 2.2).
- Implementation Framework – An implementation framework for Greater Sage-Grouse management (Appendix B (p. 1779)) has been added which includes adaptive management and monitoring strategies developed in cooperation with the USFWS and State of Wyoming. All of the adaptive management hard trigger responses were analyzed within the range of alternatives. For example, if a hard trigger is reached in Priority Habitat Management Area, and Priority Habitat Management Area would be managed as open to saleable minerals in the Proposed Plan, the response would be to manage it as closed to saleable minerals. This closure was analyzed under Alternatives B in the Draft EIS (a 4 mile closure around all occupied or undetermined Greater Sage-Grouse leks). The monitoring framework was further refined in the Final EIS, and further clarification as to how disturbance cap calculations would be measured were developed for the Final EIS.
- WAFWA Management Zone Cumulative Effects Analysis on Greater Sage-Grouse – a quantitative cumulative effects analysis for Greater Sage-Grouse was included in the Final EIS. This analysis was completed to analyze the effects of management actions on Greater Sage-Grouse at a biologically significant scale which as determined to be at the WAFWA Management Zone. The Draft EIS, in Chapter 4, included a qualitative analysis and identified that a quantitative analysis would be completed for the Final EIS at the WAFWA Management Zone.

The Draft RMP and EIS public comment period closed in September 2013. The BLM received approximately 134 individual comment letters and two form emails with approximately 2,143 submissions. The BLM identified 2,142 unique comments from the comment documents received, which touched on a wide range of issues. While many of the comments strongly supported the Preferred Alternative in the Draft RMP and EIS, commenters also identified areas where the document could be improved. The Buffalo Field Office (BFO) carefully evaluated these comments (see Appendix Y (p. 2671)). The Proposed RMP and Final EIS contains a number of changes made in response to comments. Substantive changes are identified in the document with grey shaded text. BLM has reviewed the changes made between the draft and proposed RMPs and has determined that the changes have not triggered the need to prepare a supplemental EIS per 40 CFR 1502.9. A summary of the substantive changes follows.

Physical Resources

Soils: An erosion model was included in the analysis at the request of the U.S. Environmental Protection Agency (EPA). The Revised Universal Soil- Loss Equation (from the Natural Resources Conservation Service [NRCS]) is an erosion model designed to predict the longtime average annual soil loss carried from runoff from specific slopes in specified management conditions.

BLM worked with the Campbell County Conservation District and other cooperators to refine and clarify the information presented within the Affected Environment and Environmental Consequences *Soils* sections. The Soils Exception Criteria appendix was deleted as the information it contained was redundant with other sections such as the Fluid Mineral Lease Stipulation appendix (Appendix H (p. 1959)) and the BFO reclamation policy appendix (Appendix O (p. 2495)).

Water: The EPA and other commenters requested additional background information from the 2003 Powder River Basin (PRB) EIS (BLM 2003c) and whether the assumptions and trend predictions were accurate. The requested information was added to the Proposed RMP and Final EIS. A water management plan appendix (Appendix W (p. 2623)) was added at the request of the EPA, to disclose the process for analyzing water effects and mitigation during the implementation of project level activities.

Mineral Resources

Coal: The BLM edited the Proposed RMP and Final EIS to clarify that no coal leasing allocation decisions are being made through the RMP revision. The coal leasing decisions made in the 2001 RMP update are being carried forward as no substantial new information regarding coal leasing was received during the call for coal information during RMP scoping or through comments on the Draft RMP and EIS. Federal coal lands identified in 2001 as acceptable for further coal leasing consideration are available for Lease by Application, lease modifications, emergency leases, and exchanges. Prior to offering a coal tract for sale, the unsuitability criteria will be reviewed, a tract specific National Environmental Policy Act (NEPA) analysis will be completed, and there will be opportunity for public comment. Federal coal lands acceptable for further leasing consideration do not overlap with Greater Sage-Grouse priority habitat (Maps 11 and 40).

Management action Coal-2001 was revised to clarify that the leasing decisions from 2001 are being carried forward and management action Coal-2003 was deleted from the Proposed RMP and Final EIS. Management action Coal-2002 was revised to clarify coal and fluids management within the areas identified acceptable for further coal leasing consideration.

Fluid Minerals: Management action O&G-2008 was revised to clarify coal and fluids management within the areas identified acceptable for further coal leasing consideration. An oil and gas operations appendix (Appendix V (p. 2599)) was added to summarize the fluid mineral procedures from lease nomination through permitting and development to final abandonment and lease closure for the EPA and other reviewers. There were many comments related to private property rights and split estate. An appendix (Appendix X (p. 2661)) has been added to the Proposed RMP and Final EIS summarizing the BLM's split estate authority and policy.

Several reviewers commented that the fluid mineral constraint maps in the Draft RMP and EIS were difficult to interpret. The Buffalo planning area is complex with multiple overlapping resource values, which makes interpreting the individual resource protections within the constraint maps difficult. To address the concern, BLM added an additional series of maps (Maps 17–22) displaying overlapping fluid mineral lease stipulations by stipulation type (No Surface Occupancy [NSO], Controlled Surface Use [CSU], and Timing Limitation Stipulation [TLS]) for the major resource categories (Physical, Biological, Heritage, and Visual). Reviewers should also consult the individual resource maps (i.e., elk seasonal ranges or raptors).

Fire and Fuels Management

No substantive changes were made to the fire and fuels management sections in the Proposed RMP and Final EIS.

Biological Resources

Grassland and Shrubland Communities and Riparian and Wetland Communities: The analyses in the vegetation sections were reviewed and revised to increase clarity and consistency at the EPA's request.

Wildlife: The USFWS, the Avian Power Line Interaction Committee (APLIC) and others commented on the ineffectiveness of perch inhibitors in preventing raptor perching. Therefore, BLM revised management action WL-2014 by removing the anti-perch requirement and clarifying the intent of the management action to design powerlines (distribution and transmission) to minimize wildlife related impacts and to construct powerlines to the latest APLIC standards. Raptor perch-deterrents will be analyzed within identified wildlife habitats (SS WL-4022, SS WL-4024, SS WL-4025, and Appendix D (p. 1863)), including within Greater Sage-Grouse priority habitat and within 0.5 mile of general habitat leks, and will be required where appropriate.

Some commenters felt the raptor spatial buffer distances and dates were too restrictive while others commented that the protections were not sufficient. Proposed RMP management actions WL-4027 through WL-4030 and SS WL-4029 through SS WL-4032 were revised to fully conform to the distances and dates recommended by the USFWS Wyoming Ecological Services Office. Spatial buffers may be modified for site-specific implementation decisions based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site.

A Wildlife Habitat Management Area (WHMA) for the Fortification Creek elk herd (WL-4023) is not being carried forward in the Proposed RMP. A WHMA was not supported by the State of Wyoming, whom has primary management authority over the elk herd, which is above the established population objective. The Fortification Creek RMP Amendment (BLM 2011c) decisions which are sufficient to conserve a viable elk herd are carried forward in the Proposed RMP and Final EIS.

Grazing effects were revised within the wildlife and special status species sections to clarify that while livestock grazing does affect wildlife and their habitat, livestock grazing managed in accordance with the Proposed RMP and Final EIS (*Wyoming Standards for Healthy Rangelands*) is compatible with sustaining suitable wildlife and special status species habitats and that it is improper livestock grazing that can have major adverse effects on wildlife and their habitat.

Special Status Species: The USFWS proposed the northern long-eared bat for listing as an Endangered species after the Draft RMP and EIS was published. The northern long-eared bat's documented range includes eastern Campbell County. The northern long-eared bat has been included in the biological assessment (Appendix I (p. 2025)) and BLM will conference with the USFWS in order to conserve the bat and avoid jeopardizing its existence. BLM waited until the Proposed RMP and Final EIS to include the biological assessment in order to consult on the Proposed RMP.

The text of SS WL-4002 was broadened, including recovery plans and future biological opinions, to be consistent with the companion management actions for special status plants and fish.

BLM further refined Greater Sage-Grouse management within the Proposed RMP at the Governor's request to review the management actions to ensure consistency with Wyoming Executive Orders 2011-5 and 2013-3. Executive Order 2013-3 was released after the Draft RMP and EIS was delivered to the publisher. Text from Executive Order 2013-3 was added to the Greater Sage-Grouse Planning section (Section 2.5, "Greater Sage-Grouse Habitat Management" (p. 36)). Proposed RMP management action SS WL-4021 was revised from

prohibit renewable energy projects within Greater Sage-Grouse Priority Habitat (Core Population Areas and Core Population Connectivity Corridors) to avoid renewable energy projects in Greater Sage-Grouse Core Population Areas unless it can be demonstrated that the activity would not result in declines of core Greater Sage-Grouse populations. SS WL-4022 was revised to clarify when powerlines could be authorized within Core Population Areas and when raptor perch-deterrents could be required. Raptor perch-deterrents remain a required design feature (RDF) within Greater Sage-Grouse priority habitat (Appendix D (p. 1863)). BLM revised the SS WL-4023 requirements of when a fluid mineral lease could be less than the 640 acre minimum in order to be consistent with the Wyoming 9-Plan's *Draft RMP/Draft EIS preferred alternative*. A minimum lease size is also consistent with the proposed management of adjacent Montana field offices, also in WAFWA Greater Sage-Grouse Management Zone I. In management actions SS WL-4024 and SS WL-4025 BLM clarified that the one disturbance per square mile within Core Population Areas is one energy or mining facility; the technical feasibility restriction on facilities was dropped and replaced with the Executive Order 2011-5 noise limitations; and the sagebrush restoration requirement was clarified by replacing the shrub density formula with the formula's source (Wyoming Department of Environmental Quality [DEQ] community-specific full shrub density standard, Chapter 4 Rules and Regulations option III).

Heritage and Visual Resources

Cultural Resources: BLM complied with the Northern Cheyenne's request to combine the requirements for archeological and tribal monitors into one management action, Cultural-5008.

Land Resources

Travel Management: A common to all management action, Trans-6005, was added to respond to commenters concerned that the proposed travel management restricted the operations of authorized/permitted activities. The new management action clarifies that motorized travel under administrative permits and leases will be subject to the terms of the authorization.

Lands with Wilderness Characteristics: Some commenters wanted additional acreage managed to protect wilderness characteristics while others did not want any lands managed to protect wilderness characteristics. BLM continued with the 6,864 acres identified in the Draft RMP and EIS as they are the best suited for management to maintain identified wilderness characteristics. Fluid mineral leasing was changed from closed in the Draft RMP and EIS to leasing with a NSO stipulation in the Proposed RMP and Final EIS. The NSO stipulation enables BLM to protect wilderness characteristics while allowing for potential fluid mineral development (i.e., horizontal drilling).

Special Designations

Some commenters requested additional special designation areas with increased protections and others spoke against any special designation areas.

Areas of Critical Environmental Concern (ACECs): The Fortification Creek ACEC (ACEC-7003) is not being carried forward in the Proposed RMP. The State of Wyoming has primary management authority over the elk herd. State management and the Fortification Creek RMP Amendment (BLM 2011c) decisions, which are carried forward in the Proposed RMP and Final EIS, are sufficient to conserve a viable elk herd and the other ACEC values.

National Byways: Byways did not receive any support from commenters. The management action was to evaluate, not designate, and therefore was not revised.

Socioeconomic Resources

No substantive changes were made to the socioeconomic sections in the Proposed RMP and Final EIS.

2.3. Alternatives Development Process

The BLM complied with NEPA requirements in the development of alternatives for this RMP and EIS by seeking public comment and analyzing a reasonable range of alternatives. Alternative formulation took into consideration existing land use plan decisions, and issues and concerns developed internally and solicited from the public during the scoping process. The process to develop alternatives can be broadly broken down into five steps:

1. Identify Issues (Scoping)
2. Identify Current Management (Alternative A – No Action Alternative)
3. Develop the Range of Alternatives (alternatives B and C)
4. Analyze the Effects of the Alternatives (alternatives A, B, and C)
5. Develop the Preferred Alternative (Alternative D)

Identify Issues

The BLM considered public comments received during the scoping process while developing the alternatives and management actions. The BLM considers public comments received throughout the alternative development process. Chapter 1 and the project Scoping Report (available on the RMP revision website at <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo/docs.html>) summarize the results of the public scoping process and opportunities for future public involvement.

Identify Current Management

The 1985 Buffalo RMP, as updated in 2001, as amended by the 2003 Record of Decision (ROD) and RMP Amendment for the PRB Oil and Gas Project, and as amended by the 2011 Fortification Creek Planning Area Decision Record and RMP amendment (existing plan), and other current management direction served as the basis for the No Action Alternative (Alternative A). Alternative A, in conjunction with the planning criteria and the key issues identified during the scoping process, set the stage for developing the range of alternatives.

Develop the Range of Alternatives

The BLM conducted a series of seven alternatives development workshops with a team comprised of BLM staff and cooperating agencies. During the initial workshop, the team shared their knowledge and expertise and collaborated to identify goals and objectives (i.e., desired outcomes) for each resource. Each subsequent workshop refined the management actions composing each alternative and narrowed the scope of alternatives to a reasonable range limited by the planning criteria (refer to Chapter 1, Planning Criteria). Table 2.1, “Alternatives Development Workshops” (p. 33) identifies the dates and focus of each workshop. Prior to each workshop, the BLM provided preliminary draft alternatives prepared by BLM specialists to the cooperating

agencies. These preliminary alternatives served as a starting point for alternative formulation and a basis for discussion by team members during the workshops.

Table 2.1. Alternatives Development Workshops

Workshop Number	Dates	Focus
1	May 20 – 22, 2009	Goals and Objectives
2	June 17 – 18, 2009	Range of Alternatives
3	July 15 – 16, 2009	Range of Alternatives
4	August 19 – 20, 2009	Range of Alternatives
5	September 16 – 17, 2009	Range of Alternatives
6	October 7 – 8, 2009	Range of Alternatives
7	April 27 – 29, 2010	Preferred Alternative

The team formulated the range of alternatives (alternatives B and C) to meet the purpose and need of this RMP revision using different approaches to resource use. These alternatives represent the opposite ends of a continuum of resource use from a resource conservation emphasis (Alternative B) to a resource utilization emphasis (Alternative C). Management actions developed under all alternatives are subject to valid existing rights. In addition, management actions may only be implemented when they are consistent with applicable laws, regulations, and policies. The planning area is open to locatable mineral activities unless specifically withdrawn from operation under the mining laws. Alternatives were considered, but not carried forward for detailed analysis in this RMP and EIS if they did not meet the planning criteria or the purpose and need (see Chapter 1), or were already part of an existing plan, policy, requirement, or administrative function that will continue under the revised RMP.

Analyze the Effects of the Alternatives

The fourth step in the process is to analyze the effects of the range of alternatives. This task involved analyzing the impacts of one set of resource management actions on other resources and resource uses. These data were then compiled into Chapter 4 and considered in step five, Develop the Preferred Alternative.

Develop the Preferred Alternative

The BLM developed Alternative D, the Preferred Alternative, by considering the impacts analysis (Chapter 4) of alternatives A through C; knowledge of specific issues raised throughout the planning process; planning criteria; and recommendations from cooperating agencies, BLM specialists, and resource experts.

Refer to Table 2.1, “Alternatives Development Workshops” (p. 33) for the date of the Preferred Alternative workshop. The BLM developed the Preferred Alternative using the following selection criteria:

1. Satisfies statutory requirements (applies to all alternatives).
2. Reflects what the BLM considers to be the best combination of actions to achieve its goals and objectives.
3. Represents the most effective solution to the purpose and need.
4. Provides the most efficient approach to address key planning issues.

5. Best considers cooperating agencies and BLM specialists' recommendations.

The Preferred Alternative was identified as the BLM's preliminary preference in the Draft RMP and EIS. Following publication of the Draft RMP and EIS, the BLM revised the Preferred Alternative based on comments received during the public comment period. As modified, Alternative D is now presented as the Proposed RMP in the Final EIS. Following resolution of protests and the Governor's consistency review, the BLM will prepare a ROD and Approved RMP.

2.4. Alternative Components

Each alternative comprises two categories of land use planning decisions: (1) desired outcomes (goals and objectives) and (2) allowable uses and management actions.

2.4.1. Goals and Objectives

Goals and objectives direct the BLM's actions to most effectively meet legal mandates in statutes and regulations, agency policy, as well as local and regional resource needs. Goals are broad statements of desired outcomes that are usually not quantifiable. Objectives breakdown goals into more specific desired outcomes and typically include a measurable component. The management goals and objectives for each resource are presented in Section 2.9, "Detailed Alternative Descriptions by Resource" (p. 125).

2.4.2. Allowable Uses and Management Actions

Allowable uses and management actions are developed to achieve the goals and objectives defined for each resource.

Allowable Uses

Allowable uses identify uses that are allowed, restricted, or excluded on BLM surface lands and federal mineral estate. Alternatives may include specific land use restrictions or may exclude certain land uses (e.g., mineral leasing, salable mineral development, recreation, forest management, utility corridors, and livestock grazing) in order to meet goals and objectives and conserve resource values. For example, alternatives considered for this RMP revision exclude oil and gas development within certain buffers of occupied Greater Sage-Grouse leks while allowing recreation, livestock grazing, and other land uses. Allowable uses often contain a spatial component because the alternatives identify whether particular land uses are allowed, restricted, or excluded. These spatial components are illustrated on maps to display the geographical extent of the management actions.

Management Actions

Management actions are proactive measures (e.g., measures that will be taken to enhance watershed function and condition), or limitations intended to guide BLM activities in the planning area. An example of this type of management action is to prohibit surface-disturbing activity near riparian/wetland areas in order to achieve proper functioning condition (PFC).

Organization of Allowable Uses and Management Actions in the Alternatives

For simplicity, the term “management action” is inclusive of both allowable uses and management actions. Therefore, when the text refers to management actions, it is referring to both categories. Two types of management actions are included in the alternatives. The first is management actions common to all alternatives, which will apply regardless of the alternative. The second is management actions by alternative, which represent the choice(s) considered across alternatives. Management actions by alternative represents the range of land use management decisions considered. These management actions vary among the alternatives and represent a reasonable range of management options that were considered to meet the stated goals and objectives and purpose and need of the RMP revision. RMPs are strategic in nature, and, while they provide an overarching vision for managing resources in the planning area, they must also be flexible to changing priorities, information, and circumstances.

Conservation Measures and Required Design Features

Appendix D (p. 1863) identifies Greater Sage-Grouse conservation measures many of which have typically been recommended (voluntary) mitigation measures such as best management practices (BMPs) from Washington Office (WO) Instruction Memorandum (IM)-2012-044 (BLM 2012h), BMPs for fire and fuels management from WO IM 2011-138 (BLM 2011d), guidelines from Wyoming Governor’s Executive Order 2011-5, recommended management practices from the Northeast Wyoming Greater Sage-Grouse Local Working Group’s Conservation Plan (NWSGLWG 2006), and suggested management practices from the BLM National Greater Sage-Grouse Habitat Conservation Strategy (BLM 2004b). For the most part, these measures are a restatement of existing management practices, such as co-location of rights-of-way (ROWs) or clustering of development infrastructure.

These conservation measures are treated in the RMP as RDFs for future projects implemented consistent with the direction in the approved plan. Project proponents are encouraged to include all appropriate conservation measures in their proposals. The BLM will require application of all appropriate conservation measures, warranted by site-specific analysis, in order to avoid, minimize, rectify, reduce, or compensate for impacts. Conservation measures not included in project proposals and determined appropriate from the site-specific analysis will be required as Conditions of Approval (COAs). Additional COAs developed through consultation with other federal, state, and local regulatory and resource agencies may be applied when supported by site-specific analysis.

Because of site-specific circumstances, some conservation measures may not apply to all activities (e.g., a resource or conflict is not present on a given site) and/or may require slight variations. Proposed variations in conservation measures will be analyzed and may be applied in the site specific permitting process. All variations in conservation measures will require appropriate analysis and disclosure as part of activity authorization. It is anticipated that variations in the conservation measures will be approved in very limited circumstances and only in coordination with the Wyoming Game and Fish Department (WGFD) and/or the USFWS. Conservation measures and other mitigation selected for implementation will be identified in the project’s decision document. The proponent must implement all identified measures because they are commitments made as part of the BLM decision. Because the decision document creates a clear obligation for the BLM to ensure any proposed mitigation adopted in the environmental analysis is performed, there is the expectation that applied mitigation will lead to a reduction of environmental impacts in the implementation stage and include binding mechanisms for enforcement (CEQ 2011). The determination of adequate application of the mitigation measures and conservation actions for specific projects will remain with the BLM’s authorized officer.

2.5. Greater Sage-Grouse Habitat Management

On December 9, 2011, a Notice of Availability was published in the Federal Register (FR) to initiate the BLM and U.S. Forest Service (USFS) Greater Sage-Grouse Planning Strategy across nine western states, including California, Oregon, Nevada, Idaho, Utah, and Southwest Montana in the Great Basin Region and Northwest Colorado, Wyoming, Montana, South Dakota, and North Dakota in the Rocky Mountain Region. This Proposed RMP and Final EIS is one of fifteen separate EISs that are currently being conducted to analyze and incorporate specific conservation measures across the range of the Greater Sage-Grouse, consistent with BLM policy. The ROD for the first Greater Sage-Grouse related RMP; the Lander, Wyoming RMP revision was signed in June 2014.

The BLM WO issued a National Greater Sage-Grouse Planning Strategy (BLM 2012h) on December 27, 2011. The Wyoming State Office (WYSO) issued a revised Greater Sage-Grouse Habitat Management policy, WYSO IM 2012-019 (BLM 2012g), on February 12, 2012. These policies have been incorporated into the Buffalo Proposed RMP and Final EIS.

In August 2011, the BLM convened the Sage-Grouse National Technical Team (NTT), which brought together resource specialists and scientists from the BLM, state fish and wildlife agencies, the USFWS, the U.S. Department of Agriculture (USDA) NRCS, and the USGS. The NTT developed a series of science-based conservation measures to be considered and analyzed through the land use planning process. /2WO IM 2012-044 provides direction to the BLM on how to consider the NTT conservation measures in the land use planning process.

The WO IM requires that the conservation measures in the NTT report be analyzed in at least one alternative in the land use planning EIS and that a “hard look” be given to the conservation measures, as appropriate and applicable to local ecological site variability. Alternative B incorporates the national strategy (WO IM-2012-044) and Alternative D incorporates the Wyoming strategy (WYSO IM-2012-019).

Wyoming Governor Freudenthal issued the first Executive Order on August 1, 2008, mandating special management for all state lands in Greater Sage-Grouse “Core Population Areas.” Core Population Areas are important breeding areas for Greater Sage-Grouse in Wyoming. In addition to identifying Core Population Areas, the Sage-Grouse Implementation team recommended placing restrictions on development activities to ensure that existing habitat function is maintained within the Core Population Areas. These restrictions would apply to the habitat supporting approximately 80 percent of the total estimated Greater Sage-Grouse breeding population in the state. Wyoming’s Core Population Area strategy has been updated in two subsequent executive orders: Executive Order 2010-4 and Executive Order 2011-5. Governor Mead issued a grazing supplement (Executive Order 2013-3) to Wyoming’s Core Population Area Strategy (Executive Order 2011-5) in 2013. The BLM will implement Executive Order 2013-3 in the following fashion: The BLM will collaborate with appropriate federal agencies, and the State of Wyoming as contemplated under Governor Executive Order 2013-3, to: (1) develop appropriate conservation objectives; (2) define a framework for evaluating situations where Greater Sage-Grouse conservation objectives are not being achieved on federal land, to determine if a causal relationship exists between improper grazing (by wildlife or wild horses or livestock) and Greater Sage-Grouse conservation objectives; and (3) identify appropriate site-based action to achieve Greater Sage-Grouse conservation objectives within the framework. BLM Wyoming adopted the State of Wyoming’s approach for projects under its authority, through a series of IMs; the most recent being Greater Sage-Grouse Habitat Management policy IM 2012-019 (BLM

2012g). WYSO IM 2012-019 applies the State of Wyoming Greater Sage-Grouse management strategy (Wyoming Governor's Executive Order 2011-5) to BLM surface and federal mineral estate. The Protection measures described in the WYSO policy (with the exception of certain interim measures, like the Greater Sage-Grouse leasing screen) and Executive Order 2011-5 are incorporated into Alternative D, the Proposed RMP.

The BLM developed a multi-stage review process to ensure compliance with WO IM 2012-044. The local review (June 21, 2012) demonstrated and confirmed BFO compliance with WO IM 2012-044, Wyoming Executive Order 2011-5, and WYSO IM 2012-019. The WGFD, USFWS, and the BLM WYSO participated in the local review. The USFWS refrained from providing any comments at the local review.

The regional interdisciplinary team reviewed Greater Sage-Grouse management in the Buffalo Preliminary Draft RMP and EIS on July 24, 2012. The Wyoming Governor's office, WGFD, and the NRCS participated; the USFWS was not represented. The regional managers' team performed their review on July 31, 2012; the Wyoming Governor's office, WGFD, NRCS, and USFWS participated. The BLM WO completed their review on September 24, 2012. These reviews have ensured that BFO has complied with WO IM 2012-044 and has adequately incorporated the citizen based recommendations.

2.5.1. BLM Programs for Addressing Greater Sage-Grouse Threats

In 2013, the USFWS released their Conservation Objectives Team Report, which delineates reasonable objectives, based upon the best scientific and commercial data available at the time of its release, for the conservation and survival of Greater Sage-Grouse. The report also identified present and widespread and localized threats facing the Greater Sage-Grouse and their habitat in specific populations across the west. The ranges of management actions for managing Greater Sage-Grouse habitat analyzed in this EIS are directed towards responding to these threats. The USFWS threats do not necessarily align with BLM resource program areas, and are often integrated into several different resource program areas. Table 2.2, "USFWS Threats to Greater Sage-Grouse and Their Habitat, Applicable BLM Resource Program Areas Addressing These Threats" (p. 38) provides a cross-walk between each of the USFWS listing decision and Conservation Objectives Team identified threats and the BLM program areas and shows how those threats were addressed in the BLM's land use plan.

Table 2.2. USFWS Threats to Greater Sage-Grouse and Their Habitat, Applicable BLM Resource Program Areas Addressing These Threats

USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
Wildland Fire	Fire	Fire and Fuels Management <ul style="list-style-type: none"> Follow fire management plans. Utilize appropriate resources (equipment and personnel) and strategies. Manage fire to accomplish resource objectives. Implement the Emergency Stabilization and Burned Area Rehabilitation. Special Status Species <ul style="list-style-type: none"> Fire management plan to guide suppression within sagebrush communities.
Invasive Species	Nonnative, Invasive Plant Species	Fire and Fuels Management <ul style="list-style-type: none"> Implement the Emergency Stabilization and Burned Area Rehabilitation. Grassland and Shrubland Communities <ul style="list-style-type: none"> Integrated management. Minimize disturbance. Vegetation disturbance areas to be treated species and revegetated. Contingency planning.

USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
		<p>Invasive Species and Pest Management</p> <ul style="list-style-type: none"> • Limit surface disturbance. • Use certified weed free products. • Require vegetation disturbance areas to be treated species and revegetated. • Treat species of concern. <p>Special Status Species</p> <ul style="list-style-type: none"> • Limit surface disturbance. • Avoid broad-spectrum pesticides. • Vegetation disturbance areas to be treated species and revegetated. • Habitat restoration. • Prevent WNV spread. <p>Rights-of-Way</p> <ul style="list-style-type: none"> • Limit surface disturbance. • Avoid broad-spectrum pesticides. • Vegetation disturbance areas to be treated species and revegetated. • Habitat restoration. • Prevent WNV spread. <p>Travel and Transportation Management</p> <ul style="list-style-type: none"> • Close and reclaim unnecessary routes. • Limit motor vehicles to designated routes.

USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
		<p>Recreation</p> <ul style="list-style-type: none"> • Avoid siting facilities in riparian habitat. • Limit surface disturbance in SRMAs to administrative use.
Oil and Gas	Energy Development	<p>Soil</p> <ul style="list-style-type: none"> • Avoid sensitive soils. • Lease stipulations on sensitive soils. • Riparian buffer. • Remove and reclaim unnecessary reservoirs. <p>Water</p> <p>Riparian and Wetland Communities</p> <ul style="list-style-type: none"> • Reduce riparian habitat loss. • <p>Leasables – Fluid Minerals</p> <ul style="list-style-type: none"> • Designate areas available and closed to fluid mineral leasing. • Minimize adverse impacts. • Stipulate leases to meet resource objectives. <p>Grassland and Shrubland Communities</p> <ul style="list-style-type: none"> • Site exploration and facilities to reduce vegetation impacts.

USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
		Invasive Species and Pest Management <ul style="list-style-type: none"> Minimize surface disturbance. Use certified weed-free products. Vegetation disturbance areas to be treated species and revegetated.
		Wildlife Resources <ul style="list-style-type: none"> Construct fences to avoid impacts. Surface disturbance and disruptive activities to meet wildlife objectives. Powerlines designed to minimize wildlife impacts. Special Status Species <ul style="list-style-type: none"> Maintain habitat and migration corridors. Mitigate noise impacts. Lease stipulations on special status species habitat. Habitat restoration. Manage water to prevent WNV. Design to reduce wildlife mortalities. Powerlines designed to minimize wildlife impacts. Visual Resources <ul style="list-style-type: none"> Incorporate BMPs for visual resources.

USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
		Rights-of-Way <ul style="list-style-type: none"> Designate avoidance and exclusion areas. Designate major ROW corridors. Minimize disturbance. co-locate disturbance.
Prescribed Fire	Sagebrush Removal	Fire and Fuels Management <ul style="list-style-type: none"> Use fire and other methods to meet vegetation objectives. Grassland and Shrubland Communities <ul style="list-style-type: none"> Integrated vegetation management to meet resource objectives. Livestock Grazing Management <ul style="list-style-type: none"> Provide rest following treatment until resource objectives are met.
Grazing	Grazing Range Management Structures	Livestock Grazing Management <ul style="list-style-type: none"> Designate areas suitable for grazing. Monitor and manage to achieve Standards for Healthy Rangelands. Sustain wildlife habitat. Develop range improvements. Implement AMPs. Special Status Species <ul style="list-style-type: none"> Manage water facilities to reduce mortality. Manage fences to reduce impacts.

USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
No similar threat identified	Free-Roaming Equid Management	Wild Horse and Burro Management Resource not present.
Conifer Encroachment	Pinyon and/or Juniper Expansion	Fire and Fuels Management <ul style="list-style-type: none"> • Use fire to meet desired vegetation objectives. Grassland and Shrubland Communities <ul style="list-style-type: none"> • Manage to achieve Standards for Healthy Rangelands. • Use integrated vegetation management techniques. Special Status Species <ul style="list-style-type: none"> • Maintain, enhance, and restore habitat. • Remove encroaching conifers.
Agriculture and Urbanization	Agricultural Conversion and Ex-Urban Development	Lands and Realty <ul style="list-style-type: none"> • Acquire, dispose and retain lands in accordance with resource objectives.

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USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
Hard Rock Mining	Mining	<p>Locatable Minerals Leasables- coal Salable Minerals</p> <ul style="list-style-type: none"> • Recommend areas for withdrawal (locatable). • Designate areas available and closed to coal leasing. • Designate areas as available and closed to mineral materials (salable). • Minimize adverse impacts. • Condition proposals to meet resource objectives. <p>Soil See Oil and Gas.</p> <p>Water Riparian and Wetland Communities See Oil and Gas.</p> <p>Grassland and Shrubland Communities See Oil and Gas.</p> <p>Invasive Species and Pest Management</p> <p>Wildlife Resources See Oil and Gas.</p> <p>Special Status Species See Oil and Gas.</p> <p>Visual Resources See Oil and Gas.</p> <p>Rights-of-Way See Oil and Gas.</p>

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Chapter 2 Resource Management Alternatives
BLM Programs for Addressing Greater
Sage-Grouse Threats

USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
Infrastructure, roads	Recreation	Recreation <ul style="list-style-type: none"> • Manage recreation to protect resources. • Issue SRPs. • Designate SRMAs, manage for recreation and other resources. • Site facilities to minimize adverse impacts. Travel and Transportation Management <p>See Invasive Species.</p>
Infrastructure <ul style="list-style-type: none"> • Powerlines/Pipelines • Roads • Communication Sites • Railroads 	Infrastructure	Rights-of-Way <p>See Oil and Gas.</p> Soil <p>See Oil and Gas.</p> Water Riparian and Wetland Communities <p>See Oil and Gas.</p> Grassland and Shrubland Communities <p>See Oil and Gas.</p> Invasive Species and Pest Management <p>See Oil and Gas.</p> Wildlife Resources <p>See Oil and Gas.</p> Special Status Species <p>See Oil and Gas.</p> Visual Resources <p>See Oil and Gas.</p>

USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
Infrastructure, range improvements	Range Management Structures	Livestock Grazing Management <ul style="list-style-type: none"> • Site to minimize adverse impacts. • Prevent wildlife mortalities. • Design and manage for WNV.
Water Developments	No similar threat identified	Water <ul style="list-style-type: none"> • Reclaim unneeded reservoirs. • Prevent wildlife mortalities. • Design and manage for WNV. Special Status Species <ul style="list-style-type: none"> • Prevent wildlife mortalities. • Manage to prevent WNV. Rights-of-Way <ul style="list-style-type: none"> • Prevent WNV spread. Livestock Grazing Management <p>See Infrastructure, range improvements.</p>

USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
Climate Change	No similar threat identified	<p>There is no BLM resource planning program for addressing this threat of Greater Sage-Grouse and its habitat. Proposed climate change management is incorporated in other resource programs throughout Chapter 2.</p> <p>Not applicable.</p> <p>Air Quality</p> <ul style="list-style-type: none"> • Reduce emissions. <p>Leasables – Fluid Minerals</p> <ul style="list-style-type: none"> • Incorporate appropriate BMPs (green completions, closed loop drilling, etc.) • See Oil and Gas. <p>Locatable Minerals</p> <ul style="list-style-type: none"> • Incorporate appropriate BMPs. • See Hard Rock Mining. <p>Leasables- coal</p> <ul style="list-style-type: none"> • Incorporate appropriate BMPs. • See Hard Rock Mining. <p>Salable Minerals</p> <ul style="list-style-type: none"> • Incorporate appropriate BMPs. • See Hard Rock Mining.
Weather	No similar threat identified	<p>There is no resource program in the BLM RMPs for addressing this USFWS-identified threat.</p> <p>Grazing – Adapt for drought situations</p>

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USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
Predation	No similar threat identified	Invasive Species and Pest Management <ul style="list-style-type: none"> Coordinate management with APHIS Wildlife Services. Wildlife Resources Special Status Species <ul style="list-style-type: none"> Maintain and improve habitat. Construct fences and powerlines to avoid impacts.
Disease	No similar threat identified	Water See Water Developments. Special Status Species See Water Developments. Rights-of-Way See Water Developments. Livestock Grazing Management See Water Developments. All Applicable Programs Utilize design features and BMPs to reduce risk for WNV.
Hunting	No similar threat identified	There is no resource program in the BLM RMPs for addressing this USFWS-identified threat. Not applicable.

USFWS-Identified Threats to Greater Sage-Grouse and Its Habitat (2010 warranted but precluded finding)	Conservation Objectives Team Report-Identified Threats to Greater Sage-Grouse and Its Habitat	Applicable BLM Resource Program
Contaminants	No similar threat identified	Health and Safety <ul style="list-style-type: none">● Reduce wastes.● Minimize hazards. All Applicable Programs Utilize design features and BMPs to reduce contaminant risk.
Sources: USFWS 2010, USFWS 2013c AMP Allotment Management Plan APHIS Animal and Plant Health Inspection Service BLM Bureau of Land Management BMP Best Management Practice RMP Resource Management Plan ROW right-of-way SRMA Special Resource Management Area SRP Special Recreation Permit USFWS U.S. Fish and Wildlife Service WNV West Nile Virus		

2.5.2. Range of Alternatives for Greater Sage-Grouse Management

The action alternatives (alternatives B, C, and D) in the Proposed RMP and Final EIS offer a range of management approaches to maintain or increase Greater Sage-Grouse abundance and distribution of Greater Sage-Grouse by conserving, enhancing, or restoring the sagebrush ecosystem upon which Greater Sage-Grouse populations depend in collaboration with other conservation partners. The relative emphasis given to particular resources and resource uses differs as well, including allowable uses, restoration measures, and specific direction pertaining to individual resource programs. When resources or resource uses are mandated by law or are not tied to planning issues, there are typically few or no distinctions between alternatives.

The meaningful differences among the alternatives are described in Section 2.8, “Summaries of the Alternatives” (p. 103). Section 2.9, “Detailed Alternative Descriptions by Resource” (p. 125) provides a complete description of the goals, objectives, and management actions for each alternative. In some instances, varying levels of management of Priority and General Habitat Management Areas (Map 36) overlap a single area, or polygon, due to management prescriptions from different resource programs. In instances where varying levels of management prescriptions overlap a single polygon, the stricter of the management prescriptions would apply. For the proposed land use decisions, Table 2.3, “Comparative Summary of Allocation Decisions by Proposed Land Use Decisions in the Buffalo Planning Area: Acres within Priority (PHMA) and General (GHMA) Habitat Management Areas and Percentage of BLM-Administered Estate within the Planning Area” (p. 51) compares the acreage and percentage of Priority and General Habitat Management Areas by alternative.

Table 2.3. Comparative Summary of Allocation Decisions by Proposed Land Use Decisions in the Buffalo Planning Area: Acres within Priority (PHMA) and General (GHMA) Habitat Management Areas and Percentage of BLM-Administered Estate within the Planning Area

Topic	Acreage Type	Alternative A (No Action)		Alternative B		Alternative C		Alternative D (Proposed RMP)	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Physical Resources									
Surface Disturbance on Soils with Severe Erosion Hazard	BLM Surface	(TLS) PHMA: 36,185 GHMA: 176,990	PHMA: 4.6 GHMA: 22.6	(NSO) PHMA: 36,185 GHMA: 176,990	PHMA: 4.6 GHMA: 22.6	(Lease Terms) PHMA: 36,185 GHMA: 176,990	PHMA: 4.6 GHMA: 22.6	(CSU) PHMA: 36,185 GHMA: 176,990	PHMA: 4.6 GHMA: 22.6
	BLM-Administered Fluid Mineral Estate	(TLS) PHMA: 164,019 GHMA: 663,279	PHMA: 4.8 GHMA: 19.6	(NSO) PHMA: 164,019 GHMA: 663,279	PHMA: 4.8 GHMA: 19.6	(Lease Terms) PHMA: 164,019 GHMA: 663,279	PHMA: 4.8 GHMA: 19.6	(CSU) PHMA: 164,019 GHMA: 663,279	PHMA: 4.8 GHMA: 19.6
Surface Disturbance on Soils with Poor Reclamation Suitability	BLM Surface	(Lease terms) PHMA: 85,352 GHMA: 360,907	PHMA: 11 GHMA: 46	(NSO) PHMA: 85,352 GHMA: 360,907	PHMA: 11 GHMA: 46	(Lease Terms) PHMA: 85,352 GHMA: 360,907	PHMA: 11 GHMA: 46	(CSU) PHMA: 85,352 GHMA: 360,907	PHMA: 11 GHMA: 46
	BLM-Administered Fluid Mineral Estate	(Lease terms) PHMA: 375,093 GHMA: 1,486,496	PHMA: 11 GHMA: 44	(NSO) PHMA: 375,093 GHMA: 1,486,496	PHMA: 11 GHMA: 44	(Lease Terms) PHMA: 375,093 GHMA: 1,486,496	PHMA: 11 GHMA: 44	(CSU) PHMA: 375,093 GHMA: 1,486,496	PHMA: 11 GHMA: 44
Surface Disturbance within 500 feet of Water Resources	BLM Surface	(CSU) PHMA: 2,420 GHMA: 16,180	PHMA: 0.3 GHMA: 2	(NSO) PHMA: 2,420 GHMA: 16,180	PHMA: 0.3 GHMA: 2	(Lease Terms) PHMA: 2,420 GHMA: 16,180	PHMA: 0.3 GHMA: 2	(CSU) PHMA: 2,420 GHMA: 16,180	PHMA: 0.3 GHMA: 2
	BLM-Administered Fluid Mineral Estate	(CSU) PHMA: 14,285 GHMA: 147,617	PHMA: 0.4 GHMA: 4	(NSO) PHMA: 14,285 GHMA: 147,617	PHMA: 0.4 GHMA: 4	(Lease Terms) PHMA: 147,617 GHMA:	PHMA: 0.4 GHMA: 4	(CSU) PHMA: 14,285 GHMA: 147,617	PHMA: 0.4 GHMA: 4
Mineral Resources									

Topic	Acreage Type	Alternative A (No Action)		Alternative B		Alternative C		Alternative D (Proposed RMP)	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Acres Recommended for Withdrawal (Closure) from Locatable Mineral Entry ¹	BLM Surface coupled with BLM-Administered Locatable Mineral Estate	PHMA: 0 GHMA: 0	PHMA: 0 GHMA: 0	PHMA: 490,491 GHMA: 123,626	PHMA: 63 GHMA: 4	PHMA: 442 GHMA: 442	PHMA: 0 GHMA: 0	PHMA: 22,515 GHMA: 58,788	PHMA: 3 GHMA: 2
Acres Open to Fluid Mineral Leasing Subject to the Standard Lease Form ²	BLM-Administered Fluid Mineral Estate	PHMA: 409,995 GHMA: 123,264	PHMA: 12 GHMA: 4	PHMA: 0 GHMA: 2,114	PHMA: 0 GHMA: 0	PHMA: 81,961 GHMA: 442,376	PHMA: 2 GHMA: 13	PHMA: 5,294 GHMA: 220,050	PHMA: 0 GHMA: 6
Acres Open to Fluid Mineral Leasing with Moderate Constraints	BLM-Administered Fluid Mineral Estate	PHMA: 200,108 GHMA: 532,788	PHMA: 6 GHMA: 16	PHMA: 5 GHMA: 102,183	PHMA: 0 GHMA: 3	PHMA: 571,193 GHMA: 1,859,890	PHMA: 17 GHMA: 55	PHMA: 573,587 GHMA: 1,867,165	PHMA: 17 GHMA: 55
Acres Open to Fluid Mineral Leasing with Major Constraints	BLM-Administered Fluid Mineral Estate	PHMA: 21,177 GHMA: 56,569	PHMA: 1 GHMA: 2	PHMA: 28 GHMA: 506,612	PHMA: 0 GHMA: 15	PHMA: 21,722 GHMA: 280,966	PHMA: 1 GHMA: 8	PHMA: 68,661 GHMA: 482,339	PHMA: 2 GHMA: 14
Acres Closed to Fluid Mineral Leasing	BLM-Administered Fluid Mineral Estate	PHMA: 412,561 GHMA: 1,900,445	PHMA: 12 GHMA: 56	PHMA: 674,808 GHMA: 2,002,156	PHMA: 20 GHMA: 59	PHMA: 0 GHMA: 3,0081	PHMA: 0 GHMA: 1	PHMA: 27,299 GHMA: 43,512	PHMA: 1 GHMA: 1
Acres Open to Salable Minerals	BLM-Administered Salable Mineral Estate	PHMA: 643,899 GHMA: 2,436,987	PHMA: 19 GHMA: 73	PHMA: 8,482 GHMA: 98,887	PHMA: 0.2 GHMA: 3	PHMA: 638,016 GHMA: 2,386,776	PHMA: 19 GHMA: 71	PHMA: 551,017 GHMA: 1,978,387	PHMA: 16 GHMA: 59
Biological Resources									

Topic	Acreage Type	Alternative A (No Action)		Alternative B		Alternative C		Alternative D (Proposed RMP)	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Surface Disturbance within 0.25-mile of Natural Water Bodies Containing Desirable Fish	BLM Surface	N/A ³	N/A ³	(NSO) PHMA: 7,864 GHMA: 40,947	PHMA: 1 GHMA: 5	(Lease Terms) PHMA: 7,864 GHMA: 40,947	PHMA: 1 GHMA: 5	(CSU) PHMA: 7,864 GHMA: 40,947	PHMA: 1 GHMA: 5
	BLM-Administered Fluid Mineral Estate	N/A ³	N/A ³	(NSO) PHMA: 37,296 GHMA: 429,409	PHMA: 1 GHMA: 13	(Lease Terms) PHMA: 37,296 GHMA: 429,409	PHMA: 1 GHMA: 13	(CSU) PHMA: 37,296 GHMA: 429,409	PHMA: 1 GHMA: 13
Facility Development and Occupancy within Elk Crucial Winter Range and Calving Areas	BLM Surface	N/A ³	N/A ³	(NSO) PHMA: 4,319 GHMA: 68,554	PHMA: 1 GHMA: 9	(Lease Terms) PHMA: 4,319 GHMA: 68,554	PHMA: 1 GHMA: 9	(CSU) PHMA: 4,319 GHMA: 68,554	PHMA: 1 GHMA: 9
	BLM-Administered Fluid Mineral Estate	N/A ³	N/A ³	(NSO) PHMA: 6,552 GHMA: 154,179	PHMA: 0.2 GHMA: 5	(Lease Terms) PHMA: 6,552 GHMA: 154,179	PHMA: 0.2 GHMA: 5	(CSU) PHMA: 6,552 GHMA: 154,179	PHMA: 0.2 GHMA: 5

Topic	Acreage Type	Alternative A (No Action)		Alternative B		Alternative C		Alternative D (Proposed RMP)	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Greater Sage-Grouse Occupied Leks Protective Buffers	BLM Surface	(CSU) PHMA: 1,314 GHMA: 2,278 (TLS) PHMA: 55,601 GHMA: 148,023 (NSO) PHMA: 0 GHMA: 0	(CSU) PHMA: 0.2 GHMA: 0.3 (TLS) PHMA: 7 GHMA: 19 (NSO) PHMA: 0 GHMA: 0	(CSU) PHMA: 136,230 GHMA: 555,937 (TLS) PHMA: 111,485 GHMA: 355,747 (NSO) PHMA: 111,485 GHMA: 355,747	(CSU) PHMA: 17 GHMA: 71 (TLS) PHMA: 14 GHMA: 45 (NSO) PHMA: 14 GHMA: 45	(CSU) PHMA: 1,314 GHMA: 2,278 (TLS) PHMA: 55,601 GHMA: 148,023 (NSO) PHMA: 0 GHMA: 0	(CSU) PHMA: 0.2 GHMA: 0.3 (TLS) PHMA: 7 GHMA: 19 (NSO) PHMA: 0 GHMA: 0	(CSU) PHMA: 136,261 GHMA: 2,278 (TLS) PHMA: 132,248 GHMA: 148,016 (NSO) PHMA: 7,687 GHMA: 2,278	(CSU) PHMA: 17 GHMA: 0.3 (TLS) PHMA: 17 GHMA: 19 (NSO) PHMA: 1 GHMA: 0.3
	BLM-Administered Fluid Mineral Estate	(CSU) PHMA: 6,673 GHMA: 16,106 (TLS) PHMA: 293,295 GHMA: 778,105 (NSO) PHMA: 0 GHMA: 0	(CSU) PHMA: 0.2 GHMA: 0.5 (TLS) PHMA: 9 GHMA: 23 (NSO) PHMA: 0 GHMA: 0	(CSU) PHMA: 668,495 GHMA: 2,420,650 (TLS) PHMA: 560,235 GHMA: 1,681,465 (NSO) PHMA: 560,235 GHMA: 1,681,465	(CSU) PHMA: 20 GHMA: 71 (TLS) PHMA: 17 GHMA: 50 (NSO) PHMA: 17 GHMA: 50	(CSU) PHMA: 6,673 GHMA: 16,106 (TLS) PHMA: 293,295 GHMA: 778,105 (NSO) PHMA: 0 GHMA: 0	(CSU) PHMA: 0.2 GHMA: 0.5 (TLS) PHMA: 9 GHMA: 23 (NSO) PHMA: 0 GHMA: 0	(CSU) PHMA: 668,501 GHMA: 16,103 (TLS) PHMA: 652,357 GHMA: 778,106 (NSO) PHMA: 37,936 GHMA: 16,124	(CSU) PHMA: 20 GHMA: 0.5 (TLS) PHMA: 19 GHMA: 23 (NSO) PHMA: 1 GHMA: 0.5

Topic	Acreage Type	Alternative A (No Action)		Alternative B		Alternative C		Alternative D (Proposed RMP)	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Special Status Species Raptor Active Nest Protective Biologic Buffer Zone (Surface- disturbing Activities Prohibited or Restricted)	BLM Surface	N/A ³	N/A ³	(NSO) PHMA: 1,999 GHMA: 26,119	(NSO) PHMA: 0.3 GHMA: 3	(CSU) PHMA: 1,999 GHMA: 26,119	(CSU) PHMA: 0.3 GHMA: 3	(NSO) PHMA: 1,999 GHMA: 26,119	(NSO) PHMA: 0.3 GHMA: 3
	BLM- Administered Fluid Mineral Estate	N/A ³	N/A ³	(NSO) PHMA: 32,194 GHMA: 668,277	(NSO) PHMA: 1 GHMA: 9	(CSU) PHMA: 32,194 GHMA: 668,277	(CSU) PHMA: 1 GHMA: 9	(NSO) PHMA: 32,194 GHMA: 668,277	(NSO) PHMA: 1 GHMA: 9
Special Status Species Raptor Nests Seasonal Timing Limitation	BLM Surface	PHMA: 241 GHMA: 2,773	PHMA: 0 GHMA: 0.3	PHMA: 15,530 GHMA: 130,930	(PHMA: 2 GHMA: 17	PHMA: 420 GHMA: 4,389	PHMA: 0 GHMA: 0.6	PHMA: 1,999 GHMA: 26,119	PHMA: 0.3 GHMA: 3
	BLM- Administered Fluid Mineral Estate	(PHMA: 5,291 GHMA: 16,077	PHMA: 0.2 GHMA: 0.5	PHMA: 116,267 GHMA: 885,645	PHMA: 3 GHMA: 26	PHMA: 2,433 GHMA: 72,743	PHMA: 0.1 GHMA: 2	PHMA: 21,110 GHMA: 411,870	PHMA: 0.6 GHMA: 12
Heritage and Visual Resources									
Surface Disturbance in Areas Containing Historic Properties that Retain Their Setting (Surface- disturbing Activities Prohibited or Restricted)	BLM Surface	(NSO) PHMA: 1,420 GHMA: 2,497	(NSO) PHMA: 0.2 GHMA: 0.3	(Closed) PHMA: 43,691 GHMA: 140,769	(Closed) PHMA: 6 GHMA: 18	(CSU) PHMA: 43,691 GHMA: 140,365	(CSU) PHMA: 6 GHMA: 18	(NSO) PHMA: 1,784 GHMA: 4,909 (CSU) PHMA: 42,381 GHMA: 133,251	(NSO) PHMA: 0.2 GHMA: 0.6 (CSU) PHMA: 5 GHMA: 17
	BLM- Administered Fluid Mineral Estate	(NSO) PHMA: 5,287 GHMA: 14,915	(NSO) PHMA: 0.2 GHMA: 0.4	(Closed) PHMA: 171,280 GHMA: 570,650	(Closed) PHMA: 5 GHMA: 17	(CSU) PHMA: 171,280 GHMA: 570,650	(CSU) PHMA: 5 GHMA: 17	(NSO) PHMA: 4,312 GHMA: 17,426 (CSU) PHMA: 160,486 GHMA: 435,594	(NSO) PHMA: 0.1 GHMA: 0.5 (CSU) PHMA: 5 GHMA: 13

Topic	Acreage Type	Alternative A (No Action)		Alternative B		Alternative C		Alternative D (Proposed RMP)	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Visual Resource Management – Class II	BLM Surface	(PHMA: 22,791 GHMA: 114,887)	PHMA: 3 GHMA: 15	PHMA: 44,763 GHMA: 165,397	PHMA: 6 GHMA: 21	PHMA: 0 GHMA: 0	PHMA: 0 GHMA: 0	PHMA: 44,171 GHMA: 61,450	PHMA: 6 GHMA: 8
Visual Resource Management – Class III	BLM Surface	(PHMA: 6,531 GHMA: 68,790)	PHMA: 1 GHMA: 9	PHMA: 35,959 GHMA: 229,916	PHMA: 5 GHMA: 29	PHMA: 29,989 GHMA: 130,940	PHMA: 4 GHMA: 17	PHMA: 36,552 GHMA: 332,495	PHMA: 5 GHMA: 43
Visual Resource Management – Class IV ⁴	BLM Surface	(PHMA: 108,123 GHMA: 443,325)	PHMA: 14 GHMA: 57	PHMA: 55,554 GHMA: 203,808	PHMA: 7 GHMA: 26	PHMA: 106,286 GHMA: 468,180	PHMA: 14 GHMA: 60	PHMA: 55,554 GHMA: 205,176	PHMA: 7 GHMA: 26
Land Resources									
Acres Open to Renewable Energy Development	BLM Surface	N/A ³	N/A ³	PHMA: 616 GHMA: 4,616	PHMA: 0.1 GHMA: 0.6	PHMA: 128,969 GHMA: 580,518	PHMA: 16 GHMA: 74	PHMA: 38 GHMA: 53,197	PHMA: 0 GHMA: 7
Renewable Energy Avoidance Areas	BLM Surface	N/A ³	N/A ³	PHMA: 2,959 GHMA: 35,537	PHMA: 0.4 GHMA: 4	PHMA: 8,481 GHMA: 19,109	PHMA: 1 GHMA: 2	PHMA: 68,800 GHMA: 298,685	PHMA: 9 GHMA: 38
Renewable Energy Exclusion Areas	BLM Surface	N/A ³	N/A ³	PHMA: 133,876 GHMA: 587,671	PHMA: 17 GHMA: 75	PHMA: 0 GHMA: 28,197	PHMA: 0 GHMA: 4	PHMA: 68,613 GHMA: 275,942	PHMA: 9 GHMA: 35
Major ROW/Utility Corridor Areas	BLM Surface	PHMA: 3,065 GHMA: 27,973	PHMA: 0.4 GHMA: 4	PHMA: 2,590 GHMA: 25,279	PHMA: 0.3 GHMA: 3	PHMA: 3,065 GHMA: 27,973	PHMA: 0.4 GHMA: 4	PHMA: 3,065 GHMA: 27,973	PHMA: 0.4 GHMA: 4
ROW Avoidance Areas	BLM Surface	N/A ³	N/A ³	PHMA: 6,982 GHMA: 44,316	PHMA: 0.9 GHMA: 6	PHMA: 8,481 GHMA: 19,109	PHMA: 1 GHMA: 2	PHMA: 49,741 GHMA: 264,032	PHMA: 6 GHMA: 34
ROW Exclusion Areas	BLM Surface	N/A ³	N/A ³	PHMA: 129,038 GHMA: 567,857	PHMA: 16 GHMA: 73	PHMA: 0 GHMA: 28,197	PHMA: 0 GHMA: 4	PHMA: 27,037 GHMA: 51,373	PHMA: 3 GHMA: 6

Topic	Acreage Type	Alternative A (No Action)		Alternative B		Alternative C		Alternative D (Proposed RMP)	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Acres Closed to Motorized Vehicle Use	BLM Surface	PHMA: 1,379 GHMA: 2,325	PHMA: 0.2 GHMA: 0.3	PHMA: 121,320 GHMA: 493,600	PHMA: 16 GHMA: 63	PHMA: 0 GHMA: 28,229	PHMA: 0 GHMA: 4	PHMA: 1,756 GHMA: 35,225	PHMA: 0.2 GHMA: 4
Acres Seasonally Closed to Motorized Vehicle Use	BLM Surface	PHMA: 1,993 GHMA: 61,143	PHMA: 0.2 GHMA: 8	PHMA: 44 GHMA: 17,356	PHMA: 0 GHMA: 2	PHMA: 288 GHMA: 6,388	PHMA: 0 GHMA: 0.8	PHMA: 18,192 GHMA: 61,903	PHMA: 2 GHMA: 8
Acres Limited to Designated Roads and Trails for Motorized Vehicle Use	BLM Surface	PHMA: 25,372 GHMA: 112,569	PHMA: 3 GHMA: 14	PHMA: 15,167 GHMA: 113,883	PHMA: 2 GHMA: 15	PHMA: 130,704 GHMA: 579,042	PHMA: 17 GHMA: 74	PHMA: 117,503 GHMA: 530,696	PHMA: 15 GHMA: 68
Acres of SRMAs (Number of SRMAs)	BLM Surface	PHMA: 0 GHMA: 0	PHMA: 0 GHMA: 0	PHMA: 28,043 GHMA: 26,821	PHMA: 4 GHMA: 3	PHMA: 5,359 GHMA: 24,024	PHMA: 0.7 GHMA: 3	PHMA: 27,364 GHMA: 25,451	PHMA: 3 GHMA: 3
Acres Available to Livestock Grazing	BLM Surface	N/A ⁶	N/A ⁶	PHMA: 25,962 GHMA: 272,091	PHMA: 3 GHMA: 35	PHMA: 136,000 GHMA: 625,379	PHMA: 17 GHMA: 80	PHMA: 135,209 GHMA: 620,094	PHMA: 17 GHMA: 79

Topic	Acreage Type	Alternative A (No Action)		Alternative B		Alternative C		Alternative D (Proposed RMP)	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Acres Incompatible to Livestock Grazing	BLM Surface	N/A ⁶	N/A ⁶	PHMA: 111,485 GHMA: 355,747	PHMA: 14 GHMA: 45	PHMA: 1,451 GHMA: 2,445	PHMA: 0.2 GHMA: 0.3	PHMA: 2,282 GHMA: 6,920	PHMA: 0.3 GHMA: 0.9
<p>Source: BLM 2012f</p> <p>Note: Although federal mineral estate acreage is not displayed for each resource topic in this table, land use decisions may affect management on federal mineral estate. The associated fluid mineral leasing decisions are noted in parentheses where applicable.</p> <p>BLM Surface: 782,102 acres BLM Fluid Mineral Estate: 3,386,530 acres BLM Locatable/Salable Mineral Estate: 3,348,121 acres</p> <p>PHMA: Greater Sage-Grouse Priority Habitat Management Areas (Core Population Areas and Core Population Connectivity Corridors). GHMA: Greater Sage-Grouse General Habitat Management Areas</p> <p>¹The existing withdrawals from mineral entry (totaling 11,373 acres) are not included in the acres recommended for withdrawal from mineral entry. ²As of October 1, 2008, there are 2,570,703 acres under existing leases. ³Land use decision not applicable under Alternative A. ⁴Visual Resource Management Class V no longer exists as a class objective option for managing visual resources. As a result, these areas are managed as Class IV visual resources under Alternative A. ⁵Closed to off-highway vehicle use. ⁶Approximately 10,000 acres are presently incompatible with livestock grazing. The data are not available in a GIS layer; however, all 10,000 acres are within the Big Horn Mountains portion of the planning area and therefore not within priority habitat. ⁷P: Priority Greater Sage-Grouse Habitat (Core Population Areas and Core Population Connectivity Corridors), G: General Greater Sage-Grouse Habitat.</p> <p>BLM Bureau of Land Management CSU controlled surface use GHMA General Habitat Management Area N/A Not Applicable NSO No Surface Occupancy PHMA Priority Habitat Management Area ROW right-of-way RMP Resource Management Plan SRMA Special Recreation Management Area TLS timing limitation stipulation</p>									

2.5.3. Development of the BLM Proposed Plan for Greater Sage-Grouse Management

In developing the Proposed Plan for Greater Sage-Grouse management, the BLM made modifications to the Preferred Alternative identified in the Draft Land Use Plan/EIS. The modifications are based on public comments received on the Draft Land Use Plan/EIS, internal BLM review, new information and best available science, the need for clarification in the plans, and ongoing coordination with stakeholders across the range of the Greater Sage-Grouse. As a result, the Proposed Plan provides consistent Greater Sage-Grouse habitat management across the range, prioritizes development outside of Greater Sage-Grouse habitat, and focuses on a landscape-scale approach to conserving Greater Sage-Grouse habitat.

The BLM modified the Preferred Alternative, identified as Alternative D as presented in the Draft Land Use Plan/EIS, which is now considered the proposed plan for managing BLM-administered lands within the Buffalo Planning Area.

Since release of the Draft Land Use Plan/EIS, the BLM have continued to work closely with a broad range of governmental partners, including Governors, State Fish and Game agencies, the USFWS, Indian tribes, county commissioners and many others. Through this coordination, the BLM have developed a Proposed Plan that is consistent with state, Tribal, and local strategies to the maximum extent possible and ensures the long-term conservation of the Greater Sage-Grouse. The BLM also received many substantive public comments on the Draft Land Use Plan (see Appendix Y (p. 2671)), which greatly informed the BLM's development of the Proposed Plan for Greater Sage-Grouse management.

The BLM has refined the Proposed Plan to provide a layered management approach that offers the highest level of protection for Greater Sage-Grouse in the most valuable habitat. Land use allocations in the Proposed Plan would limit or eliminate new surface disturbance in Priority Habitat Management Area, while minimizing disturbance in General Habitat Management Area. In addition to establishing protective land use allocations, the Proposed Plan for Greater Sage-Grouse management would implement a suite of management tools such as disturbance limits, Greater Sage-Grouse habitat objectives and monitoring, mitigation approaches, adaptive management triggers and responses, and lek buffer-distances throughout the range (see Appendix B (p. 1779)). These overlapping and reinforcing conservation measures will work in concert to improve Greater Sage-Grouse habitat condition and provide clarity and consistency on how the BLM will manage activities in Greater Sage-Grouse habitat.

2.5.4. BLM Proposed Plan for Greater Sage-Grouse Habitat Management

Many of the proposed plan goals, objectives, management actions and allowable uses identified in this section originate from the specific BLM resource/program areas (e.g., Physical Resources) and have been determined to be applicable to the proposed management of Greater Sage-Grouse habitat. The management action/goal/objective numbers are the same as those presented in Section 2.9, "Detailed Alternative Descriptions by Resource" (p. 125) of this chapter and have simply been consolidated here to depict how the BLM proposes to manage Greater Sage-Grouse habitat.

Special Status Species

Greater Sage-Grouse

- Goal BR:11 Sustainable sagebrush habitats that provide the quantity, quality, and connectivity that is necessary to maintain sustainable populations of Greater Sage-Grouse and other special status species. (conserves habitat and populations)
 - Objective BR:11.1 Maintain large patches of high quality interconnected sagebrush habitats, with emphasis on patches occupied by Greater Sage-Grouse. (conserves habitat)
 - Objective BR:11.2 Maintain connectivity between and within sagebrush habitats with emphasis on communities occupied by Greater Sage-Grouse. (conserves habitat)
- Goal BR:12 Successful restoration and rehabilitation of potential Greater Sage-Grouse habitat across the planning area. (conserves habitat)
 - Objective BR:12.1 Reestablish sagebrush corridors, where feasible, between Greater Sage-Grouse occupied habitats. (conserves habitat and populations)
 - Objective BR:12.2 Reconnect large patches of sagebrush habitat with emphasis on reconnecting patches occupied by stronghold and isolated populations of Greater Sage-Grouse. (conserves habitat and populations)
- SS WL-4010: The BLM will collaborate with appropriate federal agencies, and the State of Wyoming as contemplated under Governor Executive Order 2013-3, to: (1) develop appropriate conservation objectives; (2) define a framework for evaluating situations where Greater Sage-Grouse conservation objectives are not being achieved on federal land, to determine if a causal relationship exists between improper grazing (by wildlife or livestock) and Greater Sage-Grouse conservation objectives; and (3) identify appropriate site-based action to achieve Greater Sage-Grouse conservation objectives within the framework. (conserves habitat and populations)
- SS WL-4011: Develop avoidance areas restricting the application of broad-spectrum pesticides in areas containing Greater Sage-Grouse nesting and brood-rearing habitats. (conserves habitat and populations)
- SS WL-4012: Restore Greater Sage-Grouse brood-rearing habitats in wetland/riparian areas. Maintain seeps, springs, wet meadows, and riparian vegetation in a functional and diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas. (conserves habitat and populations)
- SS WL-4013: Manage vegetation composition, diversity and structure, as determined by Ecological Site Description (ESD) and WGFD protocols (WY IM-2012–019 attachment 6), to achieve Greater Sage-Grouse habitat management objectives, in cooperation with stakeholders. (conserves habitat and populations)
- SS WL-4014: Minimize disturbances that would result in alterations to springs and riparian Greater Sage-Grouse habitat. In coordination with stakeholders, develop alternative water sources to replace natural sources that have been affected or destroyed. (conserves habitat)
- SS WL-4015: Manage stored water to control mosquitoes and prevent the spread of West Nile Virus (WNV) to Greater Sage-Grouse. (conserves populations)
- SS WL-4016: Design water facilities with protective features to reduce mortality of Greater Sage-Grouse from drowning or entrapment. (conserves populations)
- SS WL-4017: Design and locate fences to reduce impacts to important Greater Sage-Grouse habitat. (conserves habitat and populations)
- SS WL-4018: Use the Fire Management Plan to incorporate the most current sagebrush habitat information and to guide fire suppression priorities in sagebrush habitats. (conserves habitat)
- SS WL-4019: Remove conifers where they have encroached upon Greater Sage-Grouse habitat in cooperation with stakeholders. Reduce the density of conifers that have encroached into, but do not yet dominate sagebrush plant communities. (conserves habitat)

- SS WL-4020: Inventory, record, and report existing type and condition of BLM fences. Prioritize areas and annually implement modifications to existing fences to reduce hazards to flying Greater Sage-Grouse, in cooperation with stakeholders. All new fences, in priority areas, will be properly designed and located to avoid hazards to flying Greater Sage-Grouse. (conserves populations)
- SS WL-4021: Avoid renewable energy projects in Greater Sage-Grouse Core Population Areas unless it can be demonstrated that the activity would not result in declines of core Greater Sage-Grouse populations. Sufficient demonstration of “no declines” should be coordinated with the WGFD and USFWS. (conserves habitat and populations)
- SS WL-4022: Powerlines (distribution and transmission) will be designed to minimize wildlife related impacts. (conserves populations) This action includes but is not limited to:
 - Avoid areas of high avian use such as water bodies (including ponds, lakes, rivers, streams and wetlands), ridge tops, prairie dog colonies, Greater Sage-Grouse Core Population Areas and Core Population Connectivity Corridors, and sharp-tailed grouse leks. (PRB Final EIS, Executive Order 2011-05)
 - Prohibit within 0.6 mile of Greater Sage-Grouse Core Population Area and Core Population Connectivity Corridor leks unless within an established corridor or it can be demonstrated that the activity will not cause Greater Sage-Grouse population declines. Transmission and collectors lines are not permitted if they are outside designated corridors or at distances greater than 0.5 mile of an existing 115 kilovolt (kV) or greater powerlines, unless there is a demonstration of no declines in Greater Sage-Grouse populations. ROWs for residential and agricultural distribution lines will be evaluated on a project-specific basis. (Executive Order 2011-05)
 - Within general Greater Sage-Grouse habitat (outside Core Population Areas and Core Population Connectivity Corridors) overhead powerlines will be located at least 0.5 mile from Greater Sage-Grouse breeding grounds. (PRB Final EIS)
 - Any new powerlines authorized within the above identified areas will be buried or if overhead then marked to increase visibility and perch-guarded to prevent raptor perching. (PRB Final EIS)
- SS WL-4023: Lease fluid minerals dependent upon lease location and habitat suitability. In order to avoid surface-disturbing activities in Greater Sage-Grouse Priority Habitat (Core Population Areas and Core Population Connectivity Corridors), priority will be given to leasing fluid mineral resources outside of priority habitat. Within Priority Habitat (Core Population Areas and Core Population Connectivity Corridors), leases should be a minimum of 640 contiguous acres of federal mineral estate. Smaller parcels may be leased only when 640 contiguous acres of federal mineral estate is not available and leasing is necessary to remain in compliance with laws, regulations and policy; for example, to protect the federal mineral estate from drainage or to commit the federal mineral estate to unit or communitization agreements. Preliminary parcels reviewed for possible offering in a lease sale should comply with this minimum lease size. Expressions of interest that are less than this minimum lease size would be evaluated and modified by the BLM to meet the minimum lease size, where possible, prior to review for possible offering in a lease sale. (conserves habitat)
- SS WL-4025: In order to avoid surface-disturbing activities in Greater Sage-Grouse Priority Habitat (Core Population Areas and Core Population Connectivity Corridors), priority will be given to development of oil and gas and other mineral resources outside of priority habitat, subject to applicable stipulations. When authorizing development of oil and gas and other mineral resources in priority habitat, subject to applicable stipulations for the conservation of Greater Sage-Grouse, priority will be given to development in non-suitable habitat areas first and then in the least suitable habitat for Greater Sage-Grouse.

Manage Greater Sage-Grouse Core Population Areas as follows (Map 40) (conserves habitat and populations):

- Prohibit surface occupancy and disruptive activities within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability). (SS WL-4024: Fluid Mineral leasing NSO)
- Within core population areas, allow on average no more than 1 energy or mining facility per 640 acres. Within all Priority Habitat Management Area, and for all resource uses, allow on average no more than 5 percent total surface disturbance per 640 acres within the Disturbance Density Calculation Tool (DDCT) analysis area. (SS WL-4024: Fluid Mineral leasing CSU)
 - Design and manage facilities to prevent WNV transmission.
 - Prohibit overhead electric transmission lines unless within 0.5 mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than 1.0 mile.
 - Work with proponents to limit project related noise where it would be expected to reduce habitat functionality.
The BLM would evaluate the potential for limitation of new noise sources on a case-by-case basis as appropriate.
BLM's near-term goal would be to limit noise sources that would be expected to negatively impact priority habitat area sage-grouse populations and to continue to support the establishment of ambient baseline noise levels for occupied priority habitat area leks. As additional research and information emerges, specific new limitations appropriate to the type of projects being considered would be evaluated and appropriate limitations would be implemented where necessary to minimize potential for noise impacts on sage-grouse priority population behavioral cycles. As new research is completed, new specific limitations would be coordinated with the WGFD and partners. Noise levels at the perimeter of the lek should not exceed 10 A-weighted decibels (dBA) above ambient noise.
 - Bury electric distribution lines where possible; if not possible, then locate overhead lines at least 0.6 mile from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards.
 - Buried utilities constructed in designated utility corridors would not require that a DDCT be conducted.
 - Locate new roads that will have relatively high levels of activity (accessing multiple wells, housing development) greater than 1.9 miles from the perimeter of occupied Greater Sage-Grouse leks. Construct roads to minimum design standards needed.
 - Vegetation treatments in nesting and wintering habitat that would reduce sagebrush canopy cover to less than 15 percent would not be conducted unless it can be shown to be beneficial to sage-grouse habitat and removal of sagebrush canopy cover below 15 percent will be subject to the DDCT.
- Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years.
- Prohibit surface-disturbing and disruptive activities from March 15 to June 30 (independent of habitat suitability). (SS WL-4024: Fluid Mineral leasing TLS)
- Prohibit surface-disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas, from December 1 to March 14. (SS WL-4024: Fluid Mineral leasing TLS)

To the extent necessary to prevent unnecessary or undue degradation, manage as follows within Greater Sage-Grouse Core Population Connectivity Corridors (conserves habitat and populations):

- Prohibit surface occupancy and disruptive activities within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability). (SS WL-4024: Fluid Mineral leasing NSO)
- Allow on average no more than 5 percent total surface disturbance per 640 acres within the DDCT analysis area. (SS WL-4024: Fluid Mineral leasing CSU)
 - Design and manage facilities to prevent WNV transmission.
 - Work with proponents to limit project related noise where it would be expected to reduce habitat functionality.

The BLM would evaluate the potential for limitation of new noise sources on a case-by-case basis as appropriate.

BLM's near-term goal would be to limit noise sources that would be expected to negatively impact priority habitat area sage-grouse populations and to continue to support the establishment of ambient baseline noise levels for occupied priority habitat area leks. As additional research and information emerges, specific new limitations appropriate to the type of projects being considered would be evaluated and appropriate limitations would be implemented where necessary to minimize potential for noise impacts on sage-grouse priority population behavioral cycles. As new research is completed, new specific limitations would be coordinated with the WGFD and partners. Noise levels at the perimeter of the lek should not exceed 10 dBA above ambient noise.
 - Buried utilities constructed in designated utility corridors would not require that a DDCT be conducted.
 - Vegetation treatments in nesting and wintering habitat that would reduce sagebrush canopy cover to less than 15 percent would not be conducted unless it can be shown to be beneficial to sage-grouse habitat and removal of sagebrush canopy cover below 15 percent will be subject to the DDCT. Wildland fire burns will be treated as disturbance if sagebrush is reduced below 5% canopy cover, unless there is an implementation plan outlining restoration efforts and 3 years of data showing a trend back to suitable habitat.
- Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years.
- Prohibit surface-disturbing and disruptive activities within 4 miles of occupied Greater Sage-Grouse leks from March 15 to June 30 (independent of habitat suitability and restricted to within Core Population Connectivity Corridors). (SS WL-4024: Fluid Mineral leasing TLS)
- Prohibit surface-disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas from December 1 to March 14. (SS WL-4024: Fluid Mineral leasing TLS)

Manage as follows within occupied Greater Sage-Grouse habitat outside of Core Population Areas and Core Population Connectivity Corridors:

- Prohibit or restrict surface occupancy and disruptive activities within 0.25 mile of the perimeter of occupied Greater Sage-Grouse leks. (SS WL-4024: Fluid Mineral leasing NSO)

- Reduce surface disturbance for authorizations within 0.25 mile of occupied Greater Sage-Grouse leks by (SS WL-4024: Fluid Mineral leasing CSU):
 - Design and manage facilities to prevent WNV transmission.
 - Prohibit overhead transmission lines.
- Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years.

Recommend for all surface-disturbing activities on BLM surface adjacent to Core Population Areas or Core Population Connectivity Corridors, or within or adjacent to lands involved in Greater Sage-Grouse conservation projects.

- Work with proponents to limit project related noise where it would be expected to reduce functionality of habitats that support priority habitat area populations. The BLM would evaluate the potential for limitation of new noise sources on a case-by-case basis as appropriate. BLM's near-term goal would be to limit noise sources that would be expected to negatively impact priority habitat area sage-grouse populations and to continue to support the establishment of ambient baseline noise levels for occupied priority habitat area leks. As additional research and information emerges, specific new limitations appropriate to the type of projects being considered would be evaluated and appropriate limitations would be implemented where necessary to minimize potential for noise impacts on sage-grouse priority population behavioral cycles. As new research is completed, new specific limitations would be coordinated with the WGFD and partners. Noise levels at the perimeter of the lek should not exceed 10 dBA above ambient noise.
- Prohibit surface-disturbing and disruptive activities within 2.0 miles of occupied Greater Sage-Grouse leks, from March 15 to June 30 (independent of habitat suitability). (SS WL-4024: Fluid Mineral leasing TLS)
- Prohibit surface-disturbing and disruptive activities from December 1 to March 14 within mapped Greater Sage-Grouse winter concentration areas that support populations of Greater Sage-Grouse that attend leks within Core Population Areas. (SS WL-4024: Fluid Mineral leasing TLS)

Other Special Status Species

- Goal BR:10 Distribution and abundance of all special status species are optimized. (conserves populations)
 - Objective BR:10.2 Manage BLM-administered lands to maintain or restore populations and habitat consistent with conservation requirements for special status species. (conserves habitat and populations)
 - Objective BR:10.3 Develop effective conservation and cooperative management plans, strategies, and agreements with stakeholders. (conserves habitat and populations)
- SS WL-4001: Utilize current research, management and conservation plans, and similar related documents to guide special status species habitat management. (conserves habitat)
- SS WL-4002: Implement actions set forth in recovery plans, conservation measures, terms and conditions, protection measures, and appropriate BMPs and reasonable and prudent measures within biological opinions for Threatened and/or Endangered wildlife species, including those

specific to this RMP and any future statewide programmatic biological opinions. (conserves habitat and populations)

- SS WL-4003: Maintain (size and quality) or enhance current habitat utilized by special status species. Enlarge/restore habitat on a site-specific basis. (conserves habitat)
- SS WL-4004: Maintain or enhance the integrity of identified special status wildlife species migration corridors. Manage identified special status wildlife species travel corridors consistent with other resource values. (conserves habitat)
- SS WL-4005: Locate and manage facilities to mitigate noise impacts on special status species. (conserves habitat)
- SS WL-4006: Manage surface-disturbing and disruptive activities to mitigate impacts on special status wildlife species and their habitats. (conserves habitat and populations)
- SS WL-4007: Apply a CSU stipulation to fluid mineral leases containing special status species habitat. Surveys required for clearance. (conserves habitat)
- SS WL-4018: Use the Fire Management Plan to incorporate the most current sagebrush habitat information and to guide fire suppression priorities in sagebrush habitats. (conserves habitat)

Vegetation

- Goal BR:1 Vegetation resources sustained in desired ecological conditions. (conserves habitat)
 - Objective BR:1.1 Manage communities for a diversity of native species, habitats, seral stages and distribution. (conserves habitat)
 - Objective BR:1.2 Manage for healthy vegetation communities to ensure their capability to provide sufficient plant composition, cover and litter accumulation to protect soils from wind and water erosion and enhance nutrient cycling and productivity. (conserves habitat)
 - Objective BR:1.3 Reclaim areas affected by surface-disturbing activities to promote healthy functioning native plant communities. (promotes habitat restoration)
 - Objective BR:1.4 Manage habitat to facilitate the conservation, recovery and maintenance of populations of native, desirable non-native, and special status plant species consistent with appropriate local, state, and federal conservation requirements and management plans. (conserves habitat)
 - Objective BR:1.5 Manage for healthy native plant communities by reducing and managing invasive, non-native noxious species. (conserves habitat)

Vegetation – Grassland and Shrubland Communities

- Goal BR:3 A diverse landscape of native grasslands and shrublands sustained in desired ecological conditions. (conserves habitat)
 - Objective BR:3.1 Manage for a full range of sagebrush, shrub, and grassland communities with diverse native species and subspecies, composition, canopies, densities, and age classes across the landscape. (conserves habitat)
- GS-4001: Manage vegetative communities (Map 25) in accordance with Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming. (conserves habitat)
- GS-4002: Use an integrated management approach (e.g., mechanical, chemical, biological treatments, prescribed fire, and grazing management techniques) to maintain, restore, and enhance the health and diversity of plant communities to achieve resource or multi-resource objectives. (conserves habitat)
- GS-4005: Manage grasslands and shrublands to protect, preserve, or enhance plant communities. (conserves habitat)

- GS-4006: Manage the siting of facilities and related infrastructure (utility corridors, roads) to reduce impacts to vegetation resources. (conserves habitat)
- GS-4007: Manage the planning and development of travel routes, recreational uses, mineral exploration and development sites, and ROW to reduce impacts to the vegetation resource. (conserves habitat)
- GS-4008: Develop a contingency plan addressing catastrophic natural events such as drought, wildfires, and large-scale pest infestations, incorporating strategies that best protect vegetation resources. (conserves habitat)
- GS-4009: Work with landowners on split estate lands to reestablish disturbed sites to healthy plant communities in accordance with the ecological site potential. (promotes habitat restoration)

Vegetation – Forest and Woodland Communities

- Forest-4006: Actively manage woodlands to prevent expansion into other communities consistent with multiple resource values, on a project-specific basis. (conserves habitat)

Vegetation – Invasive Species and Pest Management

- Goal BR:5 Healthy native communities with manageable levels of pathogens, undesirable, invasive, non-native, or noxious species. (conserves habitat)
 - Objective BR:5.1 Develop and maintain baseline information regarding the extent, location, and potential impact(s) of pest species. From this baseline information develop and implement an Integrated Pest Management Plan. (conserves habitat)
 - Objective BR:5.2 Facilitate support for an integrated approach for the detection, management or eradication of new and minor infestations. (conserves habitat)
 - Objective BR:5.3 Develop, implement, and maintain a management program for annual bromes and other invasive or undesirable species not listed as noxious, utilizing the best available science and BMPs. (conserves habitat)
 - Objective BR:5.4 Coordinate with Animal and Plant Health Inspection Service (APHIS) to facilitate pest and predator management. (conserves populations)
- Pest-4002: Manage designated pests on public surface lands using an Integrated Pest Management Approach consistent with Department of the Interior (DOI) Manual 517 (BLM 2007f). (conserves habitat)
- Pest-4003: Limit surface disturbance to the minimum needed for safe project completion to limit the spread of noxious weeds. (conserves habitat)
- Pest-4004: Use certified noxious weed seed-free products on all BLM-administered projects and lands. (conserves habitat)
- Pest-4005: Implement and maintain cooperative integrated pest management programs with county weed and pest districts, state agencies, private industry, grazing lessees, and other stakeholders in conjunction with BLM weed and pest control work on public lands adjoining deeded and state lands (Map 27). (conserves habitat)
- Pest-4006: Require surface or vegetation disturbance areas, including areas formerly receiving or holding water, be treated for invasive species and revegetated. (conserves habitat)

- Pest-4009: Treat those plants on the State of Wyoming Designated list, the appropriate county lists, and other species of concern as determined by BLM resource specialists. (conserves habitat)
- Pest-4010: Designate and prioritize areas for the treatment of annual brome species. (conserves habitat)

Vegetation – Riparian and Wetland Communities

- Goal BR:4 Health and functional capabilities in riparian/wetland systems are maintained. (conserves brood-rearing habitat)
 - Objective BR:4.1 Manage lotic and lentic wetland/riparian systems at a minimum to achieve and/or maintain PFC. (conserves brood-rearing habitat)
 - Objective BR:4.2 Improve riparian systems and wetlands in systems operating at less than PFC. (conserves brood-rearing habitat)
 - Objective BR:4.3 Manage contributing watersheds to sustain riparian health and water quality. (conserves brood-rearing habitat)
 - Objective BR:4.4 Manage and enhance riparian and wetland systems for plant, insect, fish and wildlife species that depend on these systems for their health and well being. (conserves brood-rearing habitat)
 - Objective BR:4.5 Coalbed Natural Gas (CBNG) created riparian and wetland systems will be evaluated, retained, or reclaimed to support vegetation and other resource values. (conserves brood-rearing habitat)
- Riparian-4002: Prioritize, and develop activity and implementation plans to manage riparian systems to be at or above, or continue to be improving toward, PFC while achieving the Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming. (conserves brood-rearing habitat)
- Riparian-4003: Manage riparian and wetland systems to enhance forage conditions and improve water quality. Manage all riparian systems with sensitive species concerns to a succession stage appropriate for that system, including vertical as well as horizontal vegetative structure and composition. (conserves brood-rearing habitat)
- Riparian-4004: Expand and enhance riparian/wetland systems and habitat in cooperation with stakeholders. (conserves brood-rearing habitat)
- Riparian-4005: Prevent degradation, loss, or destruction of riparian/wetland habitat. (conserves brood-rearing habitat)
- Riparian-4008: Allow surface disturbance within 500 feet of riparian/wetlands systems and aquatic habitats where riparian/wetland and other resource objectives (including, but not limited to soil, slope, and vegetation) can be met. (Riparian-4009: Fluid Mineral leasing CSU) (conserves brood-rearing habitat)
- Riparian-4010: Identify and manage systems capable of achieving Desired Future Condition (DFC). (conserves brood-rearing habitat)
- Riparian-4011: Restore vegetation in CBNG supported wetland and riparian systems on BLM surface and/or lease in accordance with the ecological site potential. (conserves brood-rearing habitat)

Climate Change

No proposed management actions directly applicable to Greater Sage-Grouse conservation (See Air Quality for proposed air resources management).

Fire and Fuels Management

- Goal FM:1 Life, property, and resource values are protected. (conserves habitat)
 - Objective FM:1.1 Respond to unplanned wildfires based on: (1) ecological, (2) social, and (3) legal consequences while supporting other resource values. (conserves habitat)
 - Objective FM:1.5 Implement appropriate emergency stabilization and rehabilitation actions following wildland fire. (conserves habitat)
- Goal FM:2 Plant community and hazardous fuel objectives are achieved. (conserves habitat)
 - Objective FM:2.1 Improve fire regime condition class and maintain or improve conditions of fire-adapted landscapes by managing fire, planned and unplanned, to accomplish beneficial resource objectives. (conserves habitat)
- Fire-3001: A Fire Management Plan for the Wyoming High Plains District will be maintained that more specifically outlines management response and implementation actions for wildland fire response of public lands. (conserves habitat)
- Fire-3002: A resource advisor appropriate to the potentially affected resource will be consulted, or assigned, to all wildland fires that involve or threaten BLM-administered lands. (conserves habitat)
- Fire-3006: Implement the BLM Emergency Stabilization and Burned Area Rehabilitation standards located in the DOI Interagency Burned Area Emergency Response Guidebook (DOI 2004) and BLM Burned Area Emergency Stabilization and Rehabilitation Handbook (BLM 2007c) as needed. (promotes habitat restoration)
- Fire-3007: Use the District Fire Management Plan to implement the objectives of this RMP; to address fire management on a landscape scale, to maintain or improve conditions in fire-adapted landscapes, and to accomplish resource management objectives. (conserves habitat)
- Fire-3011: Response to wildfire varies from full protection in areas where fire is undesirable to monitoring fire behavior in areas where fire can be managed to accomplish other resource objectives. (conserves habitat)
- Fire-3012: Prohibit heavy equipment use within the following areas, except when human safety is at risk or if the expected fire effects would cause more resource damage than the use of heavy equipment: Identified Greater Sage-Grouse important habitats: Core Population Area, nesting, brood-rearing, Core Population Connectivity Corridor, or winter habitat. (conserves habitat)
- Fire-3013: Use protection strategies in the following areas: Where sensitive or high value resources would be adversely affected by fire (i.e., Greater Sage-Grouse priority habitat). (conserves habitat)
- Fire-3014: Evaluate all fires and rehabilitate fire-damaged lands as needed to meet resource objectives. Repair suppression damages as necessary. (promotes habitat restoration)
- Fire-3015: Use wildland fire and other vegetation treatments to meet desired management objectives. (conserves habitat)

Livestock Grazing Management

- Goal LR:11 Public rangelands provide for a sustainable level of livestock grazing consistent with other resource values and sustained yield. (conserves habitat)
 - Objective LR:11.2 Manage forage to maintain or improve ecological states and achieve and/or maintain Standards for Healthy Rangelands and Guidelines for Livestock Grazing

Management for the Public Lands Administered by the BLM in the State of Wyoming. (conserves habitat)

- Objective LR:11.3 Monitor and evaluate rangeland health and condition in coordination with cooperators, and lessees to determine if, and what additional management is needed to achieve desired ecological state. (conserves habitat)
- Grazing-6001: Develop and implement appropriate livestock grazing management actions to achieve the Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming, to provide watershed protection, to improve forage for livestock, forage and habitat for wildlife, and enhance rangeland health. (conserves habitat)
- Grazing-6004: Continue implementation of existing Allotment Management Plans (AMPs). Develop and implement new AMPs with grazing lessees and other stakeholders to achieve desired resource goals and objectives. (conserves brood-rearing habitat)
- Grazing-6005: Manage livestock grazing to sustain riparian, wetland, mountain mahogany, specials status species, or other special habitats. (conserves habitat)
- Grazing-6009: Implement strategies that best protect rangeland resources during periods of drought. Cooperate with stakeholders for voluntary adjustments in livestock use and/or livestock management. (conserves habitat)
- Grazing-6015: Develop range improvements in accordance with resource needs and livestock management. (conserves habitat)
- Grazing-6016: Conduct baseline inventories. Develop, implement, and monitor AMPs. Base AMP goals/objectives in Category I and M allotments on resource protection and watershed health. (conserves habitat)
- Grazing-6019: Locate livestock salt or mineral supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands. (conserves brood-rearing habitat)
- Grazing-6021: Provide rest/deferment from livestock grazing following wildfire, prescribed burns, and other vegetative treatments until resource objectives are met. (promotes habitat restoration)

Wild Horses and Burros

Resource not present.

Lands and Realty

Lands and Realty (Land Tenure)

- Goal LR:2 Manage land tenure adjustments and land use authorizations to meet the needs of the customers while protecting other resource values. (conserves habitat)
 - Objective LR:2.1 Develop and maintain a land-ownership pattern that improves access for public use, and improves management and protection of BLM-administered lands. (conserves habitat)
- L&R-6002: Consider land use authorizations (permits, leases, etc.) on a project-specific basis consistent with other resource objectives. (conserves habitat)
- L&R-6003: Consider withdrawals for surface and/or minerals on a project-specific basis. (conserves habitat)
- L&R-6011: Acquire private or state land or interest in land from willing sellers consistent with other resource objectives, on a project-specific basis. (conserves habitat)
- L&R-6012: Acquire and dispose of land based on all resource values, including but not limited to agricultural potential and water. (conserves habitat)

- L&R-6014: Prioritize acquiring land or interests in lands in areas adjacent to large blocks of BLM-administered land or other lands having significant resource or other values before other areas. (conserves habitat)

Renewable Energy (Solar and Wind)

See Special Status Species, Greater Sage-Grouse.

Rights-of-Way and Corridors

- Goal LR:4 Primary infrastructure corridors and subsidiary routes consistent with other resource values. (conserves habitat)
 - Objective LR:4.1 Manage public lands to meet the needs of ROW customers while supporting other resource values. (conserves habitat)
 - Objective LR:4.3 Identify infrastructure corridors consistent with other resource values. (conserves habitat)
 - Objective LR:4.4 Make opportunities available for exploration and development of Carbon Dioxide (CO₂) sequestration research and activities, while avoiding or mitigating impacts of these activities on other resource values. (conserves habitat)
- ROW-6001: Designate corridors for major ROW to minimize surface disturbance and impacts to other resources. (conserves habitat)
- ROW-6004: The preferred location for new ROW will be in or adjacent to existing disturbed areas associated with existing ROW, constructed roads, or highways. (conserves habitat)
- ROW-6005: Maintain a transportation management system in cooperation with appropriate state and local agencies to meet public and resource management needs. (conserves habitat)
- ROW-6009: Designate the following corridors for major ROW transportation and utility use, (Map 58), in cooperation with the State of Wyoming: Echeta Road; Sheridan to Gillette, largely following US 14/16; Highway 59 north of Gillette; Interstate 25; Interstate 90; Gillette to Montana State Line; Powder River; Powder River Breaks (Buffalo to Gillette). Corridor use is required. No above ground lines will be authorized in the Powder River or Powder River Breaks corridors. Lines must be buried within Greater Sage-Grouse Core Population Areas unless within 0.5 mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than 1.0 mile. (conserves habitat)
- ROW-6010: Authorize and place above ground facilities (i.e., compressors, electric distribution powerlines) within ROW and other disturbance areas when resource objectives can be met. (conserves habitat)
- ROW-6012: Evaluate CO₂ sequestration proposals where in accordance with management identified within Alternative D. (conserves habitat)

Withdrawals

Included under the resource for which the withdrawal or closure is recommended.

Mineral Resources

Leasables – Fluid Minerals

- O&G-2001: Continue to require lessees to conduct operations in a manner that minimizes adverse impacts to other resources and other land uses and users. (conserves habitat)

Locatable Minerals

- Objective MR:1.1 Provide opportunities for the exploration and development of locatable minerals, as well as mill and tunnel site operations, while avoiding or mitigating the effects of

these activities on other resource values so that unnecessary or undue degradation is prevented. (conserves habitat)

Salable Minerals (Mineral Materials)

- Objective MR:5.1 Provide opportunities for exploration and development of salable minerals while avoiding or mitigating effects to other resource values. (conserves habitat)

Leasables – Coal

- Objective MR:2.1 Maintain coal leasing and exploration, while minimizing impacts to other resource values. (conserves habitat)

Leasables – Other (Non-energy Leasables)

No proposed management directly related to Greater Sage-Grouse conservation; no foreseeable commercial potential within the planning area.

Travel and Transportation Management

- Goal LR:5 A safe transportation network that supports other resource values. (conserves habitat)
 - Objective LR:5.1 Utilize a comprehensive travel management approach to sustain and enhance access, recreational experiences, and support other resource values. (conserves habitat)
 - Objective LR:5.3 Designate all BLM-administered lands as Open, Limited, or Closed to Off-highway Vehicle (OHV) use, in consideration of other resource values. (conserves habitat)
 - Objective LR:5.4 Provide for acceptable modes of legal public access that supports other resources, reduces conflicts, and provides for diverse recreation opportunities. (conserves habitat)
- Trans-6002: Evaluate roads constructed under other initiatives (e.g., oil and gas exploration) for inclusion in the BLM transportation system. Roads that are no longer needed for their original purposes are assessed for addition to the BLM transportation system prior to reclamation. (conserves habitat)
- Trans-6004: Design, construct, and maintain roads or trails based on the specific objectives for that trail or road in consideration of other resources. Design, construct, and maintain roads to minimize surface disturbance, changes to surface water runoff, and erosion. (conserves habitat)
- Trans-6006: Base road or trail closures and abandonments on resource protection, demand for new roads and accommodation of authorized uses. (conserves habitat)
- Trans-6007: Maintain transportation system roads under BLM jurisdiction in accordance with assigned maintenance levels and in consideration of other resource values. Maintain administrative roads on an as needed basis, dependent on time, funding, and access priorities. (conserves habitat)
- Trans-6008: Within 5 years of the ROD, inventory all routes on public land and develop a Travel Management Plan to classify and designate routes for continued use or decommissioning and reclamation. (conserves habitat)
- Trans-6014: Limit OHV use to designated routes unless compelling reasons exist to classify parcels as Open or Closed, and is consistent with other resource values. (conserves habitat)
- Trans-6019: Limit motorized vehicle use to designated routes within habitat of special status species consistent with travel management designations for that area. Routes will be designated to avoid occupied habitat during travel management planning. (conserves habitat)
- Trans-6020: Evaluate existing routes in the vicinity of any new system roads for closure and reclamation consistent with other resource values. (conserves habitat)

Recreation

- Objective LR:7.2 Manage recreation to protect resources, maintain public health and safety, and to provide a diverse array of benefits to the public. (conserves habitat)
- Goal LR:8 Recreation facilities balance public demand with other resource values. (conserves habitat)
 - Objective LR:8.1 Design and maintain recreation sites to meet acceptable health and safety standards while supporting other resource values. (conserves habitat)
- Rec-6003: Open the planning area to dispersed recreation where consistent with other resource values. (conserves habitat)
- Rec-6010: Avoid riparian habitat or develop and manage recreational sites, recreation facilities, and recreational access in a manner that minimizes impacts to riparian habitats. (conserves brood-rearing habitat)
- Rec-6011: Prohibit dispersed camping and commercial camps within 200 feet of perennial surface water. (conserves brood-rearing habitat)
- Rec-6015: Allow additional recreation facilities in areas where they are supported by recreational use and are consistent with other resource values. (conserves habitat)
- Rec-6018: Designate the following areas as Special Recreation Management Areas (SRMAs) and delineate discrete recreation management zone boundaries (Map 71): Burnt Hollow (17,280 acres); Dry Creek Petrified Tree (2,567 acres); Hole-in-the-Wall (11,952 acres); Middle Fork Powder River (10,083 acres); Mosier Gulch (1,026 acres); Welch Ranch (1,748 acres); Weston Hills (9,504 acres). Strategically emphasize a variety of recreation opportunities along with the protection of natural and cultural resources. Recreation and Visitor Services (R&VS) management will be recognized as the predominant land use focus in SRMAs. (conserves habitat)
- Rec-6019: Do not lease minerals within the boundary of all SRMAs except Weston Hills (CSU). (conserves habitat)
- Rec-6021: Allow surface disturbance within designated SRMAs for administrative use only, where consistent with other resource values. (conserves habitat)
- Rec-6022: Recommend withdrawals from mineral entry under the mining laws in designated SRMAs. (conserves habitat)
- Rec-6023: Allow salable mineral development within designated SRMAs for administrative use only. (conserves habitat)

Special Designations

No proposed Special Designation management directly related to Greater Sage-Grouse conservation.

Other Resources

Soil

- Objective PR:2.1 Achieve and maintain Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming. (conserves habitat)
- Objective PR:2.3 Rehabilitate all surface-disturbing activities consistent with applicable laws, regulations, and policies. (promotes habitat restoration)
- Soil-1002: Authorized surface-disturbing activities will include plans for reclamation; site-specific reclamation actions should reflect the complexity of the project, environmental concerns, and the reclamation potential of the site. (promotes habitat restoration)

Water

- Goal PR:3 Watershed, surface water, and groundwater resources are consistent with applicable state and federal standards and regulations. (conserves habitat)
 - Objective PR:3.1 BLM actions maintain or improve watershed, wetland, and riparian functions to support desired surface-flow regimes and water quality. (conserves habitat)
- Water-1007: Design and manage land use and surface-disturbing activities to reduce channel and bank erosion and the associated loss of riparian habitats. (conserves brood-rearing habitat)
- Water-1013: Allow surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, or perennial streams where water and other resource objectives (including, but not limited to soil, slope, and vegetation) can be met. (Water-1014: Fluid Mineral leasing CSU) (conserves brood-rearing habitat)
- Water-1016: Evaluate unneeded reservoirs for removal and reclamation. (promotes habitat restoration)

Fish and Wildlife Resources

- Goal BR:6 Distribution and abundance of all native and desirable non-native species are optimized. (conserves populations)
 - Objective BR:6.1 BLM actions prevent and/or reduce impacts to desirable species. (conserves habitat and populations)
 - Objective BR:6.2 In coordination with cooperating agencies, develop and implement an achievable Wildlife Monitoring and Protection Plan. (conserves habitat and populations)
 - Objective BR:6.3 Maintain, restore, or improve the continuity and productivity of fish and wildlife habitats to support WGFD population objectives. (conserves habitat)
 - Objective BR:6.4 Develop and implement an adaptive conservation and management strategy. (conserves habitat and populations)
- Goal BR:7 Sufficient functional habitat for native and desirable non-native species. (conserves habitat)
 - Objective BR:7.1 Evaluate, update, and revise as necessary existing Wildlife Habitat Management Plans. (conserves habitat)
 - Objective BR:7.2 Develop Wildlife Habitat Management Plans for areas with important habitats. (conserves habitat)
 - Objective BR:7.3 Manage habitat consistent with local, state, and federal management plans, as applicable. (conserves habitat)
 - Objective BR:7.4 Continue to gather habitat and population data while concurrently monitoring human and natural disturbance dynamics to improve habitat management. (conserves habitat and populations)
 - Objective BR:7.5 Provide security habitat, sufficient in amount and distribution, to support WGFD population objectives for fish and wildlife to escape from disruptive activities. (conserves habitat)
 - Objective: BR:7.6 Maintain and provide functioning sagebrush habitat to sustain sagebrush obligates and other sagebrush dependent species. (conserves habitat)
- Goal BR:8 Fish and wildlife are able to move between areas of functionally intact habitat. (conserves habitat and populations)
 - Objective BR:8.1 Develop Travel Management Plans for areas important for fish and wildlife while supporting other resource values. (conserves habitat and populations)
 - Objective BR:8.2 Develop a ROW Management Plan for utility corridors to manage impacts to areas of habitat important to fish and wildlife consistent with other resource values. (conserves habitat)

- Objective BR:8.3 Land acquisitions should support desirable fish and wildlife populations or habitat. (conserves habitat)
- Objective BR:8.4 Restore functionality to areas of degraded habitat important to fish and wildlife populations consistent with other resource values. (conserves habitat and populations)
- Fish-4008: Maintain or enhance streams and riparian areas associated with Class I and II streams (WGFD classifications), Powder River, Tongue River, and other appropriate areas for desired fisheries potential. (conserves brood-rearing habitat)
- Fish-4012: Allow surface-disturbing activities within 0.25 mile of naturally occurring water bodies containing native and desirable non-native fish species where fish resource objectives can be met. (Fish-4013: Fluid Mineral leasing CSU) (conserves brood-rearing habitat)
- WL-4001: Develop appropriate mitigation for surface-disturbing and disruptive activities associated with wildlife habitat management through use of the mitigation guidelines described in Appendix J (p. 2155). (conserves habitat)
- WL-4002: Maintain or improve important wildlife habitats through vegetative manipulations, habitat improvement projects, livestock grazing strategies, and the application of The Wyoming Guidelines for Managing Sagebrush Communities with Emphasis on Fire Management (Wyoming Interagency Vegetation Committee 2002) and Appendix J (p. 2155), WGFD Strategic Habitat Plan (WGFD 2001), State Wildlife Action Plan (SWAP) (WGFD 2010b), and similar guidance updated over time. (conserves habitat)
- WL-4003: Continue to use existing Habitat Management Plans and update as necessary to include management objectives and prescriptions for wildlife: South Big Horns Habitat Management Plan (BLM 1986c), including a portion or all of the Gardner Mountain and North Fork Wilderness Study Areas (WSAs); Wetlands Habitat Management Plan (BLM 1986b); and Middle Fork Powder River Habitat Management Plan (BLM 1980). (conserves habitat)
- WL-4005: Consult with the WGFD and USFWS, in accordance with MOUs, when applying mitigation for wildlife and before waiving, allowing exceptions to, or modifying wildlife-related land use restrictions and mitigation. (conserves habitat and populations)
- WL-4006: Provide, to the extent possible, suitable habitat and forage to support wildlife population objectives as defined by WGFD. BLM will cooperatively consider proposals by the WGFD to change population objective levels based on habitat capability and availability. (conserves habitat and populations)
- WL-4007: Manage access to protect crucial habitats in cooperation with WGFD and other stakeholders. (conserves habitat)
- WL-4008: Utilize current research, management and conservation plans, and similar related documents to guide wildlife habitat management. (conserves habitat)
- WL-4009: Construct new fences to avoid adverse impacts to wildlife and in accordance with BLM Fencing Handbook 1741-1 (BLM 1989) and WO IM 2010-022: Managing Structures for the Safety of Sage-grouse, Sharp-tailed grouse, and Lesser prairie chicken (BLM 2009e). (conserves habitat and populations)
- WL-4012: Inventory, record, and report existing type, condition and location of BLM fences. Prioritize fence projects and annually implement modifications in accordance with appropriate wildlife needs and the BLM Fencing Handbook 1741-1. (conserves habitat and populations)
- WL-4013: Allow surface-disturbing and disruptive activities to occur throughout the entire life of projects during seasons important for wildlife when wildlife resource objectives can be met. (conserves habitat and populations)
- WL-4014: Powerlines (distribution and transmission) will be designed to minimize wildlife related impacts and constructed to the latest APLIC standards. Prohibit above ground

distribution powerlines unless identified in an approved distribution plan. (conserves habitat and populations)

Cultural Resources

- Cultural-5007: Allow surface disturbance and infrastructure within 3.0 miles of the following sites where development is either not visible, or will result in a weak contrast to the setting: Pumpkin Buttes, Cantonment Reno, Dull Knife Battle, Crazy Woman Battle, Contributing and Unevaluated Segments of the Bozeman Trail, All Rock Art Sites, All Native American Burials. (conserves habitat)

Paleontological Resources

- Paleo-5001: Retain public lands with significant paleontological values (Map 47). (conserves habitat)
- Paleo-5006: Avoid areas containing paleontological resources of high quality or importance when developing locatable minerals. (conserves habitat)
- Paleo-5007: Apply an NSO stipulation to mineral leases in areas containing paleontological resources of high quality or importance. (conserves habitat)
- Paleo-5008: Avoid areas containing paleontological resources of high quality or importance when developing salable minerals. (conserves habitat)

Visual Resources

- VRM-5002: Incorporate BMPs for visual resources into project planning for federal actions. (conserves habitat)

RDFs are means, measures, or practices intended to reduce or avoid adverse environmental impacts. The Buffalo RMP proposes a suite of design features that would establish the minimum specifications for water developments, certain mineral development, and fire and fuels management and would mitigate adverse impacts. These design features would be required to provide a greater level of regulatory certainty than through implementing BMPs.

In general, the design features are accepted practices that are known to be effective when implemented properly at the project level. However, their applicability and overall effectiveness cannot be fully assessed except at the project-specific level when the project location and design are known. Because of site-specific circumstances, some features may not apply to some projects (e.g., when a resource is not present on a given site) or may require slight variations from what is described in the RMP/EIS (e.g., a larger or smaller protective area). All variations in design features would require appropriate analysis and disclosure as part of future project authorizations. Additional mitigation measures may be identified and required during individual project development and environmental review. The proposed RDFs are presented in Appendix D (p. 1863).

2.5.5. Adaptive Management Strategy for Greater Sage-Grouse

Management action SS WL-4010 directs that BLM's proposed management will include an adaptive management strategy for Greater Sage-Grouse.

Adaptive Management Plan

Wyoming ADPPs will include an adaptive management plan, as reviewed by the BLM WO, SOL, and USFWS, which includes: Upon determination that a hard trigger is tripped, the BLM will immediately defer issuance of discretionary authorizations for new actions within the Biologically Significant Unit for a period of 90 days. In addition, within 14 days of a determination, the Adaptive Management Working Group will convene to develop an interim response strategy and initiate an assessment to determine the causal factors.

Adaptive management is a decision process that promotes flexible resource management decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps with adjusting resource management directions as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a ‘trial and error’ process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits.

In relation to the BLM/USFS’ National Greater Sage-grouse Planning Strategy, adaptive management will help identify if Greater Sage-Grouse conservation measures presented in this EIS contain the needed level of certainty for effectiveness. Principles of adaptive management are incorporated into the conservation measures in the plan to ameliorate threats to a species, thereby increasing the likelihood that the conservation measure and plan will be effective in reducing threats to that species. The following provides the BLM adaptive management strategy for the Buffalo RMP.

Adaptive Management and Monitoring

This Proposed RMP contains a monitoring framework plan (Appendix B (p. 1779)) that includes an effectiveness monitoring component. The agencies intend to use the data collected from the effectiveness monitoring to identify any changes in habitat conditions related to the goals and objectives of the plan and other range-wide conservation strategies (DOI 2004; Stiver et al. 2006; USFWS 2013c). The information collected through the Monitoring Framework Plan outlined in Appendix B (p. 1779) will be used by the BLM/USFS to determine when adaptive management hard and soft triggers (discussed below) are met. The Greater Sage-Grouse adaptive management plan provides a means of addressing and responding to unintended negative impacts to Greater Sage-Grouse habitat will be addressed before consequences become severe or irreversible. This adaptive management plan:

- utilizes science based soft and hard adaptive management triggers,
- addresses multiple scales of data, and
- utilizes an adaptive management working group.

Adaptive Management Triggers

Adaptive management triggers are essential for identifying when potential management changes are needed in order to continue meeting Greater Sage-Grouse conservation objectives. With respect to Greater Sage-Grouse, all regulatory entities in Wyoming, including the BLM, use soft and hard triggers. Soft and hard triggers are focused on three metrics: (1) number of active leks, (2) acres of available habitat, and (3) population trends based on annual lek counts.

Soft Triggers:

Soft triggers are indicators that management or specific activities may not be achieving the intended results of conservation action or that unanticipated changes to populations or habitats have occurred that have the potential to place habitats or populations at risk. The soft trigger is

any deviation from normal trends in habitat or population in any given year. Metrics include, but are not limited to, annual lek counts, wing counts, aerial surveys, habitat monitoring, and DDCT evaluations. BLM field offices, with the assistance of their respective land and resource management plan implementation groups, local WGFD offices, and local Greater Sage-Grouse working groups will evaluate the metrics with the Adaptive Management Working Group (AMWG) on an annual basis. The purpose of these strategies is to address localized Greater Sage-Grouse population and habitat changes by providing the framework in which management will change if monitoring identifies negative population and habitat anomalies in order to avoid crossing a hard trigger threshold.

Hard Triggers:

Hard triggers are indicators that management is not achieving desired conservation results. Hard triggers would be considered a indicator that the species is not responding to conservation actions, or that a larger-scale impact or set of impacts is having a negative effect.

Within the range of normal population variables, hard triggers shall be determined to take effect when two of the three metrics exceeds 60 percent of normal variability for the area under management in a single year, or when any of the three metrics exceeds 40 percent of normal variability for a three year time period within a five-year range of analysis. A minimum of three consecutive years in a five-year period is used to determine trends (i.e., Y1-2-3, Y2-3-4, Y3-4-5).

Baseline Greater Sage-Grouse population levels are established by pre-disturbance surveys, reference surveys and accounting for regional and statewide trends in population levels. Population counts in Wyoming are maintained by the WGFD. Estimates of population are determined based upon survey protocols determined by the WGFD, and are implemented consistently throughout the State. Population counts are tracked for individual leks and then calculated for each Core Population Area (PHMA).

Adaptive Management Response**Soft Triggers Response:**

Soft triggers require immediate monitoring and surveillance to determine causal factors and may require curtailment of activities in the short- or long-term, as allowed by law. The project level adaptive management strategies will identify appropriate responses where the project's activities are identified as the causal factor. The management agency (BLM) and the AMWG will implement an appropriate response strategy to address causal factors not attributable to a specific project or to make adjustments at a larger regional or state-wide level.

Hard Trigger Response:

Upon determination that a hard trigger has been tripped, the BLM will immediately defer issuance of discretionary authorizations for new actions within the Biologically Significant Unit for a period of 90 days. In addition, within 14 days of a determination that a hard trigger has been tripped, the AMWG will convene to develop an interim response strategy and initiate an assessment to determine the causal factor or factors (hereafter called the causal factor assessment).

An interim response strategy will be developed, and implemented to the extent permitted by law, within 90 days of determination that a hard trigger has been tripped. The technical team (see Appendix B (p. 1779)) will be consulted to identify the scope and scale of the interim strategy. Based on the recommendation of the AMWG, the BLM will implement an interim response strategy through an Instruction Memorandum or other management mechanisms to direct management until the causal factor(s) and appropriate response(s) can be determined. The interim response strategy will consist of appropriate management measures undertaken at the

project stage, supported by the best available science, to address the specific metric which has been tripped and may include deferral of some activities as appropriate. Measures that were analyzed in this EIS and the COT, NTT reports, and NPT guidance will be reviewed in addition to current science to identify the most appropriate measures to be implemented as part of the interim response strategy. The BLM will comply with all applicable law in implementing such response(s), and, if applicable, will undertake a plan amendment or revision under BLM's planning regulations and policies.

2.5.6. Regional Mitigation for Greater Sage-Grouse Habitat Management

Consistent with the proposed plan's goals outlined in Table 2.7, "1000 PHYSICAL RESOURCES (PR) – AIR QUALITY (AQ)" (p. 127) through Table 2.40, "8000 SOCIOECONOMIC RESOURCES (SR) – HEALTH AND SAFETY" (p. 275), the intent of the Proposed Plan is to provide a net conservation gain to the species. To do so, in undertaking BLM management actions, and, consistent with valid existing rights and applicable law, in authorizing third party actions that result in habitat loss and degradation within priority habitat (core population areas and core population connectivity corridors), the BLM will require and ensure mitigation that provides a net conservation gain to the species including accounting for any uncertainty associated with the effectiveness of such mitigation. This will be achieved by avoiding, minimizing, and compensating for impacts by applying beneficial mitigation actions. This is also consistent with BLM Manual 6840 – Special Status Species Management, Section .02B, which states "to initiate proactive conservation measures that reduce or eliminate threats to Bureau sensitive species to minimize the likelihood of the need for listing of these species under the ESA."

Mitigation Standards. In undertaking BLM management actions, and, consistent with valid existing rights and applicable law, in authorizing third party actions that result in habitat loss and degradation, the BLM will require and ensure mitigation that provides a net conservation gain to the species including accounting for any uncertainty associated with the effectiveness of such mitigation. This will be achieved by avoiding, minimizing, and compensating for impacts by applying beneficial mitigation actions. Mitigation will follow the regulations from the White House Council on Environmental Quality (CEQ) (40 CFR 1508.20; e.g., avoid, minimize, and compensate), hereafter referred to as the mitigation hierarchy. If impacts from BLM management actions and authorized third party actions that result in habitat loss and degradation remain after applying avoidance and minimization measures (i.e. residual impacts), then compensatory mitigation projects will be used to provide a net conservation gain to the species. Any compensatory mitigation will be durable, timely, and in addition to that which would have resulted without the compensatory mitigation (see the concepts of durability, timeliness, and additionality as described further in Appendix B (p. 1779)).

Greater Sage-Grouse Conservation Team. The BLM/USFS will establish a WAFWA Management Zone Greater Sage-Grouse Conservation Team (hereafter, Team) to help guide the conservation of Greater Sage-Grouse, within 90 days of the issuance of the ROD. This Team will develop a WAFWA Management Zone Regional Mitigation Strategy (hereafter, Regional Mitigation Strategy). The Team will also compile and report on monitoring data (including data on habitat condition, population trends, and mitigation effectiveness) from States across the WAFWA Management Zone (see Monitoring section). Subsequently, the Team will use these data to either modify the appropriate Regional Mitigation Strategy or recommend adaptive management actions (see Adaptive Management section).

The BLM/USFS will invite governmental and Tribal partners to participate in this Team, including the State Wildlife Agencies and USFWS, in compliance with the exemptions provided for committees defined in the Federal Advisory Committee Act and the regulations that implement that act. The BLM/USFS will strive for a collaborative and unified approach between Federal agencies (e.g., USFWS, BLM, and USFS), Tribal governments, state and local government(s), and other stakeholders for greater sage-grouse conservation. The Team will provide advice, and will not make any decisions that impact Federal lands. The BLM/USFS will remain responsible for making decisions that affect Federal lands.

Developing a Regional Mitigation Strategy. The Team will develop a Regional Mitigation Strategy to inform the mitigation components of NEPA analyses for BLM/USFS management actions and third party actions that result in habitat loss and degradation. The Strategy will be developed within one year of the issuance of the ROD. The BLM's Regional Mitigation Manual MS-1794 will serve as a framework for developing the Regional Mitigation Strategy. The Regional Mitigation Strategy will be applicable to the States/Field Offices/Forests within the WAFWA Management Zone's boundaries.

Regional mitigation is a landscape-scale approach to mitigating impacts to resources. This involves anticipating future mitigation needs and strategically identifying mitigation sites and measures that can provide a net conservation gain to the species. The Regional Mitigation Strategy developed by the Team will elaborate on the components identified above (i.e. avoidance, minimization, and compensation; additionality, timeliness, and durability) and further explained in Appendix B (p. 1779).

In the time period before the Strategy is developed, BLM will consider regional conditions, trends, and sites, to the greatest extent possible, when applying the mitigation hierarchy and will ensure that mitigation is consistent with the standards set forth in the first paragraph of this section.

Incorporating the Regional Mitigation Strategy into NEPA Analyses. The BLM will include the avoidance, minimization, and compensatory recommendations from the Regional Mitigation Strategy in one or more of the NEPA analysis' alternatives for BLM management actions and third party actions that result in habitat loss and degradation and the appropriate mitigation actions will be carried forward into the decision.

Implementing a Compensatory Mitigation Program. Consistent with the principles identified above, the BLM needs to ensure that compensatory mitigation is strategically implemented to provide a net conservation gain to the species, as identified in the Regional Mitigation Strategy. In order to align with existing compensatory mitigation efforts, this compensatory mitigation program will be implemented at a State-level (as opposed to a WAFWA Management Zone, a Field Office, or a Forest), in collaboration with our partners (e.g., Federal, Tribal, and State agencies).

To ensure transparent and effective management of the compensatory mitigation funds, the BLM will enter into a contract or agreement with a third-party to help manage the State-level compensatory mitigation funds, within one year of the issuance of the ROD. The selection of the third-party compensatory mitigation administrator will conform to all relevant laws, regulations, and policies. The BLM will remain responsible for making decisions that affect Federal lands.

2.5.7. Greater Sage-Grouse Habitat Management Objectives

BLM administrated surface will be managed to maintain a minimum of 70% of lands capable of producing sagebrush with 10-30% sagebrush canopy cover. BLM will incorporate Greater Sage-Grouse Seasonal Habitat Objectives (Table 2.4, “Seasonal Habitat Desired Conditions for Greater Sage-Grouse” (p. 82)) into the design of projects or activities, as appropriate, based on ecological site potential unless the NEPA analysis associated with the specific project can demonstrate other appropriate habitat conditions based on other factors such as:

- A specific objective is not applicable to the site-specific conditions of the project or activity;
- An alternative objective is determined to provide equal or better protection for Greater Sage-Grouse or its habitat (based on appropriate scientific findings);
- Analysis concludes that following a specific objective would provide no more protection to Greater Sage-Grouse or its habitat than not following it, for the project being proposed; or
- Achievement of fuels management objectives require additional reduction in sagebrush cover to meet strategic protection of Greater Sage-Grouse habitat and conserve habitat quality for the species.

This information should not be viewed as providing standards by which to judge the overall quality of sagebrush habitats. Instead, these Greater Sage-Grouse habitat characteristics should be used as one tool for assessing habitats and guiding management actions. There is a tendency to review each indicator and its suitability category independently, but site suitability is determined by the relationship among the several indicator values in each matrix and the relative abundance of habitat types across the landscape. It is important to understand that the desired conditions described for these habitat types are based on average plant productivity and structural data and expert opinion relative to Greater Sage-Grouse use of a subset of sagebrush communities and they may not apply to all sagebrush communities in the planning area variation (Davies and Bates 2006). These measures also do not account for inter-annual climate variation (Davies and Bates 2006). Individual indicator values do not define site suitability and overall site suitability descriptions require an interpretation of the relationships between the indicators and other factors. Professional expertise and judgment are required. Measurement of these objectives will follow the steps described in the Habitat Assessment Framework for Fourth Order Habitat Descriptions.

As described in the above paragraphs, the identified habitat objectives are averages and will vary based on the individual ecological sites and their potential. Ecological sites are the basic component of a land-type classification system that describes ecological potential and ecosystem dynamics of land areas. All land/land use types are identified within the ecological site system, including rangeland, pasture, and forest land. An ecological site is defined as a distinctive kind of land with specific soil and physical characteristics that differ from other kinds of land in its ability to produce a distinctive kind and amount of vegetation and its ability to respond similarly to management actions and natural disturbances. Lands are classified considering discrete physical and biotic factors. Physical factors include soils, climate, hydrology, geology, and physiographic features. Biotic factors include plant species occurrence, plant community compositions, annual biomass production, wildlife-vegetation interactions, and other factors. Ecological dynamics, primarily disturbance regimes, such as grazing; fire; drought; management actions; and all resulting interactions are also a primary factor of ecological sites. Information and data pertaining to a particular ecological site is organized into a reference document known as an ESD. ESDs function as a primary repository of ecological knowledge regarding an ecological site. ESDs are maintained on the NRCS Ecological Site Information System,

which is the repository for information associated with ESDs and the collection of all site data (<https://esis.sc.egov.usda.gov/Welcome/pgESDWelcome.aspx>).

The ESD can help interpret if a site's potential is less than or greater than the identified habitat objectives.

These habitat objectives in Table 2.4 summarize the characteristics that research has found represent the seasonal habitat needs for Greater Sage-Grouse. The specific seasonal components identified in the Table were adjusted based on local science and monitoring data to define the range of characteristics used in this subregion. Thus, the habitat objectives provide the broad vegetative conditions we strive to obtain across the landscape that indicate the seasonal habitats used by Greater Sage-Grouse. These habitat indicators are consistent with the rangeland health indicators used by the BLM.

The habitat objectives will be part of the Greater Sage-Grouse habitat assessment to be used during land health evaluations (see Monitoring Framework, Appendix B (p. 1779)). These habitat objectives are not obtainable on every acre within the designated Greater Sage-Grouse habitat management areas. Therefore, the determination on whether the objectives have been met will be based on the specific site's ecological ability to meet the desired condition identified in the table.

All BLM use authorizations will contain terms and conditions regarding the actions needed to meet or progress toward meeting the habitat objectives. If monitoring data show the habitat objectives have not been met nor progress being made towards meeting them, there will be an evaluation and a determination made as to the cause. If it is determined that the authorized use is a cause, the use will be adjusted by the response specified in the instrument that authorized the use.

In addition to the references identified in the following table (Table 2.4, "Seasonal Habitat Desired Conditions for Greater Sage-Grouse" (p. 82)), the Conservation Plans developed for each of the Wyoming Local Sage-Grouse Working Groups will be consulted to identify specific habitat objectives appropriate for site-specific conditions. The Conservation Plans, updated in March 2014, are available on the WGFD website at: <https://wgfd.wyo.gov/web2011/wildlife-1000817.aspx>.

Table 2.4. Seasonal Habitat Desired Conditions for Greater Sage-Grouse

ATTRIBUTE	INDICATOR	DESIRED CONDITION ⁷	REFERENCES
BREEDING HABITAT (LEK AND NESTING/EARLY BROOD REARING)			<p>Doherty. 2008. Sage-grouse and Energy Development: Integrating Science with Conservation Planning to Reduce Impacts.</p> <p>Holloran and Anderson. 2005. Spatial Distribution of Greater Sage-grouse nests in relatively contiguous sagebrush habitats.</p>
Lek Security	Proximity of trees	Trees absent or uncommon on shrub/grassland ecological sites within 1.86 miles (3 km) of occupied leks.	<p>Baruch-Mordo, S., J.S. Evans, J.P. Severson, D.E. Naugle, J.D. Maestas, J. M. Kiesecker, M.J. Falkowski, C.A. Hagen, and K.P. Reese. 2013. Saving sage-grouse from trees.</p> <p>Stiver, S.J., E.T. Rinkes, D.E. Naugle, P.D. Makela, D.A. Nance, and J.W. Karl. In Press. Sage-Grouse Habitat Assessment Framework: Multi-scale Habitat Assessment Tool. Bureau of Land Management and Western Association of Fish and Wildlife Agencies Technical Reference XXXX-X. U.S. Bureau of Land Management, Denver, Colorado.</p>
	Proximity of sagebrush to leks	Adjacent protective sagebrush cover within 328 feet (100 m) of an occupied lek	<p>Stiver, S.J., E.T. Rinkes, D.E. Naugle, P.D. Makela, D.A. Nance, and J.W. Karl. In Press. Sage-Grouse Habitat Assessment Framework: Multi-scale Habitat Assessment Tool. Bureau of Land Management and Western Association of Fish and Wildlife Agencies Technical Reference XXXX-X. U.S. Bureau of Land Management, Denver, Colorado.</p>
NESTING/EARLY BROOD REARING⁵			

ATTRIBUTE	INDICATOR	DESIRED CONDITION ⁷	REFERENCES
Cover and Food	Seasonal habitat extent	>80% of the nesting habitat meets the recommended vegetation characteristics, where appropriate (relative to ecological site potential, etc.).	Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.
	Sagebrush cover ²	5-25%	Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985. Connelly, J.W., K.P. Reese, and M.A. Schroeder. 2003. Monitoring of Greater sage-grouse habitats and populations. University of Idaho College of Natural Resources Experiment Station Bulletin 80. University of Idaho, Moscow, ID. Hagen, C.A., J.W. Connelly, and M.A. Schroeder. 2007. A meta-analysis of greater sage-grouse <i>Centrocercus urophasianus</i> nesting and brood-rearing habitats. Wildlife Biology 13 (Supplement 1):42-50. Wyoming Executive Order No. 2011-5. 2011. Greater Sage-Grouse Core Area Protection: Casper, Wyoming, Governor's Office, State of Wyoming. June 2, 2011.
	Sagebrush height	4-31 inches (20.3-80cm)	Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.
	Arid sites ³	12-31 inches (40-80cm)	
	Mesic sites ⁴		

ATTRIBUTE	INDICATOR	DESIRED CONDITION ⁷	REFERENCES
	Predominant sagebrush shape	Predominantly spreading shape ⁵	Stiver, S.J., E.T. Rinkes, D.E. Naugle, P.D. Makela, D.A. Nance, and J.W. Karl. In Press. Sage-Grouse Habitat Assessment Framework: Multi-scale Habitat Assessment Tool. Bureau of Land Management and Western Association of Fish and Wildlife Agencies Technical Reference XXXX-X. U.S. Bureau of Land Management, Denver, Colorado.
	Perennial grass cover ²	≥10%	Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985. Stiver, S.J., E.T. Rinkes, D.E. Naugle, P.D. Makela, D.A. Nance, and J.W. Karl. In Press. Sage-Grouse Habitat Assessment Framework: Multi-scale Habitat Assessment Tool. Bureau of Land Management and Western Association of Fish and Wildlife Agencies Technical Reference XXXX-X. U.S. Bureau of Land Management, Denver, Colorado. Cagney, J., E. Bainter, B. Budd, T. Christiansen, V. Herren, M. Holloran, B. Rashford, M. Smith and J. Williams. 2010. Grazing influence, objective development, and management in Wyoming's greater sage-grouse habitat. University of Wyoming College of Agriculture Extension Bulletin B-1203. Laramie.
	Arid sites ³	≥15%	
	Mesic sites ⁴	Cool-season bunchgrasses preferred	

ATTRIBUTE	INDICATOR	DESIRED CONDITION ⁷	REFERENCES
	Perennial grass height	<u>Adequate nest cover >6 (15.2cm) in or as determined by ESD site potential and local variability.</u>	<p>Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.</p> <p>Connelly, J.W., K.P. Reese, and M.A. Schroeder. 2003. Monitoring of Greater sage-grouse habitats and populations. University of Idaho College of Natural Resources Experiment Station Bulletin 80. University of Idaho, Moscow, ID.</p> <p>Doherty, K.E., D.E. Naugle, J.D. Tack, B.L. Walker, J.M. Graham and J.L. Beck. 2014. Linking Conservation Actions to Demography: Grass Height Explains Variation in Greater Sage-grouse Nest Survival. Wildlife Biology, 20(6):320–325.</p> <p>Hagen, C.A., J.W. Connelly, and M.A. Schroeder. 2007. A meta-analysis of greater sage-grouse <i>Centrocercus urophasianus</i> nesting and brood-rearing habitats. Wildlife Biology 13 (Supplement 1):42-50.</p> <p>Herman-Brunson, K.M., K.C. Jensen, N.W. Kaczor, C.C. Swanson, M.A. Rumble, and R.W. Klaver. 2009. Nesting Ecology of Greater Sage-Grouse <i>Centrocercus urophasianus</i> at the Easter Edge of their Historic Distribution. Wildl. Biol. 15:237-246.</p>

ATTRIBUTE	INDICATOR	DESIRED CONDITION ⁷	REFERENCES
			Stiver, S.J., E.T. Rinkes, D.E. Naugle, P.D. Makela, D.A. Nance, and J.W. Karl. In Press. Sage-Grouse Habitat Assessment Framework: Multi-scale Habitat Assessment Tool. Bureau of Land Management and Western Association of Fish and Wildlife Agencies Technical Reference XXXX-X. U.S. Bureau of Land Management, Denver, Colorado.
	Perennial forb cover ² Arid sites ³ Mesic sites ⁴	≥5% ≥10%	Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.
	Perennial forb availability	Preferred forbs are common with several species present	Stiver, S.J., E.T. Rinkes, D.E. Naugle, P.D. Makela, D.A. Nance, and J.W. Karl. In Press. Sage-Grouse Habitat Assessment Framework: Multi-scale Habitat Assessment Tool. Bureau of Land Management and Western Association of Fish and Wildlife Agencies Technical Reference XXXX-X. U.S. Bureau of Land Management, Denver, Colorado.
LATE BROOD-REARING/SUMMER¹ (July-October)¹ (Apply to all habitat outside of nesting/breeding and winter)			
Cover and Food	Seasonal habitat extent	>40% of the summer/brood habitat meets recommended brood habitat characteristics where appropriate (relative to ecological site potential, etc.)	Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.

ATTRIBUTE	INDICATOR	DESIRED CONDITION ⁷	REFERENCES
	Sagebrush cover ²	5-25%	Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985. Wyoming Executive Order No. 2011-5. 2011. Greater Sage-Grouse Core Area Protection: Casper, Wyoming, Governor's Office, State of Wyoming. June 2, 2011.
	Sagebrush height	4 to 32 inches (20.3-80cm)	Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.
	Perennial grass canopy cover ²	>15%	Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.
	Upland and riparian perennial forb availability ²	Preferred forbs are common with several preferred species present ⁶	Stiver, S.J., E.T. Rinkes, D.E. Naugle, P.D. Makela, D.A. Nance, and J.W. Karl. In Press. Sage-Grouse Habitat Assessment Framework: Multi-scale Habitat Assessment Tool. Bureau of Land Management and Western Association of Fish and Wildlife Agencies Technical Reference XXXX-X. U.S. Bureau of Land Management, Denver, Colorado.

ATTRIBUTE	INDICATOR	DESIRED CONDITION ⁷	REFERENCES
	Riparian meadow habitat condition	Proper Functioning Condition	Stiver, S.J., E.T. Rinkes, D.E. Naugle, P.D. Makela, D.A. Nance, and J.W. Karl. In Press. Sage-Grouse Habitat Assessment Framework: Multi-scale Habitat Assessment Tool. Bureau of Land Management and Western Association of Fish and Wildlife Agencies Technical Reference XXXX-X. U.S. Bureau of Land Management, Denver, Colorado.
WINTER¹ November-March¹ (Apply to areas of known or likely winter-use)			
Cover and Food	Seasonal habitat extent	>80% of the wintering habitat meets winter habitat characteristics where appropriate (relative to ecological site, etc.).	Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.
	Sagebrush cover above snow ²	>5%	<p>Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.</p> <p>Stiver, S.J., E.T. Rinkes, D.E. Naugle, P.D. Makela, D.A. Nance, and J.W. Karl. In Press. Sage-Grouse Habitat Assessment Framework: Multi-scale Habitat Assessment Tool. Bureau of Land Management and Western Association of Fish and Wildlife Agencies Technical Reference XXXX-X. U.S. Bureau of Land Management, Denver, Colorado.</p> <p>Wyoming Executive Order No. 2011-5. 2011. Greater Sage-Grouse Core Area Protection: Casper, Wyoming, Governor's Office, State of Wyoming. June 2, 2011.</p>

ATTRIBUTE	INDICATOR	DESIRED CONDITION ⁷	REFERENCES
	Sagebrush height above snow	>10 inches (>25 cm)	Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.
¹ Seasonal dates can be adjusted by local unit according to geographic region. ² Absolute cover is the actual recorded cover and can exceed 100% when recorded across all species and all layers. It is not relative cover, which is the proportions of each species, and equals 100%. Note that cover is reported for only those species (e.g., sagebrush, preferred forbs) that are sampled to determine suitability of habitat for sage-grouse. Overall cover at the site will be greater than that sampled for sage-grouse habitat, due to other species present. ³ Arid corresponds to the 10 – 12 inch precipitation zone; <i>Artemisia tridentata wyomingensis</i> is a common big sagebrush sub-species for this type site (Stiver et al. <i>In Press</i>). ⁴ Mesic corresponds to the >12 inch precipitation zone; <i>Artemisia tridentata vaseyana</i> is a common big sagebrush sub-species for this type site (Stiver et al. <i>In Press</i>). ⁵ Collectively the indicators for sagebrush (cover, height, and shape), perennial grass and perennial forb (cover, height and/or availability) represent the desired condition range for nesting/early brood rearing habitat characteristics, consistent with the breeding habitat suitability matrix identified in Stiver et al. <i>In Press</i> . Sagebrush plants that are more tree or columnar-shaped provide less protective cover near the ground than sagebrush plants with a spreading shape (Stiver et al. <i>In Press</i>). Some sagebrush plants are naturally columnar (e.g., Great Basin big sagebrush), and a natural part of the plant community. However, a predominance of columnar shape arising from animal impacts may warrant management investigation or adjustments at site specific scales. ⁶ Preferred forbs are listed in Stiver et al. <i>In press</i> . Overall total forb cover may be greater than that of preferred forb cover since not all forb species are listed as preferred. ⁷ All Desired Conditions will be dependent upon site capability and local variation (e.g., weather patterns, localized drought, ESD state, etc.). ⁸ > greater than ≥ greater than or equal to % percent cm centimeter km kilometer m meter			

2.5.8. Powder River Basin Restoration Program

The PRB Restoration program is a collaborative partnership to restore and enhance Greater Sage-Grouse habitat on a landscape level in the PRB. The PRB encompasses 13,493,840 acres in northeast Wyoming and southeast Montana; surface ownership is approximately 70 percent private, 14 percent BLM (Wyoming 8%, Montana 6%), 8 percent USFS, and 8 percent States of Wyoming/Montana. Mineral ownership is 50-60 percent federal.

This BLM High Plains District Office PRB Restoration program was initiated in 2010 and was developed to form partnerships with local cooperators, federal and state agencies, private landowners, and industry to work collaboratively on Greater Sage-Grouse habitat restoration. PRB Restoration is focusing on areas affected by federal oil and gas development that has occurred over the past decade in the PRB in northeastern Wyoming

The exploration and development of CBNG has to date been the largest mineral development in the PRB. There have been approximately 21,000 CBNG wells drilled over a 12 year period (1998-2010) which has fragmented Greater Sage-Grouse habitat throughout the PRB.

Development included construction of well sites and other facilities (i.e., metering buildings, compressor stations, pumping stations), building of roads to access well sites, construction of pipelines to transport product and wastewater, construction of powerlines to bring electrical power to the wells and other infrastructure, and the construction of water holding impoundments to hold the produced water as the wells must be de-watered to reduce pressure before the natural gas is released. Hundreds of miles of pipelines were constructed to transport CBNG gas from development site to delivery point. Other pipelines include gathering, transportation and distribution pipelines and lines used to transport produced water to discharge points. With a well life of approximately 12 years, many of the CBNG wells that were originally drilled are depleted and ready for the abandonment phase. Most buried pipelines have reclaimed their native vegetative cover and will not be removed. Utility roads and overhead powerlines continue to fragment thousands of acres of Greater Sage-Grouse habitat on private, federal, and state lands.

Goals

- Build partnerships to restore habitat for the Greater Sage-Grouse in large landscape or watershed.
- Integrate habitat improvement programs and projects implemented by partners to leverage funding to enhance Greater Sage-Grouse habitat reclamation.
- Facilitate the sharing of data/data collection methods, monitoring data/methods, and BMPs.

Objectives

- Build partnerships with local governments, federal agencies, and communities to restore large landscape or watershed areas starting with small scale restoration.
- Restore* or enhance disturbed previously suitable habitat to suitable habitat for sagebrush obligate species, primarily Greater Sage-Grouse. This would include multiple sites affected by CBNG abandonment reclamation efforts, wildfires, and/or noxious/invasive plants. Priority will be given to those areas recognized as Priority Habitat (Core Population Areas and Core Population Connectivity Corridors). Habitat objectives include meeting the needs for nesting, brood-rearing, and late brood-rearing.
- Contribute to efforts focused on the management and control of mosquitoes carrying WNV. Contribution would be monetary, manpower, treatment locations, and other needs as determined.
- Reduce fuels in and near Greater Sage-Grouse habitat to enhance sagebrush stands, support restoration efforts, and to reduce future risk of high severity wildfire. Manage conifer forests and woodlands for structural diversity, to reduce encroachment into sagebrush, and to reduce fuels, especially near priority habitat, human developments, and recreation areas.
- Restore health to grassland/shrubland plant communities by managing annual bromes.

*Restoration efforts will include but are not limited to: cheatgrass treatments (herbicide and/or mowing), seeding/interseeding forbs, planting sagebrush, conifer removal in sagebrush plant communities, fence marking, noxious/invasive plant treatments, and solar systems for livestock/wildlife watering.

Partners

Partners contribute technical expertise and/or financial support on three areas of emphasis. The first and primary emphasis is restoration of affected areas by the abandonment of CBNG wells and associated infrastructure, the second is restoration of vegetation communities adversely impacted by wildfires, and third is restoration of areas outside of CBNG development with first priority given to those locations within priority habitat, followed by other habitats of high value.

Current partners in the PRB Restoration include Conservation Districts (Lake DeSmet, Powder River, Campbell County, and Sheridan County), NRCS, WGFD, private landowners, oil and gas companies, Northeast Wyoming Sage-Grouse Local Working Group, BLM Wyoming Resource Advisory Council, University of Wyoming, Sheridan College, State of Wyoming, Thunder Basin Grassland Prairie Ecosystem Association, USFWS, and others.

Healthy Land Initiatives

PRB Restoration is one of three Healthy Land Initiative focal areas for BLM Wyoming. The Healthy Land Initiative is a major vegetation resources enhancement initiative to restore and improve the health and productivity of western public lands. The Healthy Land Initiative strategy increases the effectiveness and efficiencies of vegetation enhancement treatments by focusing on treatments on a substantial percentage of lands (focal areas) – both federal and non-federal – rather than focusing on the local project level. The strategy increases opportunities to leverage cooperative solutions across ownerships and jurisdictions.

The lands in Utah, Wyoming, New Mexico, Oregon, Idaho, Nevada, and Colorado were selected because they encompass Greater Sage-Grouse habitat or other important wildlife habitat in the wildlife - energy interface. Restoring Greater Sage-Grouse habitat is crucial because the Greater Sage-Grouse habitat ranges across 10 states covering more than 100 million acres, with 64 percent of the acreage under federal management.

Treating wildlife habitat in the wildlife-energy interface is important because BLM is clearly at a national crossroads for restoring habitats for a variety of species in a manner that keeps pace with the country's energy needs and demands. Energy production on BLM-administered lands provides 5 percent of our nation's oil, 18 percent of our nation's gas, and 44 percent of our nation's coal. Smaller scale, project-by-project approaches are unlikely to be sufficient.

The Healthy Land Initiative of 2008 is a dramatic change from current practices because of the larger scope and faster pace of the habitat improvement efforts and the more intensive involvement of partners and other landowners. Increased funding and work with partners allows the BLM to:

- Concentrate a large number of treatments in each emphasis area, resulting in a substantial amount of improved habitat in an entire watershed or landscape-wide area in three to five years, rather than the typical 10 to 15 years based on standard funding levels.
- Leverage partnership funding at unprecedented levels.
- Establish or enhance existing partnerships with adjoining landowners, so that a large percent of landowners in the area (federal or non-federal) treat their lands.
- Reduce BLM's overall unit cost due to lower costs per acre from large scale projects.

Accomplishments

To date and in partnership, the PRB Restoration effort has:

On-the-ground projects

- applied herbicide treatment on about 1,250 acres of cheatgrass in priority habitat.
- applied herbicide treatment on about 22,700 acres of annual bromes in plant communities adversely impacted by wildfires located in priority habitat.
- planted about 440 acres of sagebrush – planting plugs and locally collected seeds.
- removed more than 1,500 conifer tress from upland sagebrush habitat to remove the vertical structures of avoidance and perches for raptors.

- collected native seed on 14 forb species, 14 shrub species, and 11 grass species through the work of volunteers and interns funded through the Seeds of Success program. Over 2 million viable sagebrush seeds were collected in 2012.

Educational events

- co-hosted tours for federal, state, and local agencies, elected officials, interested publics, National Public Radio.
- co-hosted workshops (1) for landowners affected by CBNG stressing the importance of the removal of CBNG wells and related infrastructure as it relates to restoring habitat, and (2) for landowners affected by recent wildfires emphasizing the importance of restoring habitats.
- supported graduate student research including (1) the collection of shed feathers at leks to help determine if there is genetic transfer occurring between populations and the distances of the genetic transfer, and (2) the ability of fathead minnows to overwinter in livestock reservoirs. Fathead minnows are being used to control mosquito larvae potentially carrying WNV.

Future

Over the next 10 to 15 years these types of projects will continue as the reclamation effort in the PRB continues. Partnerships, funding, monitoring, and adaptive management will help drive the future of the PRB Restoration effort.

Overall, the initiative allows BLM to do more in substantially less time due to the substantial funding increase. Focusing funds in each of these six areas to a watershed or large landscape area will:

- prevent weeds from spreading;
- prevent the spread of insect infestations that harm native habitat;
- keep habitat suitable so that wide-ranging species can flourish; and
- prevent rare species from being listed.

2.5.9. Monitoring Framework for Greater Sage-Grouse Habitat Management

The BLM's planning regulations, specifically 43 CFR 1610.4-9, require that land use plans establish intervals and standards for monitoring based on the sensitivity of the resource decisions. Land use plan monitoring is the process of tracking the implementation of land use plan decisions (implementation monitoring) and collecting data/information necessary to evaluate the effectiveness of land use plan decisions (effectiveness monitoring). For Greater Sage-Grouse, these types of monitoring are also described in the criteria found in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (50 CFR Vol. 68, No. 60). One of the Policy for Evaluation of Conservation Efforts When Making Listing Decisions criteria evaluates whether provisions for monitoring and reporting progress on implementation (based on compliance with the implementation schedule) and effectiveness (based on evaluation of quantifiable parameters) of the conservation effort are provided.

A guiding principle in the BLM National Sage-grouse Conservation Strategy (DOI 2004) is that "the Bureau is committed to sage-grouse and sagebrush conservation and will continue to adjust and adapt our National Sage-grouse Strategy as new information, science, and monitoring results evaluate effectiveness over time." In keeping with the WAFWA Sage-grouse Comprehensive Conservation Strategy (Stiver et al. 2006) and the Greater Sage-grouse Conservation Objectives:

Final Report (USFWS 2013c), the BLM will monitor implementation and effectiveness of conservation measures in Greater Sage-Grouse habitats.

On March 5, 2010, USFWS' 12-Month Findings for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered were posted as a FR notice (75 FR 13910-14014, March 23, 2010). This notice stated:

“...the information collected by BLM could not be used to make broad generalizations about the status of rangelands and management actions. There was a lack of consistency across the range in how questions were interpreted and answered for the data call, which limited our ability to use the results to understand habitat conditions for sage-grouse on BLM lands.”

Standardization of monitoring methods and implementation of a defensible monitoring approach (within and across jurisdictions) will resolve this situation. The BLM, USFS, and other conservation partners use the resulting information to guide implementation of conservation activities.

Monitoring strategies for Greater Sage-Grouse habitat and populations must be collaborative, as habitat occurs across jurisdictional boundaries (52 percent on BLM-administered lands, 31 percent on private lands, 8 percent on National Forest System lands, 5 percent on state lands, 4 percent on tribal and other federal lands) (75 FR 13910, March 23, 2010), and state fish and wildlife agencies have primary responsibility for population level wildlife management, including population monitoring. Therefore, population efforts will continue to be conducted in partnership with state fish and wildlife agencies. The BLM and USFS have finalized a monitoring framework, which can be found in Appendix B (p. 1779). This framework describes the process that the BLM will use to monitor implementation and effectiveness of RMP decisions. The monitoring framework includes methods, data standards, and intervals of monitoring at broad and mid scales; consistent indicators to measure and metric descriptions for each of the scales; analysis and reporting methods; and the incorporation of monitoring results into adaptive management. The need for fine-scale and site-specific habitat monitoring may vary by area depending on existing conditions, habitat variability, threats, and land health. Indicators at the fine and site scales will be consistent with the Habitat Assessment Framework; however, the values for the indicators could be adjusted for regional conditions.

More specifically, the framework discusses how the BLM and USFS will monitor and track implementation and effectiveness of planning decisions (e.g., tracking of waivers, modifications, site-level actions). The two agencies will monitor the effectiveness of RMP decisions in meeting management and conservation objectives. Effectiveness monitoring will include monitoring disturbance in habitats, as well as landscape habitat attributes. To monitor habitats, the BLM and USFS will measure and track attributes of occupied habitat, priority habitat, and general habitat at the broad scale, and attributes of habitat availability, patch size, connectivity, linkage/connectivity habitat, edge effect, and anthropogenic disturbances at the mid-scale. Disturbance monitoring will measure and track changes in the amount of sagebrush in the landscape and changes in the anthropogenic footprint, including change energy development density. The framework also includes methodology for analysis and reporting for field offices, states, ranger districts, BLM districts, National Forests, and Forest regions, including geospatial and tabular data for disturbance mapping (e.g., geospatial footprint of new permitted disturbances) and management actions effectiveness.

2.6. Alternatives Considered, but not Carried Forward for Detailed Analysis

Several alternatives and management options were considered as possible methods of resolving resource management issues and conflicts, but after further review and consideration were not carried forward for detailed analysis. The alternatives listed below were not carried forward for detailed analysis because (1) they would not fulfill requirements of the Federal Land Policy and Management Act (FLPMA) or other existing laws or regulations, (2) they did not meet the purpose and need, (3) they were already part of an existing plan, policy, or administrative function, or (4) they did not fall within the limits of the planning criteria. These alternatives considered, but not carried forward have been grouped by resource topic, although several may apply to more than one resource.

2.6.1. Physical Resources

Preserve Minimum Instream Flows

The BLM considered, but eliminated from detailed analysis, alternatives to preserve minimum instream flows in the planning area. This alternative is outside the regulatory authority of the BLM as water management is under the jurisdiction of the Wyoming State Engineer's Office. Further, the State of Wyoming and private parties own much of the surface land and mineral estate within the planning area, and the BLM has no legal authority to direct water management on non-federally managed lands or in the development of non-federal mineral leases. BLM WYSO IM WY-2005-14 addresses water disposal and land application (BLM 2005e).

2.6.2. Mineral Resources

Recommend Mineral Withdrawal Across the Planning Area

The BLM considered, but eliminated from detailed analysis alternatives to recommend a withdrawal for the remainder of the planning area under the mining laws, even in the absence of an identified resource conflict. Recommending withdrawal of the entire planning area, even in the absence of a currently-identified resource conflict, would be inconsistent with the goals and objectives for mineral resources. Moreover, the BLM lacks the authority to close lands to the Mining Law in the planning process – its authority is limited to making recommendations for future withdrawals. Alternative B analyzes the impacts of recommending mineral withdrawal for resource conflicts on 467,897 acres of BLM surface (60%), and 618,256 acres of federal mineral estate (13%).

Suspend or Eliminate All Existing Federal Fluid Mineral Leasing

The BLM considered, but eliminated from detailed analysis suspending or eliminating all existing federal oil and gas leasing and development operations and canceling existing oil and gas leases. By law, the BLM must recognize all valid existing rights. The BLM's authority to suspend or cancel existing oil and gas leases is limited by regulation. The BLM can impose reasonable limits on the manner and pace of development, and limits of this type are evaluated in the alternatives analyzed in detail. Individual locations within the planning area which the BLM would close to fluid mineral leasing are also evaluated in the alternatives analyzed in detail.

Closure to Fluid Mineral Leasing

Closing the planning area to new leasing of federal fluid minerals, even where there are no identified resource conflicts, was considered but eliminated from further analysis. Closing the entire planning area to new fluid mineral leasing would not meet BLM's purpose and need. Oil and gas development is an authorized use of public lands and meets BLM's multiple use objectives. In addition, the federal fluid mineral estate in much of the planning area has already been leased (2,570,703 acres; 65%), and the majority of the leases are developed. Therefore, mineral development will continue as leases are subject to valid existing rights and much of the unleased acreage is intermingled with leased acreage.

Public scoping comments indicate a growing level of concern with the rate and scale of oil and gas leasing and development in the planning area. Making portions of the planning area unavailable for oil and gas leasing in response to other identified resource needs is addressed in the alternatives analyzed in detail.

Remove All Stipulations and Restrictions from Oil and Gas Leases

The BLM considered removing all stipulations and restrictions from existing oil and gas leases. The BLM can authorize waivers, modifications, and exceptions to stipulations on existing leases when appropriate given site-specific resource conditions. This alternative was eliminated from detailed analysis as BLM's authority to waive existing oil and gas lease stipulations is limited by regulation.

Phase Fluid Mineral Development

The BLM considered an alternative that would regulate the rate at which oil and gas development in the planning area occurred.

The State of Wyoming and private parties own much of the surface land and mineral estate within the planning area. The BLM is required to ensure that leased federal minerals are fully developed and that production on non-federal leases does not drain federal minerals. Given the extent of non-federal mineral ownership within the planning area, a phased development alternative would not allow compliance with any of the above requirements and therefore it was eliminated from detailed analysis. Limiting development rate can be analyzed in implementation-level NEPA documents that take into consideration existing development on adjacent leases.

Prohibit Surface Water Disposal of Produced Water

The BLM considered, but eliminated an alternative to prohibit surface water disposal of produced water. Discharge of produced water is regulated by the Wyoming DEQ, Wyoming State Engineer's Office, and/or the Wyoming Oil and Gas Conservation Commission. BLM IM WY-2005-14 addresses water disposal and land application.

Require Produced Water to be Returned to Aquifers

BLM's ability to implement this alternative is limited. Much of the planning area involves non-federal minerals and non-federal surface where BLM has limited to no jurisdiction. Discharge of produced water is regulated by the Wyoming DEQ, Wyoming State Engineer's Office, and/or the Wyoming Oil and Gas Conservation Commission. The BLM considered, but eliminated this alternative from detailed analysis. Requiring produced water to be returned to

aquifers is not typically addressed in a land use plan but addressed at the project level with the appropriate state agencies.

Require Produced Water to be Put to Beneficial Use

Under this alternative, produced waters would be used for beneficial uses such as stock watering, wildlife habitat, recreational opportunities, and irrigation. The BLM's ability to implement this alternative is limited since produced water disposal is under the jurisdiction of the Wyoming DEQ, Wyoming State Engineer's Office, and/or the Wyoming Oil and Gas Conservation Commission. The BLM considered, but eliminated this alternative from detailed analysis because of the limited short-term benefit and because it is outside of the BLM's jurisdiction.

2.6.3. Fire and Fuels Management

There were no alternatives considered but eliminated from detailed analysis for this resource category.

2.6.4. Biological Resources

Emphasize the Protection of Resources by Removing Human Uses

The BLM considered, but eliminated from detailed analysis an alternative that removed human uses from the planning area. The FLPMA requires the BLM to manage public lands and resources according to the principles of multiple use and sustained yield. Included in this requirement are human uses, such as mineral development or livestock grazing, that must be managed in consideration of other resource values, such as wilderness or wildlife resources. Management actions, including closure or prohibition of various resource uses over portions of the planning area, are included in the alternatives considered in detail.

Applying the National Technical Team Conservation Measures to Priority Habitat

The BLM National Greater Sage-Grouse Strategy (WO IM-2012-044) directed field offices to consider all applicable conservation measures recommended by the NTT when revising or amending RMPs in Greater Sage-Grouse habitat. Most of the NTT conservation measures are recommended to be applied to priority habitats. However, the designated priority habitat may not be sufficient to conserve Greater Sage-Grouse within the Buffalo planning area (Taylor et al. 2012). Taylor et al. (2012) stated:

“core areas in northeast Wyoming were delineated after widespread development has already occurred, leaving few options for conserving populations. In northeast Wyoming, the far reaching influence of development has already negatively impacted the 103 active leks inside core areas...Despite the impacts, the potential may still exist to maintain populations inside core areas, but further drilling in and around the cores will compromise their remaining value.”

Because of the concern over adequacy of the BFO designated Core Population Areas to meet the planning goal for Greater Sage-Grouse conservation, an alternative applying the NTT conservation measures only to the designated priority habitat was eliminated from detailed analysis.

Instead, in Alternative B, the BFO analyzed the recommended NTT occupancy restrictions and prohibitions within 4.0 miles of lek sites and winter concentration areas to encompass the most

utilized nesting and winter habitats. Four miles is also the NTT recommended prohibition within leased mineral estate (NTT Measure 62) and a multi-state ad-hoc Greater Sage-Grouse committee suggested that within at least 4.0 miles of leks be considered nesting and brood-rearing habitat (Christiansen and Bohne 2008). Sixty percent of the BLM surface and 66 percent of the BLM-administered fluid mineral estate are within 4.0 miles of lek sites and winter concentration areas whereas designated BFO priority habitat encompasses 21 percent of the BLM surface and 22 percent of the BLM-administered fluid mineral estate. Within 4.0 miles of leks is close to the Core Population Area strategy's goal of conserving 66 percent of the population.

No Development Within Occupied Greater Sage-Grouse Habitat

The BLM considered, but eliminated from detailed analysis an alternative that prohibited development within occupied Greater Sage-Grouse habitat. The FLPMA requires the BLM to manage public lands and resources according to the principles of multiple use and sustained yield. Included in this requirement are human uses which must be managed in consideration of other resource values, including wildlife resources such as Greater Sage-Grouse. The BLM worked with cooperators such as the WGFD and the USFWS to develop alternatives protective of Greater Sage-Grouse while allowing for development. Prohibiting development within occupied habitat would eliminate multiple use opportunities within all but the non-habitat areas of the planning area such as forested, mountainous (Big Horn Mountains), or urban areas. This alternative would preclude the BLM from achieving a balance among resources and resource uses. BLM Wyoming Greater Sage-Grouse policy restricts development within Core Population Areas subject to site-specific criteria. The alternatives consider a range of prohibitions on surface occupancy ranging from areas within 0.25 mile from leks (3,594 acres or 0.45% of BLM surface) to areas within 4.0 miles of leks or winter concentration areas (467,897 acres or 60% of BLM surface).

2.6.5. Heritage and Visual Resources

There were no alternatives considered but eliminated from detailed analysis for this resource category.

2.6.6. Land Resources

Boundaries of Public Lands Should be Clearly Marked

The BLM considered, but eliminated from detailed analysis an alternative that institutes clearly marking all boundaries of public lands in the planning area. An RMP is a broad level planning document that defines allocations and levels of land uses. The marking of public land boundaries is more appropriately analyzed in implementation level NEPA documents.

Closing All Public Lands to Motorized Vehicles or Limiting Travel to Existing Roads and Trails Only

Alternatives prohibiting motorized vehicle travel and limiting travel to existing roads and trails on all BLM-administered surface were considered, but eliminated from detailed analysis. The BLM's Travel and Transportation Manual (1626) states "the planning process should consider and address the full range of various modes of travel on public lands." The BLM's travel management program is guided by resource values and user needs. A broad travel designation for the entire planning area would not allow BLM to balance resource values and user needs when considering

travel designations within the planning area. The BLM analyzes a range of travel management designations in the alternatives considered in detail.

No Livestock Grazing

The elimination of livestock grazing from all BLM-administered lands in the planning area as a method for resolving range, watershed, and wildlife habitat-related planning issues was considered, but eliminated from detailed analysis. The BLM recognizes conflicts exist between resources and resource uses. However, BLM determined that resource conditions on BLM-administered lands in the planning area do not warrant such a blanket elimination of livestock grazing because 97 percent of allotments (122 out of 125) assessed to date meet the *Wyoming Standards for Healthy Rangelands*. The non-attainment areas are confined to small portions on each of the three allotments (9,601 acres total). All three allotments are progressing towards the standards. The BLM does not have data showing that resource conflicts in these areas can be resolved by closing them to public land grazing.

The BFO administers 427 grazing leases on 477 allotments; approximately 370 of these are Category C (custodial) allotments where BLM is the minority surface owner (Appendix E (p. 1899)). With the intermingling of private and public lands, each allotment would need to be evaluated to determine the extent to which additional fencing would be required in order to enforce a grazing closure. Fencing custodial allotments to keep cattle off public lands would require hundreds of miles of new fences to prevent unauthorized grazing. In addition, the potential impacts of such extensive fencing on, for example big game movement and Greater Sage-Grouse mortality from raptor predation and collisions are better analyzed on an allotment-by-allotment basis, taking into account distribution of wildlife habitat and other resources as well as site-specific land ownership patterns.

Reduction or elimination of livestock grazing could become necessary on specific allotments where livestock grazing is causing or contributing to conflicts with the protection and/or management of other resource values or uses. Such determinations would be made during site-specific activity planning and associated environmental analysis, and would be based on several sources of information. These sources include: monitoring studies, reviewing current range management science, obtaining input from livestock operators and stakeholders, and assessments of ability to meet the *Wyoming Standards for Healthy Rangelands*.

Alternative B analyzes closing 467,897 acres or 60 percent of BLM surface to livestock grazing for resource conflict including Greater Sage-Grouse habitat and SRMAs.

No Net Loss of Grazing Animal Unit Months

The BLM considered an alternative for no net loss of grazing animal unit months (AUMs), but eliminated it from detailed analysis. The commitment to manage for no net loss of AUMs would be in conflict with 43 CFR § 4110.3 which requires the BLM to periodically review permitted use specified in grazing permits or leases and make changes in the permitted use as needed to manage, maintain, or improve rangeland productivity; to assist in restoring ecosystems to PFC; to conform with land use plans; or to comply with the provisions of 43 CFR § 4100, Subpart 4180 - Fundamentals of Rangeland Health and Standards and Guidelines for Grazing Administration. Alternative B analyzes closing 467,897 acres or 60 percent of BLM surface to livestock grazing which would result in an associated AUM reduction.

2.6.7. Special Designations

New Wilderness Study Areas

The BLM acknowledges that FLPMA Section 603 (43 United States Code [U.S.C.] § 1782) requiring a one-time wilderness review and recommendations has expired. A current inventory of public lands, including wilderness characteristics resources, is required by FLPMA Section 201 (43 U.S.C. § 1711). The BLM periodically, and on a continuing basis, monitors existing WSAs in accordance with the BLM Manual 6330 – Management of Wilderness Study Areas; however, the BLM has no authority to designate new WSAs and considered alternatives for management of those areas, including management to protect their wilderness characteristics. Using existing resource information, the BLM evaluated all public surface in the planning area, including proposals by the public, to determine those areas that contained wilderness characteristics (naturalness and opportunities for solitude or primitive or unconfined recreation). Non WSA lands with wilderness characteristics in the planning area are identified in Chapter 3 of this document.

2.6.8. Socioeconomic Resources

There were no alternatives considered but eliminated from detailed analysis for this resource category.

2.7. Management Actions Common to All Alternatives

This section describes management actions that apply to all alternatives. Management actions common to all alternatives can result because of specific management limitations defined in the laws and regulations that govern BLM management decisions. For the most part, nondiscretionary laws and regulations are not identified here but rather are set forth through the planning criteria to ensure that management actions within all alternatives are compliant with nondiscretionary laws and regulations. Appendix A (p. 1771) contains a list of the laws and regulations guiding BLM management. This section primarily includes management actions not established by such laws or policies. For example, many resource programs require the use of BMPs to reduce impacts. Collaboration with stakeholders and the development of resource specific plans are also a common requirement for many resource programs.

This section provides some of the typical actions captured by management actions that are common to all alternatives. Not all management actions are listed below; instead, actions were selected and summarized to provide an overview. The complete list of management actions common to all alternatives is provided in Table 2.7, “1000 PHYSICAL RESOURCES (PR) – AIR QUALITY (AQ)” (p. 127) through Table 2.40, “8000 SOCIOECONOMIC RESOURCES (SR) – HEALTH AND SAFETY” (p. 275) under each resource heading. Management action summaries are organized into eight broad resource topics, including: Physical Resources, Mineral Resources, Fire and Fuels Management, Biological Resources, Heritage and Visual Resources, Land Resources, Special Designations, and Socioeconomic Resources.

2.7.1. Physical Resources

Management actions for physical resources are designed to conserve air, soil, cave and karst, and water resources. Certain management actions specify conformance with various laws and

regulations such as Wyoming DEQ smoke-management rules for air quality. Other actions designed to minimize impacts on air quality include implementing appropriate mitigation measures to reduce emissions from current levels and establishing a cooperative monitoring network for criteria pollutants and Air Quality Related Values.

Soil is protected by requiring site-specific reclamation plans for authorized surface-disturbing activities. The BLM manages water resources to meet the *Wyoming Standards for Healthy Rangelands* and to achieve PFC. Under all alternatives, the BLM limits the degradation of water quality by designing and managing surface-disturbing activities to reduce channel and bank erosion, and the associated loss of riparian habitats. Appropriate management for cave and karst resources in the planning area is determined by mapping, inventorying, and evaluating identified resources for significance.

2.7.2. Mineral Resources

Mineral resources management defines the scope of mineral development, applies measures to conserve other resources, and manages lands in the planning area for mineral exploration and development. Under all alternatives, the BLM manages land not formally withdrawn or segregated from mineral entry for exploration and development of locatable minerals (mining claim minerals). The 2001 Buffalo RMP update coal management decisions remain the basis for current coal management in the planning area. Those areas determined to be available for future coal leasing consideration will be carried forward in this RMP revision (Map 11). All federal oil and gas mineral estate is open to leasing of fluid mineral resources, unless otherwise noted. All federal salable minerals (also called mineral materials) estate is available for exploration and development, unless otherwise noted.

2.7.3. Fire and Fuels Management

Fire and fuels management in the planning area follows guidance from the National Wildland Fire Management Policy (DOI and USDA 1995), the Interagency Standards for Fire and Fire Aviation Operations, the BLM Emergency Stabilization and Burned Area Rehabilitation standards located in the DOI Interagency Burned Area Emergency Response Guidebook (DOI 2004), and the BLM Burned Area Emergency Stabilization and Rehabilitation Handbook (BLM 2007c). The Wyoming High Plains District Fire Management Plan (BLM 2004c) outlines management response and implementation actions for wildland fire response on public lands in the BFO. Management prescriptions include consulting appropriate resource advisors for all resources potentially affected by wildland fire; rehabilitation of firelines on steep slopes or constructed by heavy equipment; prohibiting the use of retardant and foam within 300 feet of surface water sources; and cooperating with other agencies and landowners to implement landscape treatments to achieve fuels management objectives and to maintain or improve the condition of fire-adapted ecosystems. Prescribed burns must comply with Wyoming DEQ air quality standards and smoke management rules.

2.7.4. Biological Resources

Management actions common to all alternatives for biological resources include laws, regulations, and BLM policies that govern management of biological resources as well as actions that set management to meet thresholds, minimize resource conflict and damage, and require stakeholder

coordination. Examples of these types of management actions include: a requirement that surface or vegetation disturbance areas be treated for invasive species and revegetated; that riparian/wetland areas be managed to enhance forage conditions and improve water quality; and that the BLM work cooperatively to complete vegetation inventories with appropriate stakeholders. Vegetative communities are managed in accordance with the *Wyoming Standards for Healthy Rangelands* and are maintained to provide sustainable forage levels for livestock and wildlife. Management prescriptions for invasive species include implementing cooperative integrated pest management programs with appropriate stakeholders; using certified noxious weed seed-free products on all BLM-administered projects and lands; and limiting surface disturbance to the minimum needed for safe project completion to limit the spread of noxious weeds.

Fish and wildlife management includes actions to appropriately mitigate surface-disturbing activities and maintain or improve fish and wildlife habitat. Management calls for collaboration with the WGFD and other stakeholders to manage barriers to fish passage, activities potentially affecting native and desirable non-native fish species, and harmful non-native riparian vegetation in important fish habitats. Wildlife habitats are maintained or improved through vegetative manipulations, habitat improvement projects, and livestock grazing strategies, in accordance with appropriate planning and guidance documents. Existing habitat management plans are used and updated as necessary to reflect current wildlife management objectives and prescriptions.

In consultation with stakeholders, projects that may affect special status species are to be modified in order to protect these species. The BLM implements actions set forth in recovery plans, conservation measures, terms and conditions, and reasonable and prudent measures within biological opinions for Threatened and/or Endangered plant and wildlife species. Management actions specific to special status fish species include supporting the WGFD in obtaining water rights for the benefit of special status fish species and prioritizing special status fish species over other fish species in planning and management actions. Management actions specific to special status plant and wildlife species include utilizing current research and management and conservation plans to guide special status species habitat management, and establishing a year-round disturbance-free buffer zone of at least 0.5 mile for known active bald eagle nests. For Greater Sage-Grouse, the BLM would collaborate with appropriate federal agencies and the State of Wyoming to develop and monitor conservation objectives and identify site-based actions to achieve the objectives. Additional management actions specific to Greater Sage-Grouse include managing habitat and reduce resource conflicts, and include specific restrictions on the application of pesticides in nesting and brood-rearing habitats; specifications on the design and location of water facilities and fences; and the maintenance of seeps, springs, wet meadows, riparian vegetation, and sagebrush habitat.

2.7.5. Heritage and Visual Resources

Cultural resources management includes cooperation with Native American tribes to protect land and artifacts important to them as well as preservation of all cultural resources by limiting exposure to incompatible uses. Specific actions include ensuring areas important to Native American tribes are not transferred from federal ownership and stabilizing and providing long-term protection for significant cultural sites that are experiencing adverse impacts.

The primary emphasis of paleontological resources management is the protection of land containing significant paleontological resources. To that end, the BLM retains all public lands with significant paleontological values.

Visual resource management (VRM) involves managing each VRM class according to the definitions and objectives in the VRM manual (H-8410-1). The BLM would manage WSAs and the Middle Fork Powder River, if designated by Congress as a Wild and Scenic River (WSR), under VRM Class I objectives. Measures designed to protect visual resources (i.e., screening, painting, and designing to blend with the surrounding landscape) are required for non-temporary facilities and structures.

2.7.6. Land Resources

Lands and realty management, including cadastral survey, seeks to improve access to public land and enable better overall management of BLM-administered land. Withdrawals, Recreation and Public Purpose applications, and land use authorizations (permits, leases, etc.) are all considered on a project-specific basis. Lands meeting the identified disposal criteria have priority consideration for disposal. In order to reduce inadvertent trespass potential, the BLM uses appropriate signage and access authorizations. Management of renewable energy and ROWs include cooperating with stakeholders to coordinate renewable energy opportunities and scientific research in accordance with other resource values; providing reasonable access across public land to private land; designating ROW corridors to minimize surface disturbance; developing communication site management plans for all existing and newly identified communication site concentration areas; and maintaining a transportation management system to meet public and resource management needs.

Travel and transportation management in the planning area involves maintaining a transportation system across public lands, improving access to public lands, and designating areas as Open, Closed, or Limited to designated routes or seasons for OHV use. Unless otherwise specified, OHV use is Limited to designated routes on BLM-administered land. Areas within the planning area will no longer be classified as Limited to existing routes. Specific management actions include negotiating access across non-BLM-administered lands to isolated public lands, evaluating roads constructed under other initiatives (e.g., oil and gas exploration) for inclusion in the BLM transportation system, and improving access for people with disabilities.

The BLM manages recreational use to provide recreational opportunities for public land users while protecting public safety and other resource values. Management actions include managing recreation sites, facilities, and access to minimize impacts to riparian habitat and opening the planning area to dispersed recreation where consistent with other resource values. Newly acquired lands, and other parcels meeting the size and naturalness requirements, are evaluated for wilderness characteristics.

The BLM manages livestock grazing to achieve the *Wyoming Standards for Healthy Rangelands*, improve forage for livestock, improve forage and habitat for wildlife, and enhance rangeland health. Forage allocations in grazing permits or leases can be adjusted when supported by monitoring, field observations, rangeland (land) health assessments/evaluations, or other data acceptable to the authorized officer.

2.7.7. Special Designations

The BLM evaluates authorized activities and develops mitigation to protect the integrity of the characteristics for which ACECs were designated. The BLM manages Scenic or National Back Country Byways with the objective of encouraging responsible motorized recreational

use of the proposed byway, while protecting and displaying the scenic, cultural, geological, multiple use, and crucial wildlife habitat values that occur in the area. The Middle Fork Powder River is managed in accordance with the Middle Fork Interim Management Plan (available on the BFO website, <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo/docs.html>) until Congress designates it as a WSR or releases the river for other uses. Similarly, WSAs within the planning area including Fortification Creek, Gardner Mountain, and North Fork are managed in accordance with BLM Manual 6330 – Management of Wilderness Study Areas until Congress acts upon the proposals.

2.7.8. Socioeconomic Resources

Socioeconomic impacts are largely derived from actions for management of other resources. These management actions are described under the resource headings they belong to. Management of socioeconomic resources includes quantifying socioeconomic impacts associated with site-specific and programmatic BLM actions, referring to available indicators for the economic and social health of an affected area, and, generally, managing in a way that considers the fact that BLM actions are integrally connected with both socioeconomics and the cultural health of the planning area. Indicators of economic activity on BLM-administered lands include leases and permits, visitation estimates, grazing allotment AUMs, among others. Management prescriptions for health and safety in the planning area generally seek to reduce human and environmental risk. Some of the actions designed to reduce these risks include prioritizing abandoned mine sites that most affect human health, safety, and the environment; using public awareness techniques to prevent exposure by the public to hydrogen sulfide gas; reducing waste produced by BLM activities through waste minimization practices; and mitigating hazards from coalbed fires.

2.8. Summaries of the Alternatives

This section summarizes the four alternatives (A through D) considered in detail in the Proposed RMP and Final EIS. Due to the breadth of management prescriptions in the alternatives, only key elements of the alternatives (those with the most potential to affect resources) are summarized in this section. The summary descriptions of each alternative in this section provide a general overview of the alternative, the management emphasis associated with each alternative, and key management actions for each alternative.

Table 2.5, “Comparative Summary of Acreage Affected (and associated fluid mineral lease stipulation) by Proposed Land Use Decisions in the Buffalo Planning Area” (p. 104) identifies acreage allocations for resources and resource uses by alternative. Table 2.6, “Comparative Summary of Proposed Areas of Critical Environmental Concern” (p. 110) identifies acreage allocations and the emphasis for management in proposed ACECs. These tables provide a comparative summary of acreage allocations in the four alternatives. Detailed descriptions of the alternatives can be found in Table 2.7, “1000 PHYSICAL RESOURCES (PR) – AIR QUALITY (AQ)” (p. 127) through Table 2.40, “8000 SOCIOECONOMIC RESOURCES (SR) – HEALTH AND SAFETY” (p. 275) in this chapter. The maps in Appendix F (p. 1931) further illustrate differences in acreage allocations and management prescriptions by alternative.

Table 2.5. Comparative Summary of Acreage Affected (and associated fluid mineral lease stipulation) by Proposed Land Use Decisions in the Buffalo Planning Area

Topic	Acreage Type	Alternative A		Alternative B		Alternative C		Alternative D	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Physical Resources									
Surface Disturbance on Soils with Severe Erosion Hazard	BLM Surface	215,496 (TLS)	28%	215,496 (NSO)	28%	215,496 (Lease Terms)	28%	215,496 (CSU)	28%
	BLM-Administered Fluid Mineral Estate	669,739 (TLS)	20%	669,739 (NSO)	20%	669,739 (Lease Terms)	20%	669,739 (CSU)	20%
Surface Disturbance on Soils with Poor Reclamation Suitability	BLM Surface	455,090 (Lease terms)	58%	455,090 (NSO)	58%	455,090 (Lease Terms)	58%	455,090 (CSU)	58%
	BLM-Administered Fluid Mineral Estate	1,514,445 (Lease Terms)	45%	1,514,445 (NSO)	45%	1,514,445 (Lease Terms)	45%	1,514,445 (CSU)	45%
Surface Disturbance within 500 feet of Water Resources	BLM Surface	19,861 (CSU)	3%	19,861 (NSO)	3%	19,861 (Lease Terms)	3%	19,861 (CSU)	3%
	BLM-Administered Fluid Mineral Estate	95,172 (CSU)	3%	95,172 (NSO)	3%	95,172 (Lease Terms)	3%	95,172 (CSU)	3%
Mineral Resources									
Acres Recommended for Withdrawal (Closure) from Locatable Mineral Entry ¹	BLM Surface coupled with BLM-Administered Locatable Mineral Estate	0	0%	618,256	80%	0	0%	82,691	11%
Acres Open to Fluid Mineral Leasing Subject to the Standard Lease Form ²	BLM-Administered Fluid Mineral Estate	146,126	4%	1,225	0%	539,499	16%	135,909	4%

Topic	Acreage Type	Alternative A		Alternative B		Alternative C		Alternative D	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Acres Open to Fluid Mineral Leasing with Moderate Constraints	BLM-Administered Fluid Mineral Estate	782,501	23%	124,467	4%	2,472,472	73%	2,516,826	74%
Acres Open to Fluid Mineral Leasing with Major Constraints	BLM-Administered Fluid Mineral Estate	85,548	3%	642,232	19%	303,601	9%	556,592	16%
Acres Closed to Fluid Mineral Leasing	BLM-Administered Fluid Mineral Estate	2,346,307	69%	2,612,920	77%	30,520	1%	72,276	2%
Acres Open to Salable Minerals	BLM-Administered Salable Mineral Estate	3,319,248	99%	129,431	4%	3,290,908	98%	2,725,060	81%
Fire and Fuels Management									
Acres Available for Planned Ignitions	BLM Surface	14,000	2%	3,500	<1%	42,000	5%	14,000	2%
Biological Resources									
Surface Disturbance within 0.25-mile of Natural Water Bodies Containing Desirable Fish	BLM Surface	N/A ³	N/A ³	51,745 (NSO)	7%	51,745 (Lease Terms)	7%	51,745 (CSU)	7%
	BLM-Administered Fluid Mineral Estate	N/A ³	N/A ³	261,870 (NSO)	8%	261,870 (Lease Terms)	8%	261,870 (CSU)	8%
Facility Development and Occupancy within Elk Crucial Winter Range and Calving Areas	BLM Surface	N/A ³	N/A ³	75,175 (NSO)	10%	75,175 (Lease Terms)	10%	75,175 (CSU)	10%
	BLM-Administered Fluid Mineral Estate	N/A ³	N/A ³	173,512 (NSO)	5%	173,512 (Lease Terms)	5%	173,512 (CSU)	5%

Topic	Acreage Type	Alternative A		Alternative B		Alternative C		Alternative D	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Greater Sage-Grouse Occupied Leaks Protective Buffer (Surface-disturbing Activities Prohibited)	BLM Surface	3,594 (CSU) 203,724 (TLS)	0% 26%	695,827 (CSU) 467,897 (TLS) 467,897 (NSO)	89% 60% 60%	3,594 (CSU) 203,724 (TLS)	0% 26%	P7: 136,261 G7: 2,278 (CSU) P: 132,249 G: 148,121 (TLS) P: 7,687 G: 973 (NSO)	P7: 17% G7: <1% (CSU) P: 17% G: 19% (TLS) P: 1% G: <1% (NSO)
	BLM-Administered Fluid Mineral Estate	22,777 (CSU) 1,685,563 (TLS)	1% 50%	3,117,708 (CSU) 3,181,711 (TLS) 3,181,711 (NSO)	92% 94% 94%	22,777 (CSU) 1,685,563 (TLS)	1% 50%	P: 669,451 G: 16,103 (CSU) P: 653,307 G: 779,834 (TLS) P: 38,113 G: 16,103 (NSO)	P7: 20% G7: 0% (CSU) P: 19% G: 23% (TLS) P: 1% G: <0% (NSO)
Special Status Species Raptor Active Nest Protective Biologic Buffer Zone (Surface-disturbing Activities Prohibited or Restricted)	BLM Surface	N/A ³	N/A ³	28,437 (NSO)	4%	28,437 (CSU)	4%	28,437 (NSO)	4%
	BLM-Administered Fluid Mineral Estate	N/A ³	N/A ³	701,847 (NSO)	21%	701,847 (NSO)	21%	701,847 (NSO)	21%
Special Status Species Raptor Nests Seasonal Timing Limitation	BLM Surface	17,345	2%	113,784	15%	4,855	1%	28,437	4%
	BLM-Administered Fluid Mineral Estate	357,927	11%	855,772	25%	114,832	3%	701,847	21%
Heritage and Visual Resources									

Topic	Acreage Type	Alternative A		Alternative B		Alternative C		Alternative D	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Surface Disturbance in Areas Containing Historic Properties that Retain Their Setting	BLM Surface	3,588 (NSO)	<1%	221,490 (No Leasing)	28%	221,490 (CSU)	28%	7,289 (NSO) 179,189 (CSU)	1% 23%
	BLM-Administered Fluid Mineral Estate	19,971 (NSO)	1%	732,300 (No Leasing)	22%	732,300 (CSU)	22%	23,447 (NSO) 613,601 (CSU)	1% 18%
Visual Resource Management – Class II	BLM Surface	127,594	16%	217,021	28%	0	0%	112,329	14%
Visual Resource Management – Class III	BLM Surface	63,583	8%	276,107	35%	167,334	21%	379,429	49%
Visual Resource Management – Class IV ⁴	BLM Surface	559,674	72%	258,866	33%	584,500	75%	260,238	33%
Land Resources									
Acres Open to Renewable Energy Development	BLM Surface	N/A ³	N/A ³	6,131	1%	134,875	17%	55,516	7%
Renewable Energy Avoidance Areas	BLM Surface	N/A ³	N/A ³	45,441	6%	618,676	79%	374,518	48%
Renewable Energy Exclusion Areas	BLM Surface	N/A ³	N/A ³	730,530	93%	28,551	4%	352,068	45%
Major ROW/Utility Corridor Areas	BLM Surface	351,133	45%	29,126	4%	351,133	45%	29,126	4%
ROW Avoidance Areas	BLM Surface	N/A ³	N/A ³	56,857	7%	27,706	4%	321,149	41%

Topic	Acreage Type	Alternative A		Alternative B		Alternative C		Alternative D	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
ROW Exclusion Areas	BLM Surface	N/A ³	N/A ³	706,556	90%	28,554	4%	79,777	10%
Acres Closed to Motorized Vehicle Use	BLM Surface	3,650 ⁵	0%	625,854	80%	28,931	4%	37,389	5%
Acres Seasonally Closed to Motorized Vehicle Use	BLM Surface	37,646	5%	18,259	2%	6,839	1%	81,948	10%
Acres Limited to Designated Roads and Trails for Motorized Vehicle Use	BLM Surface	737,166	94%	137,126	18%	723,497	93%	661,726	85%
Acres of SRMAs (Number of SRMAs)	BLM Surface	0	0%	55,529 acres (8)	7%	30,570 acres (6)	4%	54,160 acres (7)	7%
Acres Available to Livestock Grazing	BLM Surface	Approximately 772,102	99%	314,205	40%	777,515	99%	772,110	99%

Topic	Acreage Type	Alternative A		Alternative B		Alternative C		Alternative D	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Acres Incompatible to Livestock Grazing	BLM Surface	Approximately 10,000 ⁶	1%	467,897	60%	4,587	1%	9,992	1%
Source: BLM 2012f									
Note: Although federal mineral estate acreage is not displayed for each resource topic in this table, land use decisions may affect management on federal mineral estate.									
¹ The existing withdrawals from mineral entry (totaling 11,373 acres) are not included in the acres recommended for withdrawal from mineral entry.									
² As of October 1, 2008, there are 2,570,703 acres under existing leases.									
³ Land use decision not applicable under Alternative A.									
⁴ Visual Resource Management Class V no longer exists as a class objective option for managing visual resources. As a result, these areas are managed as Class IV visual resources under Alternative A.									
⁵ Closed to off-highway vehicle use.									
⁶ Includes areas both not authorized for grazing and incompatible to grazing identified in the current plan.									
⁷ P: Priority Greater Sage-Grouse Habitat (Core Population Areas and Core Population Connectivity Corridors), G: General Greater Sage-Grouse Habitat.									
< less than									
% percent									
BLM Bureau of Land Management									
CSU controlled surface use									
N/A Not Applicable									
NSO No Surface Occupancy									
ROW right-of-way									
SRMA Special Recreation Management Area									
TLS timing limitation stipulation									

Table 2.6. Comparative Summary of Proposed Areas of Critical Environmental Concern

Name	Value(s) of Concern	Alternative A		Alternative B		Alternative C		Alternative D	
		Existing Designation	BLM Surface Acreage	Proposed Designation	BLM Surface Acreage	Proposed Designation	BLM Surface Acreage	Proposed Designation	BLM Surface Acreage
Burnt Hollow	Scenic, geologic features, fragile watershed, local qualities, national priority concerns and public concern for management.	None	0	ACEC	17,280	None	0	None	0
Cantonment Reno	Historic values, local and national significance.	None	0	ACEC	523	None	0	None	0
Dry Creek Petrified Tree	Geologic features, local significance and qualities that are rare.	None	0	ACEC	2,567	None	0	None	0
Fortification Creek Elk Area	Scenic, wildlife resources, local significance, national concerns, and fragile watershed.	None	0	ACEC	32,602	None	0	None	0
Hole-in-the-Wall	Cultural, scenic values, local and national significance, uniqueness, and public concerns for management.	None	0	ACEC	11,952	None	0	None	0
Pumpkin Buttes	Cultural values, Native American religious and cultural values.	None	0	ACEC	1,731	None	0	ACEC	1,731
Sagebrush Ecosystem	Wildlife and Natural System	None	0	ACEC	467,897	None	0	None	0
Welch Ranch	Recreation and wildlife.	None	0	ACEC	1,748	None	0	ACEC	1,116
Source: BLM 2012f									
ACEC Area of Critical Environmental Concern BLM Bureau of Land Management									

Restrictions on resource uses (e.g., closed to mineral leasing) apply throughout the life of the RMP, unless changed through an RMP amendment. Management actions developed under all alternatives are subject to valid existing rights. In addition, management actions may only be implemented when consistent with applicable laws, regulations, and policies. The planning area is open to locatable mineral activities unless specifically withdrawn from operation of the mining laws. NSO, CSU, and TLS stipulations apply only to fluid mineral leasing and not to other mineral resources. Changes in resource use restrictions that require an RMP amendment can result due to public demand, statewide or national policy and guidance, or other factors. The timing and degree of implementation for management prescriptions in this document depend on available budget, staffing, and agency priorities. Actions taken or authorized by the BLM during RMP implementation would comply with standard practices, guidelines for surface-disturbing activities, and other BLM guidance and policy. Therefore, these practices and guidelines are considered part of each alternative. Implementation of new BLM policy and guidance during the life of this RMP will be incorporated into the land use planning process consistent with the management prescriptions in the plan.

The planning process does not include detailed, implementation-level decisions. During the implementation stage, additional environmental analyses will be conducted, as appropriate, for site-specific actions and the BLM will determine on a project-specific basis what, if any, mitigation is required.

2.8.1. Alternative A – Current Management (No Action)

Overview of the Alternative

Alternative A represents the current management of resources on BLM surface and federal mineral estate within the planning area under the existing plan. Alternative A represents the No Action Alternative required by NEPA.

Physical Resources

Physical resources are managed under Alternative A to conserve air, water, soil, and cave and karst resources, and to support resources and resource uses. Under Alternative A, activities with expected effects to air resources are analyzed and monitoring may be performed on a project-specific basis. Alternative A places limitations on surface-disturbing activities to protect soil resources including prohibiting surface disturbance within areas of severe erosion hazard from March 1 through June 15, prohibiting surface disturbance on slopes of more than 25 percent, and restricting activity on soils having poor reclamation suitability on a project-specific basis. Water resources management under Alternative A includes prohibiting surface disturbance within 500 feet of any spring, reservoir, water well, or perennial stream. No previous management actions were defined for cave and karst management and, as such, management is considered on a project-specific basis under Alternative A.

Mineral Resources

Mineral resource uses are managed by identifying BLM-administered lands and federal mineral estate within the planning area suitable for exploration and/or development of leasable, locatable, and/or salable minerals. Management actions also seek to conserve other resource values where they are incompatible with mineral resources activity. For example, the Amsden Creek, Middle Fork Canyon, and Kerns Game Ranges are closed to mineral entry (11,373 acres), while the

WSAs (28,931 acres) remain open to mineral entry (locatable mineral activities). The WSAs, however, come under the purview of 43 CFR 3802, which includes stringent requirements for non-impairment of these areas. No new withdrawals are recommended under Alternative A. All federal coal lands are open to exploration. A portion of the federal coal lands have been reviewed against the coal screening criteria and have been determined to be acceptable for further consideration for coal leasing. Leasing of other minerals (i.e., phosphates or sodium) is considered on a project-specific basis.

Approximately 2,346,307 acres of federal mineral estate are closed to fluid mineral leasing. The remaining federal mineral estate is open for leasing subject to the following constraints: 146,126 acres are subject to standard stipulations only, 26,048 acres are subject to minor constraints, 782,501 acres are subject to moderate constraints, and 85,548 acres are subject to major constraints. Salable mineral exploration and development are prohibited on approximately 28,873 acres in the Fortification Creek, Gardner Mountain, and North Fork WSAs.

Fire and Fuels Management

For unplanned ignitions in Alternative A, fire management seeks to balance variable suppression strategies with resource values. Priority response is given to wildfires where there are high value resources, or where fires may spread to non-BLM-administered lands. No portion of the planning area is available to manage fires for other multiple resource objectives. Alternative A restricts the use of some types of suppression equipment in sensitive areas, and rehabilitates suppression damage.

Fuels management in Alternative A would treat about 14,000 acres with prescribed fire during the life of the plan (Appendix G (p. 1937)). These acres are based on treatments completed in the planning area from the years 1984 to 2007. Wildland fire and other vegetation treatments would be used to support vegetation and wildlife habitat objectives.

Biological Resources

Alternative A identifies few management actions to address vegetation and invasive species management and, as such, management is typically considered on a project-specific basis for these resources. Under Alternative A, vegetation treatments, including forest management and sagebrush spraying or burning, are designed to meet overall resource management objectives consistent with the policy to protect or improve biodiversity and water quality. Diseased old growth and overstocked forests are managed in accordance with the Healthy Forest Restoration Act. Control of noxious weeds under Alternative A is managed in cooperation with county weed and pest districts.

Alternative A management actions attempt to provide habitat for fish and wildlife and comply with the Endangered Species Act and BLM policy for special status species. For example, Alternative A management includes cooperation with the WGFD in introducing native and desirable non-native fish and maintaining reservoirs and riparian areas to improve or enhance potential fisheries. Wildlife management under Alternative A includes seasonal restrictions such as prohibiting surface disturbance in crucial elk winter range between November 15 and April 30, in elk calving areas from May 1 to June 30, and within 0.5 mile of raptor nests from February 1 to July 31. In addition, surface disturbance is prohibited in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges for big game, within 750 feet of sharp-tailed grouse leks, and within biologic buffer zones around active raptor nests.

No previous decisions were identified under current management for special status plant and fish species, and, as such, management is considered on a project-specific basis for these resources. The BLM manages vegetation resources to comply with the Endangered Species Act and BLM policy associated with management of habitat for special status species. Management prescriptions to protect Greater Sage-Grouse include requiring anti-perching devices on new powerlines with 0.5 mile of occupied Greater Sage-Grouse leks and nesting habitat, and restricting surface disturbance and occupancy within a 0.25-mile radius of the perimeter of occupied or undetermined Greater Sage-Grouse leks. Management actions that limit surface-disturbing activity for the benefit of other special status wildlife species include a year-round disturbance-free buffer zone of 0.5 mile for bald eagle winter roosts, TLS for bald eagle winter roosts of 1.0 mile from November 1 to April 1, and prohibition of surface disturbance within a biologic buffer zone around active nests of special status raptor species.

Heritage and Visual Resources

Alternative A primarily considers cultural and paleontological resource management on a project-specific basis. Specific actions include applying a NSO stipulation to fluid mineral leases where potentially eligible or significant segments of the Bozeman Trail and Crazy Woman Battle Site exist, and developing Cultural RMPs for Cantonment Reno, Dull Knife Battlefield, and the Outlaw Cave Archeological District. VRM includes managing visual resources in accordance with objectives for VRM classes that have been assigned in the planning area.

Land Resources

Forest products management under Alternative A balances forest and woodland health with other resource uses such as commercial timber production. For example, forest products management under Alternative A allows the sale of minor forest products from woodlands and/or noncommercial forestlands on BLM-administered lands throughout the planning area, offers approximately 9 million board feet of sawtimber and 1 million board feet of minor green forest products from BLM-administered forestlands over a 10 year period, and limits individual clear-cuts to less than 20 acres.

Land resource program actions under Alternative A identify approximately 108,243 acres within the planning area as available for disposal. Lands having agricultural potential and water may be considered for disposal. Priority is given to acquiring land or interests in lands in areas adjacent to large blocks of BLM-administered land, especially in areas of high recreational potential. Other land resource program actions under Alternative A include requiring approval of renewable energy development projects on a project-specific basis. Under the existing plan, no specific management actions are identified for renewable energy resources. Alternative D recommends the use of designated corridors for ROWs and requires lines to be buried within Greater Sage-Grouse Core Population Areas unless they are within 0.5 mile of existing 115 kV or larger transmission lines. Surface disturbance and occupancy associated with ROW corridors is not allowed on slopes of 25 percent or more.

Transportation management designations under Alternative A include 3,650 acres Closed to OHV use and 737,166 acres Limited to designated roads and trails for OHV use. In addition, a seasonal closure (November 15 to April 30) for motorized vehicle use is instituted on several areas (37,646 acres) in the planning area. As noted in the *Management Actions Common to All Alternatives* section above, areas will no longer be classified as Limited to existing routes.

Recreation management under Alternative A balances protection of the recreational experience with other resource uses. For example, surface disturbance and fluid mineral leasing are prohibited near the Dry Creek Petrified Tree Environmental Education Area and the Mosier Gulch Recreation Area to protect the recreational experience and other resource values. However, salable mineral development and withdrawals from appropriation under the mining laws in Recreation Areas and SRMAs are considered on a project-specific basis under Alternative A. Alternative A manages the planning area as one Extensive Recreation Management Area (ERMA) with several developed recreation sites.

No previous decisions were identified under current management for areas with wilderness characteristics, and, as such, management is considered on a project-specific basis for this resource.

Under Alternative A, the BLM does not allow livestock grazing on about 4,000 acres of BLM-administered land located in the southern Big Horn Mountains due to the area's rough terrain and steep slopes and does not allow livestock grazing on about 6,000 acres where it is incompatible with other resource values. Management stipulates that any permanent increases in forage produced are considered for wildlife and watershed protection before additional livestock use is authorized. Several livestock grazing management decisions prescribed under the other alternatives are not included under Alternative A, and, therefore, management is typically conducted on a project-specific basis. For example, Alternative A does not specify the distance salt or mineral supplements should be placed away from water sources and placement is instead managed on a project-specific basis.

Special Designations

Alternative A does not designate any ACECs and no management actions are identified regarding Scenic or National Back Country Byways and WSRs. If Congress decides not to designate the WSAs in the planning area as Wilderness, the Gardner Mountain, North Fork, and Fortification Creek WSAs will be available for oil and gas leasing. The Middle Fork Powder River segments suitable for WSR designation are managed under an interim management plan (BLM 2003d) to protect the free-flowing condition, tentative "wild" classification, and identified outstandingly remarkable values. Alternative A does not address management for the release of WSRs for other uses, nor does it consider designation of Scenic and Back Country Byways, therefore, such management is considered on a project-specific basis.

Socioeconomic Resources

BLM's management recognizes and considers local and regional economic development and land use plans.

2.8.2. Alternative B – Resource Conservation

Overview of the Alternative

Alternative B emphasizes conservation of physical, biological, heritage and visual resources, and areas with wilderness characteristics with constraints on resource uses. Relative to all alternatives, Alternative B conserves the most land area for physical, biological, and heritage resources; designates the highest number of ACECs; and is the most restrictive to motorized vehicle use and mineral development.

Physical Resources

Under Alternative B, the BLM manages physical resources (air, water, soil, and cave and karst resources) with an emphasis on conserving these resources. This alternative is less focused on supporting resource uses than the other alternatives. Alternative B requires quantitative air quality modeling of industrial activities in order to determine the potential impacts of proposed emission sources and subsequently of potential mitigation strategies. Management of soil resources is similar to Alternative A although more limitations are placed on surface-disturbing activities to protect soils. For example, soils with severe erosion hazard are protected from surface disturbance year-round instead of from March 1 through June 15. In addition, Alternative B prohibits surface disturbance and applies an NSO stipulation on all slopes 25 percent and greater, soils with poor reclamation suitability, badlands, rock outcrops, and slopes susceptible to mass movement. Management under Alternative B includes more protections for water resources through prohibitions of on-channel reservoirs, restrictions on activities resulting in surface discharge of produced water, and prohibiting the conversion of oil and gas wells to water supply wells. Similar to Alternative A, Alternative B prohibits surface-disturbing activities within 500 feet of springs, water wells, and perennial streams and associated riparian habitat. In addition, Alternative B also prohibits surface-disturbing activities within 500 feet of non-CBNG reservoirs. Cave and karst management actions under Alternative B apply restrictions to incompatible resource uses and enable greater overall management of cave and karst resources through cave specific Cave Management Plans.

Mineral Resources

Mineral resource uses are subject to more extensive constraints under Alternative B than under the other alternatives. The BLM would recommend withdrawals to locatable mineral entry on 618,256 acres (2,686,776 acres open to locatable mineral entry, should these withdrawals occur).

Approximately 2,612,920 acres of federal fluid mineral estate are closed to fluid mineral leasing. The remaining federal mineral estate is open for leasing subject to the following constraints: 1,225 acres are subject to standard stipulations only, 5,685 acres are subject to minor constraints, 124,467 acres are subject to moderate constraints, and 642,232 acres are subject to major constraints (Map 14). Approximately 1,239,723 acres are open to leasing of other minerals (i.e., phosphates, sodium, etc.) Alternative B would result in 129,431 acres open to salable mineral exploration and development and 3,218,690 acres closed to or restricted from salable mineral exploration and development.

Fire and Fuels Management

Fire and fuels management under Alternative B places more emphasis on natural processes and less emphasis on planned vegetation treatments.

Response to unplanned ignitions in this alternative would vary from full protection in areas where fire is undesirable, to managing wildfire for other resource objectives. The entire planning area would be available to manage fires to meet resource objectives. This alternative utilizes protection strategies in the wildland urban interface, wildland industrial interface, developed recreation sites, commercial timber areas, and other sensitive resource areas. The BLM would limit heavy suppression equipment to existing roads and trails or immediately adjacent to them. This alternative rehabilitates all fire related damage including suppression activity and fire severity.

Fuels management in Alternative B would treat about 3,500 acres with prescribed fire during the life of the plan. Wildland fire and other vegetation treatments would be applied to restore fire-adapted ecosystems and to reduce hazardous fuels.

Biological Resources

Vegetation management under Alternative B emphasizes natural processes and ecosystem protection. For example, Alternative B minimizes silvicultural treatments; allows insect, disease, and wildland fire to run their natural course; and manages aspen communities as a seral stage and natural component of the forest. In addition, Alternative B authorizes only native plant species for reclamation activities and restores vegetation in all CBNG supported wetland and riparian systems. Alternative B provides the most protection for riparian/wetland resources by applying an NSO stipulation within 500 feet of riparian/wetland systems, aquatic habitat, and floodplains. Invasive species and pest management under Alternative B places no limitations on the aerial application of pesticides and requires the development of pest management areas, prioritizes noxious weed treatments where infestations on private land are threatening public lands, and requires the treatment of annual brome species throughout the planning area.

Alternative B emphasizes the conservation of habitat for fish and wildlife and places more constraints on resource uses that affect biological resources compared to Alternative A. For example, fish resources management under Alternative B prohibits surface-disturbing and disruptive activities within 0.25 mile of naturally occurring water bodies containing native and desirable non-native fish species. Proactive fish management includes designing crossings of water bodies to allow fish passage and performing restoration of important instream segments for fish habitat. Alternative B applies more constraints on resource uses to protect wildlife habitat than Alternative A including applying a seasonal restriction on surface disturbance in elk crucial winter range and prohibiting surface disturbance and disruptive activities within 0.5 mile of a big game migration corridor. Under Alternative B, raptor management is species based with varying protective distances and timing by species.

Compared to other alternatives, special status species receive increased protection under Alternative B. To protect special status plant species, Alternative B prohibits surface disturbance, mineral exploration, motor vehicle use, and the use of explosives and blasting within special status plant habitat. Under Alternative B, surface disturbance is prohibited within 0.25 mile of any waters containing special status fish species. Management actions to protect Greater Sage-Grouse are greater than Alternative A and include increased controlled management distances, winter timing limitation and winter habitat restrictions, and protection of brood-rearing habitat. Management actions to protect other special status wildlife include more constraints than Alternative A and list specific areas and species that will be impacted by these actions. For example, Alternative B institutes a disturbance free zone and applies an NSO stipulation to mineral leases within 0.5 mile of bald and golden eagle roosting sites and the following riparian corridors consistently used by wintering eagles: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River.

Heritage and Visual Resources

Alternative B emphasizes the protection of cultural and paleontological resources and places restrictions on resource uses that may adversely impact them. Around sites containing historical properties, the BLM prohibits surface disturbance and initiates mineral withdrawals in areas containing sensitive cultural sites such as traditional cultural properties (TCPs). Under this alternative, the BLM prohibits salable mineral exploration, recommends withdrawals to locatable

mineral entry, and closes mineral leasing in areas containing paleontological resources of high quality or importance. Proactive management designed to protect and enhance cultural and paleontological resources include establishing site stewardship opportunities in coordination with stakeholders and initiating paleontological field surveys on all Potential Fossil Yield Classification (PFYC) Class 3, 4, and 5 formations potentially affected by proposed activities.

Under Alternative B, the BLM manages all visual resource inventory (VRI) Class II areas and special emphasis areas as VRM Class II and all VRI Class III areas outside special emphasis areas as VRM Class III.

Land Resources

Forest products management under Alternative B places a greater emphasis on the role of natural processes. For example, Alternative B offers sawtimber only from specified forest areas, manages forest product sales to remain within ecologically sustainable limits, and limits forest management to five acres per select group harvest.

Land resource program actions under Alternative B retain BLM-administered lands identified for disposal that have agricultural potential, water, or other natural resource value. Alternative B considers all lands within the planning area for acquisition without prioritizing major blocks of public land and areas of high recreation potential. Renewable energy development is excluded in all areas where surface disturbance is prohibited and is avoided in mineral leasing NSO and CSU areas, ROW avoidance areas, and all other areas with surface disturbance restrictions. The BLM authorizes transmission lines only within identified corridors and requires co-location of new communication sites within designated areas. Fewer ROW corridors are designated under Alternative B than under other alternatives and no above ground high-voltage transmission lines would be authorized in the planning area. As under Alternative A, ROWs are excluded on slopes 25 percent or greater, but Alternative B additionally stipulates that placement of above ground facilities should be avoided along major transportation routes to protect visual resources. Alternative B also prohibits CO₂ sequestration research and projects. Transportation management designations under Alternative B include 625,854 acres Closed to motorized vehicle use, and 137,126 acres Limited to designated roads and trails for motorized vehicle use. In addition, Alternative B seasonally closes 18,259 acres to motorized vehicle use within big game crucial winter range.

Under Alternative B, recreation management emphasizes protection of resources and recreational experiences, and includes more restrictions on resource uses than the other alternatives. For example, the BLM limits development of additional recreational facilities to SRMAs and other high-use areas. Alternative B expands the constraints on resource uses applied under Alternative A by not leasing minerals within designated SRMAs, instituting a 0.5 mile buffer from mineral leasing surrounding SRMAs, and recommending withdrawals from appropriation under the mining law in designated SRMAs. However, Alternative B would allow salable mineral development within designated SRMAs for administrative use. Under Alternative B, the planning area would be managed under two ERMAs (Southern Big Horns and Buffalo ERMAs), totaling 726,573 acres. The BLM would also designate a total of 55,529 acres in eight SRMAs: Burnt Hollow, Dry Creek Petrified Tree, Middle Fork Powder River, Mosier Gulch, Welch Ranch, Weston Hills, Hole-in-the-Wall, and Cabin Canyon.

Alternative B manages areas with wilderness characteristics to emphasize primitive recreational opportunities and natural values. In order to protect these characteristics, Alternative B limits incompatible uses within these areas such as mineral development and motorized vehicle use.

Alternative B limits or prohibits livestock grazing where it has been determined to be incompatible with other uses, including areas within 4 miles of the perimeter of occupied or undetermined sage-grouse leks and winter concentrations areas (467,897 acres) as proposed under this alternative. Similar to Alternative A, Alternative B authorizes permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority, livestock grazing second. Alternative B prohibits increases in livestock stocking rates as a result of vegetation treatment and locates livestock salt or mineral supplements a minimum of 0.5 mile away from water sources.

Special Designations

Alternative B designates eight ACECs including Cantonment Reno, Burnt Hollow, Dry Creek Petrified Tree, Fortification Creek Elk Area, Hole-in-the-Wall, Pumpkin Buttes, Sagebrush Ecosystem, and Welch Ranch. Refer to Table 2.6, “Comparative Summary of Proposed Areas of Critical Environmental Concern” (p. 110) for the management emphasis and acreages of each ACEC.

Alternative B would evaluate roads within the planning area for designation as National Back Country or Scenic Byways. If Congress does not designate the Middle Fork Powder River as a WSR, and releases the river for other uses, management will continue in accordance with the Middle Fork Interim Management Plan to protect and/or enhance its free-flowing condition and outstandingly remarkable values. The Middle Fork Interim Management Plan is available on the BFO website, <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo/docs.html>. If Congress decides not to designate the three WSAs in the planning area as Wilderness, and releases an area for other uses, the Gardner Mountain, North Fork, and Fortification Creek WSAs would not be available for oil and gas leasing until a plan amendment is completed. WSAs released from Congressional designation would then be subject to consideration for lands with wilderness characteristics.

Socioeconomic Resources

BLM management under Alternative B develops mitigation strategies to resolve conflicts that have detrimental effects on multiple resource use. Similar to Alternative A, BLM management under Alternative B considers local and regional economic development land use plans.

2.8.3. Alternative C – Resource Development

Overview of the Alternative

Alternative C emphasizes resource uses by limiting conservation measures afforded to physical, biological, heritage and visual resources. Relative to all other alternatives, Alternative C conserves the least land area for physical, biological, and heritage resources and is the least restrictive to motorized vehicle use and mineral development.

Physical Resources

Physical resources under Alternative C are generally managed with fewer management requirements and more allowance for the project-specific applications of management actions than the other alternatives. For example, quantitative air quality monitoring is not required for industrial activities and surface-disturbing activities and surface occupancy can be allowed on soils with severe erosion hazard, slopes 25 percent and greater, soils with poor reclamation

suitability, and on badlands and rock outcrops consistent with other resource values and subject to standard lease terms. Water resources management is more flexible in Alternative C than in other alternatives. For example, suitable abandoned oil and gas wells could be converted to water wells for livestock, recreation, and wildlife use, and on-channel reservoirs could be allowed in consideration of other resource uses. In addition, surface-disturbing activities can be allowed within 500 feet of springs, reservoirs, water wells, and perennial streams and riparian habitat. Cave and karst management under Alternative C is similar to Alternative B although fewer restrictions are placed on resource uses in proximity to cave and karst resources. For example, Alternative C applies a CSU stipulation within cave and karst areas whereas Alternative B applies an NSO stipulation. In addition, Alternative C would manage human activity in caves with significant resources by developing and implementing a Cave Management Plan for the entire planning area versus individual cave management plans.

Mineral Resources

Under Alternative C, mineral resource uses are subject to fewer constraints than under the other alternatives. No withdrawals from locatable mineral entry are recommended under Alternative C – all 3,319,535 acres currently open would remain open to locatable mineral entry within the planning area. Under Alternative C, the BLM would open all coal lands to coal exploration and leasing, resulting in zero acres closed to coal exploration and leasing and 4,775,136 acres open to coal exploration and leasing.

The entire federal fluid mineral estate is open for leasing subject to the following constraints: 539,499 acres are subject to standard stipulations only, 40,437 acres are subject to minor constraints, 2,472,472 acres are subject to moderate constraints, and 303,601 acres are subject to major constraints. Approximately 4,707,436 acres are open to leasing of other minerals (i.e., phosphates, sodium, etc.). Alternative C would also result in 3,290,908 acres open to salable mineral exploration and development and 57,213 acres closed to or restricted from salable mineral exploration and development.

Fire and Fuels Management

Fire and fuels management under Alternative C places more emphasis on suppression of unplanned ignitions, and uses planned ignitions to meet vegetation management objectives.

Response to unplanned ignitions in this alternative would use full protection strategies throughout the planning area. The BLM could use heavy equipment with few constraints for suppression efforts. This alternative rehabilitates suppression-related damage only.

Fuels management in Alternative C would treat about 42,000 acres with prescribed fire during the life of the plan. Wildland fire and other vegetation treatments would be used to restore fire-adapted ecosystems, enhance forage for commodity production, and to reduce hazardous fuels.

Biological Resources

Vegetation management under Alternative C emphasizes more resource use and greater intensive management practices compared to the other alternatives. For example, Alternative C implements silvicultural treatments to maximize forest health; utilizes intensive management tactics to manage for desired forest/woodland health; and manages forest/woodland to emphasize the forest resource. Reclamation under Alternative C could include using desirable non-native plant species for initial reclamation activities and would address vegetation restoration only on direct CBNG

disturbance areas. In addition, Alternative C would only apply standard lease terms to mineral leases within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains. Alternative C prioritizes noxious weed treatments where infestations on public land are threatening private lands, and restricts noxious weed treatments to only those plants on the State of Wyoming Designated list. In addition, Alternative C limits aerial application to insecticides and treats annual brome species only in designated areas.

Alternative C generally applies less stringent management restrictions for surface-disturbing activities within fish and wildlife habitat than the other alternatives. For example, fish resource management under Alternative C allows surface-disturbing activities within 0.25 mile of naturally occurring water bodies consistent with other resource values while Alternative B restricts activity within that buffer. Proactive fish management makes more allowances for project-specific management decisions than the other alternatives. Alternative C also places few constraints on resource uses to protect wildlife habitat. For example, surface-disturbing activities are not prohibited in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges as they are under the other alternatives.

Special status species receive limited protection from incompatible resource uses under Alternative C. Management of special status plant species under Alternative C is similar to Alternative B although restrictions on uses are typically limited to known special status plant populations versus within special status plant species habitat. Under Alternative C, surface disturbance is allowed to within 500 feet of any waters containing special status fish species when their impacts can be mitigated. Alternative C applies similar, but less stringent restrictions on surface-disturbing activities to protect special status wildlife species than Alternative B. For example, this alternative prohibits surface-disturbing activities within 0.25 mile of a special status species raptor nest whereas Alternative B prohibits surface disturbance within 1.5 miles. Similarly, Alternative C restricts surface-disturbing activities, disruptive activities, and occupancy within 0.25 mile of the perimeter of occupied or undetermined Greater Sage-Grouse leks, while Alternative B prohibits these activities within 4.0 miles of occupied or undetermined leks and winter concentration areas.

Heritage and Visual Resources

Alternative C provides for mineral development near historic and other cultural properties protecting them through NSO stipulations and other appropriate mitigation. The BLM applies stipulations such as NSO and CSU to protect culturally sensitive sites such as TCPs and/or sacred sites. In contrast to Alternative B, Alternative C does not prohibit salable mineral exploration, or initiate locatable mineral withdrawals in areas containing paleontological resources of high quality or importance. However, Alternative C does require paleontological field surveys on all PFYC Class 4 and 5 formations potentially affected by proposed activities.

Under Alternative C, the BLM manages all VRI Class II areas as VRM Class III and all VRI Class III areas as VRM Class IV.

Land Resources

Forest products management under Alternative C places a greater emphasis on forest products commodity production. The BLM manages forest products sales to maximize economic return and does not limit the size and design/shape of forest management in order to maximize the removal of harvestable products within the limits of Wyoming Forestry BMPs and other guidance.

All lands identified for disposal are available for disposal under Alternative C. In contrast to alternatives A and B, Alternative C lands and realty actions do not include land acquisition. Renewable energy development is allowed within the planning area as long as development is consistent with other resource values. Alternative C offers additional acreage for ROW development in comparison to Alternative B, and allows the authorization of above ground transmission lines in any designated corridor. Alternative C also does not require co-location of new communication sites nor does it exclude ROW on slopes of 25 percent or greater. CO₂ sequestration research and projects are allowed where consistent with other resource values. Transportation management under Alternative C closes 28,931 acres to motorized vehicle use and limits motorized vehicle use to designated roads and trails on 723,497 acres. In addition, Alternative C closes 6,839 acres of big game crucial winter range to motorized vehicle use from November 15 to April 30. As under all alternatives, motorized vehicle use is limited to designated routes on BLM-administered land throughout the planning area unless otherwise designated.

Alternative C allows additional recreation facilities in areas where they are supported by recreational use and are consistent with other resource values. Generally, Alternative C does not apply specific limitations on surface disturbance or mineral development and manages recreational areas consistent with other resource values. Under Alternative C, the BLM would designate six SRMAs: Burnt Hollow, Dry Creek Petrified Tree, Middle Fork Powder River, Mosier Gulch, Welch Ranch, and Weston Hills. The rest of the planning area would be managed as the Buffalo ERMA.

Lands with wilderness characteristics are managed to follow the management within the surrounding areas and are not managed to emphasize primitive recreational opportunities and natural values.

Livestock grazing under Alternative C is limited or prohibited only in those areas where it is currently prohibited under Alternative A. Livestock grazing is generally managed with less emphasis on providing for other resource values than the other alternatives. For example, Alternative C authorizes permanent increases in forage allocations to livestock grazing as the first priority, wildlife habitat and watershed protection as the second priority. Alternative C requires livestock salt or mineral supplements to be placed a minimum of 500 feet away from water sources, riparian areas, and aspen stands.

Special Designations

Alternative C does not designate any ACECs. If Congress does not designate the Middle Fork Powder River as a WSR, and releases the river for other uses, management will follow the management within the surrounding areas as outlined in this RMP. Like Alternative B, if Congress decides not to designate the three WSAs in the planning area as wilderness, the Gardner Mountain, North Fork, and Fortification Creek WSAs would not be available for oil and gas leasing until a plan amendment is completed. WSAs released from Congressional designation would then be subject to consideration for lands with wilderness characteristics.

Socioeconomic Resources

BLM management under Alternative C develops management strategies designed to recognize and point out conflicts that are expected to impact multiple resource use. Alternative C also incorporates, to the extent possible, local and regional economic development and land use plans.

2.8.4. Alternative D – Proposed RMP

Overview of the Alternative

Alternative D generally allows resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources. Alternative D designates the second most land as SRMAs and ACECs and emphasizes moderate constraints on resource uses to reduce impacts to resource values.

Physical Resources

Physical resources management under Alternative D places few universal constraints on resource uses and instead allows activities if they meet certain requirements designed to mitigate impacts to air, soil, water, and cave and karst resources. For example, the BLM allows activities on highly erosive soils and on slopes 25 percent and greater if the actions meet certain criteria including having an approved stabilization and reclamation plan. Similar to Alternative B, this alternative would require quantitative air quality modeling of proposed activities to determine potential emission impacts and identify mitigation strategies. Water resources management generally seeks to support other resource uses while protecting water quality and quantity by allowing activities such as converting abandoned oil and gas wells to water supply wells (with proper permitting and regulation by the Wyoming DEQ) if a beneficial use can be demonstrated and allowing surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams where water and other resource objectives can be met. In order to protect cave and karst resources, Alternative D applies site-specific buffers to restrict resource uses such as forest management around significant caves. In addition, Alternative D would manage human activity in caves with significant resources by developing and implementing a Cave Management Plan for the entire planning area with potential cave specific components.

Mineral Resources

Under Alternative D, mineral resource uses are subject to less extensive constraints than under Alternative B, but more than either alternatives A or C. The BLM recommends withdrawals from mineral entry for an additional 82,691 acres (totaling 94,288 acres potentially closed to mineral entry; closure of these acres would leave 4,720,586 acres open to mineral entry within the planning area). All coal lands are open to exploration, subject to multiple use constraints, resulting in zero acres closed to coal exploration and 4,775,136 acres open to coal leasing, subject to application of the coal planning screens in 43 CFR 3420.1-4.

Approximately 72,276 acres of federal fluid mineral estate are closed to fluid mineral leasing. The remaining federal fluid mineral estate is open for leasing subject to the following constraints: 135,909 acres are subject to standard stipulations only, 104,927 acres are subject to minor constraints, 2,516,826 acres are subject to moderate constraints, and 556,592 acres are subject to major constraints. In addition, approximately 3,801,889 acres are open to leasing of other minerals (i.e., phosphates, sodium, etc.). Alternative D would result in 2,725,060 acres remaining open to salable mineral exploration and development, and 623,061 acres closed to or restricted from salable mineral exploration and development.

Fire and Fuels Management

Fire management under Alternative D balances suppression strategies with resource values and desired conditions. Unplanned ignitions in this alternative may be managed to enhance other

resources such as wildlife habitat and forest health. Response to wildfires could vary from full protection in areas where fire is undesirable, to monitoring fire behavior in areas where fire can be used as a management tool. The entire planning area would be available to manage fires to meet resource objectives. Heavy equipment is prohibited in certain areas with sensitive resources such as riparian/wetland habitat, except where human safety is at risk or if the effects of the fire are anticipated to cause more resource damage than the use of heavy equipment.

Fuels management in Alternative D would treat about 14,000 acres with prescribed fire during the life of the plan. Wildland fire and other vegetation treatments would be used to meet desired management objectives.

Biological Resources

Vegetation management under Alternative D allows for resource uses where activities can be conducted that conserve vegetation and other resource values. For example, Alternative D manages forests and woodlands to emphasize multiple resource values and not just the forest resource as under Alternative C. Alternative D also implements silvicultural treatments to maximize forest health and manages forests and woodlands to emphasize multiple resource values including recreation, wildlife, soils, water, and forest products. Alternative D allows desirable non-native plant species for short-term reclamation activities as a component of an authorized reclamation plan. In addition, Alternative D would apply a CSU stipulation to any mineral lease within 500 feet of riparian/wetland systems and aquatic habitats. Invasive species and pest management under Alternative D includes the development of long-range pest management plans, treatment areas, and priorities in cooperation with stakeholders.

Alternative D emphasizes protection of fish and wildlife resources through the application of moderate resource constraints and defining resource objectives. For fish species, the BLM allows surface-disturbing activity within 0.25 mile of naturally occurring water bodies containing fish if fish resource objectives can be met. Proactive fish management includes performing restoration of important instream segments for fish habitat in accordance with WGFD priorities and designing crossings to allow fish passage. Alternative D would continue to prohibit surface disturbance in sensitive wildlife areas such as big game crucial winter range, but would allow other resource uses in certain habitat if the activities met specific criteria such as following an approved resource protection plan.

Special status species generally receive greater protection under Alternative D than under Alternative A. To protect special status plant species, Alternative D prohibits surface disturbance, mineral exploration, motor vehicle use, explosives, and the placement of water developments within known special status plant species populations. Alternative D prohibits new surface-disturbing activities within 0.25 mile of any waters containing special status fish species, although certain exceptions are allowed. For Greater Sage-Grouse, constraints on resource uses are greater within Core Population Areas than outside Core Population Areas. For example, the BLM would apply an NSO stipulation within 0.6 mile of Greater Sage-Grouse leks within priority habitat (Core Population Areas and Connectivity Corridors) and within 0.25 mile of occupied Greater Sage-Grouse leks outside of priority habitat. Alternative D applies similar, but less stringent restrictions on surface-disturbing activities to protect other special status wildlife species than Alternative B. For example, Alternative D institutes a disturbance free zone and applies a CSU stipulation to mineral leases within 0.5 mile of eagle roost sites and consistently used riparian corridors.

Heritage and Visual Resources

Cultural and paleontological resources generally receive more protection under Alternative D than under Alternative A. Alternative D applies an NSO stipulation to specific historic properties and a CSU stipulation to protect the setting of the same sites, subject to certain exceptions. Alternative D also avoids areas containing important paleontological resources when developing locatable and salable minerals and applies an NSO stipulation to mineral leases in the same areas. Paleontological field surveys are required on PFYC Class 4 and 5 formations potentially affected by proposed activities and on Class 3 formations as needed.

VRM under Alternative D includes managing VRI Class II areas (except Powder River Breaks and Fortification Creek) and special emphasis areas (i.e., SRMAs, ACECs, and wilderness characteristic areas) as VRM Class II.

Land Resources

Forest products management under Alternative D emphasizes commodity production while still managing for long-term ecological health of forestland. For example, sales of forest products are managed to remain within ecologically sustainable limits while maximizing economic return. The designing/shaping of forest management areas is conducted in accordance with other resource values and within the limits of the Wyoming Forestry BMPs.

The BLM actively pursues a program to dispose of BLM surface lands identified for disposal including other lands not identified but meeting appropriate disposal criteria. Land acquisition and disposal is based on all resources values, including but not limited to agricultural potential and water. Renewable energy development is excluded on 352,068 acres. Alternative D requires co-location of communication sites within identified communication site areas and avoids ROW on slopes 25 percent or greater and highly erodible soils. Alternative D requires corridor use and authorizes above ground and below ground structures in designated corridors when resource objectives can be met. Designated ROW corridors would be utilized as transportation and utility corridors. CO₂ sequestration proposals are evaluated in accordance with other management objectives. Transportation management under Alternative D closes 37,389 acres to motorized vehicle use and limits motorized vehicle use to designated roads and trails on 661,726 acres. In addition, Alternative D seasonally closes 18,259 acres to motorized vehicle use to protect wintering big game.

Recreation management under Alternative D generally increases constraints on resource uses within recreation management areas and places a greater emphasis on recreational facility development compared to current management. Surface disturbance and salable mineral development are allowed in SRMAs for administrative use only, while SRMAs are recommended for withdrawal from locatable mineral entry. Seven SRMAs totaling 54,160 acres and eight ERMAs totaling 349,663 acres would be designated under Alternative D. Cabin Canyon, proposed as an SRMA under Alternative B, would not be designated as an SRMA in Alternative D.

Non WSA lands with wilderness characteristics are managed to emphasize ecosystem health, natural values, and primitive recreational opportunities.

Livestock grazing is allowed on all public lands in the planning area except where an evaluation has determined it to be incompatible with other resource uses or values. Permanent forage allocations would consider watershed protection, livestock grazing, wildlife habitat, and other resource values. Similar to Alternative C, Alternative D allows increases in livestock stocking rates as a result of vegetation treatments and requires livestock salt or mineral supplements to be placed a minimum of 500 feet away from water sources.

Special Designations

Alternative D designates two ACECs including Fortification Creek Elk Area, Pumpkin Buttes, and Welch Ranch. Refer to Table 2.6, “Comparative Summary of Proposed Areas of Critical Environmental Concern” (p. 110) for the management emphasis and acreages of each ACEC.

Alternative D would evaluate roads in coordination with the counties and other stakeholders for designation as National Back Country or Scenic Byways. If Congress does not designate the Middle Fork Powder River as a WSR, and releases the river for other uses, management will continue to retain its free-flowing condition and outstandingly remarkable values. As under alternatives B and C, if Congress decides not to designate the three WSAs in the planning area as Wilderness, the Gardner Mountain, North Fork, and Fortification Creek WSAs will not be available for oil and gas leasing until a plan amendment is completed. WSAs released by Congressional for uses other than wilderness would then be considered pursuant to Manuals 6310 and 6320 to maintain wilderness characteristics.

Socioeconomic Resources

BLM management under Alternative D emphasizes collaboration with local, state, federal, and private entities to promote a healthy and sustainable social and economic environment. Similar to the other alternatives, Alternative D considers local and regional land use and economic development plans.

2.9. Detailed Alternative Descriptions by Resource

This section is comprised of multiple tables. Table 2.7, “1000 PHYSICAL RESOURCES (PR) – AIR QUALITY (AQ)” (p. 127) through Table 2.40, “8000 SOCIOECONOMIC RESOURCES (SR) – HEALTH AND SAFETY” (p. 275) identify goals and objectives, management actions common to all alternatives, and management actions by alternative. Table 2.7, “1000 PHYSICAL RESOURCES (PR) – AIR QUALITY (AQ)” (p. 127) through Table 2.40, “8000 SOCIOECONOMIC RESOURCES (SR) – HEALTH AND SAFETY” (p. 275) are arranged according to the following resource topics:

Number	Resource Topic
1000	Physical Resources (PR)
2000	Mineral Resources (MR)
3000	Fire and Fuels Management (FM)
4000	Biological Resources (BR)
5000	Heritage and Visual Resources (HR)
6000	Land Resources (LR)
7000	Special Designations (SD)
8000	Socioeconomic Resources (SR)

The above numbering system and abbreviations for each of the eight resource topics appear as headings and serve to organize Table 2.7, “1000 PHYSICAL RESOURCES (PR) – AIR QUALITY (AQ)” (p. 127) through Table 2.40, “8000 SOCIOECONOMIC RESOURCES (SR) – HEALTH AND SAFETY” (p. 275). Following the headings are the applicable goals and objectives for each resource topic. These goals and objectives apply to all four alternatives under consideration for the entire planning area and would apply for the life of the RMP.

Management actions are anticipated to achieve the goals and objectives identified for each resource topic. Some management actions are constant across all alternatives and are listed

for each resource topic under the Management Actions Common to All Alternatives sections. Other management actions vary by alternative and are identified in the Management Actions by Alternative sections.

Actions apply for the life of the RMP, but can be changed by amending the RMP. For example, areas identified as closed to mineral leasing refer to federal mineral estate closed from leasing for the life of the RMP unless changed through an RMP amendment. Moreover, where seasonal or other restrictions or limitations are placed on development, exception, waiver, or modification of these limitations may be approved in writing (Appendix H (p. 1959)), including documented supporting analysis, by the authorized officer. This applies to all restrictions and limitations.

2.9.1. 1000 PHYSICAL RESOURCES

Table 2.7. 1000 PHYSICAL RESOURCES (PR) – AIR QUALITY (AQ)

GOAL PR:1 Maintain existing air quality and air quality related values such as visibility by requiring that all BLM actions minimize impacts on air quality and comply with all applicable air quality laws, rules, and regulations.					
Objectives:					
PR:1.1 Reduce the impacts of criteria pollutants and greenhouse gases associated with BLM actions in compliance with applicable state and federal AAQS.					
PR:1.2 Work cooperatively with Wyoming DEQ to reduce visibility-impairing pollutants in accordance with the State of Wyoming’s Regional Haze SIP.					
PR:1.3 Reduce atmospheric deposition of pollutants to levels below accepted and LAC.					
PR:1.4 Manage fugitive dust to reduce impacts associated with BLM actions.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
AQ-1001	PR:1	Manage prescribed burns to comply with Wyoming DEQ AQD smoke-management rules and regulations.			
AQ-1002	PR:1	Define a criteria pollutant and AQRV monitoring strategy and cooperatively establish a monitoring network by creating a method for siting AQ monitors in order to provide additional data for describing background concentrations.			
AQ-1003	PR:1	Implement mitigation measures within BLM’s authority (BMPs – for example, dust suppression) to reduce emissions from current levels in the planning area and work cooperatively to encourage industry and other permittees to adopt measures to reduce emissions.			
AQ-1004	PR:1	Enhance the existing cooperative process that shares air quality information with agencies, stakeholders, and the public.			
AQ-1005	PR:1	Work cooperatively with stakeholders to reduce cumulative dust emissions (i.e., Campbell County Dust Coalition) and address other air quality concerns.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
AQ-1006	PR:1	Perform analysis of activities with expected effects to air resources. Modeling may be performed on a project-specific basis.	Require quantitative AQ modeling of industrial activities (e.g., oil and gas field development or mining activities) in order to determine the potential impacts of proposed emission sources and subsequently of potential mitigation strategies for projects expected to approach or exceed emission standards at the project level.	Do not require quantitative AQ modeling of industrial activities.	Require quantitative AQ modeling of industrial activities (i.e., oil and gas or mining) expected to result in emissions where ambient conditions may approach or exceed ambient air quality standards, in consultation with the Wyoming DEQ Air Quality Division and other stakeholder, in order to determine the potential impacts of proposed emission sources and potential mitigation strategies

Table 2.8. 1000 PHYSICAL RESOURCES (PR) – SOIL

GOAL PR:2 Soil quality is maintained, improved, or restored while supporting other resource values. Objectives: PR:2.1 Achieve and maintain Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming. PR:2.2 Incorporate soil protection consistent with soil resource capabilities for all BLM actions. PR:2.3 Rehabilitate all surface-disturbing activities consistent with applicable laws, regulations, and policies.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Soil-1001	PR:2.1 PR:2.2	Evaluate the effects of a proposed surface-disturbing activity to the soil resource using NRCS Soil Survey data and/or onsite investigation. Apply mitigation measures if necessary, relocate the activity to a more suitable soil type, or deny the authorization.			
Soil-1002	PR:2.1 PR:2.2 PR:2.3	Authorized surface-disturbing activities will include plans for reclamation; site-specific reclamation actions should reflect the complexity of the project, environmental concerns, and the reclamation potential of the site.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Soil-1003	PR:2.2	Prohibit surface-disturbing activities within areas of severe erosion hazard (Map 3) from March 1 through June 15, unless the prohibition is waived by the authorized officer.	Prohibit surface-disturbing activities on soils with a severe erosion hazard (Map 3).	Allow surface-disturbing activities on soils with a severe erosion hazard consistent with other resource values.	Allow surface-disturbing activities on soils without a severe erosion hazard. Activities on highly erosive soils would be allowed with approved site-specific construction, stabilization, and reclamation plans to conserve the soil resource and meet reclamation (Appendix O (p. 2495)) and resource objectives.
Soil-1004	PR:2.1 PR:2.2	NSO on areas of severe erosion hazard from March 1 through June 15, unless waived by the authorized officer.	Apply an NSO stipulation on soils with a severe erosion hazard.	Allow surface occupancy on soils with a severe erosion hazard subject to standard lease terms.	Apply a CSU stipulation on soils with a severe erosion hazard with approved site-specific construction, stabilization, and reclamation plans.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Soil-1005	PR:2.2	Prohibit surface-disturbing activities on slopes of more than 25% (Map 4), unless the prohibition is waived by the authorized officer.	Prohibit surface-disturbing activities on slopes 25% and greater (Map 4).	Allow surface-disturbing activities on slopes 25% and greater consistent with other resource values (Map 4).	Allow surface-disturbing activities on slopes less than 25%. Activities on slopes 25% and greater would be allowed with approved site-specific construction, stabilization, and reclamation plans to conserve the soil resource and meet reclamation (Appendix O (p. 2495)) and resource objectives (Map 4).
Soil-1006	PR:2.2	NSO for fluid mineral leases on slopes of more than 25% unless waived by the authorized officer (Map 4).	Apply an NSO stipulation on all slopes 25% and greater (Map 4).	Allow surface occupancy on slopes 25% and greater subject to standard lease terms (Map 4).	Apply a CSU stipulation on all slopes 25% and greater with approved site-specific construction, stabilization, and reclamation plans (Map 4).
Soil-1007	PR:2.2 PR:2.3	Surface-disturbing activities are restricted on soils having poor reclamation suitability on a project-specific basis (Map 5).	Prohibit surface-disturbing activities on soils with poor reclamation suitability (Map 5).	Allow surface-disturbing activities on soils with poor reclamation suitability consistent with other resource values (Map 5).	Allow surface-disturbing activities on soils with poor reclamation suitability recognizing that reclamation may be challenging and that construction, stabilization, and reclamation plans are required to conserve the soil resource (Map 5) (Appendix O (p. 2495)).
Soil-1008	PR:2.2 PR:2.3	Surface-disturbing activities are restricted on soils having poor reclamation suitability on a project-specific basis (Map 5).	Apply an NSO stipulation on soils having poor reclamation suitability (Map 5).	Allow surface occupancy on soils having poor reclamation suitability subject to standard lease terms (Map 5).	Apply a lease notice on soils with poor reclamation suitability identifying that reclamation may be challenging and that construction, stabilization, and reclamation plans are required to conserve the soil resource (Map 5).

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Soil-1009	PR:2.2	No previous decision; considered on a project-specific basis.	Prohibit surface-disturbing activities on badlands, rock outcrops, biologic crusts, and slopes susceptible to mass movement (Map 6).	Allow surface-disturbing activities on badlands, rock outcrops, biologic crusts, and slopes susceptible to mass movement consistent with other resource values (Map 6).	Avoid surface-disturbing activities on limited reclamation potential areas such as badlands, rock outcrops, biologic crusts, and slopes susceptible to mass movement (Map 6). Activities may be allowed in limited cases with approved site-specific construction, stabilization, and reclamation plans to conserve the soil resource and meet reclamation (Appendix O (p. 2495)) and resource objectives.
Soil-1010	PR:2.2	No previous decision; considered on a project-specific basis.	Apply an NSO stipulation on badlands, rock outcrops, biologic crusts, and slopes susceptible to mass movement (Map 6).	Allow surface occupancy on badlands, rock outcrops, biologic crusts, and slopes susceptible to mass movement subject to standard lease terms (Map 6).	Apply a CSU stipulation on limited reclamation potential areas such as badlands, rock outcrops, biologic crusts, and slopes susceptible to mass movement with approved site-specific construction, stabilization, and reclamation plans (Map 6).

Table 2.9. 1000 PHYSICAL RESOURCES (PR) – WATER

GOAL PR:3 Watershed, surface water, and groundwater resources are consistent with applicable state and federal standards and regulations.		
Objectives:		
PR:3.1 BLM actions maintain or improve watershed, wetland, and riparian functions to support desired surface-flow regimes and water quality.		
PR:3.2 Mitigate accelerated channel erosion and instability as a result of BLM actions.		
PR:3.3 Ensure adequate reclamation of reservoir structures and affected downstream channels associated with BLM actions.		
PR:3.4 Cooperatively develop monitoring, rehabilitation and restoration plans for degraded water bodies and riparian zones.		
PR:3.5 Reclaim or remove unneeded, nonfunctional or poorly-sited reservoirs on BLM-administered lands.		
PR:3.6 Continue monitoring groundwater potentially impacted as a result of BLM actions and expand the monitoring network as needed.		
PR:3.7 Minimize impacts to aquifers and groundwater quality.		
GOAL PR:4 Water availability to facilitate authorized uses while providing for the conservation of those waters.		
Objectives:		
PR:4.1 Develop new water-supply sources where appropriate during BLM actions.		
PR:4.2 Identify abandoned oil and gas wells that are desirable for conversion to livestock and wildlife water supply use.		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
Water-1001	PR:3.1 PR:3.4	Provide an alternative or “off-source” water supply (e.g., piping water to troughs, tanks, or ponds) in locations where BLM-authorized uses are fenced out of water sources.
Water-1002	PR:4.1	Install flow-control devices on new and existing BLM-authorized water wells and spring developments and evaluate the need for additional flow-control devices on a project-specific basis.
Water-1003	PR:3.1 PR:3.7	File for water rights on BLM water projects.
Water-1004	PR:3.1 PR:3.2	Manage surface-disturbing activities to prevent degradation of water quality for all waters.
Water-1005	PR:3.6 PR:3.7	Minimize impacts to water quality and quantity during BLM-authorized actions. BLM will work with Wyoming DEQ to assess impacts and develop mitigation.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Water-1006	PR:3.1 PR:3.2 PR:3.4	Manage water resources to meet the Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming, achieve PFC, and meet Wyoming water quality standards. Take appropriate actions to improve the biological, chemical, and geomorphic conditions of streams adversely impacted by BLM-authorized actions and permitted activities.			
Water-1007	PR:3.1 PR:3.2 PR:3.4	Design and manage land use and surface-disturbing activities to reduce channel and bank erosion and the associated loss of riparian habitats.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Water-1008	PR:3.1 PR:3.3 PR:3.5	No previous decision; considered on a project-specific basis.	Prohibit on-channel reservoirs to minimize effects to natural stream flow regimes.	Allow for on-channel reservoirs effecting natural stream flow regimes in consideration of other resource values.	Allow for on-channel reservoirs effecting natural stream flow regimes in consideration of other resource values.
Water-1009	PR:3.1 PR:3.2	No previous decision; considered on a project-specific basis.	Do not authorize activities resulting in the surface discharge of produced water from development of federal minerals.	Authorize activities associated with the surface discharge of produced water from development of federal minerals, when permitted by the State of Wyoming.	Authorize activities associated with the surface discharge of water produced during federal activities if erosive conditions, channel stability, soil characteristics, and other resource values warrant. Coordinate permitting process with the State of Wyoming.
Water-1010	PR:3.1 PR:3.2	No previous decision; considered on a project-specific basis.	Maintain existing water supply sources to meet current demand and need.	Maintain existing water supply sources and drill new water supply wells, develop new seeps and springs, and construct new reservoirs to meet demand and need.	Maintain existing water supply sources where possible, otherwise supply new water sources to meet demand and need, consistent with other resources.
Water-1011	PR:3.7 PR:4.1 PR:4.2	No previous decision; considered on a project-specific basis.	Do not convert abandoned oil and gas wells to water supply wells.	Convert suitable abandoned oil and gas development wells to water supply wells for livestock, recreation, and wildlife use.	Allow abandoned oil and gas wells to be converted to water supply wells if a beneficial use (livestock, recreation, and wildlife) can be demonstrated.
Water-1012	PR:4	No previous decision; considered on a project-specific basis.	Require alternative energy (e.g., solar and wind) to power all new and existing water resource developments.	Do not require alternative energy (e.g., solar and wind) to power new and existing water resource developments.	Encourage alternative energy (e.g., solar and wind) to power new water resource developments versus overhead power or petroleum based.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Water-1013	PR:3.1 PR:3.2	Prohibit surface disturbance within 500 feet of any spring, reservoir, water well, or perennial stream, unless the prohibition is waived by the authorized officer.	Prohibit surface-disturbing activities within 500 feet of springs, non-CBNG reservoirs, water wells, or perennial streams and associated riparian habitat.	Allow surface-disturbing activities within 500 feet of springs, non-CBNG reservoirs, water wells, or perennial streams and associated riparian habitat.	Allow surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, or perennial streams where water and other resource objectives (including, but not limited to soil, slope, and vegetation) can be met.
Water-1014	PR:3.1 PR:3.2	No previous decision; considered on a project-specific basis.	Apply an NSO stipulation to any fluid mineral lease within 500 feet of springs, non-CBNG reservoirs, water wells, or perennial streams and associated riparian habitat.	Do not apply an NSO stipulation to any fluid mineral lease within 500 feet of springs, non-CBNG reservoirs, water wells, or perennial streams and associated riparian habitat.	Apply a CSU stipulation to any fluid mineral lease within 500 feet of any spring, non-CBNG reservoir, water well, or perennial stream, based on other resource values, including, but not limited to soil, slope, and vegetation.
Water-1015	PR:3.1 PR:3.2 PR:3.4	No previous decision; considered on a project-specific basis.	Manage riparian and uplands in historically perennial systems to restore perennial flows or standing water.	Manage riparian and uplands in historically perennial systems on a project-specific basis.	Manage riparian and uplands to restore perennial flows or standing water.
Water-1016	PR:3.1 PR:3.3 PR:3.5	No previous decision; considered on a project-specific basis.	Require removal and reclamation of unneeded CBNG reservoirs for removal and reclamation.	Require removal and reclamation of unneeded CBNG reservoirs on BLM surface and where requested on private surface.	Evaluate unneeded reservoirs for removal and reclamation.

Table 2.10. 1000 PHYSICAL RESOURCES (PR) – CAVE AND KARST

GOAL PR:5 Significant cave and karst resources are conserved.					
Objectives:					
PR:5.1 Identify and determine cave and karst resources that meet significance criteria of 43 CFR 37.11(c).					
PR:5.2 Manage significant cave and karst resources while supporting other resource values.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Cave-1001	PR:5.1	Conduct cave inventories and significance determinations.			
Cave-1002	PR:5.1	Inventory and map cave and karst areas.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Cave-1003	PR:5.2	No previous decision; considered on a project-specific basis.	Manage human activity in caves with significant resources through cave specific Cave Management Plans.	Manage human activity in caves with significant resources by developing and implementing a Cave Management Plan for the planning area.	Manage human activity in caves with significant resources by developing and implementing a Cave Management Plan for the planning area, with potential cave specific components.
Cave-1004	PR:5.2	No previous decision; considered on a project-specific basis.	Apply an NSO stipulation within cave and karst areas. Close these areas to surface and sub-surface-disturbing activities.	Apply a CSU stipulation within cave and karst areas. Mineral resource activities would likely be required to maintain a buffer around significant cave entrances and passages.	Apply a CSU stipulation within cave and karst areas. Note: Mineral resource activities would likely be required to maintain a site-specific buffer around significant cave entrances and passages.
Cave-1005	PR:5.2	No previous decision; considered on a project-specific basis.	Prohibit surface-disturbing activities in areas containing cave and karst resources (Map 7).	Require a buffer from significant cave entrances for surface-disturbing activities (Map 7).	Require a site-specific buffer from significant cave entrances for surface-disturbing activities.
Cave-1006	PR:5.2	No previous decision; considered on a project-specific basis.	Prohibit forest management in areas containing cave and karst resources.	Require forest management to maintain a buffer from significant cave entrances.	Require forest management to maintain a site-specific buffer from significant cave entrances.
Cave-1007	PR:5.2	No previous decision; considered on a project-specific basis.	Restrict livestock from entrances to significant caves.	Do not restrict livestock grazing in areas containing cave and karst resources.	Restrict livestock from entrances to significant caves.

2.9.2. 2000 MINERAL RESOURCES

Table 2.11. 2000 MINERAL RESOURCES (MR) – LOCATABLE MINERALS

GOAL MR:1 Federal mineral lands are open to mineral entry to support short-term and long-term domestic needs.					
Objectives:					
MR:1.1 Provide opportunities for the exploration and development of locatable minerals, as well as mill and tunnel site operations, while avoiding or mitigating the effects of these activities on other resource values so that unnecessary or undue degradation is prevented.					
MR:1.2 Provide opportunities for the exploration, development, and reclamation of locatable minerals (including uranium), as well as mill and tunnel site operations, in coordination with other governmental agencies.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Locatable-2001	MR:1.1	Lands not formally withdrawn or segregated from mineral entry are open for the exploration and development of locatable minerals.			
Locatable-2002	MR:1.2	Implement the MOUs between BLM and Wyoming DEQ, and BLM and NRC, addressing locatable mineral exploration, development, and reclamation activities.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Locatable-2003	MR:1.1	Amsden Creek (523 acres), Middle Fork Canyon (about 10,695 acres), and Kerns (155 acres) Game Ranges are withdrawn from mineral entry; these withdrawals total 11,373 acres (Map 8). Although Fortification Creek, Gardner Mountain, and North Fork WSAs (28,931 acres) (Map 8) remain open to mineral entry, locatable mineral exploration and development activities on active claims or sites in these areas would be regulated pursuant to restrictions under 43 CFR 3802 to prevent impairment of the suitability of these areas for inclusion in the wilderness system.	Recommend withdrawals from mineral entry for areas identified within Alternative B to conserve other resource values (Map 8). This results in: <ul style="list-style-type: none"> • 159,054 acres remain open to mineral entry, if all acres recommended for withdrawal are withdrawn. • 687,813 acres recommended for withdrawal from mineral entry. • 11,373 acres remain withdrawn from mineral entry. 	Do not recommend any new withdrawals from mineral entry. Manage lands open to mineral entry in accordance with Alternative C, as consistent with other resource values. This results in: <ul style="list-style-type: none"> • 777,310 acres remain open to mineral entry. • 0 acres recommended for withdrawal from mineral entry. • 11,373 acres remain withdrawn from mineral entry. 	Recommend withdrawals from mineral entry for areas identified within Alternative D to conserve other resource values (Map 8). This results in: <ul style="list-style-type: none"> • 694,619 acres remain open to mineral entry, if all acres recommended for withdrawal are withdrawn. • 115,614 acres recommended for withdrawal from mineral entry. • 11,373 acres remain withdrawn from mineral entry.

Table 2.12. 2000 MINERAL RESOURCES (MR) – LEASABLE – COAL

GOAL MR:2 Leasable coal resources are available to support domestic and export needs.					
Objectives:					
MR:2.1 Maintain coal leasing and exploration, while minimizing impacts to other resource values.					
MR:2.2 Manage opportunities for exploration and development of coal resources.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Coal-2001	MR:2.1 MR:2.2	<p>Coal planning was completed as part of the April 2001 BFO RMP update. At that time the four coal planning screens (i.e., coal development potential, unsuitability, multiple use and surface owner consultation) were applied to certain federal coal lands within the BFO planning area. The result of this planning effort was a decision identifying lands acceptable for further coal leasing consideration. The coal management decisions made in the BFO RMP update will be carried forward in this RMP revision (Map 11). Federal coal lands identified acceptable for further coal leasing consideration are available for Lease By Applications, lease modifications, emergency leases, and exchanges. Prior to offering a coal tract for sale, the need to reapply the unsuitability criteria will be reviewed, a tract specific NEPA analysis will be completed, and there will be opportunity for public comment.</p> <p>At the time an application for a new coal lease or lease modification is submitted to the BLM, the BLM will determine whether the lease application area is "unsuitable" for all or certain coal mining methods pursuant to 43 CFR 3461.5. Priority habitat (core population areas and core population connectivity corridors) is essential habitat for maintaining Greater Sage-Grouse for purposes of the suitability criteria set forth at 43 CFR 3461.5(o)(1).</p>			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Coal-2002	MR:2.1 MR:2.2	On coal leases for which mining and reclamation plans have been approved, stipulate oil and gas leases to regulate oil and gas operations that would interfere with approved coal mining.	When a coal lease-by-application is filed over existing oil and gas leases, the coal lease applicant will be required to develop a mitigation plan acceptable to the oil and gas lessee allowing maximum recovery of both resources. Implementation of this mitigation plan must be accepted by any successful lease-by-application bidder and will become a stipulation on the coal lease. If a mitigation plan cannot be agreed upon prior to offering the coal lease sale, then BLM will delineate coal tracts to avoid oil and gas operations or will delay leasing of the coal tract.	Stipulate fluid mineral leases when nominated within the areas identified acceptable for further consideration for coal leasing (BLM 2001a) to require a mitigation plan allowing for maximization of both coal and oil and gas resources.	Stipulate fluid mineral leases when nominated over existing coal leases to allow maximum recover of the coal resources. When an oil and gas parcel is nominated over a coal lease application or coal lease modification application, the parcel will be pulled from the oil and gas sale list and deferred until such time a coal lease is issued. Once a coal leased is issued or the sale cancelled and the case closed, the deferred parcel nomination may be added to the oil and gas lease sale list with stipulations.

Table 2.13. 2000 MINERAL RESOURCES (MR) – LEASABLE – FLUID (Oil/Gas and Geothermal)

<p>GOAL MR:3 Leasable fluid mineral resources are available to support domestic needs.</p> <p>Objectives:</p> <p>MR:3.1 Provide opportunities for exploration, leasing, and development of fluid mineral resources.</p> <p>MR:3.2 Facilitate the evaluation of BLM-administered lands for fluid mineral potential.</p> <p>MR:3.3 Manage BLM-administered lands for collection of subsurface geological (geophysical) data to aid in the exploration of fluid mineral resources.</p> <p>MR:3.4 Priority will be given to leasing and development of fluid mineral resources, including geothermal, outside of Greater Sage-Grouse habitat. When analyzing leasing and authorizing development of fluid mineral resources, including geothermal, in priority habitat (core population areas and core population connectivity corridors) and general habitat, and subject to applicable stipulations for the conservation of Greater Sage-Grouse, priority will be given to development in non-habitat areas first and then in the least suitable habitat for Greater Sage-Grouse. The implementation of these priorities will be subject to valid existing rights and any applicable law or regulation, including, but not limited to, 30 U.S.C. 226(p) and 43 CFR 3162.3-1(h). Where a proposed fluid mineral development project on an existing lease could adversely affect Greater Sage-Grouse populations or habitat, the BLM will work with the lessees, operators, or other project proponents to avoid, reduce and mitigate adverse impacts to the extent compatible with lessees' rights to drill and produce fluid mineral resources. The BLM will work with the lessee, operator, or project proponent in developing an APD for the lease to avoid and minimize impacts to Greater Sage-Grouse or its habitat and will ensure that the best information about the Greater Sage-Grouse and its habitat informs and helps to guide development of such Federal leases.</p>		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
O&G-2001	MR:3.1	<p>Continue to require lessees to conduct operations in a manner that minimizes adverse impacts to other resources and other land uses and users.</p> <p>Where the federal government owns the mineral estate in Greater Sage-Grouse habitat and the surface is in non-federal ownership, apply to BLM authorizations regulating the Federal lessee the same stipulations, COAs, and/or conservation measures and RDFs applied if the mineral estate is developed on BLM-administered surface lands in that management area, to the maximum extent permissible under existing authorities, and in coordination with the landowner.</p> <p>Where the federal government owns the surface and the mineral estate is in non-federal ownership in Greater Sage-Grouse habitat, apply appropriate surface use COAs, stipulations, and mineral RDFs through ROW grants or other surface management instruments, to the maximum extent permissible under existing authorities, in coordination with the mineral estate owner/lessee.</p>
O&G-2002	MR:3.1 MR:3.2 MR:3.3	<p>Open all oil and gas mineral estate to leasing (Map 12), unless specifically identified as closed to mineral leasing. These open areas will be managed on a project-specific basis.</p> <p>Areas closed due to regulation, legislation, policy, or similar action:</p> <ul style="list-style-type: none"> • Incorporated municipalities and proximity to commercial airports • WSAs and WSRs • Withdrawals

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
O&G-2003	MR:3.1 MR:3.2 MR:3.3	Manage any acquired mineral estate, obtained during land tenure adjustments, in accordance with the management of the surrounding areas.
O&G-2004	MR:3.1 MR:3.2 MR:3.3	Defer fluid mineral leasing in areas where coal is already leased until fluid mineral development would not interfere with the economic recovery of the coal resources. This is determined on a project-specific basis during fluid mineral lease review.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
O&G-2005	MR:3.1	Make geothermal resources available for leasing in areas that are open to oil and gas leasing. Areas closed to oil and gas leasing are also closed to geothermal leasing.			
O&G-2006	MR:3.3	Areas that are open to oil and gas leasing are open to geophysical exploration subject to appropriate mitigation developed through use of the mitigation guidelines described in Appendix J (p. 2155). Areas closed to oil and gas leasing are closed to geophysical exploration. Geophysical exploration is subject to motorized travel limitations and restrictions on surface-disturbing and disruptive activities.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
N/A	N/A	<p>Note: The following definitions apply only to fluid mineral management within the BFO planning area.</p> <p>Fluid Mineral Constraints Definitions:</p> <p>Closed:</p> <ul style="list-style-type: none"> • Closed, withdrawn, or otherwise closed <p>Major:</p> <ul style="list-style-type: none"> • NSO more than 40 acres in size or more than 0.25 mile in width • TLS lasting 6 months or longer • Prohibition on surface disturbance more than 40 acres in size or more than 0.25 mile in width • VRM Class I <p>Moderate:</p> <ul style="list-style-type: none"> • CSU more than 40 acres in size or more than 0.25 mile in width • NSO less than 40 acres in size or less than 0.25 mile in width • TLS lasting more than 60 days but less than 6 months • Avoidance of 200 meters or more • VRM Class II <p>Minor:</p> <ul style="list-style-type: none"> • CSU less than 40 acres in size or less than 0.25 mile in width • TLS lasting less than 60 days • Avoidance of less than 200 meters • VRM Class III <p>Open (standard):</p> <ul style="list-style-type: none"> • Subject to standard lease terms and conditions, existing laws, regulations and formal orders 			
O&G-2007	MR:3.1 MR:3.2 MR:3.3	Continue to lease and allow development of federal oil and gas (Map 13). This results in: <ul style="list-style-type: none"> • 2,346,307 acres closed to fluid mineral leasing. • 146,126 acres subject to the standard lease terms and conditions. 	Make lands available for fluid mineral leasing and exploration in accordance with management identified within Alternative B to conserve other resources (Map 14). This results in: <ul style="list-style-type: none"> • 2,612,920 acres closed to fluid mineral leasing. 	Make lands available for fluid mineral leasing and exploration in accordance with management identified within Alternative C consistent with other resource values (Map 15). This results in: <ul style="list-style-type: none"> • 30,520 acres closed to fluid mineral leasing. 	Make lands available for fluid mineral leasing and exploration in accordance with management identified within Alternative D to conserve other resources (Map 16). This results in: <ul style="list-style-type: none"> • 72,276 acres closed to fluid mineral leasing.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
		<ul style="list-style-type: none"> • 26,048 acres subject to minor constraints. • 782,501 acres subject to moderate constraints. • 85,548 acres subject to major constraints. <p>Within the boundary of the Wyodak-Anderson coal seam is closed to leasing [Pennaco v. U.S., 377 F.3d 1147 (10th Cir. 2004)].</p> <p>30,520 acres closed from present RMP.</p>	<ul style="list-style-type: none"> • 1,225 acres subject to the standard lease terms and conditions. • 5,685 acres subject to minor constraints. • 124,467 acres subject to moderate constraints. • 642,232 acres subject to major constraints. <p>Adopt a minimum lease size of 640 contiguous acres where feasible.</p> <p>Greater Sage-Grouse Priority Habitat Area (Core Population Area and Connectivity Corridors) are closed to leasing.</p>	<ul style="list-style-type: none"> • 539,499 acres subject to the standard lease terms and conditions. • 40,437 acres subject to minor constraints. • 2,472,472 acres subject to moderate constraints. • 303,601 acres subject to major constraints. 	<ul style="list-style-type: none"> • 135,909 acres subject to the standard lease terms and conditions. • 104,927 acres subject to minor constraints. • 2,516,826 acres subject to moderate constraints. • 556,592 acres subject to major constraints.
O&G-2008	MR:3.1 MR:3.2	Stipulate oil and gas leases to regulate any oil and gas operations that would interfere with ongoing coal operations.	When a coal lease-by-application is filed over existing oil and gas leases, the coal lease applicant will be required to develop a mitigation plan acceptable to the oil and gas lessee allowing maximum recovery of both resources. Implementation of this mitigation plan must be accepted by any successful lease-by-application bidder and will become a stipulation on the coal lease. If a mitigation plan cannot be agreed upon prior to offering the coal lease sale, then BLM will delineate coal tracts to avoid oil and gas operations or will delay leasing of the coal tract.	Stipulate fluid mineral leases when nominated within the areas identified acceptable for further consideration for coal leasing (BLM 2001a) to require a mitigation plan allowing for maximization of both coal and oil and gas resources.	Stipulate fluid mineral leases when nominated over existing coal leases to allow maximum recover of the coal resources. When an oil and gas parcel is nominated over a coal lease application or coal lease modification application, the parcel will be pulled from the oil and gas sale list and deferred until such time a coal lease is issued. Once a coal leased is issued or the sale cancelled and the case closed, the deferred parcel nomination may be added to the oil and gas lease sale list with stipulations.

Table 2.14. 2000 MINERAL RESOURCES (MR) – LEASABLES – OTHER LEASABLE MINERALS

GOAL MR:4 Manage leasable minerals other than oil, gas, coal, and geothermal energy based on demand, while avoiding or mitigating impacts to other resource values.					
Objective:					
MR:4.1 Make opportunities available for exploration and development of leasable minerals other than oil, gas, coal, and geothermal energy, while avoiding or mitigating impacts of these activities on other resource values.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
OL-2001	MR:4.1	All lands in the planning area are available to exploration and development of other leasable minerals unless closed to mineral leasing.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
OL-2002	MR:4.1	Consider leasing other minerals (i.e., phosphates, sodium, etc.) on a project-specific basis.	<p>Close to leasing of other leasable minerals in accordance with management identified within Alternative B, to conserve other resource values. This results in:</p> <ul style="list-style-type: none"> • 1,239,723 acres open to leasing of other leasable minerals. • 3,547,781 acres closed to leasing of other leasable minerals. 	<p>Allow leasing of other leasable minerals in accordance with management identified within Alternative C, as consistent with other resource values. This results in:</p> <ul style="list-style-type: none"> • 4,707,436 acres open to leasing of other leasable minerals. • 80,068 acres closed to leasing of other leasable minerals. 	<p>Allow leasing of other leasable minerals in accordance with management identified within Alternative D, as consistent with other resource values. This results in:</p> <ul style="list-style-type: none"> • 3,801,889 acres open to leasing of other leasable minerals. • 4,699,229 acres closed to leasing of other leasable minerals.

Table 2.15. 2000 MINERAL RESOURCES (MR) – SALABLE MINERALS

GOAL MR:5 Salable mineral resources (also called mineral materials) are available to support short-term and long-term local and regional demand.					
Objective:					
MR:5.1 Provide opportunities for exploration and development of salable minerals while avoiding or mitigating effects to other resource values.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Salable-2001	MR:5.1	The majority of lands in the planning area, including federally administered surface/minerals and split estate, are available for mineral material exploration and development.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Salable-2002	MR:5.1	Mineral materials activities are prohibited in the Fortification Creek, Gardner Mountain, and North Fork WSAs (28,931 acres).	<p>Close to or restrict from salable mineral exploration and development in accordance with management identified within Alternative B, to conserve other resource values. This results in:</p> <ul style="list-style-type: none"> • 129,431 acres remain open to salable mineral exploration and development. • 3,218,690 acres closed to or restricted from salable mineral exploration and development. • 28,931 acres remain closed to salable minerals activities in the three current WSAs. 	<p>Allow salable mineral exploration and development in accordance with management identified within Alternative C, as consistent with other resource values. This results in:</p> <ul style="list-style-type: none"> • 3,290,908 acres remain open to salable mineral exploration and development. • 57,213 acres closed to or restricted from salable mineral exploration and development. • 28,931 acres remain closed to salable minerals activities in the three current WSAs. 	<p>Allow salable mineral exploration and development in accordance with management identified within Alternative D, as consistent with other resource values. This results in:</p> <ul style="list-style-type: none"> • 2,725,060 acres remain open to salable mineral exploration and development. • 623,061 acres closed to or restricted from salable mineral exploration and development. • 28,931 acres remain closed to salable minerals activities in the three current WSAs.

2.9.3. 3000 FIRE AND FUELS MANAGEMENT

Table 2.16. 3000 FIRE AND FUELS MANAGEMENT (FM)

GOAL FM:1 Life, property, and resource values are protected.		
Objectives:		
FM:1.1 Respond to unplanned wildfires based on: (1) ecological, (2) social, and (3) legal consequences while supporting other resource values.		
FM:1.2 Maintain partnerships with interagency cooperators and the public to strengthen coordination of all fire suppression activities.		
FM:1.3 Manage fuels in WUI areas to reduce potential losses due to fire consistent with the BLM's 10-year comprehensive strategy.		
FM:1.4 Cooperate with stakeholders to enhance the local fire prevention, defensible space protection, and public education programs.		
FM:1.5 Implement appropriate emergency stabilization and rehabilitation actions following wildland fire.		
FM:1.6 Pursue wildland fire management agreements to achieve resource objectives while protecting life and property.		
GOAL FM:2 Plant community and hazardous fuel objectives are achieved.		
Objectives:		
FM:2.1 Improve fire regime condition class and maintain or improve conditions of fire-adapted landscapes by managing fire, planned and unplanned, to accomplish beneficial resource objectives.		
FM:2.2 Cooperate with stakeholders to plan and implement fire and other vegetation treatments.		
FM:2.3 In collaboration with stakeholders, manage and coordinate fire and fuel treatments consistent with approved local fire plans (CWPP).		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
Fire-3001	FM:1.1	A Fire Management Plan for the Wyoming High Plains District will be maintained that more specifically outlines management response and implementation actions for wildland fire response of public lands.
Fire-3002	FM:1.1	A resource advisor appropriate to the potentially affected resource will be consulted, or assigned, to all wildland fires that involve or threaten BLM-administered lands.
Fire-3003	FM:1.1	Restrict or prohibit fire retardant chemicals as appropriate to protect rock art.
Fire-3004	FM:1.1	Prohibit use of retardant or foam within 300 feet of surface water sources consistent with guidelines described in the <i>Interagency Standards for Fire and Fire Aviation Operations</i> (BLM 2011e).
Fire-3005	FM:1.3 FM:1.4	Reduce hazardous fuels in the WUI.
Fire-3006	FM:1.5	Implement the BLM Emergency Stabilization and Burned Area Rehabilitation standards located in the DOI Interagency Burned Area Emergency Response Guidebook (DOI 2004) and BLM Burned Area Emergency Stabilization and Rehabilitation Handbook (BLM 2007c) as needed.
Fire-3007	FM:2.1	Use the District Fire Management Plan to implement the objectives of this RMP; to address fire management on a landscape scale, to maintain or improve conditions in fire-adapted landscapes, and to accomplish resource management objectives.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
Fire-3008	FM:2.2	<p>Ensure all prescribed burning activities comply with Wyoming DEQ air quality standards and smoke management rules.</p> <p>If prescribed fire is used in Greater Sage-Grouse habitat, the NEPA analysis for the Burn Plan will address:</p> <ul style="list-style-type: none"> • why alternative techniques were not selected as a viable options; • how Greater Sage-Grouse goals and objectives would be met by its use; • how the Conservation Objectives Team Report objectives would be addressed and met; • a risk assessment to address how potential threats to Greater Sage-Grouse habitat would be minimized. <p>Prescribed fire as a vegetation or fuels treatment shall only be considered after the NEPA analysis for the Burn Plan has addressed the four bullets outlined above. Prescribed fire could be used to meet specific fuels objectives that would protect Greater Sage-Grouse habitat (e.g., creation of fuel breaks that would disrupt the fuel continuity across the landscape in stands where annual invasive grasses are a minor component in the understory, burning slash piles from conifer reduction treatments, used as a component with other treatment methods to combat annual grasses and restore native plant communities).</p> <p>Prescribed fire in known Greater Sage-Grouse winter range shall only be considered after the NEPA analysis for the Burn Plan has addressed the four bullets outlined above. Any prescribed fire in winter habitat would need to be designed to strategically reduce wildfire risk around and/or in the winter range and designed to protect winter range habitat quality.</p>

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Fire-3009	FM:2.2 FM:2.3	Cooperate with and pursue agreements with other agencies and landowners to conduct landscape treatments to achieve enhanced fuels management and/or restoration of fire-adapted ecosystems.			
Fire-3010	FM:1.5	Rehabilitate firelines constructed by heavy equipment, or on steep slopes, to prevent or control erosion. Rehabilitation includes, but is not limited to, water barring and reseeded.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Fire-3011	FM:1.1 FM:1.2	All fires are suppressed, though variable strategies are used. Priority response is given to wildfires where there are high value resources or where fires may spread to other land ownerships. Full protection is used in high value areas such as developed areas or where sensitive resources would be adversely affected by fire. Appropriate suppression actions are used in low value areas or where fire control is very difficult or extremely hazardous to firefighting personnel. No portion of the planning area is available to manage fires for multiple objectives.	Response to wildland fires varies from full protection in areas where fire is undesirable to monitoring fire behavior in areas where fire can be managed to accomplish other resource objectives. The entire planning area is available to manage wildfire for multiple objectives.	Use full protection strategies and tactics across the entire planning area. No portion of the planning area is available to manage fires for multiple objectives.	Response to wildfire varies from full protection in areas where fire is undesirable to monitoring fire behavior in areas where fire can be managed to accomplish other resource objectives. The entire planning area is available to manage wildfire for multiple objectives.
Fire-3012	FM:1.1 FM:1.2	Restrict the use of some types of suppression equipment in some areas.	Limit heavy equipment usage to existing roads and trails, or immediately adjacent to them, in areas not identified as full protection.	Utilize heavy equipment with few constraints and consistent with other resource values.	Prohibit heavy equipment use within the following areas, except when human safety is at risk or if the expected fire effects would cause more resource damage than the use of heavy equipment: <ul style="list-style-type: none"> • Areas of cultural resource sensitivity • Riparian/wetland habitats

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> • Identified Greater Sage-Grouse important habitats: Core Population Area, nesting, brood-rearing, Connectivity Corridor, or winter habitat • Areas of highly erosive soils • Lands with wilderness characteristics <p>Limit heavy equipment usage to existing roads and trails, or immediately adjacent to them, in areas not identified as full protection.</p>
Fire-3013	FM:1.1 FM:1.2	Give priority to suppressing fires in or threatening higher value resources (commercial timber areas, developed recreation sites, and WUI areas) and keeping fires from spreading onto private, state, or other federal lands.	<p>Use protection strategies in the following areas:</p> <ul style="list-style-type: none"> • WUI • Wildland Industrial Interface • Developed recreation sites • Commercial timber areas • Where sensitive resources would be adversely affected by fire (i.e., within 4.0 miles of Greater Sage-Grouse leks or winter concentration areas) 	Use full protection strategies across the entire planning area.	<p>Use protection strategies in the following areas:</p> <ul style="list-style-type: none"> • WUI • Wildland Industrial Interface • Developed recreation • Developed electronic/communication sites of all types • Where sensitive or high value resources would be adversely affected by fire (i.e., Greater Sage-Grouse Core Population Area and Connectivity Corridor)

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Fire-3014	FM:1.5	Rehabilitate fire-damaged lands to meet resource objectives; repair suppression damages as necessary.	Rehabilitate all fire-damaged lands; repair all suppression damages.	Repair suppression related damages only.	Evaluate all fires and rehabilitate fire-damaged lands as needed to meet resource objectives. Repair suppression damages as necessary.
Fire-3015	FM:1.6	Use wildland fire and other vegetation treatments to support vegetation and wildlife habitat objectives.	Use wildland fire and other vegetation treatments to restore fire-adapted ecosystems and to reduce hazardous fuels.	Use wildland fire and other vegetation treatments to restore fire-adapted ecosystems, enhance forage for commodity production, and to reduce hazardous fuels.	Use wildland fire and other vegetation treatments to meet desired management objectives.

2.9.4. 4000 BIOLOGICAL RESOURCES

Table 2.17. 4000 BIOLOGICAL RESOURCES (BR) – VEGETATION

<p>GOAL BR:1 Vegetation resources sustained in desired ecological conditions.</p> <p>Objectives:</p> <p>BR:1.1 Manage communities for a diversity of native species, habitats, seral stages and distribution.</p> <p>BR:1.2 Manage for healthy vegetation communities to ensure their capability to provide sufficient plant composition, cover and litter accumulation to protect soils from wind and water erosion and enhance nutrient cycling and productivity.</p> <p>BR:1.3 Reclaim areas affected by surface-disturbing activities to promote healthy functioning native plant communities.</p> <p>BR:1.4 Manage habitat to facilitate the conservation, recovery and maintenance of populations of native, desirable non-native, and special status plant species consistent with appropriate local, state, and federal conservation requirements and management plans.</p> <p>BR:1.5 Manage for healthy native plant communities by reducing and managing invasive, nonnative noxious species.</p> <p>BR:1.6 Identify and manage Native American traditional plant gathering areas.</p>
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Table 2.18. 4000 BIOLOGICAL RESOURCES (BR) – VEGETATION – FORESTS AND WOODLANDS

GOAL BR:2 Healthy forests and woodlands are sustained in desired ecological conditions.					
Objective:					
BR:2.1 Manage forests and woodlands to benefit multiple resource values.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
		None identified.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Forest-4001	BR:2.1	Design vegetation treatments, including forest management and sagebrush spraying or burning, to meet overall resource management objectives consistent with the policy to protect or improve biodiversity and water quality.	Keep silvicultural treatments to a minimum, and only utilize them when catastrophic events, such as wildland fire, present hazardous conditions to the public and surrounding lands.	Design and implement silvicultural treatments to maximize forest health.	Design and implement silvicultural treatments to maximize forest health.
Forest-4002	BR:2.1	Diseased old growth and over stocked forests are managed in accordance with the HFRA.	Allow insect and disease, wildland fire, and other natural forces to run their natural course within forests and woodlands, without intervention.	Utilize intensive management tactics, such as large clear-cuts, to manage for desired forest/woodland health (HFRA) and to reduce or circumvent events such as insects, disease, and wildfire.	Utilize intensive management tactics to manage for desired forest/woodland health (HFRA) and to reduce or circumvent events such as insects, disease, and wildfire.
Forest-4003	BR:2.1	No previous decision; old growth considered on a project-specific basis.	Manage old growth forest stands to emphasize old growth characteristics.	Manage old growth forest stands to emphasize other stand characteristics.	Manage old growth forest stands to emphasize old growth characteristics.
Forest-4004	BR:2.1	No previous decision; recreation, wildlife, and other resource values considered on a project-specific basis.	Manage forests/woodlands to emphasize recreation, wildlife, and other resource values.	Manage forests/woodlands to emphasize the forest resource.	Manage forests/woodlands to emphasize multiple resource values (recreation, wildlife, soils, water, forest products).

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Forest-4005	BR:2.1	No previous decision; aspen management considered on a project-specific basis.	Manage aspen communities as a seral stage and natural component of the forest. Allow decadent and non-reproductive stands to be naturally replaced in the ecosystem by climax forest.	Manage aspen communities to maintain aspen stands and strive for the DFC of all aspen forest.	Manage aspen communities to maintain aspen stands and strive for DFC in all aspen forests.
Forest-4006	BR:2.1	No previous decision; woodland encroachment evaluated on a project-specific basis.	Allow woodlands to expand into other communities.	Actively manage woodlands to prevent expansion into other communities.	Actively manage woodlands to prevent expansion into other communities consistent with multiple resource values, on a project-specific basis.

Table 2.19. 4000 BIOLOGICAL RESOURCES (BR) – VEGETATION – GRASSLAND AND SHRUBLAND COMMUNITIES

GOAL BR:3 A diverse landscape of native grasslands and shrublands sustained in desired ecological conditions.					
Objective:					
BR:3.1 Manage for a full range of sagebrush, shrub, and grassland communities with diverse native species and subspecies, composition, canopies, densities, and age classes across the landscape.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
GS-4001	BR:3.1	Manage vegetative communities (Map 25) in accordance with Wyoming Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming.			
GS-4002	BR:3.1	Complete vegetation inventories. When applicable do so in coordination with stakeholders.			
GS-4003	BR:3.1	Use an integrated management approach (e.g., mechanical, chemical, biological treatments, prescribed fire, and grazing management techniques) to maintain, restore, and enhance the health and diversity of plant communities to achieve resource or multi-resource objectives.			
GS-4004	BR:3.1	Maintain sustainable forage levels for livestock and wildlife habitats.			
GS-4005	BR:3.1	Manage grasslands and shrublands to protect, preserve, or enhance plant communities.			
GS-4006	BR:3.1	Manage the siting of facilities and related infrastructure (utility corridors, roads) to reduce impacts to vegetation resources.			
GS-4007	BR:3.1	Manage the planning and development of travel routes, recreational uses, mineral exploration and development sites, and ROW to reduce impacts to the vegetation resource.			
GS-4008	BR:3.1	Develop a contingency plan addressing catastrophic natural events such as drought, wildfires, and large-scale pest infestations, incorporating strategies that best protect vegetation resources.			
GS-4009	BR:3.1	Work with landowners on split estate lands to reestablish disturbed sites to healthy plant communities in accordance with the ecological site potential.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
GS-4010	BR:3.1	No previous decision; considered on a project-specific basis.	Authorize only native plant species for all reclamation activities.	Allow desirable non-native plant species for initial reclamation activities.	Allow desirable non-native plant species for short-term reclamation activities as a component in an authorized reclamation plan (followed up with planting of native species).

Table 2.20. 4000 BIOLOGICAL RESOURCES (BR) – VEGETATION – RIPARIAN/WETLAND RESOURCES

GOAL BR:4 Health and functional capabilities in riparian/wetland systems.		
Objectives:		
BR:4.1 Manage lotic and lentic wetland/riparian systems at a minimum to achieve and/or maintain PFC.		
BR:4.2 Improve riparian systems and wetlands in systems operating at less than PFC.		
BR:4.3 Manage contributing watersheds to sustain riparian health and water quality.		
BR:4.4 Manage and enhance riparian and wetland systems for plant, insect, fish and wildlife species that depend on these systems for their health and well being.		
BR:4.5 CBNG created riparian and wetland systems will be evaluated, retained, or reclaimed to support vegetation and other resource values.		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
Riparian-4001	BR:4.1 BR:4.2 BR:4.3 BR:4.4	Inventory lotic and lentic riparian/wetland systems.
Riparian-4002	BR:4.1 BR:4.2 BR:4.4	Prioritize, and develop activity and implementation plans to manage riparian systems to be at or above, or continue to be improving toward, PFC while achieving the Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming.
Riparian-4003	BR:4.1 BR:4.2 BR:4.3 BR:4.4 BR:4.5	Manage riparian and wetland systems to enhance forage conditions and improve water quality. Manage all riparian systems with sensitive species concerns to a succession stage appropriate for that system, including vertical as well as horizontal vegetative structure and composition.
Riparian-4004	BR:4.1 BR:4.2 BR:4.3 BR:4.4 BR:4.5	Expand and enhance riparian/wetland systems and habitat in cooperation with stakeholders.
Riparian-4005	BR:4.1 BR:4.2 BR:4.3 BR:4.4 BR:4.5	Prevent degradation, loss, or destruction of riparian/wetland habitat.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Riparian-4006	BR:4.4 BR:4.5	Prohibit conflicting uses within riparian research areas and special exclosures, such as waterfowl reservoirs and wetland systems on springs and streams.			
Riparian-4007	BR:4.5	Evaluate CBNG created riparian and wetland systems for retention or reclamation.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Riparian-4008	BR:4.1 BR:4.2 BR:4.3 BR:4.4 BR:4.5	Prohibit surface-disturbing activities within 500 feet of springs, reservoirs, water wells, or perennial streams unless the prohibition is waived by the authorized officer.	Prohibit surface-disturbing and disruptive activities within 500 feet of riparian/wetlands systems, aquatic habitats, and floodplains.	Allow surface-disturbing and disruptive activities within 500 feet of riparian/wetlands systems, aquatic habitats, and floodplains consistent with other resource values.	Allow surface disturbance within 500 feet of riparian/wetlands systems and aquatic habitats where riparian/wetland and other resource objectives (including, but not limited to soil, slope, and vegetation) can be met.
Riparian-4009	BR:4.1 BR:4.2 BR:4.3 BR:4.4 BR:4.5	No previous decision; considered on a project-specific basis.	Apply an NSO stipulation for fluid mineral leasing within 500 feet of riparian/wetlands systems, aquatic habitats, and floodplains.	Apply standard lease terms to fluid mineral leases within 500 feet of riparian/wetlands systems, aquatic habitats, and floodplains consistent with other resource values.	Apply a CSU stipulation to any fluid mineral lease within 500 feet of riparian/wetlands systems, and aquatic habitats (based on other resource values - soil, slope).
Riparian-4010	BR:4.1 BR:4.3 BR:4.4	No previous decision; considered on a project-specific basis.	Identify and manage systems capable of achieving DFC.	Do not identify and manage systems capable of achieving DFC.	Identify and manage systems capable of achieving DFC.
Riparian-4011	BR:4.5	No previous decision; considered on a project-specific basis.	Restore vegetation in all CBNG supported wetland and riparian systems.	Restore vegetation only on direct CBNG disturbance areas (e.g., dams, reservoirs, etc.).	Restore vegetation in CBNG supported wetland and riparian systems on BLM surface and/or lease in accordance with the ecological site potential.

Table 2.21. 4000 BIOLOGICAL RESOURCES (BR) – INVASIVE SPECIES AND PEST MANAGEMENT

GOAL BR:5 Healthy native communities with manageable levels of pathogens, undesirable, invasive, non-native, or noxious species.					
Objectives:					
BR:5.1 Develop and maintain baseline information regarding the extent, location and potential impact(s) of pest species. From this baseline information develop and implement an Integrated Pest Management Plan. Integrated management would be used to control, suppress, and eradicate, where possible, noxious and invasive species per BLM Handbook H-1740-2. Manage noxious or invasive species treatments to maintain or improve Greater Sage-Grouse habitat. Apply Required Design Features as Conditions of Approval, such as those in Appendix B. Encourage the use of voluntary BMPs.					
BR:5.2 Facilitate support for an integrated approach for the detection, management, or eradication of new and minor infestations.					
BR:5.3 Develop, implement, and maintain a management program for annual bromes and other invasive or undesirable species not listed as noxious, utilizing the best available science and BMPs.					
BR:5.4 Coordinate with APHIS to facilitate pest and predator management.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Pest-4001	BR:5.1 BR:5.2 BR:5.4	Cooperate with APHIS to control grasshoppers and Mormon crickets on public lands in conjunction with the control efforts initiated on adjoining non-federal lands.			
Pest-4002	BR:5.1 BR:5.2 BR:5.3 BR:5.4	Manage designated pests on public surface lands using an Integrated Pest Management Approach consistent with DOI Manual 517 (BLM 2007f).			
Pest-4003	BR:5.1 BR:5.2 BR:5.3 BR:5.4	Limit surface disturbance to the minimum needed for safe project completion to limit the spread of noxious weeds.			
Pest-4004	BR:5.1 BR:5.2 BR:5.3	Use certified noxious weed seed-free products on all BLM-administered projects and lands.			
Pest-4005	BR:5.1 BR:5.2 BR:5.3	Implement and maintain cooperative integrated pest management programs with county weed and pest districts, state agencies, private industry, grazing lessees, and other stakeholders in conjunction with BLM weed and pest control work on public lands adjoining deeded and state lands (Map 27).			
Pest-4006	BR:5.2	Require surface or vegetation disturbance areas, including areas formerly receiving or holding water, be treated for invasive species and revegetated.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Pest-4007	BR:5.2	No previous decision; aerial application decided on a project-specific basis.	Do not limit aerial application of pesticides.	Limit aerial application to insecticides only.	Authorize aerial application in areas where topography, extent of infestation, target species, and timing limit other application methods.
Pest-4008	BR:5.1	No previous decision; treatment areas decided annually.	Develop pest management areas within 5 years of the signing of the ROD.	Determine area to be treated with pesticides on an annual basis.	Develop long range pest management plans, treatment areas, priorities, etc. in cooperation with stakeholders.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Pest-4009	BR:5.1 BR:5.2 BR:5.3	Control noxious weeds on public lands in cooperation with county weed and pest districts.	Treat those plants on the State of Wyoming Designated list, the appropriate county lists, and other species of concern as determined by BLM resource specialists. Priority treatments are those areas where infestations on private land are threatening public lands.	Treat only those plants on the State of Wyoming Designated list. Priority treatments are those areas where infestations on public land are threatening private lands.	Treat those plants on the State of Wyoming Designated list, the appropriate county lists, and other species of concern as determined by BLM resource specialists. Note: Priority treatments are those areas where infestations on private land are threatening public lands.
Pest-4010	BR:5.3	No previous decision; determine whether to treat annual brome species on a project-specific basis.	Treat annual brome species throughout the planning area.	Designate and prioritize areas for the treatment of annual brome species.	Designate and prioritize areas for the treatment of annual brome species.

Table 2.22. 4000 BIOLOGICAL RESOURCES (BR) – FISH & WILDLIFE RESOURCES

GOAL BR:6 Distribution and abundance of all native and desirable non-native species are optimized.

Objectives:

BR:6.1 BLM actions prevent and/or reduce impacts to desirable species.

BR:6.2 In coordination with cooperating agencies, develop and implement an achievable Wildlife Monitoring and Protection Plan.

BR:6.3 Maintain, restore, or improve the continuity and productivity of fish and wildlife habitats to support WGFD population objectives.

BR:6.4 Develop and implement an adaptive conservation and management strategy.

GOAL BR:7 Sufficient functional habitat for native and desirable non-native species.

Objectives:

BR:7.1 Evaluate, update, and revise as necessary existing Wildlife Habitat Management Plans.

BR:7.2 Develop Wildlife Habitat Management Plans for areas with important habitats.

BR:7.3 Manage habitat consistent with local, state, and federal management plans, as applicable.

BR:7.4 Continue to gather habitat and population data while concurrently monitoring human and natural disturbance dynamics to improve habitat management.

BR:7.5 Provide security habitat, sufficient in amount and distribution, to support WGFD population objectives for fish and wildlife to escape from disruptive activities.

BR:7.6 Maintain and provide functioning sagebrush habitat to sustain sagebrush obligates and other sagebrush dependent species.

GOAL BR:8 Fish and wildlife are able to move between areas of functionally intact habitat.

Objectives:

BR:8.1 Develop Travel Management Plans for areas important for fish and wildlife while supporting other resource values.

BR:8.2 Develop a ROW Management Plan for utility corridors to manage impacts to areas of habitat important to fish and wildlife consistent with other resource values.

BR:8.3 Land acquisitions should support desirable fish and wildlife populations or habitat.

BR:8.4 Restore functionality to areas of degraded habitat important to fish and wildlife populations consistent with other resource values.

GOAL BR:9 Terrestrial and aquatic ecosystems that provide recreational and educational benefits.

Objectives:

BR:9.1 Manage for a broad range of wildlife and fisheries based experiences.

BR:9.2 Improve public awareness, understanding, and support for resolving issues surrounding species conservation, management, and ecology.

BR:9.3 Identify, develop, and maximize distribution of natural resource interpretation media.

BR:9.4 Provide for research to support the management of fish and wildlife resources administered by the BLM.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – FISH
Fish-4001	BR:6.1 BR:6.3 BR:6.4 BR:7.3 BR:7.4 BR:7.5 BR:8.1 BR:8.2 BR:9.1	Develop appropriate mitigation for surface-disturbing and disruptive activities associated with fish management through use of the mitigation guidelines described in Appendix J (p. 2155).
Fish-4002	BR:6.1 BR:6.3 BR:7.3 BR:7.4 BR:7.5 BR:8.4 BR:9.1	Manage barriers to fish passage in cooperation with the WGFD and other stakeholders.
Fish-4003	BR:6.3 BR:6.4 BR:7.3 BR:7.4 BR:8.3 BR:9.1 BR:9.2 BR:9.3	Provide public access to fish bearing waters in cooperation with WGFD Private Lands – Public Access Program and stakeholders.
Fish-4004	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.3 BR:7.4 BR:7.5 BR:8.4 BR:9.1	Manage activities potentially affecting native and desirable non-native fish species in collaboration with the WGFD and other stakeholders.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – FISH			
Fish-4005	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.3 BR:7.4 BR:7.5 BR:8.4	Manage harmful non-native riparian vegetation in river and stream systems important to fish species in cooperation with the WGFD and other stakeholders.			
Fish-4006	BR:6.3 BR:6.4 BR:7.3 BR:7.4 BR:8.3 BR:9.1 BR:9.2 BR:9.3	Work with stakeholders to provide fisheries outreach and education.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Fish-4007	BR:6.3 BR:6.4 BR:7.3 BR:7.4 BR:7.5 BR:8.4 BR:9.1	BLM cooperates with the WGFD in introducing or reintroducing native and desirable non-native fish within the planning area where potential habitat exists.	Cooperate with the WGFD in introducing or reintroducing native and desirable non-native fish where potential habitat exists.	Do not introduce or reintroduce native and desirable non-native fish.	Cooperate with the WGFD in introducing or reintroducing native and desirable non-native fish in support of WGFD and BLM objectives.
Fish-4008	BR:6.1 BR:6.3 BR:7.3 BR:7.4 BR:7.5 BR:8.4 BR:9.1	Reservoirs and riparian areas are sometimes maintained to improve or enhance potential fisheries.	Manage reservoirs and riparian areas to improve or enhance potential fisheries.	Manage reservoirs and riparian areas to improve or enhance other resource values first and potential fisheries second.	Maintain or enhance streams and riparian areas associated with Class I and II streams, (WGFD classifications), Powder River, Tongue River, and other appropriate areas for desired fisheries potential.
Fish-4009	BR:6.1 BR:6.3 BR:7.3 BR:7.4 BR:7.5 BR:8.4 BR:9.1	Designing reservoirs to enhance fisheries where potential exists will be encouraged.	Require the design of reservoirs to include fisheries enhancement where the potential exists.	Encourage the design of reservoirs to include fisheries enhancement where the potential exists.	Incorporate fisheries enhancement in reservoir design consistent with other resource values.
Fish-4010	BR:6.1 BR:6.3 BR:7.3 BR:7.4 BR:7.5 BR:8.4 BR:9.1	No previous decision; considered on a project-specific basis.	Maintain or enhance fish habitat with actions affecting perennial waters.	Consider all resource values with actions affecting perennial waters.	Maintain or enhance fish habitat with actions affecting perennial waters consistent with other resource values.
Fish-4011	BR:6.1 BR:6.3 BR:7.3 BR:7.4 BR:7.5 BR:8.4 BR:9.1	No previous decision; considered on a project-specific basis.	Manage fish habitat towards DFC.	Manage fish habitat to meet PFC.	Identify and manage fish habitat capable of achieving DFC. Manage all other areas with fish habitat to meet PFC.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Fish-4012	BR:6.1 BR:6.3 BR:7.3 BR:7.4 BR:7.5 BR:9.1	No previous decision; considered on a project-specific basis.	Prohibit surface-disturbing and disruptive activities within 0.25 mile of naturally occurring water bodies containing native and desirable non-native fish species (Map 28).	Allow surface-disturbing activities within 0.25 mile of naturally occurring water bodies consistent with other resource values.	Allow surface-disturbing activities within 0.25 mile of naturally occurring water bodies containing native and desirable non-native fish species where fish resource objectives can be met.
Fish-4013	BR:6.1 BR:6.3 BR:7.3 BR:7.4 BR:7.5 BR:9.1	No previous decision; considered on a project-specific basis.	Apply an NSO stipulation to fluid mineral leases within 0.25 mile of naturally occurring water bodies containing native and desirable non-native fish species.	Apply standard lease terms to fluid mineral leases within 0.25 mile of naturally occurring water bodies containing native and desirable non-native fish species.	Apply a CSU stipulation within 0.25 mile of naturally occurring water bodies containing native and desirable non-native fish species.
Fish-4014	BR:6.1 BR:6.3 BR:7.3 BR:7.4 BR:8.4 BR:9.1	No previous decision; considered on a project-specific basis.	Design crossings of water bodies identified as supporting fish to allow fish passage.	Design crossings of water bodies identified as supporting fish to be consistent with all resource values.	Design crossings of water bodies identified as supporting fish to allow fish passage.
Fish-4015	BR:6.1 BR:6.3 BR:7.3 BR:7.4 BR:7.5 BR:8.4 BR:9.1	No previous decision; considered on a project-specific basis.	Perform restoration of important instream segments for fish habitat in accordance with WGFD priorities.	Perform restoration of important instream segments for fish habitat on a project-specific basis.	Perform restoration of important instream segments for fish habitat in accordance with WGFD priorities.
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – WILDLIFE			
WL-4001	BR:7.3 BR:7.4 BR:7.5 BR:8.1 BR:8.2 BR:8.4	Develop appropriate mitigation for surface-disturbing and disruptive activities associated with wildlife habitat management through use of the mitigation guidelines described in Appendix J (p. 2155).			
WL-4002	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.3 BR:8.4	Maintain or improve important wildlife habitats through vegetative manipulations, habitat improvement projects, livestock grazing strategies and the application of The Wyoming Guidelines for Managing Sagebrush Communities with Emphasis on Fire Management (Wyoming Interagency Vegetation Committee 2002) and Appendix J (p. 2155), WGFD Strategic Habitat Plan (WGFD 2001b), State Wildlife Action Plan (SWAP) (WGFD 2010), and similar guidance updated over time.			
WL-4003	BR:7.1	Continue to use existing Habitat Management Plans and update as necessary to include management objectives and prescriptions for wildlife: South Big Horns Habitat Management Plan (BLM 1986c), including a portion or all of the Gardner Mountain and North Fork WSAs; Wetlands Habitat Management Plan (BLM 1986b); and Middle Fork Powder River Habitat Management Plan (BLM 1980).			

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – WILDLIFE
WL-4004	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.3 BR:7.4 BR:8.4 BR:9.1 BR:9.2	Coordinate authorized animal damage control with federal and state wildlife agencies, and other agencies, as appropriate, using guidance provided by the existing MOU with APHIS Wildlife Services.
WL-4005	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:8.4 BR:9.1 BR:9.2	Consult with the WGFD and USFWS, in accordance with MOUs, when applying mitigation for wildlife and before waiving, allowing exceptions to, or modifying wildlife-related land use restrictions and mitigation.
WL-4006	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:8.3 BR:8.4 BR:9.1 BR:9.2	Provide, to the extent possible, suitable habitat and forage to support wildlife population objectives as defined by WGFD. BLM will cooperatively consider proposals by the WGFD to change population objective levels based on habitat capability and availability.
WL-4007	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:8.3 BR:8.4 BR:9.1 BR:9.2	Manage access to protect crucial habitats in cooperation with WGFD and other stakeholders.
WL-4008	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:8.3 BR:8.4 BR:9.1 BR:9.2 BR:9.4	Utilize current research, management and conservation plans, and similar related documents to guide wildlife habitat management.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – WILDLIFE			
WL-4009	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:8.3 BR:8.4 BR:9.1 BR:9.2 BR:9.4	Construct new fences to avoid adverse impacts to wildlife and in accordance with BLM Fencing Handbook 1741-1 (BLM 1989) and WO IM 2010–022: Managing Structures for the Safety of Sage-grouse, Sharp-tailed grouse, and Lesser prairie chicken (BLM 2009e).			
WL-4010	BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.6 BR:8.1 BR:8.3 BR:8.4 BR:9.4	Work cooperatively with the WGFD augmentation and/or reintroduction programs for acceptable wildlife species within suitable habitats.			
WL-4011	BR:7.3 BR:7.5 BR:7.6	Promote the maintenance and improvement of habitat for migratory bird species of conservation concern in a manner consistent with national, regional, and statewide bird conservation priorities.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
WL-4012	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:8.3 BR:8.4 BR:9.1 BR:9.2 BR:9.4	No previous decision.	Modify existing fences preventing wildlife movement in accordance with appropriate wildlife needs and the BLM Fencing Handbook 1741-1.	Do not modify existing fences preventing wildlife movement.	Inventory, record, and report existing type, condition and location of BLM fences. Prioritize fence projects and annually implement modifications in accordance with appropriate wildlife needs and the BLM Fencing Handbook 1741-1.
WL-4013	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:9.1 BR:9.4	No previous decision; considered on a project-specific basis.	Apply appropriate wildlife seasonal restrictions on surface-disturbing and disruptive activities to maintenance and operation of developed projects.	Do not apply wildlife seasonal restrictions on surface-disturbing and disruptive activities to maintenance and operation of developed projects.	Allow surface-disturbing and disruptive activities to occur throughout the entire life of projects during seasons important for wildlife when wildlife resource objectives can be met.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
WL-4014	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.2 BR:9.1	No previous decision; considered on a project-specific basis.	Require burial of all new low voltage utility lines and installation of BLM-approved anti-perch devices on all new high voltage utility lines.	Do not require burial of all new low voltage utility lines or installation of BLM-approved anti-perch devices on all new high voltage utility lines.	Powerlines (distribution and transmission) will be designed to minimize wildlife related impacts and constructed to the latest APLIC standards. Prohibit above ground distribution powerlines unless identified in an approved distribution plan.
Big Game					
WL-4015	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.3 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:9.1	Prohibit surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges for big game unless the prohibition is waived by the authorized officer.	Prohibit surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges for big game.	Do not prohibit surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges.	Prohibit surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges for big game.
WL-4016	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:8.1 BR:9.1	Surface disturbance and disruptive activity is not allowed in crucial elk winter range between November 15 and April 30, and in elk calving areas from May 1 to June 30, when necessary (Map 29).	Do not allow surface disturbance and disruptive activity in crucial elk winter range between November 15 and April 30, and in elk calving areas from May 1 to June 30 (Map 29).	Allow surface disturbance and disruptive activity in crucial elk winter range between November 15 and April 30, and in elk calving areas from May 1 to June 30.	Prohibit surface disturbance and disruptive activity in crucial big game winter range during WGFD specified dates, and in elk calving areas during WGFD specified dates (Map 29). Historic uses would be exempted.
WL-4017	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:8.1 BR:9.1	Surface disturbance and disruptive activity is not allowed in crucial elk winter range between November 15 and April 30, and in elk calving areas from May 1 to June 30, when necessary.	Apply a CSU stipulation to leases within elk crucial winter range and calving areas.	Do not apply a CSU stipulation to leases within elk crucial winter range and calving areas.	Apply a CSU and TLS stipulation to leases within big game crucial winter range and elk calving areas.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
WL-4018	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:8.1 BR:9.1	Require fluid mineral production and byproducts to be piped out of crucial elk winter range.	Require fluid mineral production and byproducts to be piped out of crucial elk winter range and calving areas.	Do not require fluid mineral production and byproducts to be piped out of crucial elk winter range and calving areas.	Require fluid mineral production and byproducts to be piped out of crucial elk winter range and calving areas unless operator proposes an acceptable alternative. (Note: this does not authorize off-lease measurement or comingling.)
WL-4019	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.2 BR:8.4 BR:9.1	Forest management activities are not allowed in areas where crucial elk habitat occurs or where hiding cover is insufficient to meet the minimum needs of this species.	Prohibit forest management activities within crucial elk habitat or hiding cover areas.	Allow forest management activities within crucial elk habitat and hiding cover areas.	Forest management activities shall maintain current amounts of functional crucial elk habitat and hiding cover (Map 29).
WL-4020	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:8.3 BR:8.4 BR:9.1	No previous decision; considered on a project-specific basis.	Maintain traditional migration and travel corridors for big game species. Prohibit surface disturbance and disruptive activities within 0.5 mile of a big game migration corridor. Avoid constrictions of big game corridors.	Manage traditional migration and travel corridors for big game species to be consistent with other resource values. Do not prohibit surface disturbance and disruptive activities within 0.5 mile of a big game migration corridor. Do not avoid constrictions of big game corridors.	Maintain and reestablish identified traditional priority travel corridors for big game species. <ul style="list-style-type: none">● Prohibit construction of new travel barriers within 0.5 mile of identified big game priority travel corridors.● Reduce barriers with cooperation of other agencies.● Avoid constrictions of big game corridors.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
WL-4021	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.4 BR:9.1	No previous decision; considered on a project-specific basis.	Restrict facility development and occupancy within elk crucial winter range and calving areas.	Do not restrict facility development and occupancy within elk crucial winter range and calving areas.	Allow above ground facility development within elk crucial winter range and calving areas when population and habitat use objectives can be met. (Note: this does not authorize off-lease measurement or comingling.)
WL-4022	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.4 BR:9.1	No previous decision; considered on a project-specific basis.	Loss of elk security habitat will not exceed baseline conditions as measured from roads.	Do not apply any restrictions to elk security habitat.	Retain 85% of existing security habitat as measured from roads within all elk seasonal ranges. (Excluding Fort Creek, will use amendment decision.)
WL-4023	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:8.4 BR:9.1	No previous decision; considered on a project-specific basis.	Designate a WHMA for the Fortification Creek elk herd that includes elk crucial and yearlong ranges. Management to include: <ul style="list-style-type: none"> • Closing federal minerals within crucial ranges to leasing (fluid and solid). Lease federal minerals within the yearlong range with a CSU stipulation. • Recommending federal locatable minerals within crucial ranges to be withdrawn from mineral entry. • Closing federal salable minerals within crucial ranges to mineral material sales. 	Designate a WHMA for the Fortification Creek elk herd that includes only elk crucial ranges. Management to include: <ul style="list-style-type: none"> Lease federal minerals with a CSU stipulation. Restrict surface-disturbing or disruptive activities determined to adversely affect the elk population or habitat effectiveness. 	Do not designate a WHMA for the Fortification Creek elk herd. Fortification Creek RMP Amendment (BLM 2011c) management will be carried forward within the Fortification Creek Planning Area (Map 76).

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
WL-4024	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.2 BR:9.1 BR:9.4	No previous decision; considered on a project-specific basis.	Prohibit renewable energy projects in big game crucial winter range, calving areas, and migration corridors (Map 29).	Do not prohibit renewable energy projects in big game crucial winter range, calving areas, and migration corridors.	Prohibit commercial renewable energy (wind and solar) projects in big game crucial winter range, elk calving areas, and identified big game priority travel corridors (Map 29).
Upland Game Birds					
WL-4025	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:8.4 BR:9.1	Prohibit surface disturbance and occupancy within 750 feet of sharp-tailed grouse leks at any time. Prohibit surface disturbance within an additional 0.64-mile radius of sharp-tailed grouse leks from April 1 through May 30 unless the authorized officer waives the prohibition (Map 30).	Prohibit surface disturbance and occupancy within 0.25 mile of sharp-tailed grouse leks at any time. Prohibit surface disturbance within a 2.0-mile radius of sharp-tailed grouse leks from April 1 through July 15 (Map 30).	Do not prohibit surface disturbance and occupancy within 750 feet of sharp-tailed grouse leks at any time. Do not prohibit surface disturbance within an additional 0.64-mile radius of sharp-tailed grouse leks from April 1 through May 30.	1. Avoid surface disturbance or occupancy within 0.25 mile of the perimeter of occupied sharp-tailed grouse leks, 2. Avoid human activity between 6 p.m. and 8 a.m. from March 15 to May 31 within 0.25 mile of the perimeter of occupied sharp-tailed grouse leks, and 3. Avoid surface-disturbing activities, geophysical surveys, and organized recreational activities (events) which require a special use permit in potential nesting and early brood-rearing habitat within 2.0 miles of an occupied sharp-tailed grouse lek from April 1 to July 15.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
WL-4026	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:7.6 BR:8.1 BR:8.2 BR:8.4 BR:9.1	Prohibit surface disturbance and occupancy within 750 feet of sharp-tailed grouse leks at any time. Prohibit surface disturbance within an additional 0.64-mile radius of sharp-tailed grouse leks from April 1 through May 30 unless the authorized officer waives the prohibition.	Apply an NSO stipulation to fluid mineral leases within 0.25 mile of sharp-tailed grouse leks. Apply a TLS to fluid mineral leases within a 2.0-mile radius of sharp-tailed grouse leks from April 1 through July 15.	Do not apply an NSO stipulation to fluid mineral leases within 750 feet of sharp-tailed grouse leks. Do not apply a TLS to fluid mineral leases within an additional 0.64-mile radius of sharp-tailed grouse leks from April 1 through May 30.	Apply a CSU stipulation to fluid mineral leases within 0.25 mile of sharp-tailed grouse leks. Apply a TLS to fluid mineral leases within a 2.0-mile radius of sharp-tailed grouse leks from April 1 through July 15.
Raptors					
WL-4027	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:8.1 BR:8.2 BR:9.1	Prohibit surface disturbance or occupancy within a biologic buffer zone around active nests of raptor species of conservation concern unless the prohibition is waived by the authorized officer (Map 31).	Prohibit surface disturbance and occupancy within a biologic buffer zone around active nests of raptor species (Map 32).	Do not prohibit surface disturbance or occupancy within a biologic buffer zone around active nests of raptor species of conservation concern.	Allow surface disturbance and occupancy within the USFWS Wyoming Ecological Services' recommended spatial buffers for breeding raptors (http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) when nest productivity would not be harmed (Map 33). Spatial buffers may be modified based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site. BLM may coordinate buffer distances with the WGFD and/or the USFWS.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
WL-4028	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:7.5 BR:8.1 BR:8.2 BR:9.1	Prohibit surface disturbance or occupancy within a biologic buffer zone around active nests of raptor species of high federal interest unless the prohibition is waived by the authorized officer.	Apply an NSO stipulation to fluid mineral leases within a biologic buffer zone around active nests of raptor species.	Do not apply an NSO stipulation to fluid mineral leases within a biologic buffer zone around active nests of raptor species of conservation concern.	<p>Apply a CSU stipulation to fluid mineral leases containing active raptor nests using USFWS Wyoming Ecological Services' recommended spatial buffers for breeding raptors. (http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) (Map 33).</p> <p>Spatial buffers may be modified based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site. BLM may coordinate buffer distances with the WGFD and/or the USFWS.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
WL-4029	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:8.1 BR:8.2 BR:9.1	Preclude new surface-disturbing activities within 0.5 mile of raptor nests, which could cause increased stress to and/or displacement of animals during the critical time period (February 1 to July 31) (Map 31).	Prohibit surface-disturbing activities potentially disruptive to nesting raptors within 1.5 miles of an active raptor nest during the following time periods (Map 32): <ul style="list-style-type: none"> February 1 to July 15: golden eagle, barn owl, great horned owl April 1 to July 31: osprey, merlin, sharp-shinned hawk, kestrel, prairie falcon, northern harrier, Swainson's hawk, Cooper's hawk March 1 to July 31: red-tailed hawk, short-eared owl, long-eared owl, screech owl 	Prohibit surface-disturbing activities potentially disruptive to nesting raptors within 0.5 mile of an active raptor nest during the following time periods (Map 31): <ul style="list-style-type: none"> February 1 to July 15: golden eagle, barn owl, great horned owl April 1 to July 31: osprey, merlin, sharp-shinned hawk, kestrel, prairie falcon, northern harrier, Swainson's hawk, Cooper's hawk March 1 to July 31: red-tailed hawk, short-eared owl, long-eared owl, screech owl 	Seasonally prohibit surface-disturbing and disruptive activities around active raptor nests using the USFWS Wyoming Ecological Services' recommended spatial buffers and dates for breeding raptors (http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) (Map 33). Spatial buffers may be modified based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site. BLM may coordinate buffer distances with the WGFD and/or the USFWS.
WL-4030	BR:6.1 BR:6.2 BR:6.3 BR:6.4 BR:7.1 BR:7.2 BR:7.3 BR:7.4 BR:8.1 BR:8.2 BR:9.1	Preclude new surface-disturbing activities within 0.5 mile of raptor nests, which could cause increased stress to and/or displacement of animals during the critical time period (February 1 to July 31).	Apply a TLS to fluid mineral leases within 1.5 miles of an active raptor nest for the following time periods: <ul style="list-style-type: none"> February 1 to July 15: golden eagle, barn owl, great horned owl April 1 to July 31: osprey, merlin, sharp-shinned hawk, kestrel, prairie falcon, northern harrier, Swainson's hawk, Cooper's hawk March 1 to July 31: red-tailed hawk, short-eared owl, long-eared owl, screech owl 	Apply a TLS to fluid mineral leases within 0.5 mile of an active raptor nest for the following time periods: <ul style="list-style-type: none"> February 1 to July 15: golden eagle, barn owl, great horned owl April 1 to July 31: osprey, merlin, sharp-shinned hawk, kestrel, prairie falcon, northern harrier, Swainson's hawk, Cooper's hawk March 1 to July 31: red-tailed hawk, short-eared owl, long-eared owl, screech owl 	Apply a TLS to fluid mineral leases containing active raptor nests using the USFWS Wyoming Ecological Services' recommended spatial buffers and dates for breeding raptors (http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) (Map 33). Spatial buffers may be modified based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site. BLM may coordinate buffer distances with the WGFD and/or the USFWS. BLM may coordinate buffer distances with the WGFD and/or the USFWS.

Table 2.23. 4000 BIOLOGICAL RESOURCES (BR) – SPECIAL STATUS SPECIES

<p>GOAL BR:10 Distribution and abundance of all special status species are optimized.</p> <p>Objectives:</p> <p>BR:10.1 Maintain or enhance special status species plant communities and habitats.</p> <p>BR:10.2 Manage BLM-administered lands to maintain or restore populations and habitat consistent with conservation requirements for special status species.</p> <p>BR:10.3 Develop effective conservation and cooperative management plans, strategies, and agreements with stakeholders.</p> <p>GOAL BR:11 Sustainable sagebrush habitats that provide the quantity, quality, and connectivity that is necessary to maintain sustainable populations of Greater Sage-Grouse and other special status species.</p> <p>Objectives:</p> <p>BR:11.1 Maintain large patches of high quality interconnected sagebrush habitats, with emphasis on patches occupied by Greater Sage-Grouse.</p> <p>BR:11.2 Maintain connectivity between and within sagebrush habitats with emphasis on communities occupied by Greater Sage-Grouse.</p> <p>BR:11.3 Maintain a minimum of 70% of public lands capable of producing sagebrush with 10-30% sagebrush canopy cover.</p> <p>GOAL BR:12 Successful restoration and rehabilitation of potential Greater Sage-Grouse habitat across the planning area.</p> <p>Objectives:</p> <p>BR:12.1 Reestablish sagebrush corridors, where feasible, between Greater Sage-Grouse occupied habitats.</p> <p>BR:12.2 Reconnect large patches of sagebrush habitat with emphasis on reconnecting patches occupied by stronghold and isolated populations of Greater Sage-Grouse.</p>					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – SPECIAL STATUS SPECIES PLANTS			
SS Plants-4001	BR:10.1 BR:10.2	Implement actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate BMPs and reasonable and prudent measures within biological opinions for Threatened and/or Endangered plant species.			
SS Plants-4002	BR:10.1 BR:10.2	Allow treatments within habitat for special status plant species and within known populations that are proven to benefit the species.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS Plants-4003	BR:10.1 BR:10.2	No previous decision; considered on a project-specific basis.	Prohibit the following within habitat for special status plants species (Map 34): <ul style="list-style-type: none"> • Surface-disturbing activities that could adversely impact special status plant species habitat. • Mineral exploration and development activities. • All motor vehicle use, including uses related to fire suppression and geophysical exploration activities (surveying, etc.). • Use of explosives and blasting. 	Allow the following within habitat for special status plant species, though not within known populations: <ul style="list-style-type: none"> • Surface-disturbing activities that could adversely impact special status plant species habitat. • Mineral exploration and development activities. • All motor vehicle use, including uses related to fire suppression and geophysical exploration activities (surveying, etc.). • Use of explosives and blasting. 	Allow the following within habitat for special status plant species, though not within known populations, where populations could be conserved: <ul style="list-style-type: none"> • Surface-disturbing activities that could adversely impact special status plant species. • Mineral exploration and development activities. • All motor vehicle use, including uses related to fire suppression and geophysical exploration activities (surveying, etc.). • Use of explosives and blasting. • Placement of water developments, salt and mineral supplements. <p>Where appropriate, establish a site-specific buffer, after predisturbance flowering season surveys have shown species presence or absence.</p>
SS Plants-4004	BR:10.1 BR:10.2 BR:10.3	No previous decision; considered on a project-specific basis.	Require surveys for special status plant species prior to approving any project or activity that may impact the habitat for these species.	Do not require surveys for special status plant species (except for federally listed, proposed, and candidate species) prior to approving any project or activity that may impact the habitat for these species.	Require predisturbance flowering season surveys for special status plant species prior to approving any project or activity that may impact the habitat for these species as modeled and surveyed by WYNDD and BLM. Mitigation and monitoring plan to be developed within occupied habitat.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS Plants-4005	BR:10.1 BR:10.2 BR:10.3	No previous decision; considered on a project-specific basis.	Prohibit aerial application of herbicide treatments within areas containing habitat for special status plant species.	Allow aerial application of herbicide treatments within areas containing habitat for special status plant species, though not within areas of known populations.	Allow aerial application of narrow spectrum herbicide treatments within areas containing special status plant species.
SS Plants-4006	BR:10.1 BR:10.2 BR:10.3	No previous decision; considered on a project-specific basis.	Prohibit the use of fire suppression chemicals, including foaming agents and surfactants, within areas containing habitat for special status plant species unless human safety or property are at risk or for the protection of special status plant communities that are at risk of being lost by fire.	Allow the use of fire suppression chemicals, including foaming agents and surfactants, within areas containing habitat for special status plant species, though not within areas of known populations unless human safety or property are at risk.	Allow the use of fire suppression chemicals, including foaming agents and surfactants, within areas of known special status plant populations where consistent with the biology of the plant or where human safety or property are at risk and for the protection of special status plant communities that are at risk of being lost by fire.
SS Plants-4007	BR:10.1 BR:10.2	No previous decision; considered on a project-specific basis.	Prohibit ROW within habitat for special status species plants.	Allow ROW within areas containing habitat for special status species plants, though not within areas of known populations.	Allow ROW within areas containing habitat for special status species plants, though not within areas of known populations.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS Plants-4008	BR:10.1 BR:10.2	No previous decision; considered on a project-specific basis.	Apply an NSO stipulation to fluid mineral leases within habitat for special status plant species.	Apply an NSO stipulation to fluid mineral leases within known special status plant populations.	Apply a CSU stipulation to fluid mineral leases within habitat for special status plant species. Require necessary survey and establish site specific buffer. Apply an NSO stipulation to fluid mineral leases within known special status plant populations.
SS Plants-4009	BR:10.1 BR:10.2	No previous decision; considered on a project-specific basis.	Manage livestock grazing to protect special status plant habitat.	Manage livestock grazing to protect special status plant populations. (exclosures, timing)	Manage livestock grazing to protect special status plant populations where there is an identified conflict. (exclosures, timing)
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – SPECIAL STATUS SPECIES FISH			
SS Fish-4001	BR:10.2	Modify projects that may affect special status species fish to protect these species. Consult with the USFWS in such cases, as required by the ESA.			
SS Fish-4002	BR:10.1 BR:10.2 BR:10.3	Assist authorized agencies in the restoration, reintroduction, augmentation, or reestablishment of special status species populations and habitats.			
SS Fish-4003	BR:10.1 BR:10.2	Prioritize special status fish species over other fish species in planning and management actions.			

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – SPECIAL STATUS SPECIES FISH			
SS Fish-4004	BR:10.1 BR:10.2	Implement actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate BMPs and reasonable and prudent measures within biological opinions for Threatened and/or Endangered fish species.			
SS Fish-4005	BR:10.3	Support WGFD in obtaining water rights for the benefit of special status fish habitat.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS Fish-4006	BR:10.1 BR:10.2	No previous decision; considered on a project-specific basis.	Restore or improve important stream segments for fisheries habitat.	Restore or improve important stream segments for fisheries habitat, only for special status fish species.	Restore or improve important stream segments for special status fish.
SS Fish-4007	BR:10.2	No previous decision; considered on a project-specific basis.	Prohibit surface-disturbing and disruptive activities within 0.25 mile of any waters containing special status fish species (Map 28).	Prohibit surface-disturbing and disruptive activities within 500 feet of any waters containing special status fish species when their impacts cannot be mitigated (Map 28).	Prohibit new surface-disturbing activities within 0.25 mile of any waters containing special status fish species (Map 28), unless it benefits the species. Exceptions must demonstrate the proposed impacts cannot be avoided and the proposal is least environmentally damaging alternative.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS Fish-4008	BR:10.2	No previous decision; considered on a project-specific basis.	Apply an NSO stipulation within 0.25 mile of any waters containing special status fish species.	Apply a NSO stipulation within 500 feet of any waters containing special status fish species.	Apply an NSO stipulation within 0.25 mile of any waters containing special status fish species.
SS Fish-4009	BR:10.1 BR:10.2	No previous decision; considered on a project-specific basis.	Prohibit impoundments and instream structures where adverse impacts on special status fish species and their habitat would potentially occur.	Design impoundments and instream structures to reduce impacts on special status fish species and their habitats.	All new surface-disturbing activities within 0.25 mile of any waters containing special status fish species (Map 28), must demonstrate that the proposed action will benefit the species or will be the least environmentally damaging alternative.
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – SPECIAL STATUS SPECIES WILDLIFE			
SS WL-4001	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2 BR:12.1 BR:12.2	Utilize current research, management and conservation plans, and similar related documents to guide special status species habitat management.			
SS WL-4002	BR:10.3	Implement actions set forth in recovery plans, conservation measures, terms and conditions, protection measures, and appropriate BMPs and reasonable and prudent measures within biological opinions for Threatened and/or Endangered wildlife species, including those specific to this RMP and any future statewide programmatic biological opinions.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4003	BR:10.1 BR:10.2 BR:11.1 BR:11.2 BR:12.1 BR:12.2	Manage vegetation resources to comply with the ESA and BLM policy associated with management of habitat for special status species.	Enlarge and enhance habitat and habitat connectivity for special status species.	Maintain current habitat utilized by special status species.	Maintain (size and quality) or enhance current habitat utilized by special status species. Enlarge/restore habitat on a site-specific basis.
SS WL-4004	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2 BR:12.1 BR:12.2	No previous decision; considered on a project-specific basis.	Maintain the integrity of traditional wildlife migration and travel corridors.	Manage traditional wildlife migration and travel corridors consistent with other resource values.	Maintain or enhance the integrity of identified special status wildlife species migration corridors. Manage identified special status wildlife species travel corridors consistent with other resource values.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4005	BR:10.2 BR:10.3	No previous decision; considered on a project-specific basis.	Locate and manage facilities to minimize noise impacts on special status species.	Do not locate and manage facilities to minimize noise impacts on special status species.	Locate and manage facilities to mitigate noise impacts on special status species.
SS WL-4006	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2	No previous decision; considered on a project-specific basis.	Manage surface-disturbing and disruptive activities to minimize impacts on special status wildlife species and their habitats.	Manage surface-disturbing and disruptive activities consistent with other resource values.	Manage surface-disturbing and disruptive activities to mitigate impacts on special status wildlife species and their habitats.
SS WL-4007	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2	No previous decision; considered on a project-specific basis.	Apply a CSU stipulation to fluid mineral leases containing special status species habitat.	Apply standard lease terms to fluid mineral leases containing special status species habitat.	Apply a CSU stipulation to fluid mineral leases containing special status species habitat. Surveys required for clearance.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4008	BR:10.1 BR:10.2 BR:10.3	No previous decision; considered on a project-specific basis.	Prohibit surface-disturbing and disruptive activities in all prairie dog colonies to provide suitable habitat for special status species dependent upon prairie dog colonies (Map 35).	Do not prohibit surface-disturbing and disruptive activities in prairie dog colonies.	Allow surface-disturbing and disruptive activities within active prairie dog colonies on BLM surface that do not adversely impact suitable habitat for special status species dependent upon prairie dog colonies (Map 35).
SS WL-4009	BR:10.1 BR:10.2 BR:10.3	No previous decision; considered on a project-specific basis.	Apply an NSO stipulation to fluid mineral leases containing prairie dog colonies to provide suitable habitat to special status species dependent upon prairie dog colonies.	Apply standard lease terms to fluid mineral leases containing prairie dog colonies.	Apply a CSU stipulation to fluid mineral leases containing active prairie dog colonies.
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – Upland Game Birds			
SS WL-4010	BR:10.1 BR:10.2 BR:10.3	<p>The BLM will collaborate with appropriate federal agencies and the State of Wyoming, as contemplated under the Wyoming Governor’s Executive Order 2013-3, to: 1) develop appropriate conservation objectives; 2) define a framework for evaluating situations where Greater Sage-Grouse conservation objectives are not being achieved on federal land, to determine if a significant causal relationship exists between improper grazing (by wildlife or wild horses or livestock) and Greater Sage-Grouse conservation objectives; and 3) identify appropriate site-based actions to achieve Greater Sage-Grouse conservation objectives within the framework. Absent substantial and compelling information that adjustments are necessary to the core population area strategy, these core population areas, connectivity areas, identified and mapped winter concentration areas, and protective stipulations shall not be altered for a minimum of 7 years. Any changes shall involve a transparent process that provides an opportunity for public input and proper consideration of any proposal consistent with the provisions contemplated under Wyoming’s core population area strategy.</p> <p>The BLM will coordinate new recommendations, mitigation, and sage-grouse habitat objectives and management considerations with the WGFD and other appropriate agencies, local government cooperators, and the Wyoming SGIT. These measures will be analyzed in site-specific NEPA documents, as necessary.</p> <p>The Greater Sage-Grouse adaptive management plan (Appendix B (p. 1779)) provides regulatory assurance that unintended negative impacts to Greater Sage-Grouse habitat will be addressed before consequences become severe or irreversible. Projects requiring an EIS shall develop adaptive management strategies in support of the population management objectives for Greater Sage-Grouse set by the State of Wyoming (State of WY EO 2011-05).</p> <p>Adaptive management triggers are essential for identifying when potential management changes are needed in order to continue meeting Greater Sage-Grouse conservation objectives. With respect to sage-grouse, all regulatory entities in Wyoming, including the BLM, use soft and hard triggers. Soft and hard triggers are focused on three metrics: 1) number of active leks, 2) acres of available habitat, and 3) population trends based on annual lek counts.</p>			

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – Upland Game Birds
		<p>Soft Triggers Response: Soft triggers require immediate monitoring and surveillance to determine causal factors and may require curtailment of activities in the short- or long-term, as allowed by law. The project level adaptive management strategies will identify appropriate responses where the project's activities are identified as the causal factor. The management agency (BLM) and the Adaptive Management Working Group will implement an appropriate response strategy to address causal factors not attributable to a specific project or to make adjustments at a larger regional or state-wide level.</p> <p>Hard Trigger Response: Upon determination that a hard trigger has been tripped, the BLM will immediately defer issuance of discretionary authorizations for new actions within the Biologically Significant Unit for a period of 90 days. In addition, within 14 days of a determination that a hard trigger has been tripped, the Adaptive Management Working Group will convene to develop an interim response strategy and initiate an assessment to determine the causal factor or factors (hereafter called the causal factor assessment).</p>
SS WL-4011	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2	Develop avoidance areas restricting the application of broad-spectrum pesticides in areas containing Greater Sage-Grouse nesting and brood-rearing habitats.
SS WL-4012	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2 BR:12.1 BR:12.2	Restore Greater Sage-Grouse brood-rearing habitats in wetland/riparian areas. Maintain seeps, springs, wet meadows, and riparian vegetation in a functional and diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas.
SS WL-4013	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2 BR:11.3 BR:12.1 BR:12.2	Manage vegetation composition, diversity and structure, as determined by ecological site description and WGFD protocols (WY IM-2012–019 attachment 6), to achieve Greater Sage-Grouse habitat management objectives, in cooperation with stakeholders.
SS WL-4014	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2	Minimize disturbances that would result in alterations to springs and riparian Greater Sage-Grouse habitat. In coordination with stakeholders, develop alternative water sources to replace natural sources that have been affected or destroyed.
SS WL-4015	BR:10.1 BR:10.2 BR:10.3	Manage stored water to control mosquitoes and prevent the spread of WNV to Greater Sage-Grouse.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – Upland Game Birds
SS WL-4016	BR:10.1 BR:10.2 BR:10.3	Design water facilities with protective features to reduce mortality of Greater Sage-Grouse from drowning or entrapment.
SS WL-4017	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2	Design and locate fences to reduce impacts to important Greater Sage-Grouse habitat.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – Upland Game Birds			
SS WL-4018	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2 BR:11.3 BR:11.4	Use the Fire Management Plan to incorporate the most current sagebrush habitat information and to guide fire suppression priorities in sagebrush habitats.			
SS WL-4019	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2 BR:11.3 BR:11.4	Remove conifers where they have encroached upon Greater Sage-Grouse habitat in cooperation with stakeholders. Reduce the density of conifers that have encroached into, but do not yet dominate sagebrush plant communities.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4020	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2	No previous decision; considered on a project-specific basis.	Increase the visibility of existing fences within Greater Sage-Grouse habitat to reduce hazards to flying Greater Sage-Grouse, in cooperation with stakeholders.	Do not increase the visibility of existing fences to reduce hazards to flying Greater Sage-Grouse.	Inventory, record, and report existing type and condition of BLM fences. Prioritize areas and annually implement modifications to existing fences to reduce hazards to flying Greater Sage-Grouse, in cooperation with stakeholders. All new fences, in priority areas, will be properly designed and located to avoid hazards to flying Greater Sage-Grouse.
SS WL-4021	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2	No previous decision; considered on a project-specific basis.	Prohibit renewable energy projects within Greater Sage-Grouse nesting, brood-rearing and winter habitat.	Do not prohibit renewable energy projects in Greater Sage-Grouse nesting, brood-rearing and winter concentration areas.	Avoid renewable energy (solar and wind) projects in Greater Sage-Grouse Core Population Areas unless it can be demonstrated that the activity would not result in declines of core Greater Sage-Grouse populations. Sufficient demonstration of “no declines” should be coordinated with the WGFD and USFWS.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4022	BR:10.1 BR:10.2 BR:10.3	Require anti-perching devices on new powerlines within 0.5 mile of occupied Greater Sage-Grouse leks and nesting habitat.	Require anti-perching devices on existing and new powerlines in occupied Greater Sage-Grouse habitat to minimize raptor use. Evaluate and take advantage of opportunities to remove or modify existing power lines within Greater Sage-Grouse habitat.	Require anti-perching devices on new powerlines within occupied Greater Sage-Grouse habitat to minimize raptor use of these poles.	<p>Powerlines (distribution and transmission) will be designed to minimize wildlife related impacts. This action includes but is not limited to:</p> <ul style="list-style-type: none"> • Avoid areas of high avian use such as water bodies (including ponds, lakes, rivers, streams and wetlands), ridge tops, prairie dog colonies, Greater Sage-Grouse Core Population and Connectivity Areas, and sharp-tailed grouse leks (PRB Final EIS, EO 2011-05). • Prohibit within 0.6 miles of Greater Sage-Grouse Core Population and Connectivity Area leks unless within an established corridor or it can be demonstrated that the activity will not cause Greater Sage-Grouse population declines. <p>Major overhead powerlines will not be authorized unless co-located with an existing 115 kilovolt or greater powerline, as close as technically feasible, not to exceed 0.5 miles or within a designated corridor authorized for overhead powerlines.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> • Distribution lines may be authorized when effectively mitigated to protect Greater Sage-Grouse and the authorized officer determines that overhead installation is the action alternative with the fewest adverse impacts. <p>Agricultural and residential lines will be considered to be adequately mitigated for Greater Sage-Grouse if constructed at least 0.6 mile from the lek perimeter with appropriate timing constraints and installation of raptor deterrents. These ROW authorizations will be subject to approval by the State Director.</p> <ul style="list-style-type: none"> • Within general Greater Sage-Grouse habitat (outside core population and connectivity areas) overhead powerlines will be located at least 0.5 miles from Greater Sage-Grouse breeding and nesting grounds (PRB Final EIS). • Any new power lines authorized within the above identified areas will be buried or if overhead then marked to increase visibility and perch-guarded to prevent raptor perching (PRB Final EIS).

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4023	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2 BR:11.3 BR:11.4	<p>Lease fluid minerals where not prohibited by regulation, policy, withdrawal, or similar action</p> <p>Note: Within the boundary of the Wyodak-Anderson coal seam is presently closed to leasing due to Pennaco v. U.S., 377 F.3d 1147 (10th Cir. 2004).</p>	<p>Lease fluid minerals dependent upon Greater Sage-Grouse habitat suitability, population density, and development density</p> <p>Close to leasing within 4.0 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks and winter concentration areas (independent of habitat suitability).</p> <p>Adopt a minimum lease size of 640 contiguous acres.</p>	<p>Lease fluid minerals where not prohibited by regulation, policy, withdrawal, or similar action.</p>	<p>Lease fluid minerals dependent upon lease location and habitat suitability.</p> <p>In order to avoid surface-disturbing activities in Greater Sage-Grouse Priority Habitat (Core Population Areas and Core Population Connectivity Corridors), priority will be given to leasing fluid mineral resources outside of priority habitat.</p> <p>Within Priority Habitat (Core Population Areas and Connectivity Corridors), leases should be a minimum of 640 contiguous acres of federal mineral estate. Smaller parcels may be leased only when 640 contiguous acres of federal mineral estate is not available and leasing is necessary to remain in compliance with laws, regulations and policy; for example, to protect the federal mineral estate from drainage or to commit the federal mineral estate to unit or communitization agreements. Preliminary parcels reviewed for possible offering in a lease sale should comply with this minimum lease size. Expressions of interest that are less than this minimum lease size would be evaluated and modified by the BLM to meet the minimum lease size, where possible, prior to review for possible offering in a lease sale.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4024	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2 BR:11.3 BR:11.4	<p>Apply the following stipulations to fluid mineral leases:</p> <ul style="list-style-type: none"> CSU - Surface-disturbing activities or surface occupancy is prohibited or restricted on or within a 0.25-mile radius of the perimeter of occupied or undetermined Greater Sage-Grouse leks. TLS - Disruptive activity is restricted on or within a 0.25-mile radius of the perimeter of occupied or undetermined Greater Sage-Grouse leks from 6 pm to 8 am from March 15 to May 15. TLS - Surface-disturbing activities are prohibited from March 15 to June 30 in suitable Greater Sage-Grouse nesting and early brood rearing habitat and within 2 miles of any occupied or undetermined Greater Sage-Grouse leks. 	<p>Apply the following stipulations to fluid mineral leases:</p> <ul style="list-style-type: none"> NSO prohibiting surface-disturbing activities, disruptive activities, and occupancy within 4.0 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks and winter concentration areas (independent of habitat suitability). TLS prohibiting surface-disturbing and disruptive activities within 4.0 miles of occupied and undetermined Greater Sage-Grouse leks from March 1 to July 15 (independent of habitat suitability). TLS prohibiting surface-disturbing and disruptive activities within nesting and early brood-rearing habitat greater than 4.0 miles of an occupied or undetermined Greater Sage-Grouse lek, from March 1 to July 15. TLS prohibiting surface-disturbing and disruptive activities within 4.0 miles of Greater Sage-Grouse winter concentration areas, from November 15 to March 14 (independent of habitat suitability). 	<p>Apply the following stipulations to fluid mineral leases:</p> <ul style="list-style-type: none"> CSU within 0.25 mile of the perimeter of occupied or undetermined Greater Sage-Grouse leks. TLS within 2 miles of any occupied or undetermined Greater Sage-Grouse leks and within suitable Greater Sage-Grouse nesting and early brood rearing habitat (greater than 2 miles). TLS within Greater Sage-Grouse winter concentration areas from November 15 to March 14. 	<p>Apply the following stipulations to fluid mineral leases within Greater Sage-Grouse Core Population Areas:</p> <ul style="list-style-type: none"> NSO prohibiting surface occupancy and disturbing activities, disruptive activities, and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability). CSU within Greater Sage-Grouse Core Population Areas <ul style="list-style-type: none"> Allow on average no more than 1 energy or mining facility and on average no more than 5% total surface disturbance per 640 acres within the DDCT analysis area.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
			<ul style="list-style-type: none"> • TLS prohibiting surface-disturbing and disruptive activities within Greater Sage-Grouse winter habitat greater than 4.0 miles of Greater Sage-Grouse winter concentration areas, from November 15 to March 14. • CSU allowing no more than 1 disturbance and 3% total surface disturbance per 640 acres within the DDCT analysis area. • CSU - Restore disturbed sagebrush communities on BLM administered surface to full shrub density ($D_{Post} = [D_{Pre} * 1/(N+1)]$) for all pre-disturbance shrub species (Based on Wyoming DEQ Chapter 4 Rules and Regulations, Appendix 4A, option III community-specific full shrub density standard) and 5% minimum canopy cover of sagebrush. A 90% confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. 		<ul style="list-style-type: none"> ○ In Greater Sage-Grouse core population areas, the density of disturbance of an activity (oil and gas or mining) would be limited to an average of one site per square mile (640 acres) within the DDCT, subject to valid existing rights and applicable law. The one location and cumulative value of existing disturbances will not exceed 5 percent of suitable habitat of the DDCT area. Utilize the Greater Sage-Grouse density disturbance process as described in Appendix B (p. 1779). ○ Inside Greater Sage-Grouse (priority habitat) core population areas and connectivity corridors, all suitable habitat disturbed (any program area) will not exceed 5% of suitable habitat within the DDCT area using the DDCT process described in Appendix B (p. 1779). ○ Design and manage facilities to prevent WNV transmission.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
			<p>D_{Pre} is the pre-disturbance total shrub density. D_{Post} is the post-disturbance total shrub density. N is the number of primary pre-disturbance shrub species.</p> <p>Apply to all surface-disturbing activities on BLM surface within nesting, brood-rearing, or winter habitat.</p> <p>Encourage unitization, offsite mitigation, and orderly (e.g., phased and/or clustered) development as means of minimizing adverse impacts to Greater Sage-Grouse.</p> <p>Require a full reclamation bond specific to the site and sufficient to cover costs required for full reclamation.</p> <p>Limit seismic activity to designated routes on BLM surface.</p> <p>Apply appropriate BMPs (see BMP Section) as COAs.</p>		<ul style="list-style-type: none"> Prohibit overhead electric transmission lines unless within one-half mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than one mile. Limit project related noise where it would be expected to reduce habitat functionality. The BLM would evaluate the potential for limitation of new noise sources on a case-by-case basis as appropriate. BLM's near-term goal would be to limit noise sources that would be expected to negatively impact priority habitat area sage-grouse populations and to continue to support the establishment of ambient baseline noise levels for occupied priority habitat area leks.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>As additional research and information emerges, specific new limitations appropriate to the type of projects being considered would be evaluated and appropriate implemented where necessary to minimize potential for noise impacts on sage-grouse priority population behavioral cycles. As new research is completed, new specific limitations would be coordinated with the WGFD and partners. Noise levels at the perimeter of the lek should not exceed 10 dBA above ambient noise.</p> <ul style="list-style-type: none"> ○ Bury electric distribution lines where possible, if not possible; then locate overhead lines at least 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> ○ Buried utilities constructed in designated utility corridors would not require that a DDCT be conducted. ○ Locate new roads that will have relatively high levels of activity (accessing multiple wells, housing development) greater than 1.9 miles from the perimeter of occupied Greater Sage-Grouse leks. Locate new roads used to provide facility site access and maintenance > 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks. <p>Vegetation treatments in nesting and wintering habitat that would reduce sagebrush canopy cover to less than 15% would not be conducted unless it can be shown to be beneficial to sage-grouse habitat and removal of sagebrush canopy cover below 15% will be subject to the DDCT.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>Wildland fire burns will be treated as disturbance if sagebrush is reduced below 5% canopy cover, unless there is an implementation plan outlining restoration efforts and 3 years of data showing a trend back to suitable habitat.</p> <ul style="list-style-type: none"> • CSU - Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5% minimum canopy cover of sagebrush. A 90% confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. • TLS prohibiting surface-disturbing and disruptive activities from March 15 to June 30 (independent of habitat suitability). • TLS prohibiting surface-disturbing and disruptive activities within mapped Greater Sage-Grouse winter concentration areas, from December 1 to March 14.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>Apply the following stipulations to fluid mineral leases within Greater Sage-Grouse Population Connectivity Areas:</p> <ul style="list-style-type: none"> • NSO prohibiting surface occupancy and disturbing activities, disruptive activities, and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability). • CSU within Greater Sage-Grouse Population Connectivity Areas. <ul style="list-style-type: none"> ○ Allow on average no more than 5% total surface disturbance per 640 acres within the DDCT analysis area. <p>In Greater Sage-Grouse Core Population Connectivity Corridors, subject to valid existing rights and applicable law, the cumulative value of existing disturbances will not exceed 5 percent of suitable habitat of the DDCT area. Utilize the Greater Sage-Grouse density disturbance calculation tool described in (Appendix B (p. 1779)).</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>Inside Greater Sage-Grouse (priority habitat) core population areas and connectivity corridors, all suitable habitat disturbed (any program area) will not exceed 5% of suitable habitat within the DDCT area using the DDCT process described in Appendix B (p. 1779).</p> <ul style="list-style-type: none"> ○ Design and manage facilities to prevent WNV transmission. ○ Limit project related noise where it would be expected to reduce habitat functionality. The BLM would evaluate the potential for limitation of new noise sources on a case-by-case basis as appropriate. BLM's near-term goal would be to limit noise sources that would be expected to negatively impact priority habitat area sage-grouse populations and to continue to support the establishment of ambient baseline noise levels for occupied priority habitat area leks.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>As additional research and information emerges, specific new limitations appropriate to the type of projects being considered would be evaluated and appropriate limitations would be implemented where necessary to minimize potential for noise impacts on sage-grouse priority population behavioral cycles. As new research is completed, new specific limitations would be coordinated with the WGFD and partners. Noise levels at the perimeter of the lek should not exceed 10 dBA above ambient noise.</p> <ul style="list-style-type: none"> • Buried utilities constructed in designated utility corridors would not require that a DDCT be conducted. • Vegetation treatments in nesting and wintering habitat that would reduce sagebrush canopy cover to less than 15% would not be conducted unless it can be shown to be beneficial to sage-grouse habitat and removal of sagebrush canopy cover below 15% will be subject to the DDCT.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>Wildland fire burns will be treated as disturbance if sagebrush is reduced below 5% canopy cover, unless there is an implementation plan outlining restoration efforts and 3 years of data showing a trend back to suitable habitat.</p> <ul style="list-style-type: none"> • CSU - Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5% minimum canopy cover of sagebrush. A 90% confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. • TLS prohibiting surface-disturbing and disruptive activities within 4.0 miles of an occupied Greater Sage-Grouse lek, from March 15 to June 30 (independent of habitat suitability and restricted to within Population Connectivity Areas).

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> • TLS prohibiting surface-disturbing and disruptive activities within mapped Greater Sage-Grouse winter concentration areas, from December 1 to March 14. <p>Apply the following stipulations to fluid mineral leases within Greater Sage-Grouse habitat outside of Core Population and Population Connectivity Areas:</p> <ul style="list-style-type: none"> • NSO prohibiting surface occupancy and disturbing activities, disruptive activities, and occupancy within 0.25 mile of the perimeter of occupied Greater Sage-Grouse leks. • CSU within 0.25 mile of occupied Greater Sage-Grouse leks. <ul style="list-style-type: none"> ○ Design and manage facilities to prevent WNV transmission. ○ Prohibit overhead electric transmission lines.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> CSU - Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5% minimum canopy cover of sagebrush. A 90% confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. <p>Recommend for all surface-disturbing activities on BLM surface adjacent to Core or Connectivity Population Areas, or within or adjacent to lands involved in Greater Sage-Grouse conservation projects.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> CSU requiring proponents to limit project related noise where it would be expected to reduce functionality of habitats that support priority habitat area populations. The BLM would evaluate the potential for limitation of new noise sources on a case-by-case basis as appropriate. BLM's near-term goal would be to limit noise sources that would be expected to negatively impact priority habitat area sage-grouse populations and to continue to support the establishment of ambient baseline noise levels for occupied priority habitat area leks. As additional research and information emerges, specific new limitations appropriate to the type of projects being considered would be evaluated and appropriate limitations would be implemented where necessary to minimize potential for noise impacts on sage-grouse priority population behavioral cycles. As new research is completed, new specific limitations would be coordinated with the WGFD and partners. Noise levels at the perimeter of the lek should not exceed 10 dBA above ambient noise.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> • TLS prohibiting surface-disturbing and disruptive activities within 2.0 miles of occupied Greater Sage-Grouse leks, from March 15 to June 30 (independent of habitat suitability). • TLS prohibiting surface-disturbing and disruptive activities from December 1 to March 14 within mapped Greater Sage-Grouse winter concentration areas that support populations of Greater Sage-Grouse that attend leks within Core Population Areas. <p>In cases where federal oil and gas leases are or have been issued without stipulated restrictions or requirements that are later found to be necessary, or with stipulated restrictions or requirements later found to be insufficient, consider their inclusion before approving subsequent exploration and development activities. Include these restrictions or requirements only as reasonable measures or as conditions of approval in authorizing APDs or Master Development Plans.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>Conversely, in cases where leases are or have been issued with stipulated restrictions or requirements that are later found to be excessive or unnecessary, the stipulated restrictions or requirements may be appropriately modified, excepted or waived in authorizing actions. Both the application of reasonable measures or COAs and the modification, exception, or waiver of stipulated restrictions or requirements must first be based upon site-specific analysis including the necessary supporting NEPA.</p> <p>Note (priority and general habitat): The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, would not impair the function or utility of the site for the current or subsequent seasonal habitat, life-history, or behavioral needs of Greater Sage-Grouse.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4025	BR:10.1 BR:10.2 BR:10.3 BR:11.1 BR:11.2 BR:11.3 BR:11.4	<p>Surface-disturbing activities or surface occupancy is prohibited or restricted on or within 0.25-mile radius of the perimeter of occupied or undetermined Greater Sage-Grouse leks.</p> <p>Disruptive activity is restricted on or within 0.25- mile radius of the perimeter of occupied or undetermined Greater Sage-Grouse leks from 6 pm to 8 am from March 15 to May 15.</p> <p>Surface-disturbing activities are prohibited from March 15 to June 30 in suitable Greater Sage-Grouse nesting and early brood rearing habitat and within 2 miles of any occupied or undetermined Greater Sage-Grouse leks (Map 37).</p>	<p>Manage Greater Sage-Grouse habitat as follows (Map 38):</p> <ul style="list-style-type: none"> Prohibit surface-disturbing activities, disruptive activities, and occupancy within 4.0 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks and winter concentration areas (independent of habitat suitability). Prohibit surface-disturbing and disruptive activities within 4.0 miles of occupied and undetermined Greater Sage-Grouse leks from March 1 to July 15 (independent of habitat suitability). Prohibit surface-disturbing and disruptive activities in nesting and early brood-rearing habitat greater than 4.0 miles of occupied and undetermined Greater Sage-Grouse leks, from March 1 to July 15. Prohibit surface-disturbing activities, disruptive activities and occupancy within 4.0 miles of Greater Sage-Grouse winter concentration areas, from November 15 to March 14 (independent of habitat suitability). 	<p>To the extent necessary to prevent unnecessary or undue degradation, manage as follows within occupied Greater Sage-Grouse habitat (Map 39):</p> <ul style="list-style-type: none"> Restrict surface-disturbing and disruptive activities and occupancy within 0.25 mile of the perimeter of occupied or undetermined Greater Sage-Grouse leks. Prohibit surface-disturbing and disruptive activities in all areas within 2 miles of occupied leks from March 15 to June 30 (independent of habitat suitability). Prohibit surface-disturbing and disruptive activities in identified nesting and early brood-rearing habitat outside the 2-mile lek buffer, from March 15 to June 30. Avoid surface-disturbing and disruptive activities and occupancy within Greater Sage-Grouse winter concentration areas from November 15 to March 14. 	<p>Manage Greater Sage-Grouse Core Population Areas as follows (Map 40):</p> <ul style="list-style-type: none"> Prohibit surface-disturbing activities, disruptive activities, and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability). Allow on average no more than 1 energy or mining facility and on average no more than 5% total surface disturbance per 640 acres within the DDCT analysis area . <p>In Greater Sage-Grouse core population areas, the density of disturbance of an activity (oil and gas or mining) would be limited to an average of one site per square mile (640 acres) within the DDCT, subject to valid existing rights and applicable law. The one location and cumulative value of existing disturbances will not exceed 5 percent of suitable habitat of the DDCT area. Utilize the Greater Sage-Grouse density disturbance calculation tool described in Appendix B (p. 1779).</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
			<ul style="list-style-type: none"> Prohibit surface-disturbing and, disruptive activities within winter habitat greater than 4.0 miles of Greater Sage-Grouse winter concentration areas, from November 15 to March 14. Allow no more than 1 disturbance and 3% total surface disturbance per 640 acres within the DDCT analysis area. Restore disturbed sagebrush communities on BLM surface to full shrub density ($D_{Post} = [D_{Pre} * 1/(N+1)]$) for all pre-disturbance shrub species and 5% minimum canopy cover of sagebrush. A 90% confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. <p>Apply to all surface-disturbing activities on BLM surface within nesting, brood-rearing, or winter habitat.</p>		<p>Inside Greater Sage-Grouse (priority habitat) core population areas and connectivity corridors, all suitable habitat disturbed (any program area) will not exceed 5% of suitable habitat within the DDCT area using the DDCT process described in Appendix B (p. 1779).</p> <p>Inside Greater Sage-Grouse (priority habitat) core population areas and connectivity corridors, all suitable habitat disturbed (any program area) will not exceed 5% of suitable habitat within the DDCT area using the DDCT process described in Appendix B (p. 1779).</p> <ul style="list-style-type: none"> Design and manage facilities to prevent WNV transmission. Prohibit overhead electric transmission lines unless within one-half mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than one mile.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
			<p>Within 4.0 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks and winter concentration areas (independent of habitat suitability):</p> <ul style="list-style-type: none"> • Exclude all ROW. • Recommend for withdrawal from locatable mineral location and entry under the Mining Law, subject to valid existing rights. • Prohibit mineral material sales. • Close to solid and fluid mineral leasing. • Close to non-energy leasable mineral leasing. • Do not recommend for federal land withdrawal (43 CFR 2300) unless the land management is consistent with Greater Sage-Grouse conservation. • Avoid constructed roads beyond 4 miles of occupied and undetermined Greater Sage-Grouse leks and winter concentration areas. • Close to livestock grazing. <p>Within occupied Greater Sage-Grouse habitat:</p> <ul style="list-style-type: none"> • Avoid ROWs. • Require full reclamation bonding specific to the site and sufficient to cover costs required for full reclamation. 		<ul style="list-style-type: none"> • Work with proponents to limit project related noise where it would be expected to reduce habitat functionality. The BLM would evaluate the potential for limitation of new noise sources on a case-by-case basis as appropriate. BLM's near-term goal would be to limit noise sources that would be expected to negatively impact priority habitat area sage-grouse populations and to continue to support the establishment of ambient baseline noise levels for occupied priority habitat area leks. As additional research and information emerges, specific new limitations appropriate to the type of projects being considered would be evaluated and appropriate limitations would be implemented where necessary to minimize potential for noise impacts on sage-grouse priority population behavioral cycles.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>As new research is completed, new specific limitations would be coordinated with the WGFD and partners. Noise levels at the perimeter of the lek should not exceed 10 dBA above ambient noise.</p> <ul style="list-style-type: none"> ○ Bury electric distribution lines where possible, if not possible; then locate overhead lines at least 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards. ○ Buried utilities constructed in designated utility corridors would not require that a DDCT be conducted. ○ Locate new roads that will have relatively high levels of activity (accessing multiple wells, housing development) greater than 1.9 miles from the perimeter of occupied Greater Sage-Grouse leks. Locate new roads used to provide facility site access and maintenance > 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> ○ Vegetation treatments in nesting and wintering habitat that would reduce sagebrush canopy cover to less than 15% would not be conducted unless it can be shown to be beneficial to sage-grouse habitat and removal of sagebrush canopy cover below 15% will be subject to the DDCT. Wildland fire burns will be treated as disturbance if sagebrush is reduced below 5% canopy cover, unless there is an implementation plan outlining restoration efforts and 3 years of data showing a trend back to suitable habitat. ● Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5% minimum canopy cover of sagebrush. A 90% confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> • Prohibit surface-disturbing and disruptive activities from March 15 to June 30 (independent of habitat suitability). • Prohibit surface-disturbing and disruptive activities within mapped Greater Sage-Grouse winter concentration areas, from December 1 to March 14. <p>To the extent necessary to prevent unnecessary or undue degradation, manage as follows within Greater Sage-Grouse Population Connectivity Areas:</p> <ul style="list-style-type: none"> • Prohibit surface occupancy and disturbing activities, disruptive activities and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability). • Allow on average no more than 5% total surface disturbance per 640 acres within the DDCT analysis area. <p>In Greater Sage-Grouse Core Population Connectivity Corridors, subject to valid existing rights and applicable law, the cumulative value of existing disturbances will not exceed 5 percent of suitable habitat of the DDCT area.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>Utilize the Greater Sage-Grouse density disturbance tool described in Appendix B (p. 1779).</p> <p>Inside Greater Sage-Grouse (priority habitat) core population areas and connectivity corridors, all suitable habitat disturbed (any program area) will not exceed 5% of suitable habitat within the DDCT area using the DDCT process described in Appendix B (p. 1779).</p> <ul style="list-style-type: none"> ○ Design and manage facilities to prevent WNV transmission. ○ Work with proponents to limit project related noise where it would be expected to reduce habitat functionality. The BLM would evaluate the potential for limitation of new noise sources on a case-by-case basis as appropriate.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>BLM's near-term goal would be to limit noise sources that would be expected to negatively impact priority habitat area sage-grouse populations and to continue to support the establishment of ambient baseline noise levels for occupied priority habitat area leks.</p> <p>As additional research and information emerges, specific new limitations appropriate to the type of projects being considered would be evaluated and appropriate limitations would be implemented where necessary to minimize potential for noise impacts on sage-grouse priority population behavioral cycles. As new research is completed, new specific limitations would be coordinated with the WGFD and partners. Noise levels at the perimeter of the lek should not exceed 10 dBA above ambient noise.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> o Buried utilities constructed in designated utility corridors would not require that a DDCT be conducted. o Vegetation treatments in nesting and wintering habitat that would reduce sagebrush canopy cover to less than 15% would not be conducted unless it can be shown to be beneficial to sage-grouse habitat and removal of sagebrush canopy cover below 15% will be subject to the DDCT. <p>Wildland fire burns will be treated as disturbance if sagebrush is reduced below 5% canopy cover, unless there is an implementation plan outlining restoration efforts and 3 years of data showing a trend back to suitable habitat.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> • Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all pre-disturbance shrub species and 5% minimum canopy cover of sagebrush. A 90% confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. • Prohibit surface-disturbing and disruptive activities within 4 miles of occupied Greater Sage-Grouse leks from March 15 to June 30 (independent of habitat suitability and restricted to within Population Connectivity Areas). • Prohibit surface-disturbing and disruptive activities within mapped Greater Sage-Grouse winter concentration areas, from December 1 to March 14.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>Manage as follows within occupied Greater Sage-Grouse habitat outside of Core Population and Population Connectivity Areas:</p> <ul style="list-style-type: none"> ● Prohibit or restrict surface occupancy and disruptive activities within 0.25 mile of the perimeter of occupied Greater Sage-Grouse leks. ● Reduce surface disturbance for authorizations within 0.25 miles of occupied Greater Sage-Grouse leks by: <ul style="list-style-type: none"> ○ Design and manage facilities to prevent WNV transmission. ○ Prohibit overhead transmission lines. ● Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all pre-disturbance shrub species and 5% minimum canopy cover of sagebrush. A 90% confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>Recommend for all surface-disturbing activities on BLM surface adjacent to core or connectivity population areas, within or adjacent to lands involved in Greater Sage-Grouse conservation projects. BLM parcels less than 640 acres that only meet the population density factor may be excluded.</p> <p>Work with proponents to limit project related noise where it would be expected to reduce functionality of habitats that support priority habitat area populations. The BLM would evaluate the potential for limitation of new noise sources on a case-by-case basis as appropriate. BLM's near-term goal would be to limit noise sources that would be expected to negatively impact priority habitat area sage-grouse populations and to continue to support the establishment of ambient baseline noise levels for occupied priority habitat area leks.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<p>As additional research and information emerges, specific new limitations appropriate to the type of projects being considered would be evaluated and appropriate limitations would be implemented where necessary to minimize potential for noise impacts on sage-grouse priority population behavioral cycles. As new research is completed, new specific limitations would be coordinated with the WGFD and partners. Noise levels at the perimeter of the lek should not exceed 10 dBA above ambient noise.</p> <ul style="list-style-type: none"> ● Prohibit surface-disturbing and disruptive activities within 2.0 miles of occupied Greater Sage-Grouse leks, from March 15 to June 30 (independent of habitat suitability). ● Prohibit surface-disturbing and disruptive activities from December 1 to March 14 within mapped Greater Sage-Grouse winter concentration areas that support populations of Greater Sage-Grouse that attend leks within Core Population Areas.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					Note (priority and general habitat): The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, would not impair the function or utility of the site for the current or subsequent seasonal habitat, life-history, or behavioral needs of Greater Sage-Grouse.
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES – Raptors			
SS WL-4026	BR:10.1 BR:10.2 BR:10.3	Establish a year-round disturbance-free buffer zone of at least 0.5 mile for known active bald eagle nests. Establish a 1.0-mile limited activity zone for known active nests (February 1 to August 15) (Map 41).			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4027	BR:10.1 BR:10.2 BR:10.3	Establish a year-round disturbance-free buffer zone of at least 0.5 mile for known bald eagle winter roosts.	Establish a year-round disturbance-free buffer zone of at least 0.5 mile for consistently used bald or golden eagle winter roosts and the following riparian corridors consistently used by bald eagles:	Establish a year-round disturbance-free buffer zone of at least 0.5 mile for known bald eagle winter roosts.	Establish a year-round disturbance-free buffer zone of at least 0.5 mile for consistently used bald or golden eagle winter roosts and the following riparian corridors consistently used by bald eagles:

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
		<p>Additionally, establish a 1.0-mile limited activity zone for known roosts (November 1 to April 1). Also, protect documented cottonwood trees, and other potential critical habitats related to hunting and concentration areas for bald eagles (Map 41).</p>	<p>Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. The stipulation area may be adjusted to 1.0 mile or greater based on topographic features, visibility, disturbance and human activity levels, and other factors. The buffer zone restriction will be based on site specific information and coordinated with the USFWS's Wyoming Field Office, which will provide written concurrence. Consistent use is evident by the documentation of nests along several of these streams (Clear Creek, Piney Creek, Powder River, and Tongue River) and eagle use along the streams throughout the winter over multiple winters.</p> <p>Additionally, establish at least a 1.0-mile limited activity zone for consistently used roosts and the identified riparian corridors (November 1 to April 1). The buffer zone restriction will be based on site specific information and coordinated with the USFWS's Wyoming Field Office, which will provide written concurrence.</p>	<p>Additionally, establish a 1.0-mile limited activity zone for known roosts (November 1 to April 1) (Map 41). Also, protect documented cottonwood trees, and other potential critical habitats related to hunting and concentration areas for bald eagles.</p>	<p>Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. The stipulation area may be adjusted to 1.0 mile based on topographic features, visibility, disturbance and human activity levels, and other factors. This buffer zone restriction will be based on site specific information and BLM may coordinate with the USFWS.</p> <p>Additionally, apply a 1.0-mile limited activity TLS for consistently used roosts and the identified riparian corridors (November 1 to April 1). The buffer zone restriction will be based on site specific information and BLM may coordinate with the USFWS.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4028	BR:10.1 BR:10.2 BR:10.3	Apply TLS for known bald eagle winter roosts of 1.0 mile from November 1 to April 1.	<p>Apply an NSO stipulation to fluid mineral leases within 0.5 mile of consistently used bald or golden eagle winter roosts and the following riparian corridors consistently used by bald eagles: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. The stipulation area may be adjusted to 1.0 mile or greater based on topographic features, visibility, disturbance and human activity levels, and other factors.</p> <p>Additionally, apply at least a 1.0-mile limited activity TLS for consistently used roosts and the identified riparian corridors (November 1 to April 1). The buffer zone restriction will be based on site specific information and coordinated with the USFWS's Wyoming Field Office, which will provide written concurrence.</p>	Apply standard lease terms to fluid mineral leases within 0.5 mile of the following riparian corridors consistently used by bald eagles: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. This buffer may be adjusted to 1.0 mile or greater based on topographic features, visibility, disturbance and human activity levels, and other factors.	<p>Apply an NSO stipulation to fluid mineral leases within 0.5 mile of consistently used bald or golden eagle winter roosts and the following riparian corridors consistently used by bald eagles: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. The stipulation area may be adjusted to 1.0 mile based on topographic features, visibility, disturbance and human activity levels, and other factors. This buffer zone restriction will be based on site specific information and BLM may coordinate with the USFWS.</p> <p>Additionally, apply a 1.0-mile limited activity TLS for consistently used roosts and the identified riparian corridors (November 1 to April 1). The buffer zone restriction will be based on site specific information and BLM may coordinate with the USFWS.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4029	BR:10.1 BR:10.2 BR:10.3	No previous decision; considered on a project-specific basis.	Prohibit surface-disturbing and disruptive activities to nesting raptors within 1.5 miles of a special status species raptor nest during the following time periods for the protection of raptor nesting areas (Map 32): <ul style="list-style-type: none"> • January 1 to August 15: bald eagle • March 1 to July 31: ferruginous hawk, peregrine falcon • April 15 to September 15: burrowing owl • April 1 to August 31: northern goshawk 	Prohibit surface-disturbing and disruptive activities to nesting raptors within 0.25 mile of a special status species raptor nest during the following time periods for the protection of raptor nesting areas (Map 31): <ul style="list-style-type: none"> • January 1 to August 15: bald eagle • March 1 to July 31: ferruginous hawk, peregrine falcon • April 15 to September 15: burrowing owl • April 1 to August 31: northern goshawk 	Seasonally prohibit surface-disturbing and disruptive activities to nesting raptors using USFWS Wyoming Ecological Services' recommended spatial buffers and dates for breeding raptors (http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) (Map 33). Spatial buffers may be modified based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site. BLM may coordinate buffer distances with the WGFD and/or the USFWS.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4030	BR:10.1 BR:10.2 BR:10.3	Prohibit surface disturbance or occupancy within a biologic buffer zone around active nests of special status raptor species unless the prohibition is waived by the authorized officer.	Prohibit surface disturbance and occupancy within a biologic buffer zone around active nests of special status raptor species.	Do not prohibit surface disturbance or occupancy within a biologic buffer zone around active nests of special status raptor species.	Prohibit surface disturbance, disruptive activities, and occupancy around active nests of special status raptor species within a species specific biologic buffer zone using USFWS Wyoming Ecological Services' recommended spatial buffers for breeding raptors (http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) (Map 33). Spatial buffers may be modified based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site. BLM may coordinate buffer distances with the WGFD and/or the USFWS.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4031	BR:10.1 BR:10.2 BR:10.3	No previous decision; considered on a project-specific basis.	<p>Apply TLS to fluid mineral leases within 1.5 miles of a special status species raptor nest during the following time periods for the protection of raptor nesting areas:</p> <ul style="list-style-type: none"> • March 1 to July 31: ferruginous hawk, peregrine falcon • April 15 to September 15: burrowing owl • April 1 to August 31: northern goshawk 	<p>Apply TLS to fluid mineral leases within 0.25 mile of a special status species raptor nest during the following time periods for the protection of raptor nesting areas:</p> <ul style="list-style-type: none"> • March 1 to July 31: ferruginous hawk, peregrine falcon • April 15 to September 15: burrowing owl • April 1 to August 31: northern goshawk 	<p>Apply a TLS to mineral leases containing nests of active special status raptor species using USFWS Wyoming Ecological Services' recommended spatial buffers and dates for breeding raptors (http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) (Map 33). Spatial buffers may be modified based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site. BLM may coordinate buffer distances with the WGFD and/or the USFWS.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
SS WL-4032	BR:10.1 BR:10.2 BR:10.3	No previous decision; considered on a project-specific basis.	Apply an NSO stipulation to fluid mineral leases within a biologic buffer zone around active nests of special status raptor species.	Apply a CSU stipulation to fluid mineral leases within a biologic buffer zone around active nests of special status raptor species.	Apply an NSO stipulation to fluid mineral leases containing active nests of special status raptor species within a species specific biologic buffer zone using USFWS Wyoming Ecological Services' recommended spatial buffers for breeding raptors (http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) (Map 33). Spatial buffers may be modified based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site. BLM may coordinate buffer distances with the WGFD and/or the USFWS. BLM may coordinate buffer distances with the WGFD and/or the USFWS.
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Amphibians, Reptiles, and Bats					
SS WL-4033	BR:10.1 BR:10.2 BR:10.3	No previous decision; considered on a project-specific basis.	Prohibit surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats, in the following areas: (1) identified 100-year floodplains, (2) areas within 1,640 feet (500 meters) of perennial waters, springs, playas, wells, and wetlands, (3) areas within 100 feet of ephemeral channels, and (4) within 1,640 feet (500 meters) of south-facing rock outcrops.	Do not prohibit surface-disturbing and disruptive activities in the following areas: (1) identified 100-year floodplains, (2) areas within 1,640 feet (500 meters) of perennial waters, springs, playas, wells, and wetlands, (3) areas within 100 feet of ephemeral channels, and (4) within 1,640 feet (500 meters) of south-facing rock outcrops.	Require surveys for special status amphibian, reptile, and bat species prior to approving any project or activity that may impact the habitat for these species. This habitat includes: perennial waters, vernal pools, playas, wetlands, and south-facing rock outcrops.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					Allow surface-disturbing and disruptive activities, where special status amphibian, reptile, and bat species occur: (1) areas within 1,640 feet (500 meters) of perennial waters, vernal pools, playas, and wetlands, and (2) within 1,640 feet (500 meters) of south-facing rock outcrops when populations and habitat can be conserved.
SS WL-4034	BR:10.1 BR:10.2 BR:10.3	No previous decision; considered on a project-specific basis.	Apply an NSO stipulation to fluid mineral leases for the protection of special status amphibian and reptile species and their habitats, in the following areas: (1) identified 100-year floodplains, (2) areas within 500 meters of perennial waters, springs, playas, wells, and wetlands, (3) areas within 100 feet of ephemeral channels, and (4) within 500 meters of south-facing rock outcrops.	Apply standard lease terms to fluid mineral leases in the following areas: (1) identified 100-year floodplains, (2) areas within 500 meters of perennial waters, springs, playas, wells, and wetlands, (3) areas within 100 feet of ephemeral channels, and (4) within 500 meters of south-facing rock outcrops.	Require surveys for special status amphibian, reptile, and bat species prior to approving any project or activity that may impact the habitat for these species. This habitat includes: perennial waters, vernal pools, playas, wetlands, and south-facing rock outcrops. Apply a CSU stipulation to fluid mineral leases for the protection of special status amphibian, reptile, and bat species and their habitats where special status species occur: (1) areas within 1,640 feet (500 meters) of perennial waters, vernal pools, playas, and wetlands, and (2) within 1,640 feet (500 meters) of south-facing rock outcrops.

2.9.5. 5000 HERITAGE AND VISUAL RESOURCES

Table 2.24. 5000 HERITAGE AND VISUAL RESOURCES (HR) – CULTURAL RESOURCES

GOAL HR:1 Stewardship and appreciation of cultural resources is promoted.

Objectives:

HR:1.1 In compliance with NAGPRA, maintain and enhance programs that provide opportunities for scientific research of cultural resources.

HR:1.2 Develop a public outreach and education program to instill a preservation ethic in the public regarding archeological and historic resources.

HR:1.3 Develop and maintain interpretation of cultural resources in areas of high public interest.

HR:1.4 Enhance public experience through interpretive facilities and support of heritage tourism.

GOAL HR:2 Native American sacred sites are preserved and protected.

Objectives:

HR:2.1 In coordination with tribes, identify Native American sacred sites.

HR:2.2 In coordination with tribes and other stakeholders, provide for tribal access to known sacred sites.

HR:2.3 Consult with Native Americans to identify resource types or places that may be impacted by BLM actions.

HR:2.4 Maximize opportunities for cooperation with tribal governments for managing cultural resources and public education.

GOAL HR:3 National Register eligible and unevaluated cultural resources are protected.

Objectives:

HR:3.1 Identify cultural resources by defining priority geographic areas for new field inventory, based on the probability for unrecorded significant cultural resources.

HR:3.2 In cooperation with stakeholders, develop and implement activity plans for significant cultural resources.

GOAL HR:4 Cultural resources are identified, preserved, and protected, while remaining available for appropriate uses by present and future generations.					
Objectives:					
HR:4.1 Manage each type of cultural resource according to their proper use allocation, and monitor their condition and use.					
HR:4.2 Develop activity plans for special areas or historic properties identified as high risk for adverse impacts.					
HR:4.3 Recruit site stewards to assist with monitoring the condition of sites important to national heritage.					
GOAL HR:5 Select historic properties are managed for long-term heritage and educational values and to enhance the public experience.					
Objectives:					
HR:5.1 Maintain compatible recreational use with the historic values of these historic properties.					
HR:5.2 Maintain the setting for those contributing trail segments, battlefield sites, forts, and other historic properties for which setting is an important aspect of site integrity, by utilizing viewshed management tools.					
HR:5.3 Maximize partnership and cooperative management opportunities.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Cultural-5001	HR:3.2 HR:4.2 HR:4.3	Complete site stabilization and long-term protection for significant sites that are experiencing adverse impacts.			
Cultural-5002	HR:1.1 HR:2.1 HR:2.2 HR:2.3 HR:2.4	Maintain existing relationships and develop new relationships with Native American tribes to identify sites, areas, and resources important to them. Document and keep confidential sites, areas, and resources that necessitate protection. Incorporate the information obtained from the tribes into planning decisions. Manage identified areas of tribal importance to minimize disturbance.			
Cultural-5003	HR:2.1 HR:2.2 HR:2.3 HR:2.4	Ensure areas of importance to Native American tribes are not transferred from federal ownership.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Cultural-5004	HR:1.1 HR:1.2 HR:1.3 HR:1.4	No previous decision; considered on a project-specific basis.	Establish site stewardship opportunities in coordination with stakeholders for appropriate sites.	Do not establish site stewardship opportunities.	Establish site stewardship opportunities in coordination with stakeholders for appropriate sites.
Cultural-5005	HR:1.3 HR:3.2 HR:4.1 HR:4.2	Develop CRMPs for Cantonment Reno, Dull Knife Battlefield, and the Outlaw Cave Archeological District and for additional federally owned sites as they are nominated for the National Register of Historic Places.	Develop management plans for specific sites or geographic regions based on site significance and/or potential impacts in cooperation with stakeholders.	Do not develop management plans for specific sites or geographic regions.	Develop CRPPs for the protection and preservation of the following geographic areas in cooperation with stakeholders: <ul style="list-style-type: none"> • Pumpkin Buttes • Sites Associated with Red Cloud's War and the Great Sioux War (including Dull Knife Battlefield, Cantonment Reno, Crazy Woman Battle, Bozeman Trail) • South Big Horn Mountains

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Cultural-5006	HR:4.1 HR:5.1 HR:5.2	Bozeman Trail and Crazy Woman Battle Site. NSO stipulations will be applied to fluid mineral leases where potentially eligible or significant segments exist (within 0.25 mile or visual horizon, whichever is closer, from the Bozeman Trail) (Map 43).	Initiate mineral withdrawals in areas containing historic properties that retain their historic setting (Map 44). Close to mineral leasing areas containing historic properties that retain their historic setting.	Do not initiate mineral withdrawals in areas containing historic properties that retain their historic setting. Mitigate through appropriate stipulation such as NSO or CSU to protect the setting. Allow mineral leasing in areas containing historic properties that retain their historic setting, when appropriate mitigation is accomplished. Mitigate through appropriate stipulation such as NSO or CSU to protect the setting.	Apply NSO stipulations to fluid mineral leases containing the following historic properties (Map 45): <ul style="list-style-type: none"> ● Pumpkin Buttes ● Cantonment Reno ● Dull Knife Battle ● Crazy Woman Battle ● Contributing and Unevaluated Segments of the Bozeman Trail ● All Rock Art Sites ● All Rock Shelter Sites ● All Native American Burials Apply CSU stipulations (surface disturbance and infrastructure must either not be visible, or will result in a weak contrast) to protect the setting within 3.0 miles of the following sites: <ul style="list-style-type: none"> ● Pumpkin Buttes ● Cantonment Reno ● Dull Knife Battle ● Crazy Woman Battle ● Contributing and Unevaluated Segments of the Bozeman Trail ● All Rock Art Sites ● All Native American Burials

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Cultural-5007	HR:3.1 HR:4.1	No previous decision; considered on a project-specific basis.	Prohibit surface disturbance in areas containing historic properties, or within 5.0 miles or visual horizon (whichever is closer) of historic properties that retain their integrity of setting.	Allow surface disturbance in areas containing historic properties when appropriate mitigation is accomplished.	<p>Prohibit surface disturbance within the following sites:</p> <ul style="list-style-type: none"> ● Pumpkin Buttes ● Cantonment Reno ● Dull Knife Battle ● Crazy Woman Battle ● Contributing and Unevaluated Segments of the Bozeman Trail ● All Rock Art Sites ● All Rock Shelter Sites ● All Native American Burials <p>Allow surface disturbance and infrastructure within 3.0 miles of the following sites where development is either not visible, or will result in a weak contrast to the setting:</p> <ul style="list-style-type: none"> ● Pumpkin Buttes ● Cantonment Reno ● Dull Knife Battle ● Crazy Woman Battle ● Contributing and Unevaluated Segments of the Bozeman Trail ● All Rock Art Sites ● All Native American Burials

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Cultural-5008	HR:2.1 HR: 2.3 HR:2.4HR:3.1 HR:4.1	No previous decision; considered on a project-specific basis.	Require archeological monitors for all surface-disturbing activities. Require Native American monitors for surface-disturbing federal undertakings when requested by tribes.	Require archeological monitors for projects on a project-specific basis. Do not require Native American monitors for surface-disturbing federal undertakings.	Require archeological monitors for projects in accordance to developed strategy. Require Native American monitoring for surface-disturbing federal undertakings in accordance with agreements or on a project-specific basis
Cultural-5009	HR:1.1 HR:2.1 HR:2.2 HR:2.4	No previous decision; considered on a project-specific basis.	Establish programmatic agreements with every tribe the field office consults.	Do not establish programmatic agreements with tribes.	Establish programmatic agreements with interested tribes.
Cultural-5010	HR:2.1 HR:2.3 HR:2.4	No previous decision; considered on a project-specific basis.	Establish agreements that provide tribal access to known TCPs and sacred sites on BLM-administered surface, in coordination with stakeholders.	Establish tribal access to known TCPs and sacred sites on BLM-administered surface on a project-specific basis.	Establish agreements that provide tribal access to the Pumpkin Buttes and any other TCPs or sacred sites on BLM-administered surface, in coordination with stakeholders.
Cultural-5011	HR:2.3 HR:2.4	No previous decision; considered on a project-specific basis.	Initiate mineral withdrawals in areas containing sensitive sites such as TCPs and/or sacred sites to protect the setting. Close to mineral leasing areas containing sensitive sites such as TCPs and/or sacred sites to protect the setting.	Do not initiate mineral withdrawals in areas containing sensitive sites such as TCPs and/or sacred sites. Mitigate through appropriate stipulation such as NSO or CSU to protect the setting. Allow mineral leasing in areas containing sensitive sites such as TCPs and/or sacred sites. Mitigate through appropriate stipulations such as NSO or CSU to protect the setting.	Mitigate adverse effects to sensitive sites such as TCPs and/or sacred sites through appropriate prohibitions and measures to protect setting. Allow mineral leasing in areas containing sensitive sites such as TCPs and/or sacred sites. Mitigate through appropriate stipulations such as NSO, CSU, surface occupancy prohibitions or measures to protect setting.

Table 2.25. 5000 HERITAGE AND VISUAL RESOURCES (HR) – PALEONTOLOGICAL RESOURCES

GOAL HR:6 Paleontological resources are preserved and protected. Objectives: HR:6.1 Reduce threats to paleontological resources from natural or human-caused deterioration. HR:6.2 Implement proper assessment procedures for all surface-disturbing activities on public lands, split estate, and under all federal actions. GOAL HR:7 Paleontological resources are appreciated and scientific knowledge of paleontological resources promoted. Objectives: HR:7.1 Provide paleontological research opportunities for qualified scientists/academia. HR:7.2 Manage select paleontological sites for their educational value and to enhance the public experience.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Paleo-5001	HR:6.1 HR:6.2	Retain public lands with significant paleontological values (Map 47).			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Paleo-5002	HR:6.1 HR:6.2	No previous decision; considered on a project-specific basis.	Require paleontological field surveys on all PFYC Class 3, 4, and 5 formations potentially affected by proposed activities. Require monitoring of surface-disturbing activities on all Class 4 and 5 formations and as needed for Class 3 formations.	Require paleontological field surveys on all PFYC Class 4 and 5 formations potentially affected by proposed activities. Monitoring may be required on a project-specific basis.	Require paleontological field surveys on PFYC Class 4 and 5 formations potentially affected by proposed activities and Class 3 formations as needed. Require monitoring of surface-disturbing activities based on survey results.
Paleo-5003	HR:6.1 HR:6.2	No previous decision; considered on a project-specific basis.	Do not identify specific casual collection areas.	Identify and designate casual collection areas for common invertebrate, plant, and petrified wood fossil collection by the public.	Do not identify specific casual collection areas.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Paleo-5004	HR:7.1	No previous decision; cooperative agreements and partnerships with researchers, museums, or other institutions are established as requested by proponents.	Actively solicit research efforts throughout the planning area to identify, monitor, and gather research data on paleontological resources. Proactively develop supporting cooperative agreements and partnerships with researchers, museums or other institutions.	Evaluate and establish cooperative agreements and partnerships with researchers, museums or other institutions as requested by proponents.	Evaluate and establish cooperative agreements and partnerships with researchers, museums or other institutions where appropriate; BLM initiated or as requested by proponents.
Paleo-5005	HR:6.1 HR:6.2 HR:7.2	No previous decision; considered on a project-specific basis.	Designate areas containing paleontological resources of high quality or importance for special management, as they are identified.	Do not designate areas containing paleontological resources of high quality or importance for special management.	Designate areas containing paleontological resources of high quality or importance for special management, as they are identified.
Paleo-5006	HR:6.1 HR:6.2	No previous decision; considered on a project-specific basis.	Initiate locatable mineral withdrawals in areas containing paleontological resources of high quality or importance.	Do not initiate locatable mineral withdrawals in areas containing paleontological resources of high quality or importance.	Avoid areas containing paleontological resources of high quality or importance when developing locatable minerals.
Paleo-5007	HR:6.1 HR:6.2	No previous decision; considered on a project-specific basis.	Close to mineral leasing areas containing paleontological resources of high quality or importance.	Allow mineral leasing in areas containing paleontological resources of high quality or importance.	Apply an NSO stipulation to mineral leases in areas containing paleontological resources of high quality or importance.
Paleo-5008	HR:6.1 HR:6.2	No previous decision; considered on a project-specific basis.	Prohibit salable mineral exploration and development in areas containing paleontological resources of high quality or importance.	Allow salable mineral exploration and development in areas containing paleontological resources of high quality or importance.	Avoid areas containing paleontological resources of high quality or importance when developing salable minerals.

Table 2.26. 5000 HERITAGE AND VISUAL RESOURCES (HR) – VISUAL RESOURCES

GOAL HR:8 The scenic (visual) quality of BLM-administered lands are maintained.		
Objectives:		
HR:8.1 Perform VRI and update VRM management classes.		
HR:8.2 Manage each VRM class according to the definitions in the VRM manual (H-8410-1).		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
VRM-5001	HR:8.2	Manage WSAs under VRM Class I objectives. Any facilities or structures proposed in WSAs will be designed so as not to impair wilderness suitability. If the Middle Fork Powder River is designated by Congress as a Wild and Scenic River, the river will be managed as VRM Class I.
VRM-5002	HR:8.2	Incorporate BMPs for visual resources into project planning for federal actions.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
VRM-5003	HR:8.1 HR:8.2	Manage areas rated as VRI Class IV that do not contain special emphasis areas as VRM Class IV. Manage areas that were not rated during the VRI that contain BLM-administered surface to match the surrounding VRM classification.			
VRM-5004	HR:8.2	Require non-temporary facilities and structures to be screened, painted, and designed to blend with the surrounding landscape except where safety indicates otherwise.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
VRM-5005	HR:8.1 HR:8.2	Manage visual resources in accordance with objectives for VRM classes that have been assigned to the planning area (Map 48).	Manage all VRI Class II areas and special emphasis areas as VRM Class II (Map 49).	Manage all VRI Class II areas as VRM Class III (Map 50).	Manage VRI Class II areas (except the Powder River Breaks, Fortification Creek and northwestern portion of the Main Powder River VRI rating units) and special emphasis areas as VRM Class II (Map 51). Special emphasis areas will include: SRMAs, designated ACECs, and lands with wilderness characteristics units.
VRM-5006	HR:8.1 HR:8.2	Manage visual resources in accordance with objectives for VRM classes that have been assigned to the planning area (Map 48).	Manage all VRI Class III areas outside special emphasis areas as VRM Class III (Map 49).	Manage all VRI Class III areas as VRM Class IV (Map 50).	Manage all VRI Class III areas, plus the Powder River Breaks, Fortification Creek and northwestern portion of the Main Powder River VRI rating units (outside of special emphasis areas) as VRM Class III (Map 51).
VRM-5007	HR:8.2	No previous decision; utilize visual simulations on a project-specific basis.	Complete a visual simulation and mitigation design for all proposed actions within or viewable from VRM Classes I to III.	Utilize visual simulations on a project-specific basis.	Complete a visual simulation and mitigation design for all proposed actions within VRM Classes I and II. Visual simulation and mitigation design may be required on a project-specific basis within VRM Class III areas with high visual sensitivity.

2.9.6. 6000 LAND RESOURCES

Table 2.27. 6000 LAND RESOURCES (LR) – FOREST PRODUCTS

GOAL LR:1 Healthy forests and woodlands are available to provide a variety of products for consumptive use.					
Objectives:					
LR:1.1 Provide for diverse social and economic outputs in a fair, balanced, efficient, and ecologically sustainable manner.					
LR:1.2 Manage forests and woodlands to provide a diversity of forest products.					
LR:1.3 Cooperation with stakeholders in the utilization of silviculture and land management while implementing Wyoming Forestry BMPs.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
FP-6001	LR:1.1	Prohibit forest management activities within 200 feet of surface waters.			
FP-6002	LR:1.1 LR:1.2	Allow the sale of permits to meet the public demand for personal use of forest products consistent with wildlife habitat requirements and other resource values.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
FP-6003	LR:1.1 LR:1.2	Allow the sale of minor forest products (posts, poles, and fuelwood) from woodlands and/or noncommercial forestlands throughout the planning area on BLM-administered lands (Map 52).	Offer sawtimber only from specified forest areas (Map 52).	Offer an array of forest products from forest and woodlands throughout the planning area (Map 52).	Offer an array of forest products from forest and woodlands throughout the planning area in accordance with other resource values (Map 52).
FP-6004	LR:1.1 LR:1.2	Offer approximately 9 MMBF of sawtimber for sale from BLM-administered forestlands over the next ten years. In addition, offer approximately 1 MMBF of minor green forest products for sale over the next ten years from BLM-administered forestlands.	Manage forest product sales to remain within ecologically sustainable limits.	Manage forest product sales to maximize economic return.	Manage forest product sales to remain within ecologically sustainable limits while maximizing economic return.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
FP-6005	LR:1.3	No previous decision; access dealt with on a project-specific basis.	Require the contractor and/or partner involved in commercial sales to take responsibility for acquiring access when needed for forest management purposes.	Do not require the contractor and/or partner involved in commercial sales to take responsibility for acquiring access. BLM will negotiate and procure access when needed for forest management purposes.	Require the contractor and/or partner involved in commercial sales to take responsibility for acquiring access when needed for forest management purposes. BLM will negotiate and procure access when needed. (BLM driven project or commercial sale.)
FP-6006	LR:1.1	Limit individual clear-cuts to less than 20 acres.	Limit forest management to 5 acres per select group harvest; with the exception being the harvest and removal after catastrophic events that require removal for safety. Design all forest management and/or silvicultural practices to have meandering boundaries that follow topographic lines and natural obstacles.	Do not limit the acres and design/shape of forest management. Design select group harvests and all other methods of forest management practices to maximize the removal of harvestable products within the limits of the Wyoming Forestry BMPs and other guidance.	Design/shape forest management areas to have meandering boundaries, follow topography, avoid natural barriers, and in accordance with other resource values and within the limits of the Wyoming Forestry BMPs and other guidance without limiting the harvest area size.
FP-6007	LR:1.1 LR:1.2	Consider fencing of regeneration areas to prevent livestock from damaging seedlings.	Require fencing of regeneration areas to prevent damage to seedlings.	Do not require fencing of regeneration areas to prevent damage to seedlings.	Protect forest regeneration areas that are being damaged or in an area where damage is probable.
FP-6008	LR:1.1 LR:1.2	Plant trees on forest management areas that fail to regenerate naturally to minimum stocking levels within five years of harvest completion and rehabilitation activities.	Allow forest management areas to regenerate naturally.	Plant and maintain trees following forest management to minimum stocking levels.	Evaluate forest management areas and their successional dynamics, and where necessary implement tactics to assure regeneration (forest sustainability).
FP-6009	LR:1.1 LR:1.2	Initiate pre-commercial tree thinning on overstocked re-leasable seedling and sapling size stands.	Do not utilize pre-commercial thinning or other non-harvest silvicultural operations.	Utilize pre-commercial thinning and other silvicultural practices to create healthy and economically sustainable forest stands.	Utilize pre-commercial thinning and other silvicultural practices to create healthy and economically sustainable forest stands consistent with other resource values.

Table 2.28. 6000 LAND RESOURCES (LR) – LANDS AND REALTY

GOAL LR:2 Manage land tenure adjustments and land use authorizations to meet the needs of the customers while protecting other resource values.		
Objectives:		
LR:2.1 Develop and maintain a land-ownership pattern that improves access for public use, and improves management and protection of BLM-administered lands by:		
<ol style="list-style-type: none"> 1. Acquiring legal easements to BLM-administered lands for recreational opportunities and administrative use. 2. Responding to requests for land authorizations for access needs. 3. Responding to requests for land transfers. 4. Giving priority to land exchanges and/or sales on custodial grazing allotments while supporting other resource values. 		
LR:2.2 Through consolidation and disposal, the overall result should be no net acreage gain during the life of the RMP.		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
L&R-6001	LR:2.1	Consider R&PP applications on a project-specific basis. Prohibit subsequent uses on these lands unless they are compatible with each R&PP authorization.
L&R-6002	LR:2.1	Consider land use authorizations (permits, leases, etc.) on a project-specific basis consistent with other resource objectives.
L&R-6003	LR:2.1	Consider withdrawals for surface and/or minerals on a project-specific basis.
L&R-6004	LR:2.1	Review withdrawal proposals from other agencies on a project-specific basis.
L&R-6005	LR:2.1 LR:2.2	Lands meeting the identified disposal criteria will have priority consideration for disposal.
L&R-6006	LR:2.1	Avoid the potential of inadvertent trespass by people accessing public lands through the use of appropriate signage and access authorizations.
L&R-6007	LR:2.1	Review existing withdrawals on a case-by-case basis. Determine whether the use is consistent with the intent of the withdrawal and whether the withdrawal should be continued, modified, revoked or terminated.
L&R-6008	LR:2.1	Any land becoming unencumbered by withdrawals will be managed in a manner consistent with adjacent or comparable public land within the planning area.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
L&R-6009	LR:2.1	Review existing classification and segregations on a case-by-case basis to determine whether classification and segregation is appropriate and should be continued, modified or terminated.			
L&R-6010	LR:2.1	Land on which a classification or segregation has been terminated will be managed in a manner consistent with adjacent or comparable public land within the planning area.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
L&R-6011	LR:2.1	Acquire private or state land or interest in land from willing sellers in coordination with other resource objective, on a project-specific basis.	Acquire private or state land or interest in land from willing sellers in coordination with other resource objectives (i.e., Greater Sage-Grouse habitat).	Do not acquire private or state lands or interest in land.	Acquire private or state land or interest in land from willing sellers consistent with other resource objectives, on a project-specific basis.
L&R-6012	LR:2.1	Consider disposal of lands having agricultural potential and water by sale, exchange, or desert land entry.	Retain lands having agricultural potential, water, or other natural resource value (i.e., Greater Sage-Grouse habitat).	Dispose of lands having agricultural potential or water.	Acquire and dispose of land based on all resource values, including but not limited to agricultural potential and water. Do not classify, open, or make available any BLM-administered public lands within the planning area for agricultural leasing or agricultural entry under either Desert Land Entry or Indian Allotment for one or more of the following reasons: rugged topography, presence of sensitive resources, lack of water or access, small parcel size, and/or unsuitable soils. Greater Sage-Grouse habitat will be retained in federal management unless: (1) the agency can demonstrate that disposal of the lands will provide a net conservation benefit to the Greater Sage-Grouse or (2) the agency can demonstrate that the lands will have no direct or indirect adverse impact on conservation of the Greater Sage-Grouse.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
L&R-6013	LR:2.2	Approximately 108,243 acres of BLM-administered lands are identified for disposal (Map 53). These areas have priority consideration for exchange, public sale, or transfer of jurisdiction to another agency, subject to disposal criteria.	Retain lands identified for disposal, but having important natural resource values (i.e., Greater Sage-Grouse habitat).	Do not retain lands identified for disposal, but having important natural resource values, until all other lands identified for disposal are disposed of (Map 54).	Actively pursue a program to dispose of BLM surface lands identified for disposal including other lands not identified but meeting appropriate disposal criteria (Map 54). These areas have priority consideration for exchange, public sale, or transfer of jurisdiction to another agency, subject to disposal criteria.
L&R-6014	LR:2.2	Priority is given to acquiring land or interests in lands in areas adjacent to large blocks of BLM-administered land, especially in areas of high recreational potential like the south Big Horn Mountains.	Consider all lands within the planning area for acquisition from interested parties without giving priority to major blocks of public land, and areas of high recreational potential.	Do not acquire land in areas adjacent to major blocks of public land or areas of high recreational potential.	Prioritize acquiring land or interests in lands in areas adjacent to large blocks of BLM-administered land or other lands having significant resource or other values before other areas.
L&R-6015	LR:2.2	Pursue easements that will provide access to BLM-administered lands for recreation and administrative purposes.	Pursue easements accessing public lands that would benefit BLM management for any resource value.	Do not pursue easements to facilitate BLM management.	Pursue easements accessing public lands that would benefit any resource value.
L&R-6016	LR:2.2	No previous decision; considered on a project-specific basis.	Pursue land tenure adjustments on lands holding custodial grazing allotments and/or sales, in accordance with other resource values.	Allow land tenure adjustments for lands holding custodial grazing allotments and/or sales independent of other resource values.	Pursue land tenure adjustments on lands holding custodial grazing allotments and/or sales, in accordance with other resource values.

Table 2.29. 6000 LAND RESOURCES (LR) – RENEWABLE ENERGY

GOAL LR:3 Renewable energy development consistent with other resource values.					
Objectives:					
LR:3.1 Identify BLM-administered lands that are suitable and not suitable for renewable energy development while supporting other resource values.					
LR:3.2 In cooperation with stakeholders, provide opportunities for scientific research of renewable energy and affected resources.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
RE-6001	LR:3.2	Cooperate with stakeholders to promote opportunities for scientific research for renewable energy in accordance with other resource values.			
RE-6002	LR:3.2	Cooperate with stakeholders to coordinate renewable energy opportunities in accordance with other resource values.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
RE-6003	LR:3.1	No previous decision; considered on a project-specific basis.	Exclude renewable energy development in the following areas (730,530 acres) (Map 55): <ul style="list-style-type: none"> • Areas closed to mineral leasing (fluid and solid) • Areas closed to mineral entry (locatable and salable) • ROW exclusion areas • All other areas where surface disturbance is prohibited 	Exclude renewable energy development on 28,551 acres in accordance with management outlined in Alternative C.	Exclude renewable energy development on 352,068 acres in accordance with management outlined in Alternative D. <ul style="list-style-type: none"> • Southern Big Horn Mountains • Areas closed to mineral leasing (fluid and solid) • Areas recommended for withdrawal to mineral entry (locatable) • Areas closed to mineral material entry (salable) • ROW exclusion areas • Areas within 3.0 miles and visible from historic properties that retain an intact setting • All other areas where surface disturbance is prohibited

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
RE-6004	LR:3.1	No previous decision; considered on a project-specific basis.	<p>Avoid renewable energy development in the following areas (45,441 acres) (Map 55):</p> <ul style="list-style-type: none"> • Mineral leasing (fluid and solid), NSO, and CSU areas • ROW avoidance areas • All other areas with surface disturbance restrictions <p>Allow renewable energy development on 6,131 acres.</p>	<p>Avoid renewable energy development on 618,676 acres where inconsistent with other resource values.</p> <p>Allow renewable energy development on 134,875 acres.</p>	<p>Avoid renewable energy development on 374,518 acres in the following areas (Map 56):</p> <ul style="list-style-type: none"> • Mineral leasing (fluid and solid), NSO, and CSU areas • ROW avoidance areas • Areas greater than 3.0 miles and visible from historic properties that retain an intact setting • All other areas with surface disturbance restrictions <p>Renewable energy development would be avoided in Greater Sage-Grouse priority habitat (Core Population Areas and Core Population Connectivity Corridors), unless it can be sufficiently demonstrated that the development activity would not result in declines of Greater Sage-Grouse priority populations. Sufficient demonstration of “no declines” should be coordinated with the WGFD and USFWS.</p>

Table 2.30. 6000 LAND RESOURCES (LR) – RIGHTS-OF-WAY AND CORRIDORS

GOAL LR:4 Primary infrastructure corridors and subsidiary routes consistent with other resource values.		
Objectives:		
LR:4.1 Manage public lands to meet the needs of ROW customers while supporting other resource values.		
LR:4.2 Maintain and acquire access routes across non public lands to meet resource management and use objectives.		
LR:4.3 Identify infrastructure corridors consistent with other resource values.		
LR:4.4 Make opportunities available for exploration and development of CO ₂ sequestration research and activities, while avoiding or mitigating impacts of these activities on other resource values.		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
ROW-6001	LR:4.3	Designate corridors for major ROW to minimize surface disturbance and impacts to other resources.
ROW-6002	LR:4.2	Provide reasonable access across public land to private land, subject to other resource values.
ROW-6003	LR:4.1	Develop communication site management plans for all existing and newly identified communication site concentration areas.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
ROW-6004	LR:4.3	The preferred location for new ROW will be in or adjacent to existing disturbed areas associated with existing ROW, constructed roads, or highways.			
ROW-6005	LR:4.2	Maintain a transportation management system in cooperation with appropriate state and local agencies to meet public and resource management needs.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
ROW-6006	LR:4.1	Continue to authorize ROW grants.	<p>Make lands available for ROW in accordance with management identified within Alternative B to conserve other resources. This results in:</p> <ul style="list-style-type: none"> • 706,556 acres excluded from ROW. • 56,857 acres identified for ROW avoidance. • 18,869 acres are open for ROW development. 	<p>Make lands available for ROW in accordance with management identified within Alternative C to conserve other resources. This results in:</p> <ul style="list-style-type: none"> • 28,554 acres excluded from ROW. • 27,706 acres identified for ROW avoidance. • 725,842 acres are open for ROW development. 	<p>Make lands available for ROW in accordance with management identified within Alternative D to conserve other resources (Map 59). This results in:</p> <ul style="list-style-type: none"> • 79,777 acres excluded from ROW. • 321,149 acres identified for ROW avoidance. <p>Greater Sage-Grouse priority habitat (core population areas and core population connectivity corridors) are designated as avoidance areas for ROWs.</p> <ul style="list-style-type: none"> • 381,176 acres are open for ROW development.
ROW-6007	LR:4.1	<p>Authorize communication sites only in the Pumpkin Buttes area on South Middle Butte until that area has been fully utilized, unless the decision is waived by the authorized officer.</p> <p>Prohibit communication sites on North Middle Butte unless it becomes absolutely necessary to use that butte for the line-of-sight needs (such as microwave transmission).</p>	Prohibit new communication authorizations in the Pumpkin Buttes area. Maintain existing land use authorizations until they expire.	<p>Allow authorizations for communication sites in the Pumpkin Buttes area without first fully utilizing the South Middle Butte.</p> <p>Authorize communication sites on North Middle Butte regardless of line-of-sight needs.</p>	<p>Manage authorizations for communication sites in the Pumpkin Buttes area for the protection of cultural and visual resources.</p> <p>New authorizations would be limited to existing towers. Prohibit communication sites on North Middle Butte.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
ROW-6008	LR:4.1	No previous decision; considered on a project-specific basis.	Require new communication proposals to co-locate within existing communication sites (portable stations excluded).	Preference is to use designated communication concentration areas. Proposals outside concentration areas are not required to be co-located.	Identify and designate communication concentration areas. Evaluate proposals outside designated concentration areas and co-locate sites where feasible.
ROW-6009	LR:4.1	<p>Designate the following corridors for major ROW (Map 57):</p> <ul style="list-style-type: none"> • Echeta Road • Sheridan to Gillette, largely following US 14/16 • Highway 59 north of Gillette • Interstate 25 • Interstate 90, Gillette to Montana State Line • Powder River • Powder River Breaks (Buffalo to Gillette) <p>Corridor use is recommended, but not required. There are no restrictions on above ground lines except that lines must be buried within Greater Sage-Grouse Core Population Areas unless within 0.5 mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than 1.0 mile.</p>	<p>Designate the following corridors for major ROW transportation and utility corridor (Map 58):</p> <ul style="list-style-type: none"> • Echeta Road • Sheridan to Gillette, largely following US 14/16 • Highway 59 north of Gillette • Interstate 25 • Interstate 90, Gillette to Montana State Line • Powder River <p>Corridor use is required. No above ground lines will be authorized.</p>	<p>Designate the following corridors for major ROW transportation and utility corridor (Map 57):</p> <ul style="list-style-type: none"> • Echeta Road • Sheridan to Gillette, largely following US 14/16 • Highway 59 north of Gillette • Interstate 25 • Interstate 90, Gillette to Montana State Line • Powder River • Powder River Breaks (Buffalo to Gillette) <p>Corridor use is required. Above ground lines can be authorized in any corridor.</p>	<p>Designate the following corridors for major ROW transportation and utility use, (Map 58) in cooperation with the State of Wyoming:</p> <ul style="list-style-type: none"> • Echeta Road • Sheridan to Gillette, largely following US 14/16 • Highway 59 north of Gillette • Interstate 25 • Interstate 90, Gillette to Montana State Line • Powder River • Powder River Breaks (Buffalo to Gillette) <p>Corridor use is required. No above ground lines will be authorized in the Powder River or Powder River Breaks corridors. Lines must be buried within Greater Sage-Grouse Core Population Areas unless within 0.5 mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than 1.0 mile.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
ROW-6010	LR:4.1	No previous decision; considered on a project-specific basis.	Avoid placement of above ground facilities such as powerlines along major transportation routes to protect visual resources.	Place above ground facilities such as powerlines along major transportation routes.	Authorize and place above ground facilities (i.e., compressors, electric distribution powerlines) within ROW and other disturbance areas when resource objectives can be met.
ROW-6011	LR:4.1	Surface disturbance and occupancy will not be allowed on slopes of 25% or more.	Exclude ROW on slopes 25% or greater and highly erodible soils.	Do not exclude ROW on slopes 25% or greater and highly erodible soils.	Avoid ROW on slopes 25% or greater and highly erodible soils.
ROW-6012	LR:4.4	No previous decision.	Prohibit CO ₂ sequestration research and projects.	Allow CO ₂ sequestration research and projects where consistent with other resource values.	Evaluate CO ₂ sequestration proposals where in accordance with management identified within Alternative D.

Table 2.31. 6000 LAND RESOURCES (LR) – TRAVEL AND TRANSPORTATION MANAGEMENT

GOAL LR:5 A safe transportation network that supports other resource values.		
Objectives:		
LR:5.1 Utilize a comprehensive travel management approach to sustain and enhance access, recreational experiences, and support other resource values.		
LR:5.2 Maintain an inventory of the road and trail system.		
LR:5.3 Designate all BLM-administered lands as Open, Limited, or Closed to OHV use, in consideration of other resource values.		
LR:5.4 Provide for acceptable modes of legal public access that supports other resources, reduces conflicts, and provides for diverse recreation opportunities.		
GOAL LR:6 Opportunities for safe and enjoyable OHV use are provided while supporting other resource values.		
Objectives:		
LR:6.1 Assess OHV demand and plan for and balance the demand for OHV use with other uses.		
LR:6.2 Manage OHV use to conserve soil functionality, vegetative cover, watershed health, and other resource values.		
LR:6.3 Manage OHV use in partnership with stakeholders.		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
Trans-6001	LR:5.4	Negotiate access across non-BLM-administered lands to isolated public land parcels from willing landowners.
Trans-6002	LR:5.1 LR:5.4	Evaluate roads constructed under other initiatives (e.g., oil and gas exploration) for inclusion in the BLM transportation system. Roads that are no longer needed for their original purposes are assessed for addition to the BLM transportation system prior to reclamation.
Trans-6003	LR:5.1	Require maintenance of all designated routes to meet or exceed BLM standards according to the road classification (i.e. road, primitive road, trail) assigned in FAMS.
Trans-6004	LR:5.1	Design, construct, and maintain roads or trails based on the specific objectives for that trail or road in consideration of other resources. Design, construct, and maintain roads to minimize surface disturbance, changes to surface water runoff, and erosion.
Trans-6005	LR:5.1 LR:5.4	All motorized use, except emergency response, will be subject to the Open, Closed and Limited OHV area designations, unless specifically addressed in an authorization or otherwise approved by the authorized officer.
Trans-6006	LR:5.1 LR:5.4	Base road or trail closures and abandonments on resource protection, demand for new roads and accommodation of authorized uses.
Trans-6007	LR:5.4 LR:6.1 LR:6.2 LR:6.3	Maintain transportation system roads under BLM jurisdiction in accordance with assigned maintenance levels and in consideration of other resource values. Maintain administrative roads on an as needed basis, dependent on time, funding, and access priorities.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
Trans-6008	LR:5.2	Within 5 years of the ROD, inventory all routes on public land and develop a travel management plan to classify and designate routes for continued use or decommissioning and reclamation. Include maintenance standards for routes to be retained for public use, as well as specific measures to accomplish road closure in the travel management plan. Inventory, designate, number, and sign all routes as appropriate. Posted signs will include allowed uses and activities. Restrictions to existing roads and trails remains in effect until travel management planning is completed and designated routes are identified.
Trans-6009	LR:5.1 LR:6.3	Establish TMAs for locations receiving intensive use or areas where resource damage is imminent.
Trans-6010	LR:5.3	Restrict OHV use to signed roads in areas limited to designated roads and trails.
Trans-6011	LR:5.1 LR:5.4	Consider ways to allow motorized access for people with disabilities under section 504 of the Rehabilitation Act of 1973.
Trans-6012	LR:5.4	Identify areas appropriate for providing access for people with disabilities for recreational activities. Prioritize trails appropriate for upgrades that make them ADA compliant.
Trans-6013	LR:5.1 LR:5.3	<p>Allow temporary closures to motorized vehicle use in areas that pose public health and safety risks, and/or where resource damage is imminent.</p> <p>In Greater Sage-Grouse priority habitat (core population areas and core population connectivity corridors) and general habitat, temporary closures will be considered in accordance with 43 CFR subpart 8364 (Closures and Restrictions); 43 CFR subpart 8351 (Designated National Area); 43 CFR subpart 6302 (Use of Wilderness Areas, Prohibited Acts, and Penalties); 43 CFR subpart 8341 (Conditions of Use).</p> <p>Temporary closure or restriction orders under these authorities are enacted at the discretion of the authorized officer to resolve management conflicts and protect persons, property, and public lands and resources. Where an authorized officer determines that off-highway vehicles are causing or will cause considerable adverse effects upon soil, vegetation, wildlife, wildlife habitat, cultural resources, historical resources, threatened or endangered species, wilderness suitability, other authorized uses, or other resources, the affected areas shall be immediately closed to the type(s) of vehicle causing the adverse effect until the adverse effects are eliminated and measures implemented to prevent recurrence. (43 CFR 8341.2) A closure or restriction order should be considered only after other management strategies and alternatives have been explored. The duration of temporary closure or restriction orders should be limited to 24 months or less; however, certain situations may require longer closures and/or iterative temporary closures. This may include closure of routes or areas.”</p>
Trans-6014	LR:5.3	Limit OHV use to designated routes unless compelling reasons exist to classify parcels as Open or Closed, and is consistent with other resource values. Until individual routes are designated, areas subject to route designation will be classified as Limited to existing routes (Map 60). Once route designation is completed, areas will no longer be classified as Limited to existing routes.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Trans-6015	LR:5.1 LR:5.2 LR:5.4 LR:6.1	Consider nominations from the public for appropriate OHV use areas, consistent with other resource values.			
Trans-6016	LR:5.1 LR:5.3 LR:6.1 LR:6.2	Prohibit motorized travel if damage to vegetation, soils, or water quality would result.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Trans-6017	LR:6.2	Open stock driveways and stock rests to motorized vehicle use.	Limit motorized vehicle use to designated routes within stock driveways.	Open stock driveways and stock rests to motorized vehicle use.	Allow OHV use only on designated routes within stock driveways for the general public and in additional areas within stock driveways and rests under a trailing permit.
Trans-6018	LR:6.2	No previous decision; considered on a project-specific basis.	Allow over-the-snow vehicle use consistent with motorized use designations when snow cover is sufficient to prevent resource damage.	Allow over-the-snow vehicle use when snow cover is sufficient to prevent resource damage.	Allow over-the-snow vehicle use consistent with OHV use designations when snow cover is sufficient to prevent resource damage.
Trans-6019	LR:6.2	No previous decision; considered on a project-specific basis.	Close areas within habitat of special status species to motorized vehicle use..	Allow motorized vehicle use within habitat of special status species consistent with travel management designations for that area.	Limit motorized vehicle use to designated routes within habitat of special status species consistent with travel management designations for that area. Routes will be designated to avoid occupied habitat during travel management planning.
Trans-6020	LR:5.1 LR:5.4	No previous decision; considered on a project-specific basis.	Evaluate existing routes in the vicinity of any new system roads for closure and reclamation consistent with other resource values.	Do not close and reclaim existing routes in the vicinity of any new system roads.	Evaluate existing routes in the vicinity of any new system roads for closure and reclamation consistent with other resource values.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Trans-6021	LR:5.3	<p>Areas where OHV use is Closed (approximately 3,650 acres) are defined in the corresponding special designation and resource alternatives, and also include (Map 65):</p> <ul style="list-style-type: none"> • Middle Fork Canyon 6.0 miles southwest of Barnum • Cantonment Reno 20 miles northwest of Kaycee • Dry Creek Petrified Tree EEA 9.0 miles east of Buffalo 	<p>Close areas to motorized vehicle use to protect sensitive resources as defined in the corresponding special designation and resource sections of Alternative B (625,854 acres) and in addition include (Map 66):</p> <ul style="list-style-type: none"> • Wilderness Study Areas • Lands with wilderness characteristics • Habitat for sensitive plant and wildlife species • Middle Fork Canyon • Cantonment Reno ACEC • Dry Creek Petrified Tree EEA • A 500-foot buffer of designated nonmotorized trails 	<p>Close areas to motorized vehicle use to protect sensitive resources as defined in the corresponding special designation and resource sections of Alternative C and no additional areas (28,931 acres) (Map 67).</p>	<p>Close areas to motorized vehicle use to protect sensitive resources as defined in the corresponding special designation and resource sections of Alternative D (37,389 acres) and in addition include (Map 68):</p> <ul style="list-style-type: none"> • Wilderness Study Areas • Lands with wilderness characteristics identified for special management • Middle Fork Canyon • Cantonment Reno • Dry Creek Petrified Tree EEA • A 500-foot buffer of designated nonmotorized trails
Trans-6022	LR:5.3	<p>Limit OHV use to existing or designated roads and trails (737,166 acres) (Map 65).</p>	<p>Limit motorized vehicle travel to designated roads and trails in 137,126 acres, consistent with other resource values in Alternative B (Map 66).</p>	<p>Limit motorized vehicle travel to designated roads and trails in 723,497 acres, consistent with other resource values in Alternative C (Map 67).</p>	<p>Limit motorized vehicle travel to designated roads and trails in 661,729 acres, consistent with other resource values in Alternative D (Map 68).</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Trans-6023	LR:5.3	<p>Areas where motorized vehicle use is Closed (approximately 37,646 acres) from November 15 to April 30 include (Map 65):</p> <ul style="list-style-type: none"> • North Fork Powder River area 10 miles northwest of Barnum • Barnum Mountain 6.0 miles west of Barnum • A portion of the Middle Fork Management Area 12 miles southwest of Barnum • Fortification Creek Area, including portions of WSA <p>Note: The Ed O. Taylor is Closed for winter, following the hunting season.</p>	<p>Prohibit motorized vehicle use from November 15 to April 30 within the following areas (Map 66):</p> <ul style="list-style-type: none"> • Big game crucial winter ranges 	<p>Prohibit motorized vehicle use from November 15 to April 30 within the following areas (Map 67):</p> <ul style="list-style-type: none"> • Big game crucial winter ranges in the Southern Big Horns 	<p>Protect wintering big game by seasonally prohibiting motorized vehicle use within big game crucial winter ranges in accordance with WGFD recommendations (presently November 15 or December 1 to April 30) (Map 68).</p>
Trans-6024	LR:5.3	No previous decision; considered on a project-specific basis.	Prohibit motorized vehicle use from May 1 to June 30 within big game calving areas.	Do not prohibit motorized vehicle use seasonally within big game calving areas.	Protect big game by seasonally prohibiting motorized vehicle use within big game calving areas in accordance with WGFD recommendations (presently May 1 to June 30).
Trans-6025	LR:5.1 LR:5.3 LR:6.2	No previous decision; considered on a project-specific basis.	Allow motorized travel off designated routes only under a special use permit (grazing lessee, administrative use, etc.).	Allow motorized travel not causing resource damage, to go up to 300 feet off designated routes, for necessary tasks.	Allow motorized travel not causing resource damage to go up to 300 feet off designated routes for dispersed camping and game retrieval, where consistent with travel management designations in defined areas (activities under administrative permits excluded) (Map 60).

Table 2.32. 6000 LAND RESOURCES (LR) – RECREATION

GOAL LR:7 Diverse recreational opportunities are provided.		
Objectives:		
LR:7.1 Manage SRMAs and ERMA's in partnership with stakeholders.		
LR:7.2 Manage recreation to protect resources, maintain public health and safety, and to provide a diverse array of benefits to the public.		
LR:7.3 Manage recreation opportunities to maintain a minimal level of user conflict.		
GOAL LR:8 Recreation facilities balance public demand with other resource values.		
Objective:		
LR:8.1 Design and maintain recreation sites to meet acceptable health and safety standards while supporting other resource values.		
GOAL LR:9 Awareness, education, and support for BFO recreation programs and opportunities.		
Objective:		
LR:9.1 Emphasize and support collaborative public outreach.		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
Rec-6001	LR:7.1 LR:7.2	Develop or revise RAMPs for the SRMAs and ERMA's as public demand and management needs dictate.
Rec-6002	LR:7.2	Allow casual use of the public land for hiking, bicycling, hunting, fishing, camping and similar uses.
Rec-6003	LR:7.2 LR:8.1 LR:9.1	Open the planning area to dispersed recreation where consistent with other resource values.
Rec-6004	LR:9.1	Provide general and interpretive information as well as information designed to prevent trespass to visitors of SRMAs and other high-use recreation areas.
Rec-6005	LR:8.1	Maintain existing facilities consistent with the recreational setting.
Rec-6006	LR:7.2	Provide diverse recreational opportunities in cooperation with a variety of user groups.
Rec-6007	LR:9.1	Work with state, local groups, and adjacent landowners to identify and develop recreational facilities and trails and to improve public access to public lands.
Rec-6008	LR:7.2 LR:8.1	Design any new recreation facilities within a SRMA to be ADA compliant. Upgrade existing recreation facilities to be ADA compliant as time and funding allow.
Rec-6009	LR:7.2	Pursue access to public lands for recreational purposes.
Rec-6010	LR:7.2	Avoid riparian habitat or develop and manage recreational sites, recreation facilities, and recreational access in a manner that minimizes impacts to riparian habitats.
Rec-6011	LR:7.2	Prohibit dispersed camping and commercial camps within 200 feet of perennial surface water.
Rec-6012	LR:7.2	Manage access to caves for recreationists under a Cave Management Plan.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Rec-6013	LR:7.2	Use the best available technology to minimize noise and light pollution potentially affecting recreation facilities and sites.			
Rec-6014	LR:7.2	Close developed recreation sites such as picnic areas, campgrounds, and environmental education areas to livestock grazing.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Rec-6015	LR:7.3 LR:8.1	No previous decision; considered on a project-specific basis.	Limit development of additional recreation facilities to SRMAs and other high-use areas.	Allow additional recreation facilities in areas where they are supported by recreational use and are consistent with other resource values.	Allow additional recreation facilities in areas where they are supported by recreational use and are consistent with other resource values. In Greater Sage-Grouse priority habitat (core population areas and core population connectivity corridors), do not construct new recreation facilities (e.g., campgrounds, trails, trailheads, staging areas) unless the development would have a net conservation gain to Greater Sage-Grouse habitat (such as concentrating recreation, diverting use away from important areas, etc.), or unless the development is required for visitor health and safety or resource protection.
Rec-6016	LR:7.2 LR:7.3	Camping is limited to 14 days at any one spot.	Allow camping, unless otherwise posted, for no more than 14 days within any period of 28 consecutive days. After this period, the visitor must relocate to another site at least 5.0 miles away.	Allow camping, unless otherwise posted, for no more than a period of 14 days within any period of 28 consecutive days. After this period, the visitor must relocate to another site at least 1.0 mile away.	Allow camping for no more than 14 days within any 28 consecutive days. After reaching this time limit, the visitor must relocate to another site at least 1.0 mile away.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Rec-6017	LR:7.1	No previous decision; the planning area has been managed as one ERMA with several developed recreation sites and trails.	<p>Divide the planning area into the following ERMA (Map 69):</p> <ul style="list-style-type: none"> • Southern Big Horns ERMA (128,761 acres): Lands south of the Bighorn National Forest and west of I-25 in southwestern Johnson County (excludes Middle Fork and Hole-in-the-Wall SRMAs) • Buffalo ERMA (597,812 acres): This ERMA includes the remainder of the planning area not included in the Southern Big Horns ERMA or the designated SRMAs. <p>Recreation opportunities in ERMA's will be allowed that are in concert with protecting cultural and visual resources and sustaining the biological integrity of habitats for plant, wildlife, and fish species. In sensitive areas, recreation use could be limited.</p>	Do not designate any ERMA's. Address recreation issues outside of SRMAs on a case-by-case basis through site-specific analysis.	<p>Divide the planning area into the following ERMA (Map 71):</p> <ul style="list-style-type: none"> • Cabin Canyon (1,369 acres): Includes lands adjacent to State of Wyoming lands north of Bishop Road. • Face of the Bighorns/North Fork ERMA (34,477 acres): Includes lands from the Poison Creek Trail area south along the Face of the Bighorns, the Horn, and the North Fork WSA. • Gardner Mountain ERMA (55,181 acres): Includes lands along and south of the Mayoworth-Slip Road and north of Barnum Mountain Road. • Kaycee Stockrest ERMA (2,685 acres) • North Bighorns ERMA (2,926 acres): Includes parcels in Sheridan County adjacent to the Bighorn National Forest. • Powder River Basin ERMA (224,483 acres): This ERMA includes the public lands in the planning area with reasonable public access of sufficient size to support recreation that are not included in the other ERMA's or SRMAs.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> • Southern Bighorns ERMA (25,535 acres): Lands in southwestern Johnson County adjacent to the Middle Fork Powder River and Hole-in-the-Wall SRMAs. • Walk-in Area ERMA (3,007 acres): Includes BLM-administered lands adjacent to WGFD walk-in areas not designated in another SRMA or ERMA. <p>Strategically emphasize a variety of recreation opportunities along with the protection of natural and cultural resources. R&VS management will be recognized as an important affected resource in ERMAs. ERMAs will be managed to allow continued recreation opportunities and to protect RSCs in concert with other resource values or uses.</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Rec-6018	LR:7.1	<p>No SRMAs have been previously designated. Recreation and/or interpretation decisions were applied to the following areas:</p> <ul style="list-style-type: none"> • South Big Horns • Gardner Mountain WSA • North Fork WSA • Dry Creek Petrified Tree • Fortification Creek • Weston Hills • Mosier Gulch • Cantonment Reno • Bozeman Trail and Crazy Woman Battle Site 	<p>Designate the following areas as SRMAs and delineate discrete recreation management zone boundaries (Map 69):</p> <ul style="list-style-type: none"> • Burnt Hollow (17,280 acres) • Cabin Canyon (1,369 acres) • Dry Creek Petrified Tree (2,567 acres) • Hole-in-the-Wall (11,952 acres) • Middle Fork Powder River (10,083 acres) • Mosier Gulch (1,026 acres) • Welch Ranch (1,748 acres) • Weston Hills (9,504 acres) <p>Emphasize recreation opportunities in SRMAs that are in concert with protecting cultural and visual resources and sustaining the biological integrity of habitats for plant, wildlife, and fish species. In sensitive areas, recreation use could be limited to protect natural and cultural resources.</p>	<p>Designate the following areas as SRMAs and delineate discrete recreation management zone boundaries (Map 70):</p> <ul style="list-style-type: none"> • Burnt Hollow (17,280 acres) • Dry Creek Petrified Tree (2,567 acres) • Middle Fork Powder River (1,294 acres) • Mosier Gulch (868 acres) • Welch Ranch (1,748 acres) • Weston Hills (9,504 acres) <p>Emphasize managing BLM-administered lands for a variety of structured and dispersed recreational opportunities in a manner favorable to accommodate the maximum amount of recreation use in combination with other BLM land uses, in order to produce social and economic benefits.</p>	<p>Designate the following areas as SRMAs and delineate discrete recreation management zone boundaries (Map 71):</p> <ul style="list-style-type: none"> • Burnt Hollow (17,280 acres) • Dry Creek Petrified Tree (2,567 acres) • Hole-in-the-Wall (11,952 acres) • Middle Fork Powder River (10,083 acres) • Mosier Gulch (1,026 acres) • Welch Ranch (1,748 acres) • Weston Hills (9,504 acres) <p>Strategically emphasize a variety of recreation opportunities along with the protection of natural and cultural resources. R&VS management will be recognized as the predominant land use focus in SRMAs. Manage SRMAs under site specific management plans. Site specific management plans will be consistent with and implement the provisions specified for SRMAs in Appendix T (p. 2543).</p>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Rec-6019	LR:7.1 LR:7.2 LR:8.1	Oil and gas leasing and development are not allowed in the Mosier Gulch Recreation Area. Surface disturbance or occupancy is prohibited within 0.5 mile of the Dry Creek Petrified Tree site unless waived by the authorized officer.	Do not lease minerals within the boundary of a designated SRMA.	Lease fluid minerals with a CSU stipulation to be consistent with SRMA management objectives in all SRMAs.	Do not lease minerals within the boundary of the following SRMAs: <ul style="list-style-type: none"> ● Burnt Hollow (17,280 acres) ● Dry Creek Petrified Tree (2,567 acres) ● Hole-in-the-Wall (11,952 acres) ● Middle Fork Powder River (10,083 acres) ● Mosier Gulch (1,026 acres) ● Welch Ranch (1,748 acres) Lease fluid minerals with a CSU stipulation to be consistent with SRMA management in the following SRMAs: <ul style="list-style-type: none"> ● Weston Hills (9,504 acres)
Rec-6020	LR:7.1 LR:7.2 LR:8.1	Prohibit surface disturbance or occupancy within a 0.5 mile of Dry Creek Petrified Tree Environmental Education Area, unless waived by the authorized officer.	Institute a 0.5-mile buffer from mineral leasing surrounding SRMAs.	Do not institute a mineral leasing buffer surrounding SRMAs.	Do not institute a mineral leasing buffer surrounding SRMAs.
Rec-6021	LR:7.1 LR:7.2 LR:8.1	Prohibit surface disturbance or occupancy within 0.5 mile of Dry Creek Petrified Tree Environmental Education Area, unless waived by the authorized officer.	Prohibit surface disturbance within designated SRMAs unless for administrative use and consistent with other resource values.	Allow surface disturbance within designated SRMAs consistent with other resource values.	Allow surface disturbance within designated SRMAs for administrative use only, where consistent with other resource values.
Rec-6022	LR:7.1 LR:7.2 LR:8.1	Pursue withdrawals from appropriation under the mining laws in recreation areas and SRMAs on a project-specific basis.	Recommend withdrawals from appropriation under the mining laws in designated SRMAs.	Do not recommend withdrawals from appropriation under the mining laws in designated SRMAs.	Recommend withdrawals from mineral entry under the mining laws in designated SRMAs.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Rec-6023	LR:7.1 LR:7.2 LR:8.1	Allow salable mineral development within recreation areas and SRMAs on a project-specific basis.	Allow salable mineral development within designated SRMAs for administrative use only.	Allow salable mineral development within designated SRMAs consistent with other resource values.	Allow salable mineral development within designated SRMAs for administrative use only.
Rec-6024	LR:7.2 LR:7.3	Allow licensed motor vehicles on existing and designated routes without requiring a fee or permit. ORV permits are required for non-licensed vehicles on designated routes enrolled in the Wyoming Trails Program.	Evaluate fees for access to eligible areas, as allowed by the Federal Lands Recreation Enhancement Act.	Do not evaluate fees for access to eligible areas, as allowed by the Federal Lands Recreation Enhancement Act.	Evaluate fees for access to eligible areas, as allowed by the Federal Lands Recreation Enhancement Act, when resource condition and/or documented public desire for expanded services are warranted.
Rec-6025	LR:7.2 LR:7.3 LR 8.1	Recreational target shooting (excludes hunting) is generally allowed on BLM-administered lands that have not been administratively closed. Decisions to limit or close areas to recreational target shooting have been implemented at: <ul style="list-style-type: none"> ● Burnt Hollow (17,280 acres) ● Welch Ranch (1,748 acres) ● Weston Hills (9,464 acres) 	Make ERMA's available (open) for recreational shooting; close all SRMAs (55,529 acres) to recreational shooting.	All BLM-administered surface within the planning area is open to recreational target shooting, except where prohibited for human health and safety by state or federal law.	Close the following areas to recreational target shooting to protect natural and cultural resources, promote human health and safety, and reduce user conflicts: <ul style="list-style-type: none"> ● Burnt Hollow (17,280 acres) ● Welch Ranch (1,748 acres) <i>Note: All developed recreation sites (including trailheads, picnic areas, etc.) are closed to target shooting per 43 CFR 8365.2-5(a).</i>

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
		<i>Note: All developed recreation sites (including trailheads, picnic areas, etc.) are closed to target shooting per 43 CFR 8365.2-5(a).</i>			<p>Establish RMA standards and indicators, monitor recreational target shooting and increase education and enforcement of target shooting regulations in the following RMAs:</p> <ul style="list-style-type: none"> ● Cabin Canyon (1,369 acres) ● Dry Creek Petrified Tree (2,567 acres) ● Hole-in-the-Wall (11,952 acres) ● Kaycee Stockrest ERMA (2,685 acres) ● Middle Fork Powder River (10,083 acres) ● Mosier Gulch (1,026 acres) ● Walk-in Area ERMA (3,007 acres): Includes BLM-administered lands adjacent to WGFD walk-in areas not designated in another SRMA or ERMA. ● Weston Hills (9,504 acres) <p>Establish partnerships with shooting sports advocacy organizations or other interested agencies or organizations to accommodate opportunities for shooting sports on public lands, where consistent with other resource values.</p>

Table 2.33. 6000 LAND RESOURCES (LR) – LANDS WITH WILDERNESS CHARACTERISTICS

GOAL LR:10 All lands that have wilderness characteristics have been identified, evaluated, and management determined.					
Objectives:					
LR:10.1 Assess all BLM-administered lands for potential areas containing wilderness characteristics.					
LR:10.2 Inventory areas identified as possessing wilderness characteristics and determine appropriate management.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
LWC-6001	LR:10.1 LR:10.2	Evaluate newly acquired lands, and other parcels meeting the size and naturalness requirements for wilderness characteristics.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
LWC-6002	LR:10.2	No previous decision; considered on a project-specific basis.	<p>Manage lands with wilderness characteristics (Map 73) to emphasize primitive recreational opportunities and natural values (12,237 acres).</p> <p>Management would include:</p> <ul style="list-style-type: none"> • Close or limit motorized vehicles to designated roads and trails • Managing for visual resources as Class II • Closing the area to mineral leasing (fluid and solid) • Recommending withdrawal to locatable mineral entry • Closing the areas to salable mineral development • Excluding ROW • Prohibiting renewable energy development • Commercial woodcutting would be prohibited unless it is a byproduct of an environmental restoration effort. 	Do not apply any special restrictions related to lands with wilderness characteristics. Manage lands with wilderness characteristics to follow the general management outlined in Alternative C of this RMP.	<p>Manage lands with wilderness characteristics (Map 74) to emphasize ecosystem health, natural values, and primitive recreational opportunities (6,864 acres).</p> <p>The lands with wilderness characteristics area will be managed to protect wilderness characteristics. Management would include:</p> <ul style="list-style-type: none"> • Closing the area to motorized use • Managing for visual resources as Class II • Leasing fluid minerals with a NSO stipulation with no exceptions, modifications or waivers • Recommending withdrawal to locatable mineral entry • Closing the areas to salable mineral development • Excluding ROW • Prohibiting renewable energy development

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
			<ul style="list-style-type: none"> Prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the area's natural values. 		<ul style="list-style-type: none"> Prohibit Commercial woodcutting would be prohibited unless it is a byproduct of an environmental restoration effort. Prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the area's natural values.

Table 2.34. 6000 LAND RESOURCES (LR) – LIVESTOCK GRAZING MANAGEMENT

GOAL LR:11 Public rangelands provide for a sustainable level of livestock grazing consistent with other resource values and sustained yield.		
Objectives:		
LR:11.1 Continue livestock grazing on available BLM-administered lands.		
LR:11.2 Manage forage to maintain or improve ecological states and achieve and/or maintain Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming.		
LR:11.3 Monitor and evaluate rangeland health and condition in coordination with cooperators, and lessees to determine if, and what additional management is needed to achieve desired ecological state.		
LR:11.4 Emphasize the use of mechanical, chemical, and biological methods, as well as fire and livestock grazing to achieve desired ecological state.		
LR:11.5 Continue the existence and use of stock driveways and other stock driveway withdrawals.		
LR:11.6 Identify and implement opportunities for vegetation improvements to increase the number of AUMs available for livestock grazing to support and sustain the economies of local communities.		
LR:11.7 Create and maintain reserve common allotments or pastures for temporary grazing purposes to facilitate another allotment in attaining management objectives.		
LR:11.8 In coordination with cooperators and lessees develop and implement allotment management plans, where feasible. Emphasis to be placed on Category I allotments.		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
Grazing-6001	LR:11.1 LR:11.2 LR:11.3 LR:11.4 LR:11.6 LR:11.7 LR:11.8	Develop and implement appropriate livestock grazing management actions to achieve the Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming, to provide watershed protection, to improve forage for livestock, forage and habitat for wildlife, and enhance rangeland health.
Grazing-6002	LR:11.1 LR:11.2 LR:11.3 LR:11.4 LR:11.6 LR:11.8	Continue to authorize appropriate amounts, kinds, and seasons of use. Forage allocations in grazing leases can be adjusted when supported by monitoring, field observations, rangeland health standards assessment/evaluation results, or other data acceptable to the authorized officer. Category C allotments have a low priority, Category M allotments have a medium priority, and Category I allotments have a high priority for monitoring and funding of range improvement projects.
Grazing-6003	LR:11.1 LR:11.3 LR:11.8	Continue the M, C, and I allotment categorization designations (Map 72).
Grazing-6004	LR:11.1 LR:11.2 LR:11.3 LR:11.4 LR:11.6 LR:11.8	Continue implementation of existing AMPs. Develop and implement new AMPs with grazing lessees and other stakeholders to achieve desired resource goals and objectives.
Grazing-6005	LR:11.1 LR:11.2 LR:11.3 LR:11.8	Manage livestock grazing to sustain riparian, wetland, mountain mahogany, specials status species, or other special habitats.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Grazing-6006	LR:11.1 LR:11.2 LR:11.3	Manage Category C allotments to continue authorized livestock use.			
Grazing-6007	LR:11.1 LR:11.2 LR:11.3 LR:11.4 LR:11.6 LR:11.7 LR:11.8	Construct reservoirs, wells, troughs and pipelines to provide water to disperse grazing use. The grazing lessee or other cooperator will be required to maintain water in troughs located on public land during the frost-free period (April through October) for wildlife.			
Grazing-6008	LR:11.1 LR:11.5	Retain designated stock driveways and livestock trails. Consider any stock driveway designation change on a project-specific basis and analyze through an environmental assessment.			
Grazing-6009	LR:11.1 LR:11.2 LR:11.3 LR:11.7 LR:11.8	Implement strategies that best protect rangeland resources during periods of drought. Cooperate with stakeholders for voluntary adjustments in livestock use and/or livestock management.			
Grazing-6010	LR:11.2 LR:11.4	Rest prescribed burn areas from livestock grazing prior to treatment when necessary to increase or maintain fuels for burning.			
Grazing-6011	LR:11.2 LR:11.3 LR:11.4	Authorize OHV travel for maintaining range improvements and animal husbandry activities by the grazing lessee and his/her agent, consistent with other management actions, as long as resource damage does not occur or new routes created.			
Grazing-6012	LR:11.2 LR:11.4	Avoid creating concentrations of livestock in areas of known eligible and unevaluated cultural sites. (salt blocks, water source)			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Grazing-6013	LR:11.1 LR:11.3	Suspend or adjust livestock grazing use in areas where forest management has occurred whenever grazing would impair forest regeneration.	Restoration treatments may include actions to reduce or eliminate potential grazing impacts to meet regeneration objectives following forest management.	Restoration treatments will not include actions to reduce or eliminate potential grazing impacts to meet regeneration objectives following forest management.	Restoration treatments may include actions to reduce or eliminate potential grazing impacts to meet regeneration objectives following forest management.
Grazing-6014	LR:11.1 LR:11.2 LR:11.3 LR:11.4 LR:11.6	Manage Category M allotments to continue the current authorized livestock use on 98 "M" allotments at 43,573 AUMs.	Manage Category M allotments to achieve multiple resource health and objectives.	Manage Category M allotments to achieve livestock management objectives only.	Manage Category M allotments to achieve multiple resource health and objectives.
Grazing-6015	LR:11.1 LR:11.2 LR:11.6	Allow development of range improvements. Establish resource monitoring studies as necessary to detect undesirable changes in the current satisfactory resource conditions.	Develop range improvements for Category M allotments in accordance with resource needs and livestock management.	Develop range improvements for Category M allotments that are lessee proposed and funded only.	Develop range improvements in accordance with resource needs and livestock management.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Grazing-6016	LR:11.1 LR:11.2 LR:11.3 LR:11.4 LR:11.6 LR:11.8	<p>Manage Category I allotments as described below. Conduct baseline inventories. Develop, implement, and monitor AMPs.</p> <p>After range condition class has been upgraded to "good" on allotments now rated "poor" to "fair," allocate the increased available forage first to wildlife to meet the population objectives of the WGFD. Any of the increased forage not needed for wildlife will be available to be licensed for livestock use.</p>	Base AMP goals/objectives on multiple resource health and livestock management in Category I allotments.	Base AMP goals/objectives on livestock management only in Category I allotments.	Conduct baseline inventories. Develop, implement, and monitor AMPs. Base AMP goals/objectives in Category I and M allotments on resource protection and watershed health.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Grazing-6017	LR:11.1 LR:11.2 LR:11.3 LR:11.7	Livestock grazing is not authorized on about 4,000 acres of public land located in the canyons and slopes of the southern Big Horn Mountains because of the rough terrain and steep slopes. Livestock grazing is allowed on all public lands in the resource area except on about 6,000 acres (1%) where it has been determined to be incompatible with other resource uses or values.	Limit or prohibit livestock grazing where it has been determined to be incompatible with other resource values as proposed under this alternative. 467,897 acres are incompatible and 314,205 acres are available to livestock grazing.	Limit or prohibit livestock grazing only in those areas where it is currently prohibited. 4,587 acres are incompatible and 777,515 acres are available to livestock grazing.	Allow livestock grazing on all public lands in the planning area except where an evaluation has determined it to be incompatible with other resource uses or values (campgrounds, entrances of caves, sites of cultural significance). <ul style="list-style-type: none"> The BLM will prioritize (1) the review of grazing permits/leases, in particular to determine if modification is necessary prior to renewal, and (2) the processing of grazing permits/leases in Greater Sage-Grouse priority habitat (core population areas and core population connectivity corridors) followed by general habitat. In setting workload priorities, precedence will be given to existing permits/leases in these areas not meeting Land Health Standards, with focus on those containing riparian areas, including wet meadows. The BLM may use other criteria for prioritization to respond to urgent natural resource concerns (ex., fire) and legal obligations.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none">• The NEPA analysis for renewals and modifications of livestock grazing permits/leases that include lands within PHMAs will include specific management thresholds based on Greater Sage-Grouse Habitat Objectives Table and Land Health Standards (43 CFR 4180.2) and one or more defined responses that will allow the authorizing officer to make adjustments to livestock grazing that have already been subjected to NEPA analysis.• Allotments within priority habitat (core population areas and core population connectivity corridors), and focusing on those containing riparian areas, including wet meadows, will be prioritized for field checks to help ensure compliance with the terms and conditions of the grazing permits. Field checks could include monitoring for actual use, utilization, and use supervision.

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
					<ul style="list-style-type: none"> At the time a permittee or lessee voluntarily relinquishes a permit or lease, the BLM will consider whether <i>the public lands where that permitted use was authorized should remain available for livestock grazing or be used for other resource management objectives, such as reserve common allotments or fuel breaks.</i> <p>9,992 acres are incompatible and 772,110 acres are available to livestock grazing.</p>
Grazing-6018	LR:11.1 LR:11.2 LR:11.3 LR:11.6	Any permanent increases in the amount of forage produced are considered for wildlife and watershed protection before additional livestock use is authorized.	Authorize permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority, livestock grazing second.	Authorize permanent increases in forage allocations to livestock grazing as the first priority, wildlife habitat and watershed protection second.	<p>Permanent forage allocations would consider watershed protection, livestock grazing, wildlife habitat, and other resource values.</p> <p>Increases in vegetative production would be allocated for watershed protection first, then for forage and habitat.</p>
Grazing-6019	LR:11.1 LR:11.3 LR:11.6	No previous decision; considered on a project-specific basis.	Locate livestock salt or mineral supplements a minimum of 0.5 mile away from water sources, riparian areas, and aspen stands.	Locate livestock salt or mineral supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands.	Locate livestock salt or mineral supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands.
Grazing-6020	LR:11.1 LR:11.2 LR:11.4 LR:11.7	No previous decision; considered on a project-specific basis.	Designate and manage future Resource Reserve common allotments as needed. Develop management criteria for reserve common allotments at the time of designation.	Do not designate reserve common allotments.	Designate and manage future reserve common allotments as needed. Develop management criteria for the reserve common allotments at the time of designation

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Grazing-6021	LR:11.1 LR:11.2 LR:11.3 LR:11.4 LR:11.6 LR:11.7	Livestock grazing strategies on vegetative treatment areas generally include rest the first year following treatments and deferment of livestock grazing the second year.	Provide a minimum of two years rest from livestock grazing following prescribed burns and other vegetative treatments. Allow additional rest where necessary to achieve resource goals and objectives.	Provide a maximum of two growing seasons rest from livestock grazing following prescribed burns and other vegetative treatments.	Provide rest/deferment from livestock grazing following wildfire, prescribed burns, and other vegetative treatments until resource objectives are met.
Grazing-6022	LR:11.1 LR:11.2 LR:11.3 LR:11.4	No previous decision; considered on a project-specific basis.	Prohibit increases in livestock stocking rates as a result of vegetation treatments.	Allow increases in livestock stocking rates as a result of vegetation treatments.	Allow increases in livestock stocking rates as a result of vegetation treatments when resource objectives are met.

2.9.7. 7000 SPECIAL DESIGNATIONS

Table 2.35. 7000 SPECIAL DESIGNATIONS (SD) – AREAS OF CRITICAL ENVIRONMENTAL CONCERN

GOAL SD:1 The integrity of unique resources are protected and opportunities for compatible uses are provided.					
Objectives:					
SD:1.1 Identify areas for potential special designation that contain important scenic, ecological, and/or cultural values that are currently unprotected.					
SD:1.2 Utilize special designations to meet resource protection needs within appropriate geographical areas.					
SD:1.3 Interpret sites of high public interest.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
ACEC-7001	SD:1.2	Evaluate BLM authorized activities and develop mitigation to protect the integrity of the characteristics for which the ACEC was designated.			
ACEC-7002	SD:1.3	Develop educational materials describing access and features of ACECs and appropriate use protocols.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
ACEC-7003	SD:1.1	There are currently no ACECs designated in the planning area. Existing management for proposed ACECs has been determined to be protective of the resource values.	Designate the following areas as ACECs (Map 73): <ul style="list-style-type: none"> • Burnt Hollow (17,280 acres) • Cantonment Reno (523 acres) • Dry Creek Petrified Tree (2,567 acres) • Fortification Creek Elk Area (32,602 acres) • Hole-In-The-Wall (11,952 acres) • Pumpkin Buttes (1,731 acres) • Sagebrush Ecosystem ACEC: public lands within 4.0 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks and winter concentration areas (467,897 acres) • Welch Ranch (1,748 acres) 	Do not designate any ACECs.	Designate the following areas as ACECs (Map 74): <ul style="list-style-type: none"> • Pumpkin Buttes (1,731 acres) • Welch Ranch (1,116 acres)

Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
ACEC-7004	SD:1.2	Continue with no ACECs designated in the planning area.	<p>Manage designated ACECs through the following actions:</p> <ul style="list-style-type: none"> • Closing or limiting motorized vehicles to designated roads and trails • Managing for visual resources as Class II • Closing the area to mineral leasing (fluid and solid) • Recommending withdrawal to locatable mineral entry • Closing the area to salable minerals • Excluding ROW • Prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the area's values for which the ACEC was designated 	Continue with no ACECs designated in the planning area.	Manage ACECs under site specific management plans. Site specific management plans will be consistent with and implement the provisions specified for ACECs in Appendix S (p. 2531)..

Table 2.36. 7000 SPECIAL DESIGNATIONS (SD) – SCENIC OR NATIONAL BACK COUNTRY BYWAYS

GOAL SD:2 Potential National Byways are evaluated to enhance opportunities for the public to see and enjoy public lands.					
Objectives:					
SD:2.1 Where appropriate, identify scenic or national back country byways and develop management prescriptions to maintain resource values.					
SD:2.2 Promote the increased awareness of historical and cultural values and facilitate a sense of stewardship within proposed national back country byways.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
BCB-7001	SD:2.1	Manage national back country byways with the objective of encouraging responsible use of the proposed byway, while protecting and displaying the scenic, cultural, geological, multiple use, and crucial wildlife habitat values that occur in the area.			
BCB-7002	SD:2.2	Coordinate with local residents in the area of any designated national back country byway to develop information and interpretive materials for visitors that highlight multiple uses of public lands and land stewardship in the area.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
BCB-7003	SD:2.1	No previous decision; considered on a project-specific basis.	<p>Evaluate roads within the planning area for designation as National Back Country or Scenic Byways. Eligible routes may be proposed for National Back Country or Scenic Byway designation (Map 73).</p> <p>Potential routes include:</p> <ul style="list-style-type: none"> ● Hazelton Road ● Slip Road ● Trabing/Sussex ● Powder River ● Rome Hill ● Tipperary/Thompson Road 	Do not evaluate roads within the planning area for National Back Country or Scenic Byway inclusion.	<p>Evaluate roads in coordination with the counties and other stakeholders for designation as National Back Country or Scenic Byways. Eligible routes may be proposed for National Back Country or Scenic Byway designation (Map 74).</p> <p>Potential routes include:</p> <ul style="list-style-type: none"> ● Hazelton Road ● Slip Road ● Trabing/Sussex ● Powder River ● Rome Hill ● Tipperary/Thompson Road

Table 2.37. 7000 SPECIAL DESIGNATIONS (SD) – WILD AND SCENIC RIVERS

GOAL SD:3 Suitable waterway segments' free-flowing condition, water quality, outstandingly remarkable values and tentative classification would be protected and/or enhanced until such time that Congress designates the Middle Fork Powder River as a WSR or releases the river for other uses.					
Objectives:					
SD:3.1 Manage suitable segments to protect and enhance their free-flowing condition, water quality, outstandingly remarkable values and tentative classification.					
SD:3.2 Develop partnerships for managing and promoting suitable waterways to enhance their public enjoyment.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
WSR-7001	SD:3.1	Manage the Middle Fork Powder River (Map 75) in accordance with the Middle Fork Interim Management Plan until Congress acts upon the nomination. (The interim management plan and eligibility review report are available on the BFO website, http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo/docs.html .)			
WSR-7002	SD:3.2	Work with stakeholders to manage the Middle Fork Powder River corridor.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
WSR-7003	SD:3.1 SD:3.2	No previous decision.	If Congress does not designate the Middle Fork Powder River as a WSR, and releases the river for other uses, management will continue in accordance with the Middle Fork Interim Management Plan to protect and enhance its free-flowing condition and outstandingly remarkable values.	If Congress does not designate the Middle Fork Powder River as a WSR, and releases the river for other uses, do not apply special provisions related to protection of free-flowing characteristics and outstanding resource values. Manage the Middle Fork Powder River to follow the management outlined in Alternative C of this RMP.	If Congress does not designate the Middle Fork Powder River as a WSR, and releases the river for other uses, management will continue to retain the free-flowing characteristics and outstanding remarkable values.

Table 2.38. 7000 SPECIAL DESIGNATIONS (SD) – WILDERNESS STUDY AREAS

GOAL SD:4 Existing WSAs will meet the “non-impairment standard” under BLM Manual 6330 – Management of Wilderness Study Areas.					
Objectives:					
SD:4.1 Monitor and document condition and use of each WSA at least once per year.					
SD:4.2 Manage and protect the characteristics of each WSA so as to maintain their existing size, naturalness, unique values, and outstanding opportunities.					
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
WSA-7001	SD:4.2	If Congress acts to either designate as Wilderness or release WSAs from further consideration (Fortification Creek, Gardner Mountain, North Fork) (Map 75), the RMP will be amended as necessary.			
WSA-7002	SD:4.2	Manage WSAs for the preservation of natural conditions and processes, and to provide opportunities for solitude or a primitive and unconfined type of recreation. Under the guidance of BLM Manual 6330 – Management of Wilderness Study Areas, manage WSAs to emphasize primitive, nonmotorized activities to maintain the current natural values.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
WSA-7003	SD:4.2	If Congress decides not to designate the WSAs as wilderness, lease for oil and gas development in the following WSAs: <ul style="list-style-type: none"> • Gardner Mountain WSA (6,423 acres) • North Fork WSA (10,089 acres) • Fortification Creek WSA (12,419 acres) 	If Congress decides not to designate a WSA as wilderness, do not lease mineral rights until a plan amendment is completed. Additionally, motorized travel, surface-disturbing activities and any other activities (except valid existing rights) that may impair wilderness characteristics will be prohibited until a plan amendment is completed. WSAs released by Congressional for uses other than wilderness would then be considered pursuant to Manuals 6310 and 6320 to maintain wilderness characteristics.	If Congress decides not to designate a WSA as wilderness, do not lease mineral rights until a plan amendment is completed. Additionally, motorized travel, surface-disturbing activities and any other activities (except valid existing rights) that may impair wilderness characteristics will be prohibited until a plan amendment is completed. WSAs released by Congressional for uses other than wilderness would then be considered pursuant to Manuals 6310 and 6320 to maintain wilderness characteristics.	If Congress decides not to designate a WSA as wilderness, do not lease mineral rights until a plan amendment is completed. Additionally, motorized travel, surface-disturbing activities and any other activities (except valid existing rights) that may impair wilderness characteristics will be prohibited until a plan amendment is completed. WSAs released by Congressional for uses other than wilderness would then be considered pursuant to Manuals 6310 and 6320 to maintain wilderness characteristics.
WSA-7004	SD:4.2	No previous decision; considered on a project-specific basis. All WSAs are currently Closed to motorized use or use is Limited to designated routes, though no routes have been designated in any of the WSAs.	Prohibit all motorized and mechanized equipment within WSAs.	Prohibit motorized equipment within WSAs.	Prohibit all motorized and mechanized equipment within WSAs.

2.9.8. 8000 SOCIOECONOMIC RESOURCES

Table 2.39. 8000 SOCIOECONOMIC RESOURCES (SR) – SOCIAL AND ECONOMIC

GOAL SR:1 Opportunities for economic and social sustainability are provided at the national, regional, and local levels.		
Objectives:		
SR:1.1 Ensure local and regional economic development and local land use plans are considered in BLM actions.		
SR:1.2 Consider and address economic impact of BLM actions.		
SR:1.3 Coordinate and address impacts to the social structure to the extent BLM actions are expected to affect the social structure.		
SR:1.4 Recognize city and county infrastructure needs associated with BLM actions.		
GOAL SR:2 Sustainable consumptive economic development opportunities are provided for and are balanced against non-consumptive uses.		
Objectives:		
SR:2.1 Identify options to utilize resources consistent with a multiple resource management philosophy that provides a balance between local, regional, and national views.		
SR:2.2 Maintain a balance between consumptive and nonconsumptive uses.		
GOAL SR:3 Use conflicts are managed through public education and outreach.		
Objective:		
SR:3.1 Work cooperatively with local agencies to foster public awareness.		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
Socio-8001	SR:2	Remain sensitive to the economic and social health of the impacted area.
Socio-8002	SR:1	Refer to available socioeconomic monitoring plans that provide indicators for the economic and social health of an affected area.
Socio-8003	SR:1	Manage in a way that considers the fact that BLM actions are integrally connected with both socioeconomics and the cultural health of the planning area.

Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES			
Socio-8004	SR:1	Quantify socioeconomic impacts associated with site-specific and programmatic BLM actions to the extent possible.			
Socio-8005	SR:3	Share the results with state and local governmental officials for the purpose of promoting collaborative management, where possible, to ensure the affected parties and overlapping jurisdictions are provided that information as required by law.			
Record #	Goal/Obj.	Alternative A (Current Management)	Alternative B (Resource Conservation)	Alternative C (Resource Utilization)	Alternative D (Proposed RMP)
Socio-8006	SR:2	No previous decision.	Develop mitigation strategies designed to resolve conflicts that have detrimental effects on multiple resource use.	Develop management strategies designed to recognize and point out conflicts that are expected to have an impact on multiple resource use.	Work with local, state, federal, and private entities with the intention of developing mitigation strategies designed to promote a healthy and sustainable social and economic environment.
Socio-8007	SR:1 SR:3	BLM's management recognizes and considers local and regional economic development and land use plans.	Consider local and regional economic development and land use plans.	Incorporate, to the extent possible, local and regional economic development and land use plans.	In consideration of local and regional economic development and land use plans, work cooperatively with all stakeholders to identify the socioeconomic impacts of BLM actions and develop strategies that would mitigate those impacts where possible with the overriding goal of promoting sustainability in a multiple resource use environment.

Table 2.40. 8000 SOCIOECONOMIC RESOURCES (SR) – HEALTH AND SAFETY

GOAL SR:4 Public health and safety are protected.		
Objectives:		
SR:4.1 Reduce or eliminate hazards to human health and safety and the environment by reporting, cleanup, and reclamation of contaminated sites.		
SR:4.2 Integrate environmental protection and hazard management into all BLM actions.		
SR:4.3 Collaborate with Wyoming DEQ to identify, mitigate, or remediate Abandoned Mine Land sites and coalbed fires.		
SR:4.4 Avoid public exposure to H ₂ S.		
SR:4.5 Reduce or eliminate physical hazards through appropriate mitigation.		
Record #	Goal/Obj.	MANAGEMENT ACTIONS COMMON TO ALL ALTERNATIVES
Health-8001	SR:4.1 SR:4.2	Identify, report, control, and mitigate imminent and potential hazards or threats to human health and/or the environment from hazardous substance releases and physical hazards.
Health-8002	SR:4.1	Manage the cleanup of hazardous substance and other contaminant spills and releases to reduce human health and/or environmental risk, reclaim and monitor contaminated lands, and carry out emergency response activities.
Health-8003	SR:4.3	Identify and prioritize abandoned mine sites for reclamation that most affect human health or safety, and the environment.
Health-8004	SR:4.4	Require, as appropriate, warning signs, sirens, and public education to prevent exposure by the public to hydrogen sulfide gas associated with oil and gas development and production. Develop and maintain a field office hydrogen sulfide gas safety plan to identify areas of potential hydrogen sulfide gas, appropriate safety distances, and access restrictions, if necessary.
Health-8005	SR:4.5	Ensure appropriate review of BLM-authorized activities and the application of effective management controls to minimize hazardous substance and other contaminant spills, releases, and physical hazards.
Health-8006	SR:4.1 SR:4.5	Reduce waste produced by BLM activities and from authorized uses of public lands through waste minimization practices that promote reducing, reusing, recycling, substituting, and other innovative methods of pollution prevention.
Health-8007	SR:4.3	Identify, monitor, and mitigate hazards to public health and safety from coal seamfires.

Note: NSO, CSU, and TSU stipulations identified in the management actions in Table 2.7, “1000 PHYSICAL RESOURCES (PR) – AIR QUALITY (AQ)” (p. 127) through Table 2.40, “8000 SOCIOECONOMIC RESOURCES (SR) – HEALTH AND SAFETY” (p. 275), apply only to fluid mineral leasing.

%-Percent	CSU Controlled Surface Use	M Maintain Allotment	ROD Record of Decision
AAQS Ambient Air Quality Standard	CWPP Community Wildfire	MMBF Million Board Feet	ROW right-of-way
ACEC Area of Critical	Protection Plan	MOU Memorandum of Understanding	RSC Recreation Setting Characteristic
Environmental Concern	dba A-weighted decibels	MR Mineral Resources	SD Special Designations
ADA Americans With Disabilities Act	DDCT Disturbance Density	N/A Not Applicable	SIP State Implementation Plan
AMP Allotment Management Plan	Calculation Tool	NAGPRA Native American Graves	SR Socioeconomic Resources
APD Application for Permit to Drill	DEQ Department of Environmental	Protection and Repatriation Act	SRMA Special Recreation
APHIS Animal and Plant	Quality	NEPA National Environmental	Management Area
Health Inspection Service	DFC Desired Future Condition	Policy Act	SWAP State Wildlife Action Plan
AQD Air Quality Division	DOI Department of the Interior	NRC Nuclear Regulatory Commission	TCP Traditional Cultural Property
AQ Air Quality	EEA Environmental Education Area	Natural Resources Conservation	TLS Timing Limitation Stipulation
AQRV Air Quality Related Value	EIS Environmental Impact Statement	Service	TMA Travel Management Area
AUM Animal Unit Month	EO Executive Order	NSO No Surface Occupancy	U.S.C. United States Code
BFO Buffalo Field Office	ERMA Extensive Recreation	O&G Oil and Gas	USFWS United States
BLM Bureau of Land Management	Management Area	OHV Off-Highway Vehicle	Fish and Wildlife Service
BMP Best Management Practice	ESA Endangered Species Act	ORV Outstandingly Remarkable Value	VRI Visual Resource Inventory
BR Biological Resources	FAMS Facility Asset Management	PFC Proper Functioning Condition	VRM Visual Resource Management
C Custodial Allotment	System	PFYC Potential Fossil Yield	WGFD Wyoming Game and
CBNG Coalbed Natural Gas	FM Fire and Fuels Management	Classification	Fish Department
CFR Code of Federal Regulations	H ₂ S Hydrogen Sulfide	PHMA Priority Habitat Management	WHMA Wildlife Habitat Management
CO ₂ Carbon Dioxide	HFRA Healthy Forest Restoration Act	Area	Area
COA Condition of Approval	HR Heritage and Visual Resources	PR Physical Resources	WO Washington Office
CRMP Cultural Resources	I Improvement Allotment	PRB Powder River Basin	WSA Wilderness Study Area
Management Plan	IM Instruction Memorandum	R&PP Recreation and Public Purposes	WSR Wild and Scenic River
CRPP Cultural Resource Project Plans	kV kilovolt	R&VS Recreation and Visitor Services	WUI Wildland Urban Interface
	LAC Limit of Acceptable Change	RAMP Recreation Area Management	WYNDD Wyoming Natural
	LOC Level of Concern	Plan	Diversity Database
	LR Land Resources	RDF Required Design Feature	WNv West Nile Virus
		RMA Recreation Management Area	
		RMP Resource Management Plan	

2.10. Summary of Environmental Consequences by Alternative

Table 2.41, “Summary of Environmental Consequences by Alternative” (p. 277) summarizes potential impacts under alternatives A through D. Where appropriate, the table quantifies potential impacts anticipated from BLM-authorized actions. Table 2.41, “Summary of Environmental Consequences by Alternative” (p. 277) summarizes impacts under the four alternatives in acres (e.g., more acreage implies more impact, either beneficial or adverse) or qualitative descriptions comparing the anticipated impacts among the alternatives (i.e., negligible, minor, moderate, or major). See the Scale of Impacts section in the Chapter 4 Introduction, for the definition of each of these terms as applied to the extent of anticipated impact. The *Summary of Impacts* section for each resource in Chapter 4 provides a more detailed comparison of impacts between alternatives. Chapter 4 describes cumulative impacts from non-BLM actions; Table 2.41, “Summary of Environmental Consequences by Alternative” (p. 277) does not include cumulative impacts.

The environmental consequences of alternatives are not anticipated to exceed known legal thresholds or standards over the life of this RMP, with the exception of air quality. Standard practices, RDFs, BMPs, and guidelines for surface-disturbing activities are built into each alternative to avoid and minimize potential impacts. The BLM would consider mitigation of residual impacts during subsequent implementation-level projects and any associated environmental analyses performed at that time. All alternatives include reclamation of surface disturbance to reduce long-term impacts.

Table 2.41. Summary of Environmental Consequences by Alternative

Resources	Alternative A	Alternative B	Alternative C	Alternative D
Air Quality				
NAAQS	May Exceed	May Exceed	May Exceed	May Exceed
WAAQS	May Exceed	May Exceed	May Exceed	May Exceed
AQRV Impacts	Minor Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Visibility Impacts	Minor Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Atmospheric Deposition	Minor Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Soil and Water				
Acres of Surface Disturbance Anticipated	322,026 short-term/ 100,138 long-term	422,903 short-term/ 78,152 long-term	422,544 short-term/ 130,621 long-term	486,957 short-term/ 128,086 long-term
Soil with Severe Erosion Hazard (215,496 acres of BLM surface, 669,739 acres of fluid-mineral estate)	Surface-disturbing activities prohibited unless waived by authorized officer.	Surface-disturbing activities prohibited.	Surface-disturbing activities allowed consistent with other resource values.	Surface-disturbing activities allowed when resource objectives can be achieved.
Impacts from Long-term Erosion	Major Adverse	Minor Adverse	Major Adverse	Moderate Adverse
Produced Water Impact to Soils	Minor Adverse	Negligible Adverse	Minor Adverse	Minor Adverse
Impacts to Groundwater and Surface Water	Minor Adverse	Negligible Adverse	Moderate Adverse	Minor Adverse
Minerals				
Impacts to the Locatable Minerals Resource	Negligible Adverse	Major Adverse	Negligible Adverse	Major Adverse
Impacts to Coal Resources	No Effect	Moderate Adverse	No Effect	No Effect

Resources	Alternative A	Alternative B	Alternative C	Alternative D
Total Projected New Federal Conventional Oil and Gas Wells	1,828	7	1,990	1,773
Total Projected New Federal CBNG Wells	903	101	5,280	2,721
Impacts to the Salable Minerals Resource	Minor Adverse	Major Adverse	Minor Adverse	Moderate Adverse
Fire and Fuels Management				
Impacts of Restrictions to Implementation of Planned Ignitions	Negligible Adverse	Moderate Adverse	Minor Beneficial	Negligible Beneficial
Impacts to Goals and Strategies of Unplanned Ignitions	Minor Adverse	Moderate Adverse	Negligible Adverse	Negligible Beneficial
Vegetation				
Acres of Forests and Woodlands Treated to Provide Forest Products and Improve Forest Health	4,000 to 6,000	200 to 1,000	16,000 to 24,000	16,000 to 20,000
Impacts to Grasslands and Shrublands	Major Adverse	Minor Adverse	Major Adverse	Moderate Adverse
Surface-disturbing Activities within 500 feet of Riparian/Wetland Areas (23,831 acres)	Prohibited unless waived by the authorized officer	Prohibited	Allowed when consistent with other values	Allowed where resource objectives can be met
Invasive Species and Pest Management				
Potential to Spread Invasive and Non-native Species	Major Adverse	Minor Adverse	Major Adverse	Moderate Adverse
Fish and Wildlife				
Impacts to Water Quality and Fish Habitat	Moderate Adverse	Minor Adverse	Major Adverse	Minor Adverse
Acres of NSO Restrictions and Surface Disturbance Prohibition on Big Game Winter Ranges	4,583 (unless waived by the authorized officer)	4,583	0	4,583
Impact of Motorized Vehicle Use to Wildlife	Major Adverse	Minor Adverse	Major Adverse	Moderate Adverse
Special Status Species				
Impacts to Special Status Plant Species within the Planning Area	Negligible Adverse	Negligible Beneficial	Minor Adverse	Negligible Adverse
Impacts to Special Status Wildlife Species within the Planning Area	Major Adverse	Minor Adverse	Major Adverse	Moderate Adverse
Heritage				
Potential to Impact Eligible/Listed Cultural Sites	Moderate Adverse	Negligible Adverse	Minor Adverse	Negligible Adverse
Potential to Impact Paleontological Localities	Moderate Adverse	Negligible Adverse	Minor Adverse	Negligible Adverse

Resources	Alternative A	Alternative B	Alternative C	Alternative D
Visual Resources				
Percent of Planning Area Managed as VRM Class I-II ¹	19%	33%	5%	19%
Percent of Planning Area Managed as VRM Class III-IV ¹	81%	67%	95%	81%
Impact to Areas with Unique Scenic Features	Moderate Adverse	Negligible Adverse	Moderate Adverse	Minor Adverse
Renewable Energy				
Acres/Percent of BLM surface with Good or Better Wind Potential Managed as Renewable Energy Exclusion or Avoidance	0	49,099/ 99%	0	48,184/ 97%
Rights-of-Way and Corridors				
Potential To Limit the Development of ROWs	Moderate Beneficial	Major Adverse	Major Beneficial	Moderate Adverse
Miles/Acres of New Roads and Trails Due to ROW Authorizations	1,225/11,501	450/6,585	1,500/15,025	785/12,800
Travel and Transportation Management				
Miles of New Roads and Trails for Public Access	9	3	12	12
Recreation				
Impact Recreation Desired Settings, Opportunities, Activities, Experiences, and Beneficial Outcomes	Moderate Adverse	Major Beneficial	Major Adverse	Moderate Beneficial
Number/Total Acres of SRMAs	0/0	8/55,529	30,570	7/54,160
Lands with Wilderness Characteristics				
Impacts to Lands with Wilderness Characteristics	Moderate Adverse	Major Beneficial	Major Adverse	Moderate Beneficial
Livestock Grazing				
Total Authorized AUMs ² Lost from Surface-disturbing Activities	8,352	6,615	11,526	12,241
Authorized AUMs ² Projected at the End of the Planning Cycle/Percent Reduction from Baseline (106,078)	97,726/ 7.9%	44,538/ 58.0%	94,552/ 10.9%	93,837/ 11.5%
Special Designations				
Number/Acres Designated as ACECs	0/0	8/511,000	0/0	2/2,849
Impacts to the Middle Fork Powder River Suitable WSR	Negligible Adverse	Major Beneficial	Minor Adverse	Minor Beneficial
Socioeconomics				

Resources	Alternative A	Alternative B	Alternative C	Alternative D
Effect on Planning Area Population	Low Impact	Medium Impact (due to anticipated reductions focused in oil/gas service areas, which generally correspond to population centers)	Low Impact	Low Impact
Effect on Housing and Community Services	Low Impact	Medium Impact (due to anticipated population reductions)	Low Impact	Low Impact
Impacts on Quality of Life and Local Culture	Low Impact (continued policy of balanced use; no change from current conditions)	Low to Medium Impact (change from recent trends would constitute greater emphasis on resource conservation)	Low Impact (change from recent trends would constitute greater emphasis on resource development)	Low Impact (continued policy of balanced use, with some change from current conditions)
Forecasted annual earnings (millions of 2011 dollars) due to activities on BLM surface and federal mineral estate ³	202.8	3.9	243.0	206.4
Forecasted Oil and Gas Tax Revenues (millions of 2011 dollars)	95.4	1.8	165.2	118.8
Forecasted annual employment due to activities on BLM surface and federal mineral estate ³	3,482	109	4,206	3,562

¹ VRM classes establish a measurable standard for the amount of change allowed to a specific area's visual resource.

² Authorized AUMs are the AUMs actually billed for and paid for each year by the permittee/lessee.

³ Estimate of annual earnings and employment includes direct, indirect, and induced economic activity (the "multiplier effect").

ACEC Area of Critical Environmental Concern ROW rights-of-way
AUM animal unit month SRMA Special Recreation Management Area
AQRV Air Quality Related Value VRM Visual Resource Management
BLM Bureau of Land Management WAAQS Wyoming Ambient Air Quality Standards
CBNG Coalbed Natural Gas WSR Wild and Scenic River
NAAQS National Ambient Air Quality % percent
Standards
NSO No Surface Occupancy

Chapter 3. Affected Environment

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This chapter describes existing conditions for the resources in the Buffalo Field Office (BFO) planning area and serves as the baseline against which Chapter 4 analyzes and compares impacts under alternatives A, B, C, and D. A variety of laws, regulations, policies, and other requirements direct public land management, as summarized in Chapter 1. The BFO operates under these requirements and guidance. In addition to describing existing conditions, this chapter describes management challenges as identified through the Bureau of Land Management (BLM) Analysis of the Management Situation (AMS) and issues identified during the public scoping process.

3.1. Physical Resources

3.1.1. Air Quality

This section describes the air resources in the region that would be potentially affected by BLM activities and decisions in the Buffalo planning area. The discussion of air resources includes a description of the topography, climate, climate change, and existing air quality of the planning area. Air pollutants addressed include criteria air pollutants, hazardous air pollutants (HAPs), and sulfur and nitrogen compounds that could contribute to Air Quality Related Values (AQRV), including visibility, atmospheric deposition, and acid rain.

3.1.1.1. Regional Context

For this analysis, air quality data were examined from monitors located within the planning area (Campbell, Johnson, and Sheridan counties) and in nearby areas (Weston and Converse counties). Air quality data from these locations provides an overall summary of current air quality conditions within the planning area and in the surrounding regions.

3.1.1.2. Regulatory and Policy Framework

The Clean Air Act (CAA) and its amendments mandate the control of air pollutants throughout the United States. The CAA imposes an obligation on all state and federal agencies, including the BLM, to comply with all state and local air pollution requirements. The CAA addresses criteria air pollutants, state and National Ambient Air Quality Standards (NAAQS) for criteria air pollutants, AQRVs such as visibility and deposition, and the Prevention of Significant Deterioration (PSD) program.

Further, the National Environmental Policy Act ([NEPA] Public Law 91-190, January 1, 1970) requires federal agencies to "... promote efforts which will prevent or eliminate damage to the environment ..." and to "... attain the widest range of beneficial uses ... without degradation, risk to health and safety, or other undesirable and unintended consequences ..."

Air quality protection is also a part of the Federal Land Policy and Management Act ([FLPMA] Public Law 94-579, October 21, 1976), which states that "... it is the policy of the United States that ... the public lands be managed in a manner that will protect ... air and atmospheric ... values ..."

In 2011 BLM and other federal land managers including the Environmental Protection Agency (EPA), signed an Memorandum of Understanding (MOU) entitled "Regarding Air Quality Analyses and Mitigation for Federal O&G Decisions Through the National Environmental Policy Act Process".

3.1.1.3. Indicators

This analysis addresses criteria pollutants (carbon monoxide [CO], nitrogen oxide [NO_x], particulate matter less than 2.5 microns in diameter [PM_{2.5}, particulate matter less than 10 microns in diameter [PM₁₀], sulfur dioxide [SO₂], organics and toxics (HAPs and volatile organic compounds [VOCs]), and sulfur and nitrogen compounds, which could contribute to visibility impairment and atmospheric deposition, including acid rain. The analysis also addresses greenhouse gases (GHG) including carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). The NAAQS set the maximum standards for criteria air pollutants. The CAA provides special protection for air quality and visibility in designated classified areas of the country. National parks larger than 6,000 acres and wilderness areas larger than 5,000 acres that existed or were authorized as of August 7, 1977 receive the highest degree of air quality protection under the CAA. The CAA originally designated the 158 Class I areas, but in 1980 Bradwell Bay, Florida, and Rainbow Lake, Wisconsin were excluded for purposes of visibility protection. In addition to the 156 remaining Class I areas, five Tribal areas have been designated Class I areas, including the Northern Cheyenne area, which is located in Montana just north of the Buffalo planning area. All other wilderness areas (and areas such as national monuments and seashores) are designated Class II. For air quality impact analyses as part of Environmental Impact Statement (EIS) development, the Class II wilderness area may be referred to as a sensitive Class II wilderness area because potential air pollutants could impair air quality concentrations, visibility, or lake acidification in these areas. The CAA's PSD program establishes allowable increases of a given pollutant for a particular area from specific sources. For the purposes of the Resource Management Plan (RMP), no formal PSD increment consumption analysis will be performed since this is handled through the permit process for a particular new source by state or other Federal agencies.

Criteria Air Pollutants

The EPA has established air quality standards for criteria pollutants and identifies them as the NAAQS. Concentrations of air pollutants greater than the national standards represent a risk to human health. Criteria pollutants include CO, nitrogen dioxide (NO₂), ozone (O₃), PM₁₀ and PM_{2.5}, SO₂, and lead.

Wyoming and National Ambient Air Quality Standards

Wyoming Ambient Air Quality Standards (WAAQS) and NAAQS identify maximum limits for criteria air pollutant concentrations at all locations to which the public has access. The WAAQS and NAAQS are legally enforceable standards. Concentrations above the WAAQS and NAAQS represent a risk to human health that by law, require public safeguards be implemented. State standards must be at least as protective of human health as federal standards, and may be more restrictive than the federal standards.

Volatile Organic Compounds and Hazardous Air Pollutants

There are numerous organic compounds in the atmosphere, referred to as VOC, that are emitted from anthropogenic sources, such as petroleum products, paints, stains, etc., and from biogenic sources, such as trees and crops, that act as precursors to O₃ production and secondary aerosol formation. Because of their toxic effects, a subset of these compounds has been designated as HAPs, including benzene, toluene, ethylbenzene, xylene (also referred to as BTEX), N-hexane, and formaldehyde. Although HAPs do not have federal ambient air quality standards (AAQS) (there are exposure thresholds), some states have established "significance thresholds" to

evaluate human exposure for potential chronic inhalation illness and cancer risks. The State of Wyoming has not established AAQS or significance thresholds for HAPs. The EPA regulates the emissions of HAPs from major stationary sources and some minor area sources through the National Emissions Standards for HAPs.

Visibility

Visibility can be expressed in terms of deciviews, a measure for describing perceived changes in visibility. One deciview is defined as a change in visibility that is just perceptible to an average person, which is approximately a 10 percent change in light extinction. To estimate potential visibility impairment, monitored aerosol concentrations are used to reconstruct visibility conditions for each day monitored. These daily values are then ranked from clearest to haziest and divided into three categories to indicate the mean visibility for all days (average), the 20 percent of days with the clearest visibility (20% clearest), and the 20 percent of days with the worst visibility (20% haziest). Visibility can also be defined by standard visual range (SVR) measured in miles, and is the farthest distance at which an observer can see a black object viewed against the sky above the horizon; the larger the SVR, the cleaner the air.

Since 1980 the Interagency Monitoring of Protected Visual Environments (IMPROVE) network has measured visibility in national parks and wilderness areas. There are six IMPROVE stations in Wyoming, including two in the Buffalo planning area — one in the Thunder Basin National Grasslands and one in the Cloud Peak Wilderness.

Atmospheric Deposition

Atmospheric deposition refers to processes by which air pollutants are removed from the atmosphere and deposited into terrestrial and aquatic ecosystems. Air pollutants can be deposited by either wet (precipitation via rain or snow) or dry (gravitational) settling of particles and adherence of gaseous pollutants to soil, water, and vegetation. Much of the concern about deposition is due to secondary formation of acids and other compounds from emitted nitrogen and sulfur species such as NO_x and SO_2 , which can contribute to acidification of lakes, streams, and soils, and affect other ecosystem characteristics, including nutrient cycling and biological diversity.

Substances deposited include:

- Acids, such as sulfuric and nitric, sometimes referred to as acid rain
- Air toxics, such as pesticides, herbicides, and VOCs
- Heavy metals, such as mercury
- Nutrients, such as nitrates and ammonium (NH_4)

The accurate measurement of atmospheric deposition is complicated by contributions to deposition from several components – rain, snow, cloud water, particle settling, and gaseous pollutants. Deposition varies with precipitation and other meteorological variables (e.g., temperature, humidity, winds, and atmospheric stability), which in turn, vary with elevation and time.

Federal land managers, including the United States Forest Service (USFS) and National Park Service, have established guidelines or Levels of Concern (LOC) for total deposition of nitrogen and sulfur compounds in Class 1 Wilderness Areas. Total nitrogen deposition, which includes both wet and dry deposition, of 2.2 kilograms (kg) per hectare (ha) per year or less is considered to be unlikely to harm terrestrial or aquatic ecosystems. For total sulfur deposition, the LOC is 3 kg per ha per year.

Monitoring of Air Quality, Visibility, and Deposition in the Buffalo Planning Area

Various state and federal agencies continuously monitor air pollutant concentrations, visibility, and atmospheric deposition in and near the Buffalo planning area. Table 3.1, “Air Quality Monitoring Sites in and Near the Buffalo Planning Area” (p. 286) lists the air quality monitoring sites in the Buffalo planning area (Sheridan, Johnson, and Campbell counties), as well as sites in adjacent counties (Weston and Converse counties). The Wyoming Department of Environmental Quality (DEQ) operates monitors as part of the State and Local Monitoring Site (SLAMS) network and the Special Purpose Monitoring (SPM) network.

There are two monitors in the IMPROVE network located in the Buffalo planning area – one in the Cloud Peak Wilderness in Johnson County and one in the Thunder Basin National Grasslands in Campbell County. The BLM operates monitors in Johnson County as part of the Wyoming Air Resource Monitoring System (WARMS), including one at the Buffalo site. The Clean Air Status and Trends Network (CASTNet) measures concentrations of nitrogen and sulfur compounds and O₃ at multiple sites in Wyoming. The closest CASTNet sites to the Buffalo planning area are the BLM WARMS monitoring sites at Basin and Newcastle. The Basin site is located north of Worland, and the Newcastle site is co-located with the National Acid Deposition Program (NADP) monitoring site near Newcastle. Data from these sites might not be representative of concentrations in the Buffalo planning area. Atmospheric deposition (wet) measurements of NH₄, sulfate (SO₄), and various metals are taken at the Newcastle monitor, which the BLM operates as part of the NADP. Figure 3.1, “Location of Meteorological and Air Quality Monitoring Sites and Class I and II Areas in Northeast Wyoming” (p. 289) presents a map of northwestern Wyoming and parts of Montana, South Dakota, and Nebraska that includes an outline of the Buffalo planning area, the locations of Class I and II areas, and the locations of the various air quality and meteorological monitors discussed in this analysis.

Table 3.1. Air Quality Monitoring Sites in and Near the Buffalo Planning Area

County	Site Name	Type of Monitor	Parameter	Operating Schedule	Location	
					Longitude	Latitude
Air Quality Monitoring Sites in the Planning Area						
Campbell	Thunder Basin	SPM	O ₃ , NO _x , and meteorology	Hourly	-105.3000	44.6720
	South Campbell County	SPM	O ₃ , NO _x , PM ₁₀ , and meteorology	1/3 (PM ₁₀) and hourly (NO _x and O ₃)	-105.5000	44.1470
	Belle Ayr Mine	SPM	NO _x and PM _{2.5}	1/3 (PM _{2.5}) and hourly (NO _x)	-105.3000	44.0990
	Wright	SPM	PM ₁₀	1/6	-105.5000	43.7580
	Gillette	SLAMS	PM ₁₀	1/6	-105.5000	44.2880
	Black Thunder Mine	SPM	PM _{2.5}	1/3	-105.2000	43.6770
	Buckskin Mine	SPM	PM _{2.5}	1/3	-105.6000	44.4720
	South Coal	WARMS	PM _{2.5} and meteorology		-105.8378	44.9411
	Thunder Basin	IMPROVE	PM _{2.5} , nitrates, ammonium, nitric acid, sulfates, SO ₂ , and meteorology	1/3	-105.2874	44.6634

County	Site Name	Type of Monitor	Parameter	Operating Schedule	Location	
					Longitude	Latitude
Johnson	Buffalo	WARMS	PM _{2.5} , nitrates, ammonium, nitric acid, sulfate, SO ₂ , and meteorology	1/3 (PM _{2.5}) & Weekly (others)	-106.0189	44.1442
	Cloud Peak	IMPROVE	PM _{2.5} , nitrate, ammonium, nitric acid, sulfate, SO ₂ , and meteorology	1/3	-106.9565	44.3335
Sheridan	Sheridan - Highland Park	SLAMS	PM ₁₀ and PM _{2.5}	1/3 (PM ₁₀); 1/3 and 1/6 (PM _{2.5})	-107.0000	44.8060
	Sheridan - Police Station	SLAMS	PM ₁₀ and PM _{2.5}	1/1 (PM ₁₀); 1/3 and 1/6 (PM _{2.5})	-107.0000	44.8330
	Arvada	SPM	PM ₁₀		-106.1000	44.6540
	Sheridan	WARMS	O ₃ , PM _{2.5} , nitrates, ammonium, nitric acid, sulfate, and SO ₂	1/3 (PM _{2.5}) & 1/7 (others)	-106.8472	44.9336
Air Quality Monitoring Sites near the Planning Area						
Weston	Newcastle ¹	CASTNet	O ₃ , PM _{2.5} , nitrates, ammonium, nitric acid, sulfate, SO ₂ , and meteorology	1/3 (PM _{2.5}) and 1/7 (others)	-104.1919	43.8731
	Newcastle	NADP	Wet deposition of ammonium, sulfates, and metals	Weekly	-104.1917	43.873

County	Site Name	Type of Monitor	Parameter	Operating Schedule	Location	
					Longitude	Latitude
Converse	Antelope Mine	SPM	NO _x and PM _{2.5}	1/3 (PM _{2.5}) & hourly (NO _x)	-105.4000	43.42700
	Basin ¹	CASTNET	O ₃ , PM _{2.5} , nitrate, ammonium, nitric acid, sulfate, and meteorology	Hourly (O ₃ , PM _{2.5}) Weekly all others	-108.0411	44.28
Source: WARMS 2013; EPA 2013a; IMPROVE 2013; Wyoming DEQ 2013c; National Atmospheric Deposition Program 2013 ¹ Newcastle and Basin WARMS sites were upgraded to full CASTNET sites in 2012 1/3 Sampling occurs once every 3 days 1/6 Sampling occurs once every six days CASTNET Clean Air Status and Trends Network IMPROVE Interagency Monitoring of Protected Visual Environments NADP National Atmospheric Deposition Program NO _x nitrogen oxides O ₃ ozone PM ₁₀ particulate matter less than 10 microns in diameter PM _{2.5} particulate matter less than 2.5 microns in diameter SLAMS State and Local Monitoring Site SO ₂ sulfur dioxide SPM Special Purpose Monitoring WARMS Wyoming Air Resource Monitoring System						

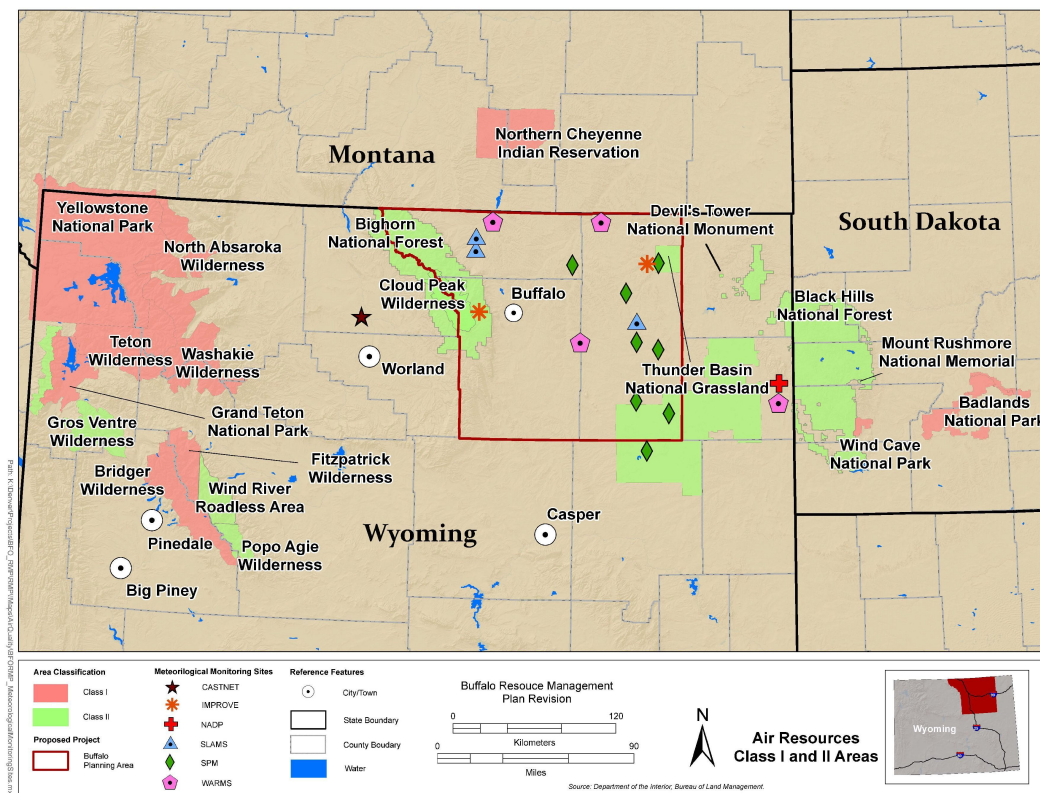


Figure 3.1. Location of Meteorological and Air Quality Monitoring Sites and Class I and II Areas in Northeast Wyoming

3.1.1.4. Current Condition

Climate

The climate in the planning area is temperate; it is a semi-arid region with long cold winters and short summers. The major factors controlling climate in the planning area are elevation, strong westerly winds, moisture flow, and mountainous barriers to the west. Elevations in the planning area are both variable and relatively flat, ranging from 3,400 feet along the Powder River at the Montana state line to 6,000 feet at the top of the Pumpkin Buttes; the elevation is 4,544 feet near Gillette and 4,645 feet near Buffalo. The Big Horn Mountains along the western edge of the planning area rise to more than 13,000 feet. In Gillette, monthly average temperatures range from 21.6 degrees Fahrenheit (°F) in the winter to 70.8°F in the summer. Wind speed and direction are highly variable because of the effect of local topography in the planning area. Wind speeds are generally strong and gusts above 40 miles per hour are not unusual. Table 3.2, “Climate Information for the Buffalo Planning Area” (p. 290) lists temperature, precipitation, and wind speed data for the planning area.

Table 3.2. Climate Information for the Buffalo Planning Area

Climate Component	Description
Temperature	Mean maximum summer temperature ¹ : 80.1 °F and 83.0 °F Mean minimum winter temperature ¹ : 14.1 °F and 14.6 °F Mean annual temperature ¹ : 45.3 °F and 46.2 °F
Precipitation	Mean annual precipitation: 13 to 17 inches Mean annual snowfall: 34 and 58 inches
Winds	Mean annual wind speed ² : 9.5 miles per hour Prevailing wind direction ² : north/northwest
Source: Western Regional Climate Center 2013 ¹ Buffalo (site 481165) and Gillette (site 483855) respectively (1981–2010) ² Buffalo (2000–2012) °F degrees Fahrenheit	

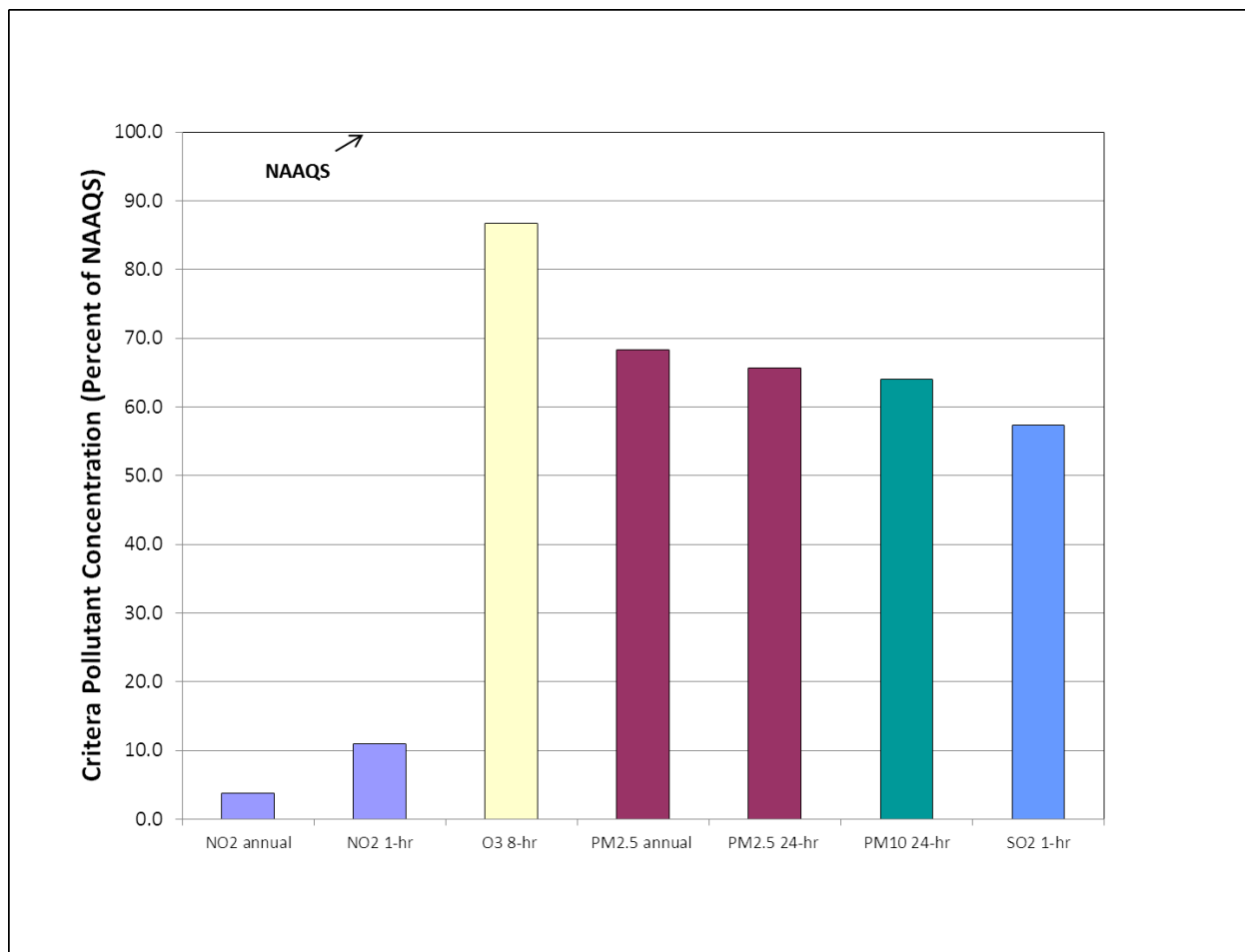
Air Quality

Table 3.3, “Applicable National and State Primary Air Quality Standards for Criteria Pollutants and Recent Representative Concentrations for the Planning Area” (p. 290) is an overview of the applicable primary WAAQS and NAAQS and recent representative maximum pollutant concentrations measured in or near the planning area. Figure 3.2, “Representative Maximum Pollutant Concentrations in the Buffalo Planning Area as a Percentage of the NAAQS” (p. 291) shows that the planning area is currently in compliance with all applicable national air quality standards, with the exception of existing PM₁₀ nonattainment area in Sheridan (due primarily to PM emissions from wood stove use in the winter months).

Table 3.3. Applicable National and State Primary Air Quality Standards for Criteria Pollutants and Recent Representative Concentrations for the Planning Area

Pollutant	Averaging Time	NAAQS			WAAQS			Representative Concentrations		
		(ppm)	(ppb)	(µg/m ³)	(ppm)	(ppb)	(µg/m ³)	(ppm)	(ppb)	(µg/m ³)
Carbon Monoxide	1 hour ¹	35	35,000	N/A	35	35,000	N/A	1	500	N/A
	8 hour ¹	9	9,000	N/A	9	9,000	N/A	0.3	300	N/A
Nitrogen Dioxide	1 hour ²	0.10	100	N/A	0.1	100	N/A	0.010	10.3	N/A
	Annual ³ (Arithmetic Mean)	0.053	53	N/A	0.053	53	N/A	0.001	1.4	N/A
Ozone	8 hour ⁴	0.075	75	N/A	0.075	75	N/A	0.064	64	N/A
PM ₁₀	24 hour ⁵	N/A	N/A	150	N/A	N/A	150	N/A	N/A	39
PM _{2.5}	24 hour ⁶	N/A	N/A	35	N/A	N/A	35	N/A	N/A	14
	Annual ⁷	N/A	N/A	12	N/A	N/A	15	N/A	N/A	5.0
Sulfur Dioxide	1 hour ⁸	0.075	75	N/A	0.075	75	N/A	0.0058	6	N/A
	3 hour ⁹	0.05	500	N/A	N/A	N/A	N/A	0.0	7.2	N/A
	24 hours ⁸	0.14	140	N/A	N/A	N/A	N/A	0.00	4.9	N/A
	Annual Mean ⁸	0.030	30	N/A	N/A	N/A	N/A	0.000	0.22	N/A

Pollutant	Averaging Time	NAAQS			WAAQS			Representative Concentrations		
		(ppm)	(ppb)	(µg/m³)	(ppm)	(ppb)	(µg/m³)	(ppm)	(ppb)	(µg/m³)
Source: EPA 2013a; Wyoming DEQ 2013c										
¹The Yellowstone site was terminated effective 5/31/2012. Cheyenne Ncore was used in lieu of Yellowstone. EPA's Air Quality System was used to generate an AMP501 Extract Raw Data Report for the 2013 1 hr CO data. The first ranking was used.										
²EPA's Air Quality System was used to generate an AMP350MX Raw Data Max Values Report for the 2013 8 hour CO average. The first ranking was used.										
³EPA's Air Quality System was used to generate an AMP480 Design Value Report for the 1 hr data at the 98th Percentile. The values for 2011-2013 were averaged over the three years. The 2012 data only had three quarters of valid data.										
⁴EPA's Air Quality System was used to generate an AMP450 Quicklook Criteria Parameters Report for the Annual Arithmetic Mean for CY 2013 data.										
⁵EPA's Air Quality System was used to generate an AMP350MX report for the 8 hour averaged ozone data from 2011-2013. The 4th highest value from each year was averaged (a three year average) to generate the result.										
⁶EPA's Air Quality System was used to generate an AMP450NC Quicklook All Parameters Report for the 24 hour Average for CY 2013.										
⁷EPA's Air Quality System was used to generate an AMP450 Report for the 98th Percentile 24 hour average and the Annual Arithmetic Mean data for CY 2013. Due to the Meadowlark Site having an establishment date of 7/1/2012, a three year average was not computed.										
⁸EPA's AAQS was used to generate an AMP450 Report for the 98th Percentile 1 hour data, 24 hour average, and Annual Arithmetic Mean data for CY 2013.										
⁹EPA's Air Quality System was used to generate an AMP450NC Report for the 3 hour block average data for CY 2013. The 2nd highest value was used for CY 2013.										
EPA Environmental Protection Agency										
N/A not applicable										
NAAQS National Ambient Air Quality Standards										
PM _{2.5} particulate matter less than 2.5 microns in diameter										
PM ₁₀ particulate matter less than 10 microns in diameter										
ppm parts per million										
ppb parts per billion										
µg/m³ micrograms per cubic meter										
SLAMS State and Local Air Monitoring System										
WAAQS Wyoming Ambient Air Quality Standards										
WARMS Wyoming Air Resource Monitoring System										



Source: EPA 2013a

NAAQS National Ambient Air Quality Standards

NO₂ nitrogen dioxide

PM₁₀ particulate matter less than 10 microns in diameter

PM_{2.5} particulate matter less than 2.5 microns in diameter

SO₂ sulfur dioxide

Note: The representative maximum pollutant concentrations as a percentage of the NAAQS were calculated using the values in Table 3.3, “Applicable National and State Primary Air Quality Standards for Criteria Pollutants and Recent Representative Concentrations for the Planning Area” (p. 290), which also provides the location and time period associated with monitoring data.

Figure 3.2. Representative Maximum Pollutant Concentrations in the Buffalo Planning Area as a Percentage of the NAAQS

Summary of Air Quality Modeling Studies of the Powder River Basin

During the last decade, a number of studies have been conducted to evaluate the potential effects of emissions from natural resource development sources and activities in the Buffalo planning area, primarily associated with coal and coalbed natural gas (CBNG) development in the Powder River Basin (PRB). Several of these air quality impact assessment studies for the PRB have included air quality modeling and related activities such as the development of comprehensive emission inventories. The studies summarized below exemplify the types of analyses that have

been conducted or are ongoing in the Buffalo planning area that not only include estimates of the expected increases in criteria pollutant emissions from these activities, but also examine their potential future year impacts on air quality concentrations using air quality modeling tools.

PRB-I

In 2002, Argonne National Laboratory conducted an air quality impact assessment for the PRB, referred to as PRB-I (Argonne National Laboratory 2002). The geographic area of interest included the Montana and Wyoming portions of the PRB. The primary focus of the study was to examine potential air quality impacts from CBNG and conventional oil and gas (O&G) development sources in the Wyoming and Montana portions of the PRB. Prior studies focused on Wyoming only and Montana only, but this study was conducted for the two areas combined. At the time of the assessment, development was expected to occur over a 20-year period for the Montana portion of the PRB and over a 10-year period for the Wyoming portion.

The assessment included the application of the CALPUFF air quality model (version 5) using MM5/CALMET-derived meteorological inputs for 1996 and emission inputs for a base year of 2000. The modeling domain included most of Wyoming and Montana and portions of North Dakota, South Dakota, and Nebraska. The assessment focused on criteria pollutants (NO₂, SO₂, CO, PM₁₀ and PM_{2.5}), HAPs, visibility, and atmospheric deposition to lakes (lake chemistry). O₃ was not addressed due to limitations of the CALPUFF modeling system.

CALPUFF was used to estimate direct, indirect, and cumulative near-field and far-field air quality impacts for comparison with air quality standards and PSD increments. The study considered four development alternatives for Wyoming project sources. Near-field modeling focused on project sources located in Wyoming found that:

- For all four alternatives, the concentration increases due to the emissions from the Wyoming project sources are expected to be less than the maximum allowable PSD increments for Class II areas, representing percentages equal to or less than about 32, 3, and 67 percent of the maximum allowable Class II PSD increments for NO₂, SO₂, and PM₁₀, respectively.
- HAPs impacts are expected to be small, except for formaldehyde.

Far-field modeling results indicated that:

- The maximum far-field impacts of criteria air pollutants due to the Wyoming project source emissions were shown to occur at the Northern Cheyenne Indian Reservation, the closest Class I sensitive receptor area.
- The concentration increases in NO₂, SO₂, and PM₁₀ due to the Wyoming project emissions are expected to be less than the maximum allowable PSD increments for all mandatory Class I areas and all alternatives. The concentration increases attributable to the emissions from Wyoming project sources are lower than those attributed to non-Wyoming project source emissions for all criteria pollutants examined.
- The number of days per year with visibility degradation equal to or greater than 1 deciview due to emissions from the Wyoming project sources was estimated to be on average approximately 4 days for the Preferred Alternative (at the sensitive receptors). The highest value (20 days) was modeled at the Crow Indian Reservation under the Preferred Alternative.
- For Florence Lake, the estimated potential change in acid neutralizing capacity (ANC) due to emissions from all sources under the Preferred Alternative is slightly above 10 percent, which is the limit of acceptable change (LAC) threshold for lakes with background ANC values greater than 25 microequivalents per liter (µeq/L), as used for this study. For Upper Frozen Lake, the estimated potential change in ANC is greater than 1 µeq/L, which is the LAC threshold for

lakes with background ANC values less than 25 µeq/L. In both cases, the impact is mostly due to non-Wyoming sources, likely because the lakes are generally upwind of the PRB.

- For other sensitive lakes, the estimated potential changes in ANC due to Wyoming project sources and cumulative sources for all alternative combinations evaluated are less than 10 percent (the applicable LAC threshold for lakes with background ANC values greater than 25 µeq/L).

Finally, the assessment report indicated that mitigation options for NO₂ and fugitive dust were to be considered.

PRB Coal Review

Four studies comprise the PRB Coal Review (ENSR 2005a). These focused on current conditions (for 2002), and cumulative effects for three (at the time) future years including 2010, 2015, and 2020.

Current Conditions

To establish the current conditions, ENSR (ENSR 2005a) prepared a summary of 2002 air quality in the PRB area. The Wyoming portion of the study area included Campbell, Sheridan, and Johnson counties excepting the Bighorn National Forest lands to the west of the PRB, and the northern portion of Converse County. The Montana portion of the PRB study area included portions of Rosebud, Custer, Powder River, Big Horn, and Treasure counties (where coal mines are located).

This assessment of current conditions included the application of the CALPUFF air quality model (version 5) using MM5/CALMET-derived meteorological inputs for 1996 and emission inputs for a base year of 2002. The modeling domain included most of Wyoming, southeastern Montana, southwestern North Dakota, western South Dakota, and western Nebraska. The assessment focused on criteria pollutants (NO₂, SO₂, CO, PM₁₀ and PM_{2.5}), HAPS, visibility, and acid deposition. Impacts from different source groups were evaluated, including CBNG sources, coal-related sources, coal mines, non-coal sources, power plants, Wyoming sources, Montana sources, and all sources.

Modeled impacts of the cumulative sources showed predicted values that were greater than the 24-hour PM₁₀ standards at near-field receptors, both in Wyoming and Montana. These impacts are primarily attributable to nearby sources and result in concentrations that exceed the NAAQS by approximately 15 percent for the Montana receptors and by more than a factor of two for the Wyoming receptors. These impacts only affect the near-field receptors. Modeled impacts of other criteria air pollutants were shown to be well below the NAAQS as well as the individual state AAQS for all receptors. Visibility in Class I and in sensitive Class II areas was affected with impacts above 1 deciview for several modeled days. Impacts on acid deposition were shown to be well below established guidelines.

The CALPUFF results were used to quantify the relative impacts from sources/source categories for each receptor. Results vary by receptor, pollutant and AQRV. Coal-related (and CBNG) sources were shown to have their greatest impacts at the near field receptors. Coal-related sources were estimated to comprise 50 percent or more of the overall (all sources) impact at numerous Class I and Class II receptors. CBNG was associated with up to 30 percent of the coal-related impact – this varied by receptor, pollutant and AQRV.

Cumulative Effects 2010

ENSR (ENSR 2006) conducted additional modeling to examine the effects of Reasonably Foreseeable Development (RFD) for 2010. The modeling approach was the same as that used to establish the current conditions, except that emissions from existing sources were adjusted to represent 2010 levels in accordance with RFD. The types of sources considered included power plants, coal mines, conventional O&G, CBNG, and other coal-related energy development sources.

This study examined two scenarios, a lower production (or development) scenario and a higher production scenario. The study evaluates impacts on air quality and air quality-related values resulting from projected development of RFD activities in the study area. For Wyoming, these include coal mine development as well as coal-related activities (i.e., railroads, coal-fired power plants, major transmission lines, and coal technology projects) and non-coal-related activities (i.e., other mines, CBNG, conventional O&G, major transportation pipelines, and key water storage reservoirs) in the Wyoming PRB study area. For Montana, these include coal mine development and coal-related activities in the Montana PRB study area.

For both development scenarios, the modeled near-field concentrations for all criteria pollutants were shown to increase in accordance with the increase in emissions. Maximum 24-hour $PM_{2.5}$ concentrations for the Wyoming receptors were estimated to be 13 percent higher (compared to current conditions) for the lower development scenario and 31 percent higher for the upper development scenario. Annual $PM_{2.5}$ concentrations for the Wyoming receptors were estimated to be 15 percent higher for the lower development scenario and 35 percent higher for the upper development scenario. The results are similar for the Montana receptors. For both receptor groups (Wyoming and Montana), modeled impacts above the ambient standard occurred at a small number of near-field receptors, and impacts decrease dramatically away from these locations.

Modeled visibility impacts at the identified Class I areas indicated an increase in the number of days with impacts above 1 deciview. The greatest visibility impacts were modeled at Badlands, Theodore Roosevelt, and Wind Cave National Parks, with an increase in the number of days exceeding 1 deciview of less than or equal to 26 days per year. The modeling results indicated a greater increase in the number of days with degraded visibility at certain of the Class II areas, including Agate Fossil Beds National Monument (30 days), Fort Laramie National Historic Site (30 days), and Soldier Creek Wilderness Area (29 days).

For acid deposition of nitrogen and sulfur compounds, the modeling results indicated substantial percentage increases in deposition under the lower and upper development scenarios. Impacts were estimated to be below the threshold values (with the exception of Florence Lake and Upper Frozen Lake). In this study, the modeled impacts were primarily attributable to coal-related sources and power plants, including sources from both Montana and Wyoming.

Model results selected HAPs emissions (benzene, ethyl benzene, formaldehyde, n-hexane, toluene, and xylene) for the 2010 upper development scenario estimated impacts to be above the acute Reference Exposure Level (REL) for formaldehyde at two receptors in Wyoming. The modeled impacts for the 2010 lower development scenario reflected the same patterns as the 2002 base year.

Cumulative Effects 2015

ENSR (ENSR 2008) conducted additional modeling to examine the effects of RFD for 2015. The modeling approach was the same as that used for the current conditions and 2010 analyses, but an updated version of the CALPUFF model (version 5.8) was used and the model inputs were also updated. MM5/CALMET-derived meteorological inputs for 2003 were used. The emissions inputs were derived using 2004 base-year emissions projected to 2015. The types of sources considered included power plants, coal mines, conventional O&G, CBNG, and other coal-related energy development sources.

For the Wyoming near-field receptors, the 24-hour PM_{10} and $PM_{2.5}$ concentrations included localized values that were greater than the NAAQS for the base year (2004), as well as for both development scenarios for 2015. The modeling results for the 2015 development scenarios indicated an increase in concentration of about a factor of two, relative to the base year for these parameters, primarily due to CBNG operations and coal mining activities. Additionally, a 30 to 50 percent increase of annual PM_{10} and $PM_{2.5}$ concentrations at the Wyoming near-field receptors was also predicted. This level of increase would lead to values greater than the annual standards for both PM_{10} and $PM_{2.5}$. Impacts of NO_2 and SO_2 emissions are predicted to be below the NAAQS and WAAQS at the Wyoming near-field receptors.

Modeled impacts at Montana near-field receptors indicated compliance with the NAAQS and the Montana AAQS for all pollutants and averaging periods except the 1-hour NO_2 .

Modeled visibility impacts at Class I and Class II areas showed an increase in the number of days with impacts above 1 deciview, compared to the 2004 base year, by as much as 36 days for the lower development scenario 47 days for the upper development scenario.

For acid deposition of nitrogen and sulfur compounds, the modeling results indicated substantial percentage increases in deposition under the lower and upper development scenarios. Impacts were estimated to be below the threshold values (with the exception of Florence Lake and Upper Frozen Lake). As for 2010, the modeled impacts were primarily attributable to coal-related sources and power plants, including sources from both Montana and Wyoming.

Model results for the base year (2004) and 2015 development scenarios predicted impacts to be well below the acute RELs, Reference Concentrations for Chronic Inhalation, and carcinogenic risk threshold for HAPs. Benzene exposure was predicted to increase by 50 percent as a result of projected PRB development, but even with this increase the risk is below carcinogenic risk thresholds.

Cumulative Effects 2020

AECOM (ENSR 2009b) conducted additional modeling to examine the effects of RFD for 2020. The modeling approach was the same as that used for the 2015 analyses.

For the Wyoming near-field receptors, the modeled impact of the 24-hour PM_{10} and $PM_{2.5}$ concentrations showed localized values greater than the NAAQS for the base year (2004), as well as for both development scenarios for 2020. For the 2020 development scenarios, concentrations of these parameters were shown to increase by a factor of 2.5 relative to the base year, primarily due to CBNG operations and coal mining activities. Annual PM_{10} and $PM_{2.5}$ concentrations at peak Wyoming near-field receptors were shown to increase by about 20 percent, commensurate with modeled values greater than the annual standards for $PM_{2.5}$. Impacts of NO_2 and SO_2 emissions were predicted to be below the NAAQS and Wyoming AAQS at the Wyoming near-field receptors.

Modeling results for the Montana near-field receptors showed compliance with the NAAQS and the Montana AAQS for all pollutants and averaging periods. The 1-hour NO₂ concentrations at Montana near-field receptors were predicted to exceed the AAQS for 2015, but not for 2020. The authors suggest that this is due to a southward relocation of CBNG wells.

Modeled visibility impacts at Class I and Class II areas were shown to increase in the number of days with impacts above 1 deciview, compared to the 2004 base year, by up to 59 days for the lower development scenario and up to 60 days for the upper development scenario.

The model results indicated that the increased deposition, especially from SO₂ emissions from power plants, contributed to modeled values greater than the ANC thresholds at Florence Lake and Upper Frozen Lake. The authors suggest that increased growth in power plant operations (presumably especially upwind of the sensitive lakes) would further reduce the ANC of the sensitive lakes and that this issue should be carefully examined for each proposed future development project.

PRB-II

The modeling and air analysis completed for the 2009 PRB I report were based on a projected level of development that ultimately never came to fruition. As a result, the PRB I analysis is not representative of the current state of air quality or for the future of coal or O&G development in the planning area. The BLM recently completed a subsequent report, PRB II (released February 2014), which included a modeling analysis to characterize future development and air quality impacts in the planning area.

The geographic area of interest for the PRB II study is the Montana and Wyoming portions of the PRB. Types of sources to be considered include CBNG, conventional O&G development sources, and coal in the Wyoming and Montana portions of the PRB. Pollutants of interest are: criteria pollutants (O₃, NO₂, SO₂, CO, PM₁₀, PM_{2.5}), HAPS, visibility, deposition (lake chemistry).

The proposed modeling approach included the use of the Weather Research and Forecasting meteorological model and the Comprehensive Air Quality Model, with Extensions photochemical air quality model. The proposed modeling domain included a high resolution (4-kilometer) grid over the PRB study area. The analysis examined a 2008 base-year and cumulative impacts for future-years of 2020 and 2030. Due to revised O&G development plans within the Buffalo planning area and adjacent areas that were not accounted for in the PRB II air quality analysis, the BLM will not be using the PRB II air analysis to inform planning decisions for the Buffalo RMP or for future O&G projects in the planning area. Air quality modeling analyses that are currently underway for the Converse County EIS (AECOM) and the 2011 base case model being prepared as part of the Three State Data Warehouse Project will include updated RFD and emissions for the planning area. These current modeling efforts will be used to assess current and future air quality within the planning area.

WRAP-III

To support future modeling studies of the area, Environ (2011) conducted an analysis of the criteria pollutant emissions for O&G exploration and production operations in the PRB. This study did not perform modeling. The study focused on emission inventory development only for the year 2006. The emissions totals for the PRB for 2006 are 21,086 tons of NO_x and 14,367 tons of VOC. Overall, compressor engines accounted for approximately 44 percent and drilling rigs accounted for approximately 27 percent of basin-wide NO_x emissions. Pneumatic devices, well

fugitive devices, and compressor engines accounted for approximately 61 percent of basin-wide VOC emissions.

Summary

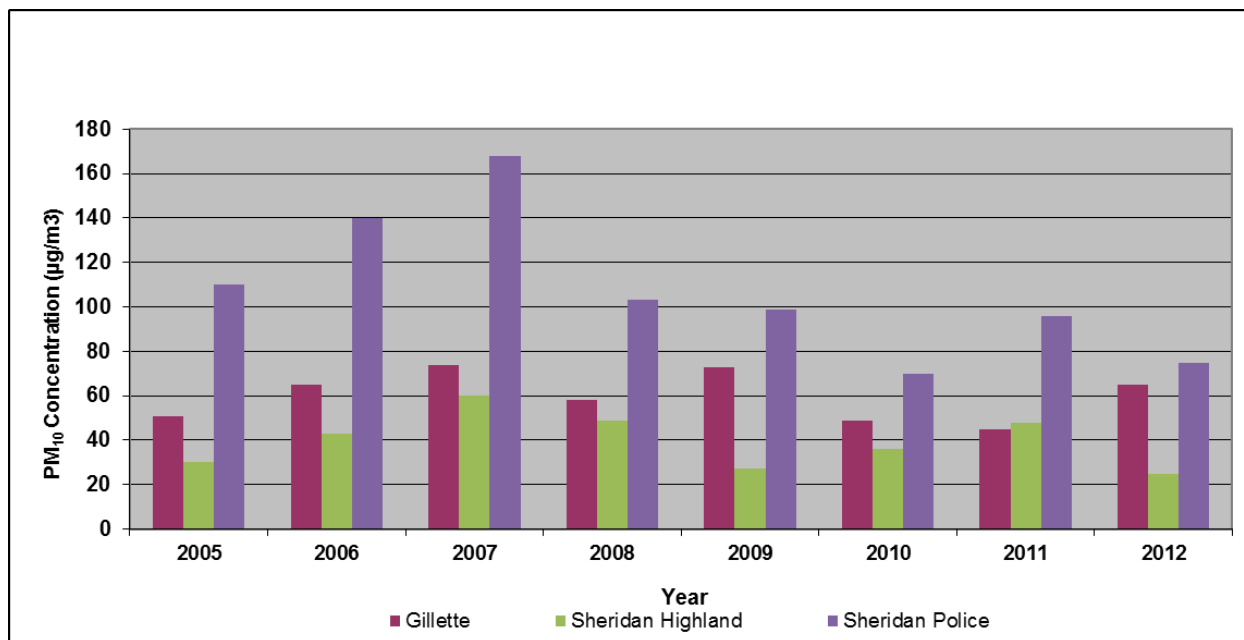
In summary, recent modeling and modeling-related studies of the PRB have provided quantitative information on the potential effects of various development scenarios on air quality and deposition throughout the region as well as the relative contribution of various sources/source categories to air quality impacts. The PRB-I modeling (using CALPUFF) showed that planned development would result in air quality impacts, including some localized values greater than the air quality standards for PM₁₀ and PM_{2.5}, and degraded visibility at nearby Class I and Class II areas. Additional modeling conducted in support of a multi-year coal review study (also using CALPUFF) found that coal-related (and CBNG) sources were shown to have their greatest impacts at the near field receptors. For a base-year of 2002, coal-related sources were estimated to comprise 50 percent or more of the overall impact at numerous Class I and Class II receptors. CBNG was associated with up to 30 percent of the coal-related impact – this varied by receptor, pollutant, and AQRV. Additional modeling for 2010, 2015 and 2020 indicated that RFD would result in air quality impacts, including some localized values greater than the air quality standards for PM₁₀ and PM_{2.5}, degraded visibility at nearby Class I and Class II areas, and increased deposition to sensitive lakes. An additional modeling study (PRB-II) examined impacts for future years of 2020 and 2030. However, due to revised development plans in the planning area and adjacent areas that were not factored into the PRB II air analysis, the BLM does not intend to use the PRB II air analysis to inform the Buffalo RMP or future O&G development in the planning area. Air resources will be managed in accordance with the Buffalo RMP Air Resource Plan, which was developed collaboratively with EPA Region 8 and the Wyoming DEQ-Air Quality Division (AQD).

3.1.1.5. Trends

This section evaluates the recent trends in air quality in the Buffalo planning area by examining criteria pollutant, visibility, and deposition data collected at various monitoring sites in and near the planning area. It should be noted that no statistics were computed to quantify the actual trends or their significance attributes. Rather, all discussions below related to the various trends are derived from simple visual inspection of the data.

Air Pollutant Concentrations

Air quality data collected at a number of monitors in the Buffalo planning area (see Table 3.1, “Air Quality Monitoring Sites in and Near the Buffalo Planning Area” (p. 286)) are presented graphically for PM₁₀, PM_{2.5}, O₃ and SO₂. Figure 3.3, “Peak 24-Hour Average Particulate Matter Concentrations at Selected Sites in the Buffalo Planning Area” (p. 298) shows annual peak 24-hour average PM₁₀ concentrations at the Gillette, Sheridan Highland, and Sheridan Police Station sites for the period 2005 to 2012. Although the peak concentration for 2007 was over the standard at the Sheridan Police Station Site, recent measurements of 24-hour PM₁₀ at this site and other sites shown are well below the standard.

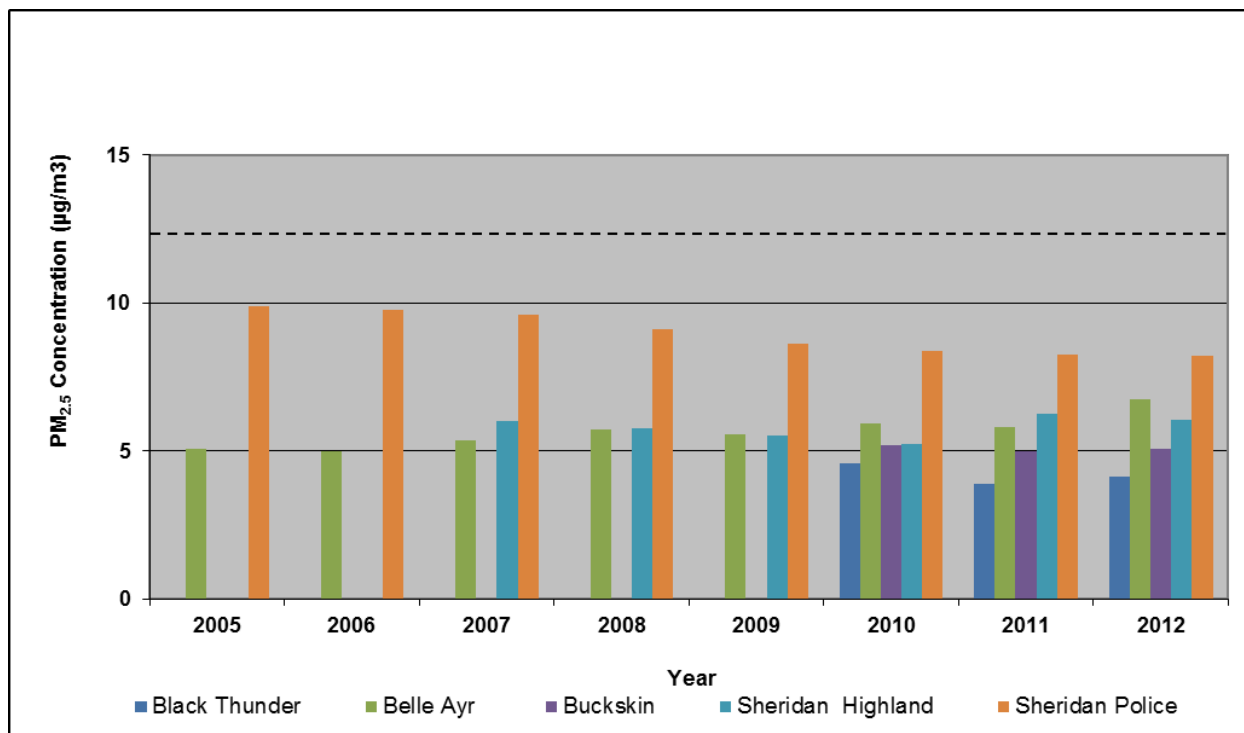


Source: EPA 2013a

NAAQS National Ambient Air Quality Standards
 PM₁₀ particulate matter less than 10 microns in diameter

Figure 3.3. Peak 24-Hour Average Particulate Matter Concentrations at Selected Sites in the Buffalo Planning Area

Figure 3.4, “Three-year Average of Annual Mean PM_{2.5} Concentrations for the Buffalo Planning Area” (p. 299) presents the annual mean averaged over three years of PM_{2.5} data collected at the Black Thunder, Belle Ayr, Buckskin, Sheridan Highland Park, and Sheridan Police Station monitors for the period 2005 to 2012. For some of the sites, complete data records were not available until more recent years. Except for the Police Station site, the concentrations measured at the other sites are well below the annual average NAAQS.

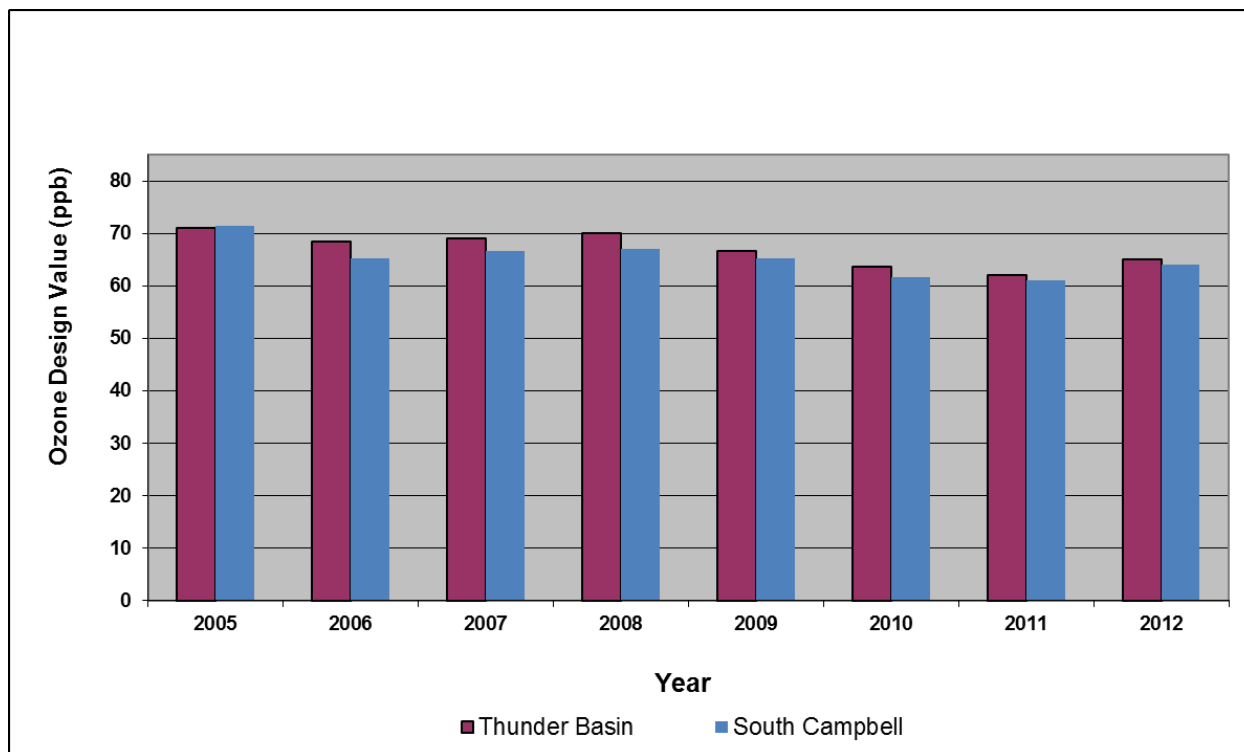


Source: EPA 2013a

PM_{2.5} particulate matter less than 2.5 microns in diameter
 ug/m³ micrograms per cubic meter

Figure 3.4. Three-year Average of Annual Mean PM_{2.5} Concentrations for the Buffalo Planning Area

Figure 3.5, “8–Hour Ozone Design Value” (p. 300) presents recent design values calculated using monitoring data for the period 2005 to 2012. The O₃ design value is calculated as the 3-year average of the fourth highest observed concentration. The data indicate a slight downward trend for the period 2008 through 2011, with a slight increase in design value calculated for 2012 at both sites.

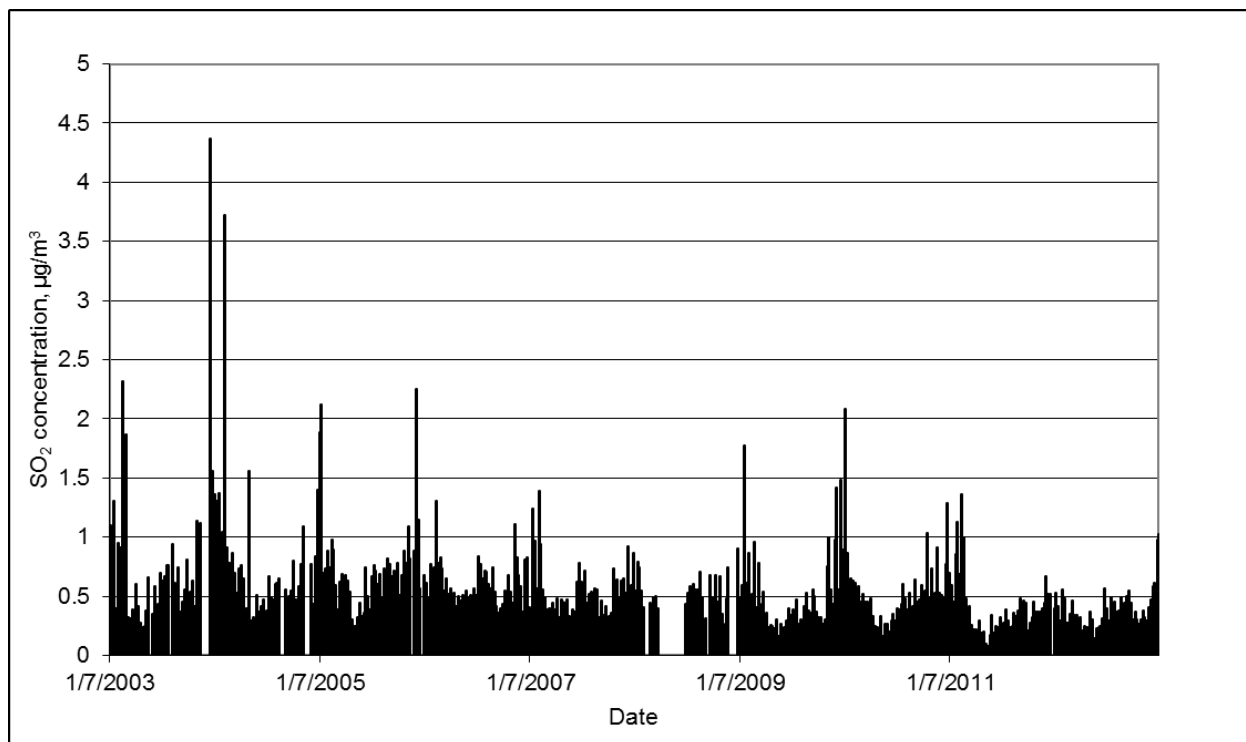


Source: EPA 2013a

ppb parts per billion

Figure 3.5. 8-Hour Ozone Design Value

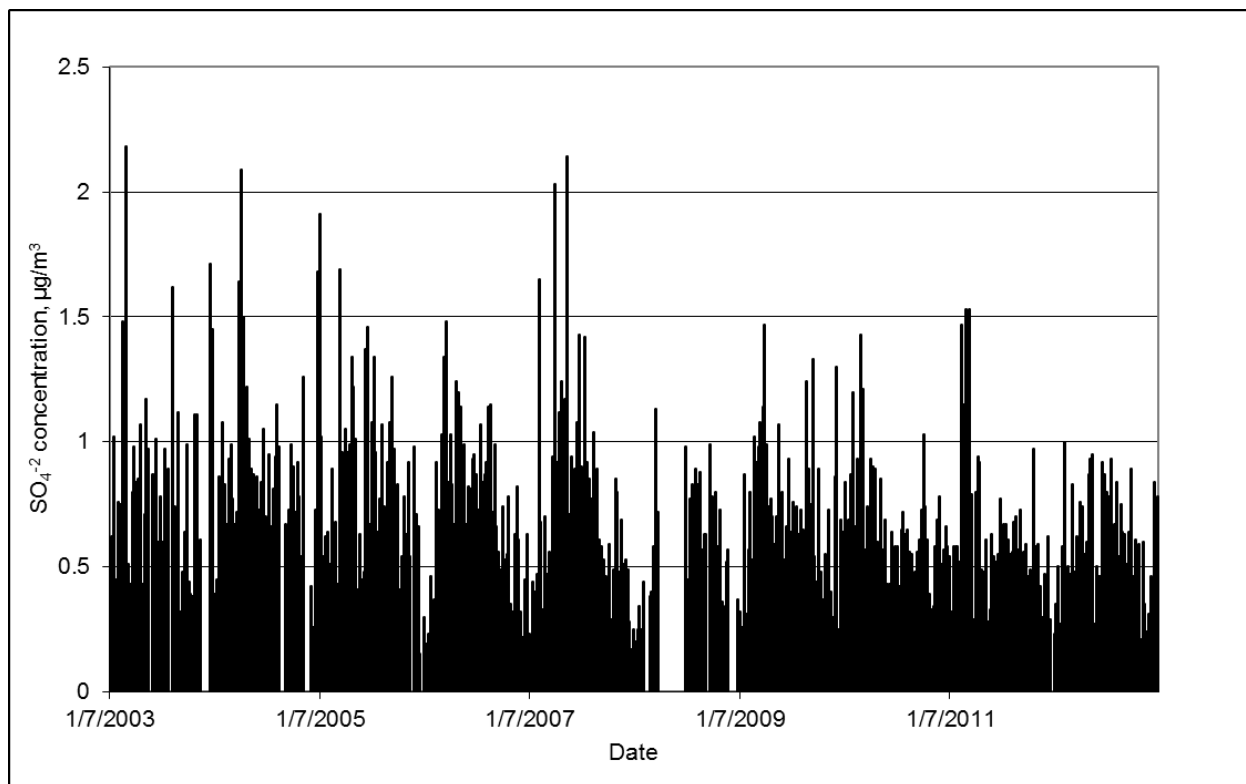
Monitoring sites at Buffalo and Sheridan as part of the BLM WARMS network provide a summary of observed concentrations of sulfur and nitrogen compounds in the planning area. Figure 3.6, “Weekly SO₂ Concentrations (μg/m³) – Buffalo WARMS Monitor” (p. 301) through Figure 3.9, “Weekly NH₄ Concentrations (μg/m³) – Buffalo WARMS Monitor” (p. 304) present weekly average concentrations of SO₂, SO₄, NO₃, and NH₄, respectively, for the Buffalo site for the period 2003 to 2011. Figure 3.10, “Weekly SO₂ Concentrations (μg/m³) – Sheridan WARMS Monitor” (p. 305) through Figure 3.13, “Weekly NH₄ Concentrations (μg/m³) – Sheridan WARMS Monitor” (p. 308) present similar measures for the Sheridan site for this same period. There are data missing for a number of weeks throughout this period, especially in 2008. The data show weekly and seasonal variations in these compounds at both sites, with no real discernible long-term trends over this period. Observed concentrations of SO₂, SO₄, and NO₃, are consistently higher at the Sheridan site in the northwest portion of the planning area compared to the Buffalo site. Observations of NH₄ are comparable at both sites during this period.



Source: WARMS 2013

µg/m³ micrograms per cubic meter
SO₂ sulfur dioxide

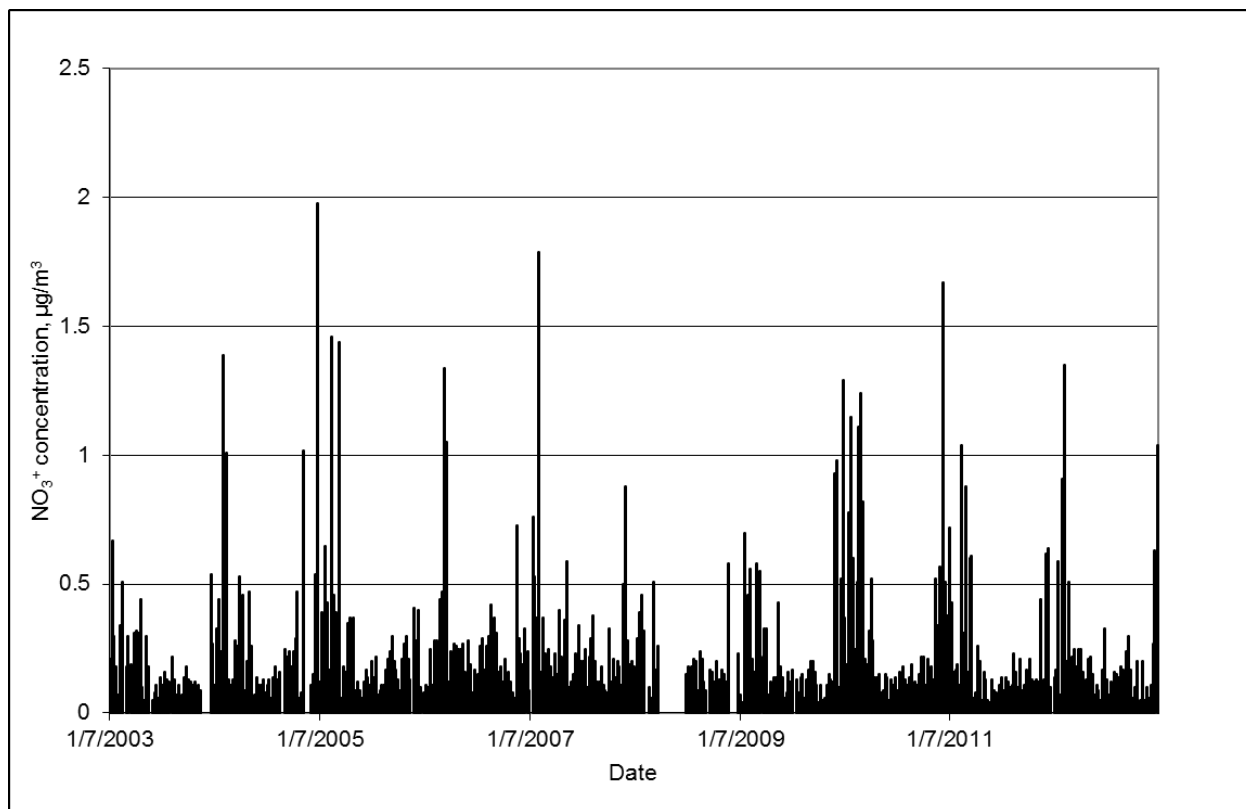
Figure 3.6. Weekly SO₂ Concentrations (µg/m³) – Buffalo WARMS Monitor



Source: WARMS 2013

$\mu\text{g}/\text{m}^3$ micrograms per cubic meter
 SO_4 sulfate

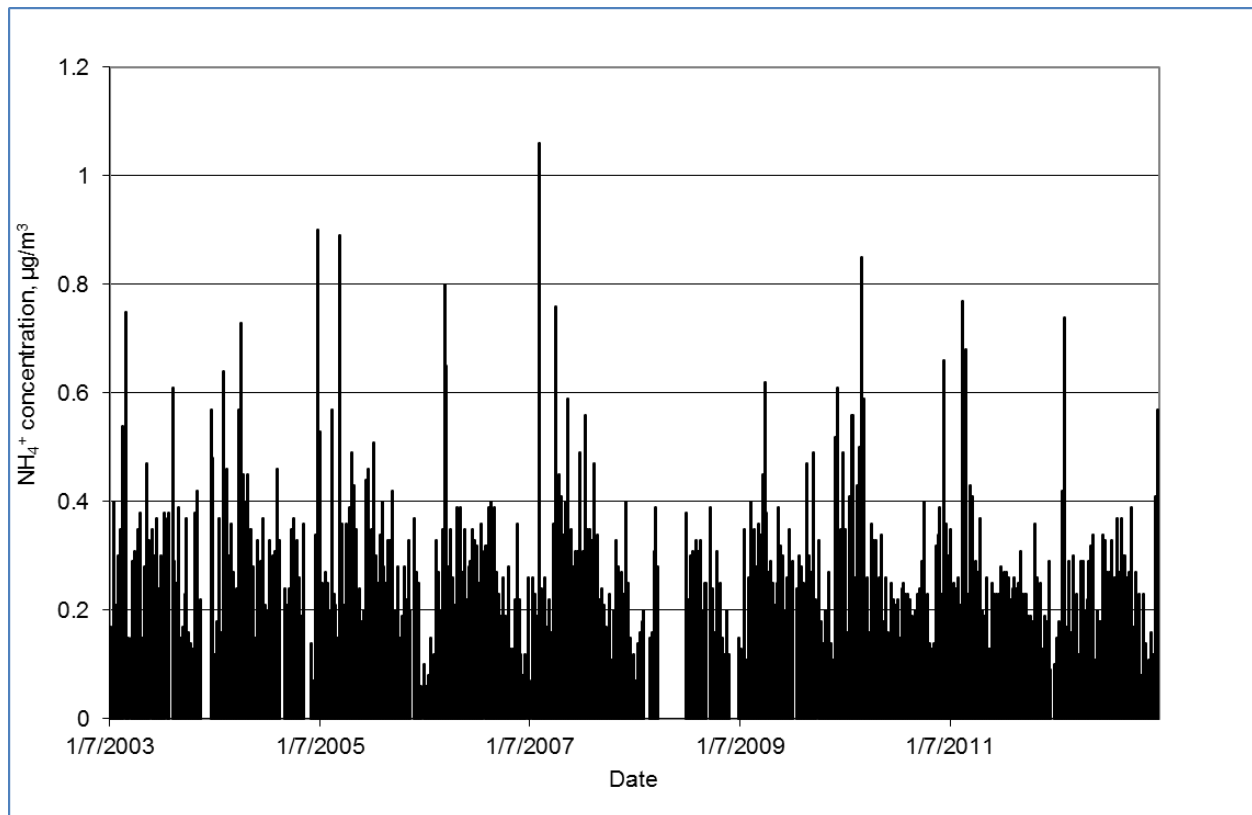
Figure 3.7. Weekly SO_4 Concentrations ($\mu\text{g}/\text{m}^3$) – Buffalo WARMS Monitor



Source: WARMS 2013

ug/m³ micrograms per cubic meter
NO₃ nitrate

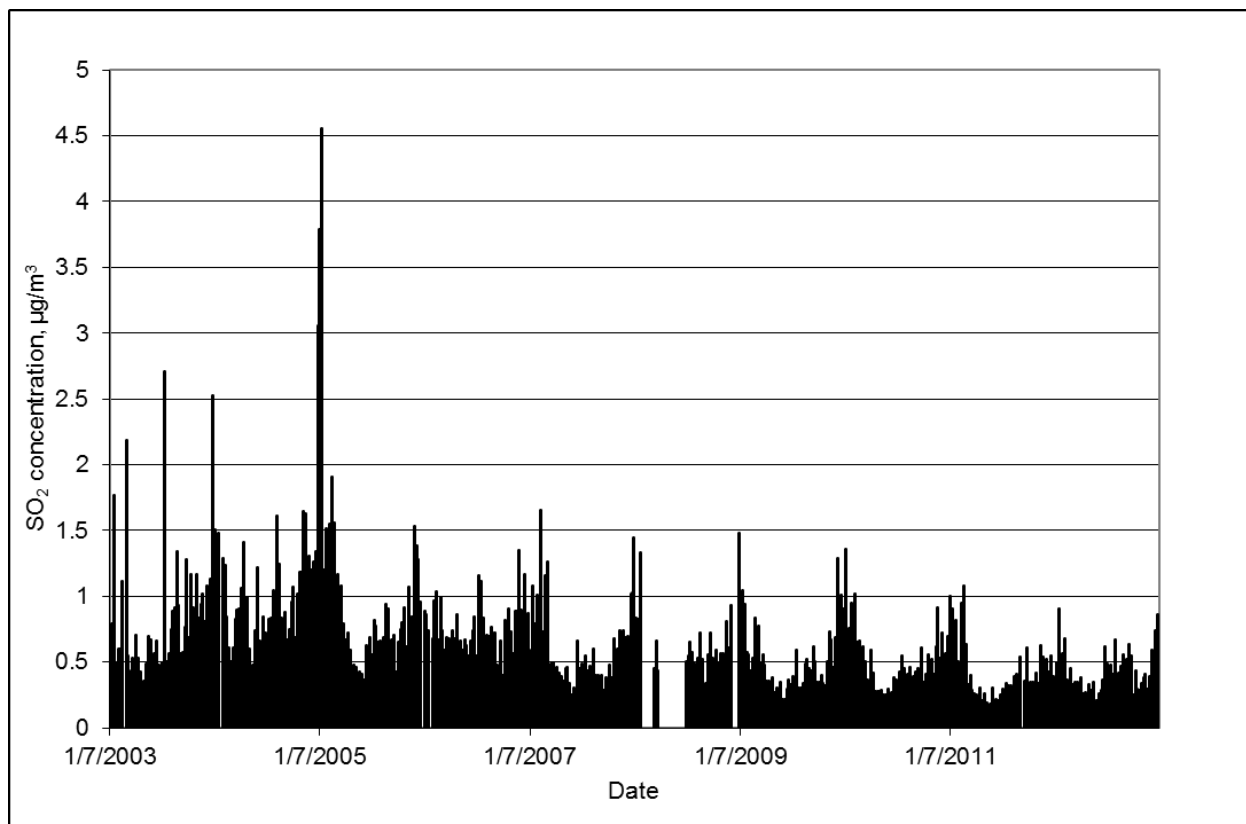
Figure 3.8. Weekly NO₃ Concentrations (µg/m³) – Buffalo WARMS Monitor



Source: WARMS 2013

µg/m³ micrograms per cubic meter
NH₄ ammonium

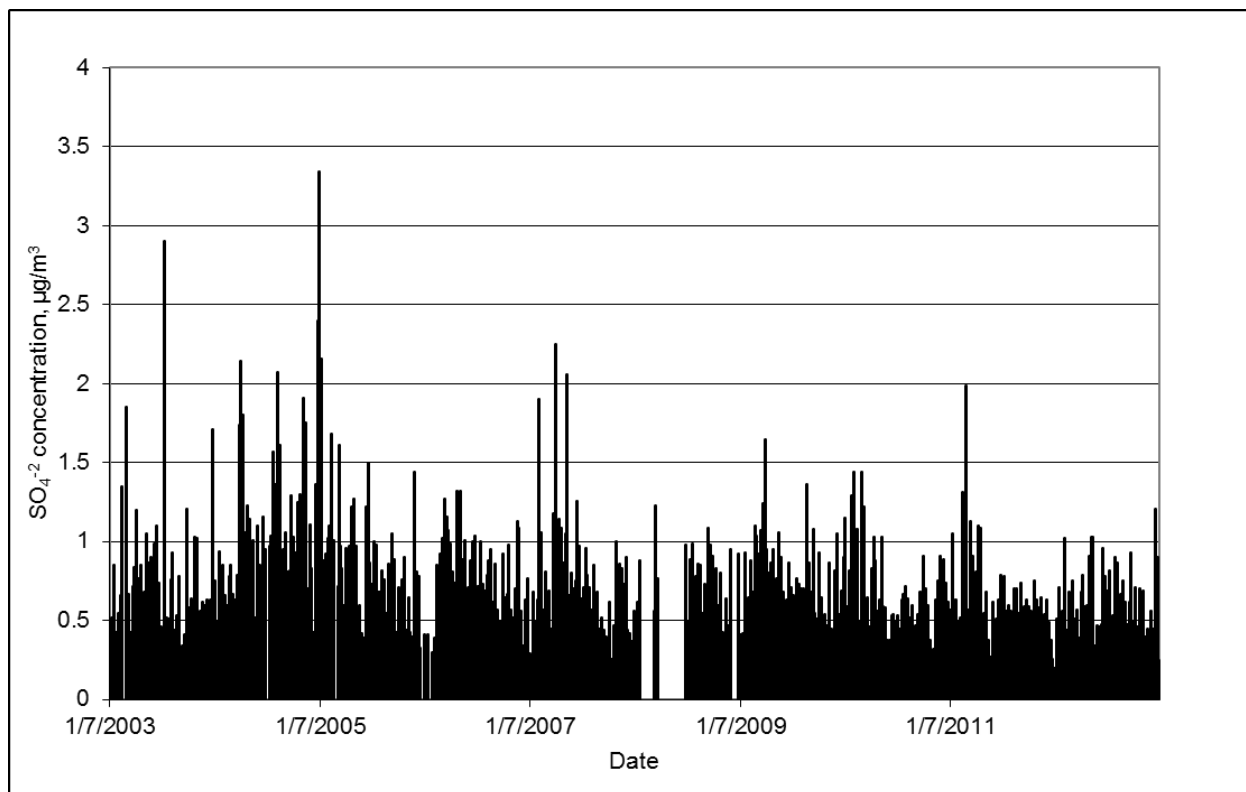
Figure 3.9. Weekly NH₄ Concentrations (µg/m³) – Buffalo WARMS Monitor



Source: WARMS 2013

ug/m³ micrograms per cubic meter
SO₂ sulfur dioxide

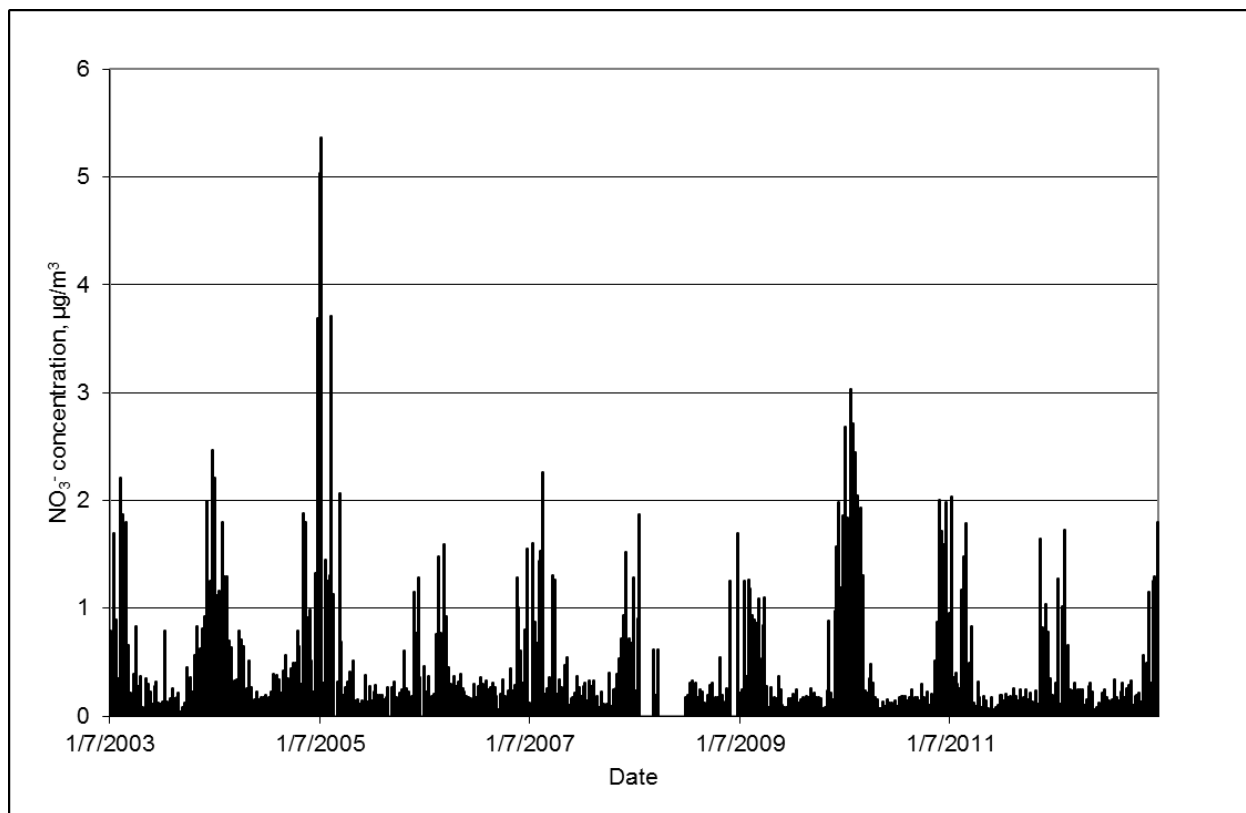
Figure 3.10. Weekly SO₂ Concentrations (µg/m³) – Sheridan WARMS Monitor



Source: WARMS 2013

ug/m³ micrograms per cubic meter
SO₄ sulfate

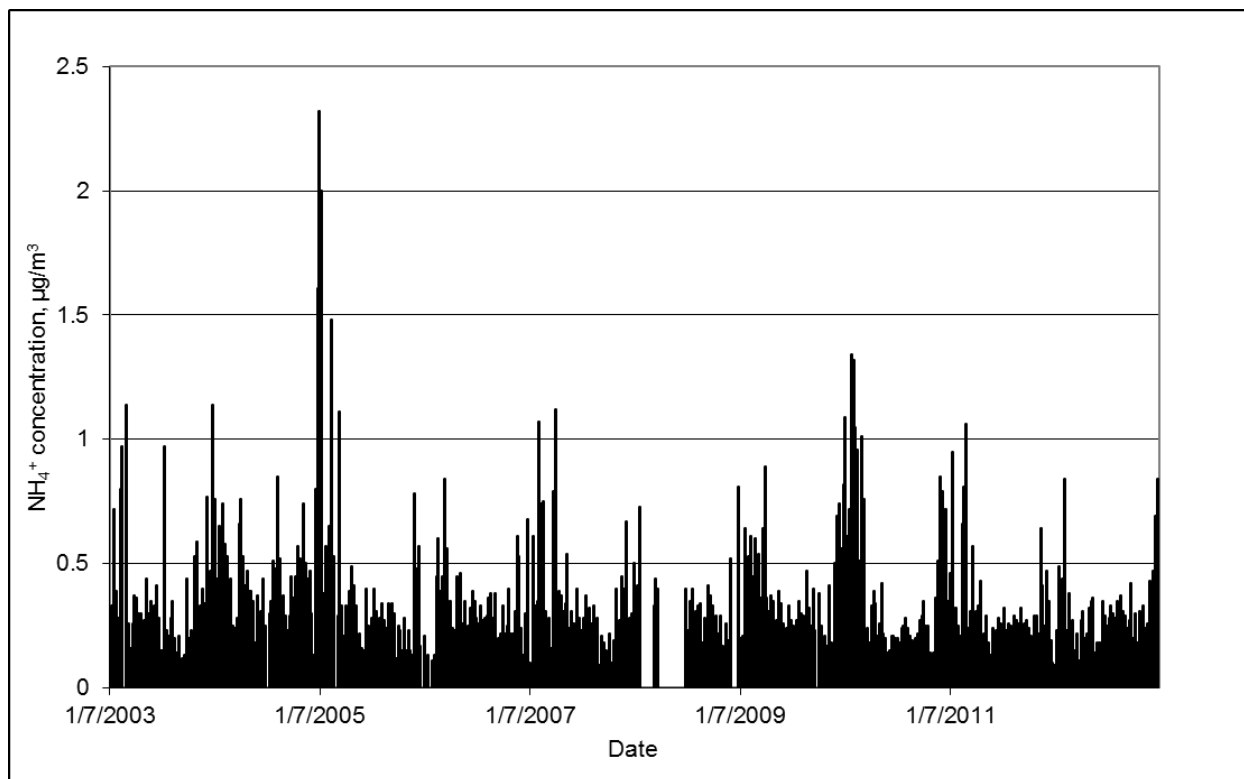
Figure 3.11. Weekly SO₄ Concentrations (µg/m³) – Sheridan WARMS Monitor



Source: WARMS 2013

ug/m³ micrograms per cubic meter
NO₃ nitrate

Figure 3.12. Weekly NO₃ Concentrations (µg/m³) – Sheridan WARMS Monitor



Source: WARMS 2013

ug/m³ micrograms per cubic meter
NH₄ ammonium

Figure 3.13. Weekly NH₄ Concentrations (µg/m³) – Sheridan WARMS Monitor

Visibility

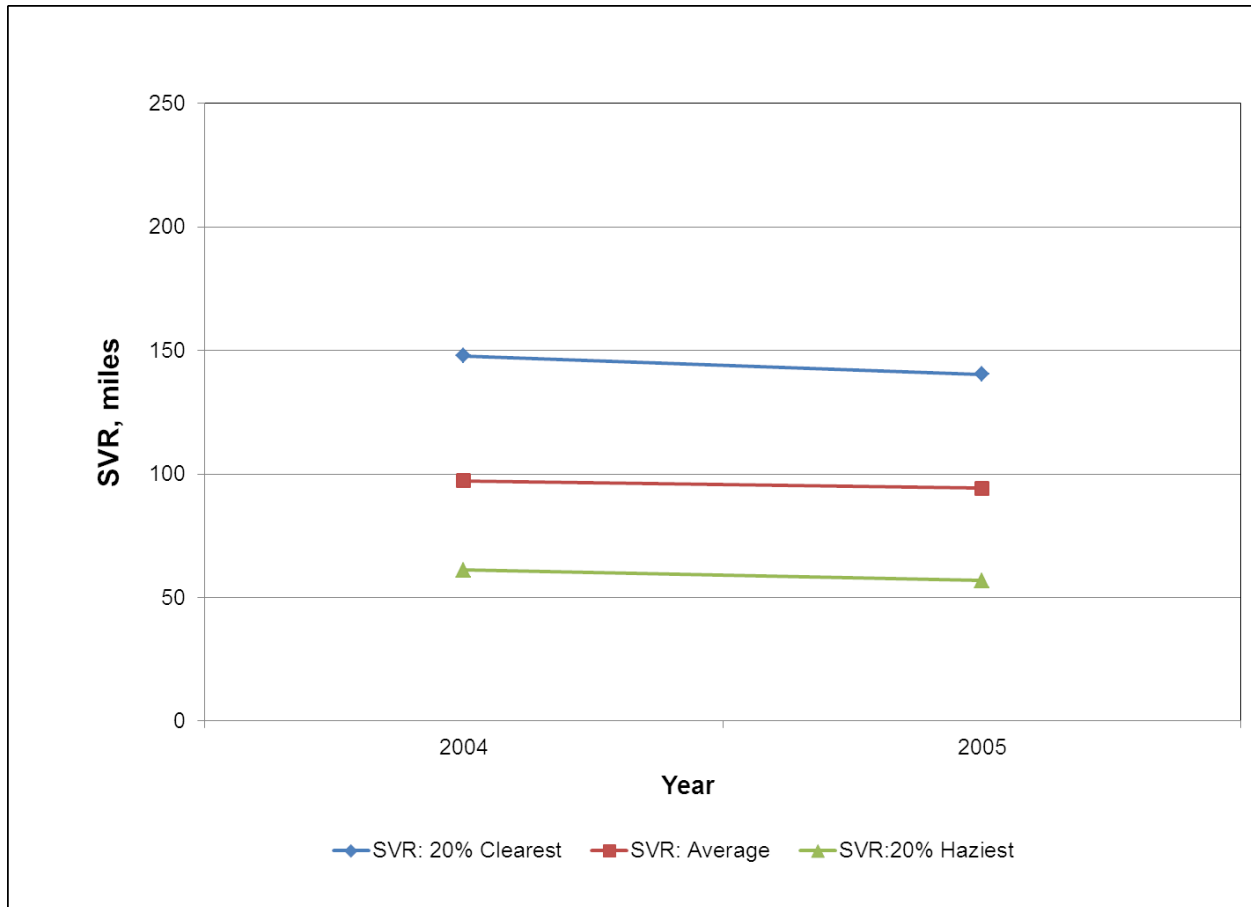
An assessment of the general trends in visibility was conducted by examining weekly and annual average SVR estimates for the Thunder Basin, Cloud Peak, and Badlands IMPROVE monitors. There are several national parks, wilderness areas, national monuments, national memorials, Tribal Areas and national trails in or near the Buffalo planning area. Table 3.4, “Class I and Class II Areas in or near the Buffalo Planning Area” (p. 309) lists these areas, which are designated Class I or Class II areas in accordance with the CAA. Although there are a number of Class II areas in and near the Buffalo planning area, there are no Class I areas in the planning area. The nearest Class I areas are the Northern Cheyenne Indian Reservation, located in southern Montana, and the Wind Cave National Park and Badlands Wilderness Area, both in located South Dakota.

Table 3.4. Class I and Class II Areas in or near the Buffalo Planning Area

Area Type	Area Name	Closest Distance to the Buffalo Planning Area (miles)	Direction from the Buffalo Planning Area	Clean Air Act Designation of the Area
National Park	Wind Cave National Park	110	East	Class I
Recreation Area	Missouri National Recreational River	275	North and East	Class II

Area Type	Area Name	Closest Distance to the Buffalo Planning Area (miles)	Direction from the Buffalo Planning Area	Clean Air Act Designation of the Area
Tribal Area	Northern Cheyenne Indian Reservation	25	North	Class I
Wilderness Areas	Cloud Peak Wilderness Area	In	Western edge of planning area	Class II
	Badlands Wilderness Area	150	East	Class I
National Forests	Bighorn National Forest	In	Near western edge of planning area	Class II
	Black Hills National Forest	20	East	Class II
	Thunder Basin National Grassland	In	Eastern quarter of planning area	Class II
National Monument	Devils Tower National Monument	20	Eastern quarter of planning area	Class II
Historic Trail	Lewis and Clark National Historic Trail	140	North	Class II
National Memorial	Mount Rushmore National Memorial	100	East	Class II
Source: NPS 2006				

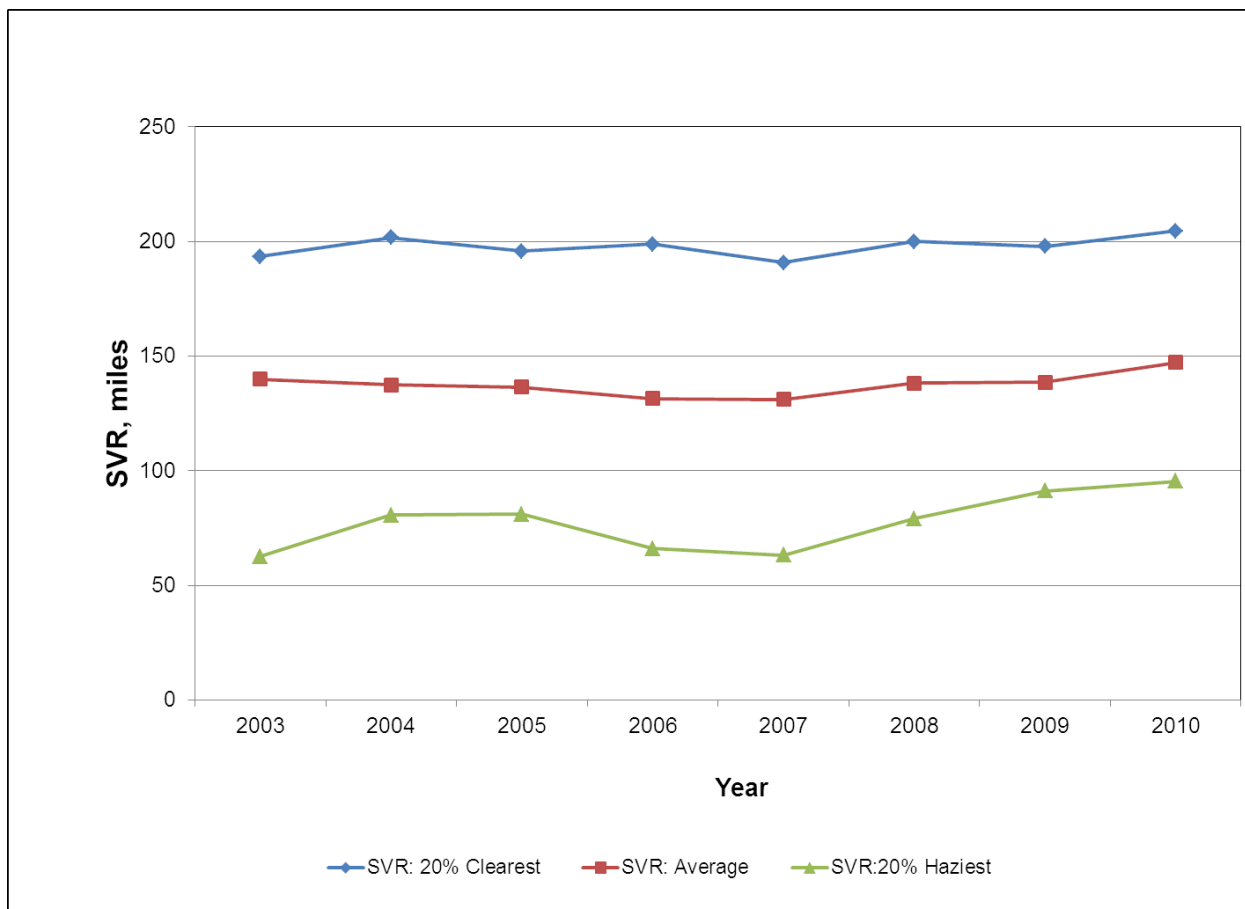
As noted above, data collected at the Thunder Basin National Grasslands and Cloud Peak Wilderness IMPROVE monitoring sites have been used indirectly to measure visibility in the planning area. Figure 3.14, “Annual Visibility (SVR) for the Thunder Basin IMPROVE Site” (p. 310) presents visibility data for the Thunder Basin IMPROVE site for the period 2004 to 2005, and Figure 3.15, “Annual Visibility (SVR) for the Cloud Peak IMPROVE Site” (p. 311) presents visibility data for the Cloud Peak IMPROVE site for the period 2003 to 2010. Figure 3.16, “Weekly Visibility (SVR) for the Thunder Basin IMPROVE Site” (p. 312) presents weekly visibility data for the Thunder Basin IMPROVE site for the period 2003 to 2012, and Figure 3.17, “Weekly Visibility (SVR) for the Cloud Peak IMPROVE Site” (p. 313) presents week visibility data for the Cloud Peak IMPROVE site for the period 2003 through 2012. According to the EPA, “In our nation’s scenic areas, the visual range has been substantially reduced by air pollution. In eastern parks, average visual range has decreased from 90 miles to 15-25 miles. In the West, visual range has decreased from 140 miles to 35-90 miles.” A comparison of these numbers and data from the two sites indicates that they are consistent and show very good to excellent visibility ranges in the planning area, even for the 20 percent haziest days. Although there are not enough data to discern trends at the Thunder Basin site, the 8-year record for the Cloud Peak site does show a very slight improvement in visibility during the last four years of this period. These data also show that visibility is consistently better at the Cloud Peak Wilderness site compared to the Thunder Basin site.



Source: IMPROVE 2013

IMPROVE Interagency Monitoring of Protected Visual Environments
SVR standard visual range

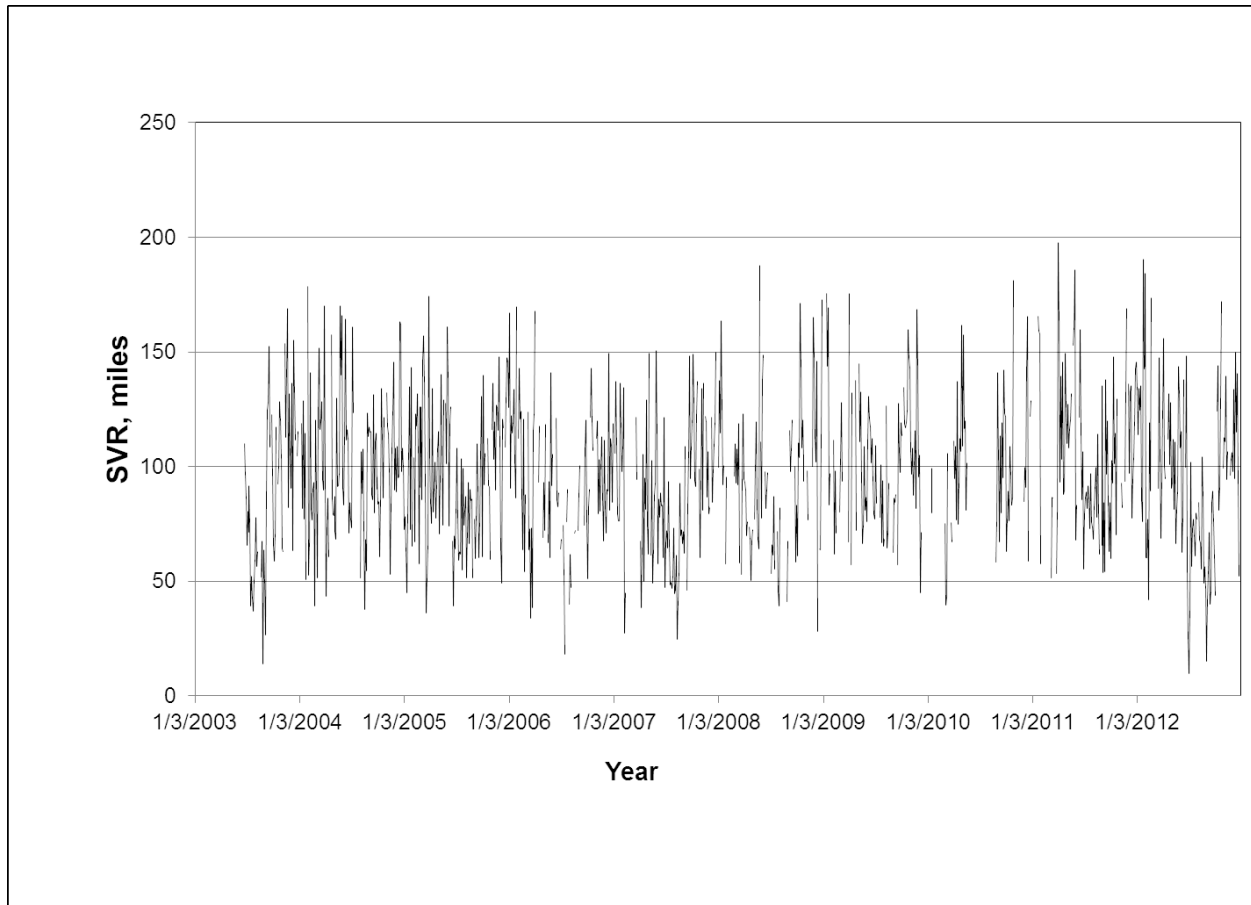
Figure 3.14. Annual Visibility (SVR) for the Thunder Basin IMPROVE Site



Source: IMPROVE 2013

IMPROVE Interagency Monitoring of Protected Visual Environments
SVR standard visual range

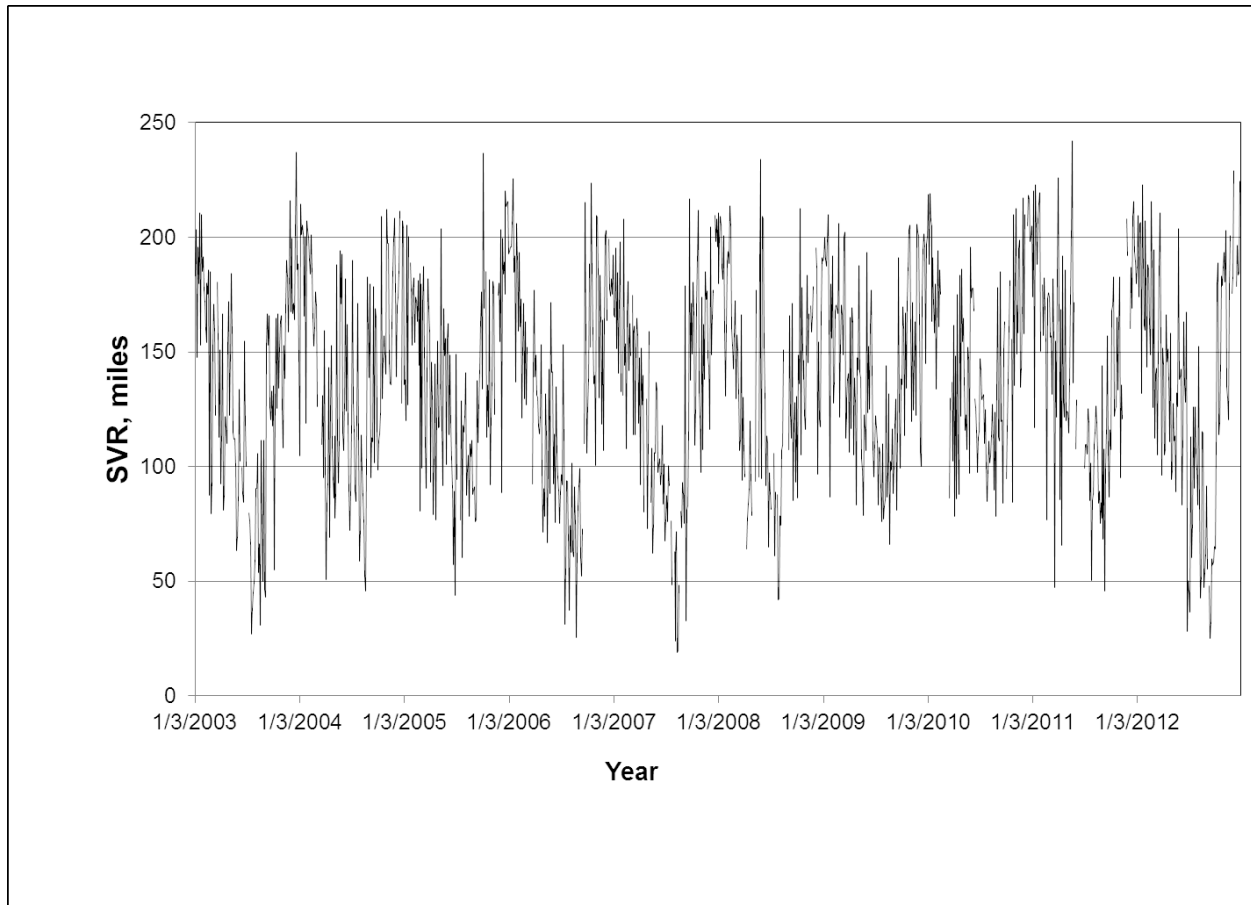
Figure 3.15. Annual Visibility (SVR) for the Cloud Peak IMPROVE Site



Source: IMPROVE 2013

IMPROVE Interagency Monitoring of Protected Visual Environments
SVR standard visual range

Figure 3.16. Weekly Visibility (SVR) for the Thunder Basin IMPROVE Site

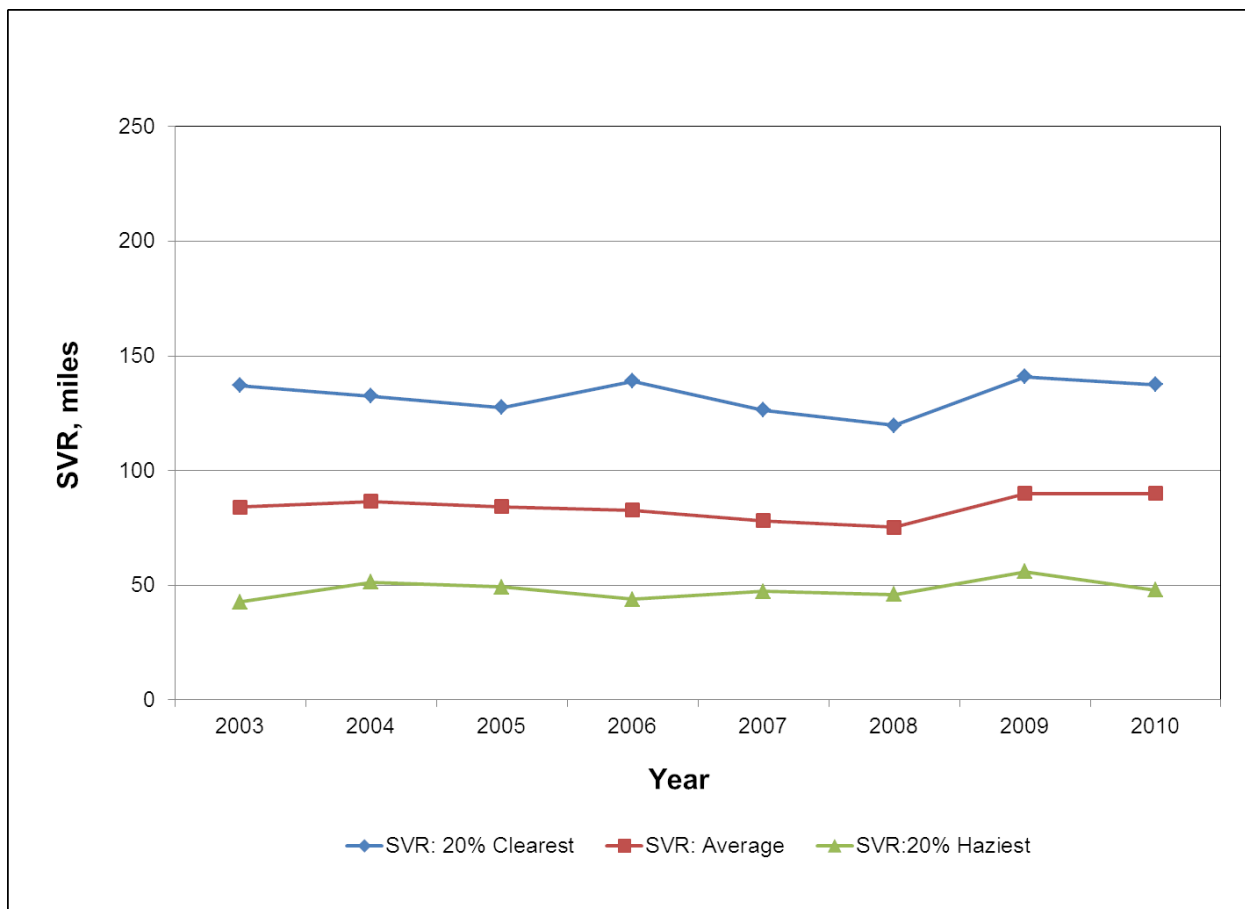


Source: IMPROVE 2013

IMPROVE Interagency Monitoring of Protected Visual Environments
SVR standard visual range

Figure 3.17. Weekly Visibility (SVR) for the Cloud Peak IMPROVE Site

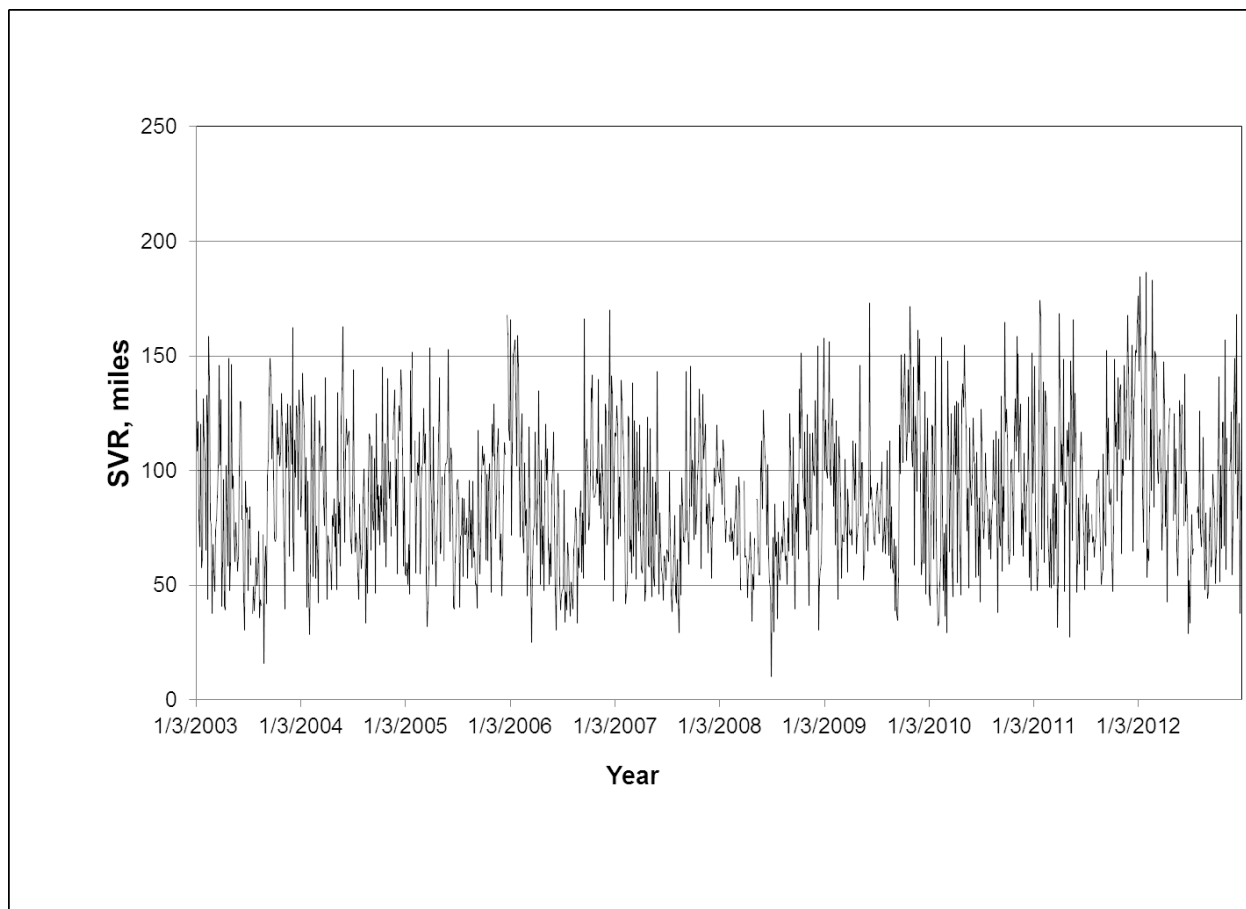
In addition to visibility measurements in the Buffalo planning area, Figure 3.18, “Annual Visibility (SVR) for the Badlands National Park IMPROVE Site” (p. 314) presents SVR visibility estimates for the Badlands National Park site located east of the planning area for the period 2003 to 2010, and Figure 3.19, “Weekly Visibility (SVR) for the Badlands IMPROVE Site” (p. 315) presents weekly visibility estimates for the Badlands National Park site east of the planning area for this same period. The visibility estimates for the Badlands site are lower than those for the Thunder Basin and Cloud Peak sites, but there is no discernible trend in visibility during this period at the Badlands monitor.



Source: IMPROVE 2013

IMPROVE Interagency Monitoring of Protected Visual Environments
SVR standard visual range

Figure 3.18. Annual Visibility (SVR) for the Badlands National Park IMPROVE Site



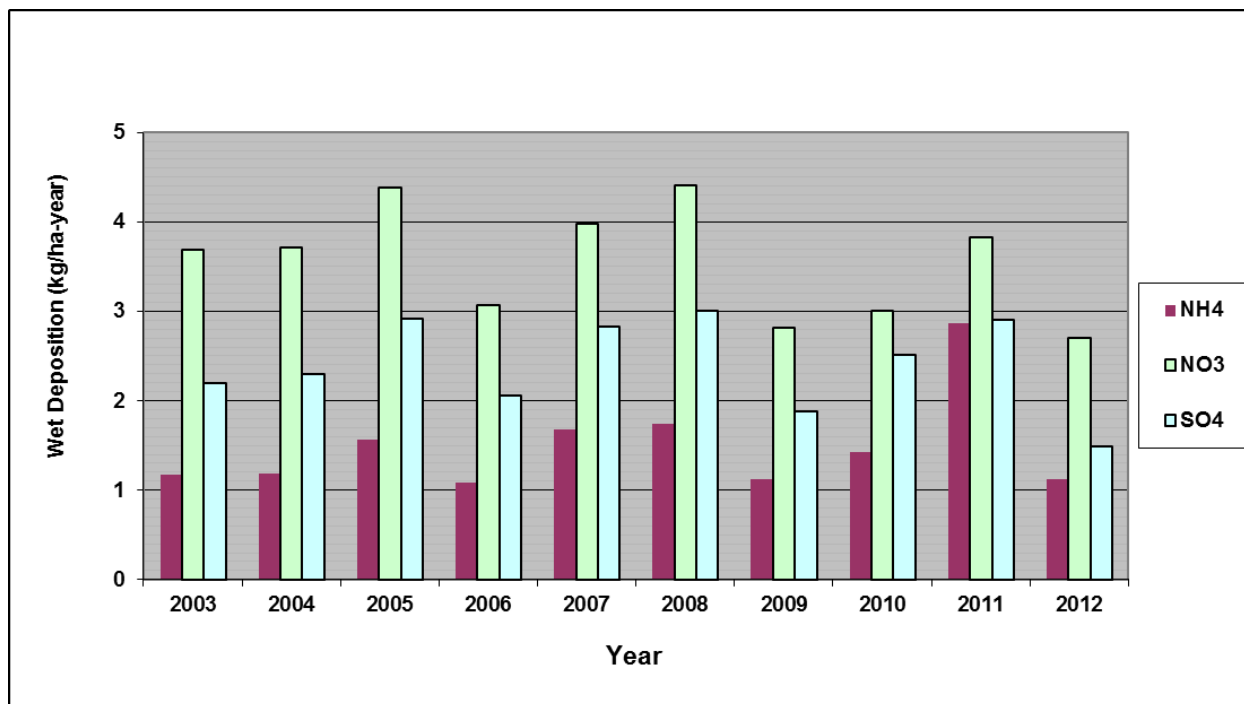
Source: IMPROVE 2013

IMPROVE Interagency Monitoring of Protected Visual Environments
SVR standard visual range

Figure 3.19. Weekly Visibility (SVR) for the Badlands IMPROVE Site

Atmospheric Deposition

There are no NADP or CASTNet/WARMS stations in the planning area, but wet deposition measurements are available for the Newcastle NADP monitor located just east of the area. Figure 3.20, “Mean Annual Wet Deposition (kilogram per hectare per year) – Newcastle, Wyoming NADP Site” (p. 316) presents mean annual wet deposition for NH_4 , NO_3 , and SO_4 , for the period 2003 to 2012. There are no discernible long-term trends in these measurements over this period. Wet nitrogen deposition (of NH_4 and NO_3) is exceeding the current LOCs at the Newcastle monitor for this period, and wet sulfur deposition does not exceed the LOC at this site during this period.



Source: National Atmospheric Deposition Program 2013

kg/ha-year kilograms per hectare-year
 NADP National Acid Deposition Program
 NH₄ ammonium
 NO₃ nitrate
 SO₄ sulfate

Figure 3.20. Mean Annual Wet Deposition (kilogram per hectare per year) – Newcastle, Wyoming NADP Site

Hazardous Air Pollutants

Existing sources of HAPs, criteria pollutants, and GHGs in the planning area include fossil fuel combustion that emits HAPs, and oil, gas, and coal development operations that emit VOCs, NO_x, and hydrogen sulfide (H₂S). In addition, large fires are a source of HAPs emissions. The growth in resource development and accompanying increases in emissions from these types of sources will depend on a number of external factors that make it difficult to estimate actual trends in these pollutants in the planning area.

Summary of Air Quality Trends

Available air quality data for recent years for a number of criteria pollutants examined for various monitors in and near the Buffalo planning area do not show any major upward or downward trends over the period of record. Concentrations of PM_{2.5} and the calculated 8-hour average O₃ design values are consistent year to year, without any discernible trends. Although trends were not explicitly calculated for SO₂, SO₄, NO₃, and NH₄, the data do not indicate any major trends for the 10-year period examined for the Buffalo and Sheridan sites. The visibility data collected at the Cloud Peak and Thunder Basin sites show very good to excellent visibility, even for the 20 percent haziest days, with a very slight degradation observed at the Cloud Peak monitor during the last few years of the 10-year period of record. The data collected at the Badlands National Park IMPROVE

site show generally lower estimates of visibility range compared to Cloud Peak and Thunder Basin, with no distinct trend in visibility range during the period 2003 to 2012. Wet-deposition data for NH_4 , NO_3 , and SO_4 , for the Newcastle NADP site east of the planning area also show no distinct trend in deposition over the 2003 to 2012 period examined in this analysis.

3.1.1.6. Climate Change

A growing body of evidence indicates that Earth's atmosphere is warming. Records show that surface temperatures in the Wyoming region have risen approximately 1.5°F since the 1960 to 1979 baseline years (Global Change Research Program 2009). The largest increase in average temperature has occurred in the winter months in the northern portions of the region. Relatively cold days in the region are becoming less frequent and relatively hot days are becoming more frequent (Global Change Research Program 2009). Observed changes in oceans, ecosystems, and ice cover are consistent with this warming trend (National Academy of Sciences 2006). Ongoing scientific research has identified the potential impacts of GHG emissions, including CO_2 , CH_4 , N_2O , water vapor and several trace gases, on global climate change. Through complex interactions at regional and global scales, these GHG emissions cause a net warming of the atmosphere (which makes surface temperatures suitable for life on Earth), primarily by decreasing the amount of heat energy Earth radiates back into space. Although GHG concentrations in the atmosphere and climatic conditions have varied throughout Earth's history, recent industrialization and burning of fossil fuels has caused global atmospheric CO_2 concentration to increase dramatically; this most recent CO_2 increase is likely to contribute to overall climatic changes (National Academy of Sciences 2006).

Global atmospheric concentrations of CO_2 , CH_4 , and N_2O have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values (as determined from ice cores spanning many thousands of years). The global increase in CO_2 concentrations is due primarily to fossil fuel use and land use change, while those of CH_4 and N_2O are due to agricultural soil management, animal manure management, sewage treatment, and mobile and stationary combustion of fossil fuels (Intergovernmental Panel on Climate Change 2007; EPA 2013a).

According to climate change researchers, the effects of climate change are expected to vary by region, season, and time of day (National Academy of Sciences 2006, Global Change Research Program 2009). Computer model forecasts indicate that increases in temperature will not be evenly or equally distributed, but are likely to be accentuated at higher latitudes. Warming during winter is expected to be greater than during the summer, and increases in daily minimum temperatures are more likely than increases in daily maximum temperatures (National Academy of Sciences 2006). Within a given region, increasing temperatures also could affect the amount of water vapor in the atmosphere, the timing and amount of precipitation, the intensity of storm systems, snow melt, and soil moisture. All of these factors can affect climate, day-to-day weather conditions, plant physiology, and air quality in the planning area.

Based on research compiled for the International Panel on Climate Change Fourth Assessment Report, 2007, (Intergovernmental Panel on Climate Change 2007) potential effects of climate change on resources in the affected environment are likely to be varied. Within North America, the report specifically forecasts that: warming in western mountains is projected to cause decreased snowpack, more winter flooding and reduced summer flows, exacerbating competition for over-allocated water resources; in the early decades of the century, moderate climate change is projected to increase aggregate yields of rain-fed agriculture by 5 to 20 percent, but with important variability among regions; major challenges are projected for crops that are near the warm end

of their suitable range or which depend on highly utilized water resources; cities that currently experience heat waves are expected to be further challenged by an increased number, intensity and duration of heat waves during the course of the century, with potential for adverse health impacts; and coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution. Specific modeling and/or assessments of the potential effects for the Buffalo planning area and for the State of Wyoming currently do not exist; however, there are downscaled models that can be applied, such as the Northwestern Plains Rapid Ecoregional Assessment (REA) and the 2014 National Climate Assessment (NCA) (<http://nca2014.globalchange.gov/report/regions/great-plains>).

In 2014, the Northwestern Plains REA presented the results of the climate change analysis for this ecoregion. The current or baseline period of 1980 to 1999 was analyzed. The general annual average precipitation pattern for the Northwestern Plains ecoregion is a trend of increasing precipitation from the northwest to the southeast. This trend is not present in the November to February period and is less apparent during the warm rainy season in May and June. The PRB southwest of the Black Hills is another exception as it is relatively drier than the southeastern area of the ecoregion. Figure 3.21, “Current (1980–1999) Total Annual Precipitation (mm)” (p. 320) shows the current total annual precipitation in the Northwestern Plains.

The mean annual temperature pattern in the Northwestern Plains indicates that the southeastern corner of the Northwestern Plains is generally warmer than the rest of the ecoregion. The model shows an exception as an area in south central Montana that is slightly warmer than the surrounding areas during the November to February season.

The NCA released on May 5, 2014 updates the baseline period (1981–2010) for precipitation and temperature. The NCA portrays similar baseline conditions that the REA shows.

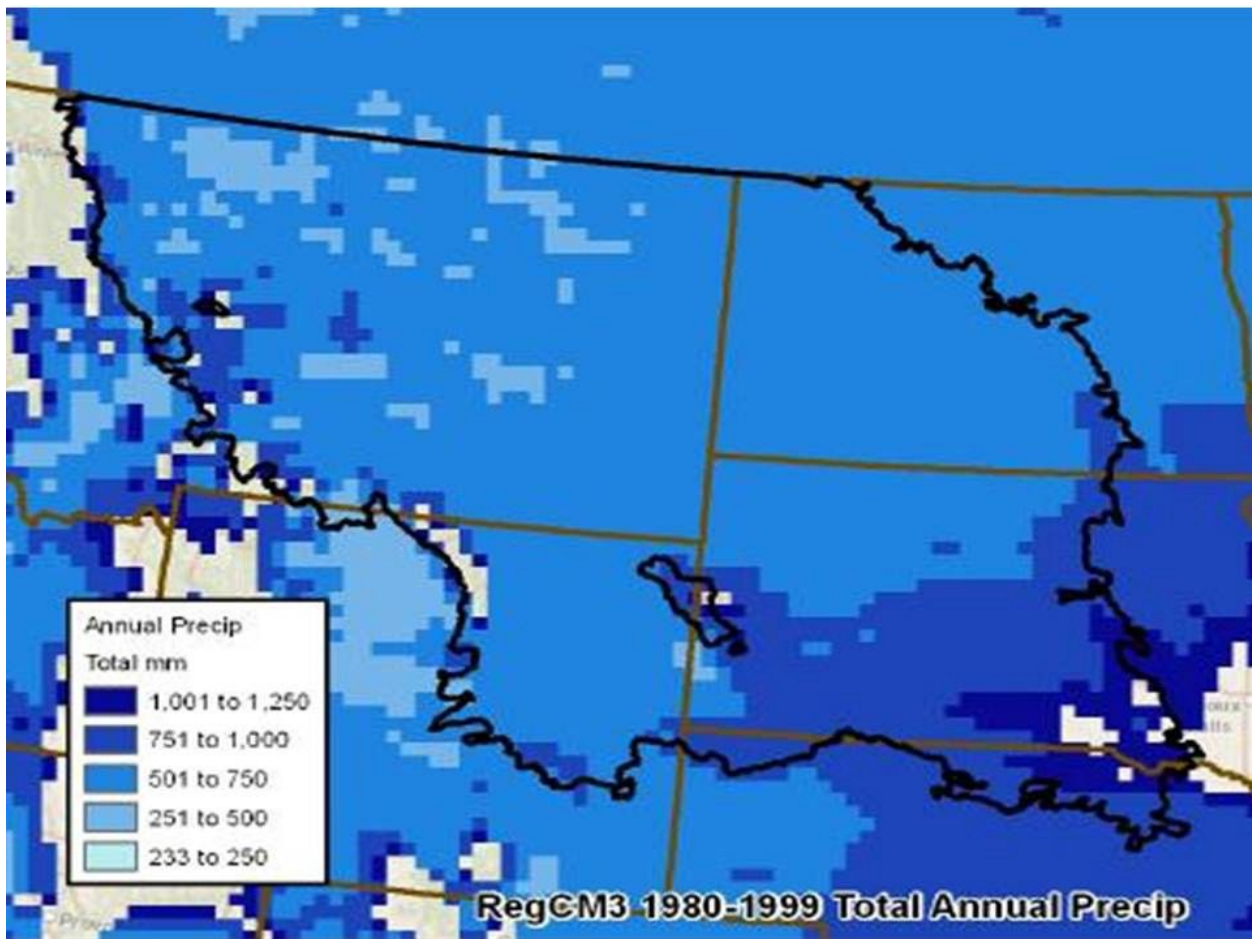


Figure 3.21. Current (1980–1999) Total Annual Precipitation (mm)

The mean annual temperature for existing climate pattern in the Northwestern Plains is presented on Figure 3.22, “Current (1980 - 1999) Mean Annual Temperature (°C)” (p. 321). The climate change model indicates that the southeastern corner of the Northwestern Plains is generally warmer than the rest of the ecoregion. The model shows an exception as an area in south central Montana that is slightly warmer than the surrounding areas during the November to February season.

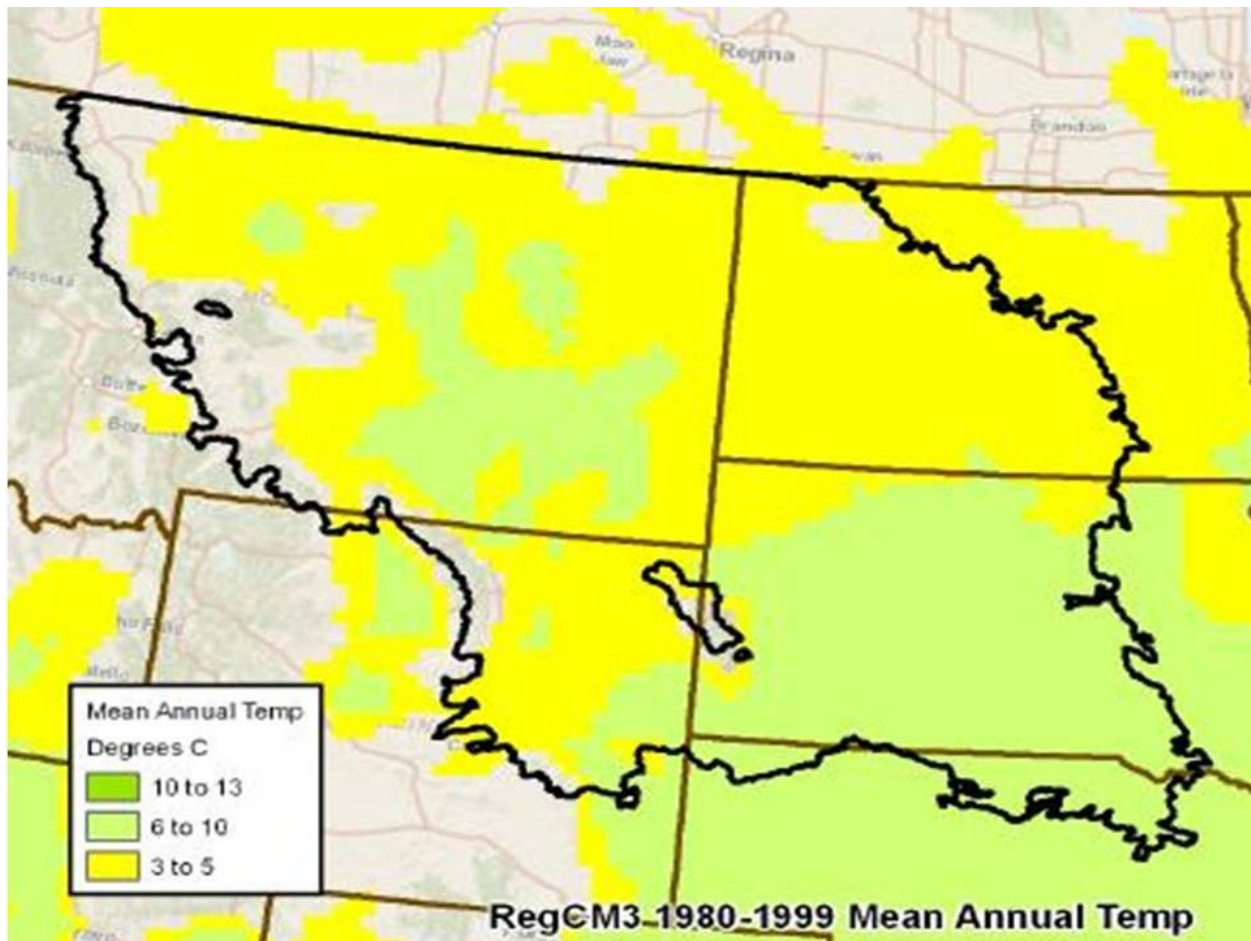


Figure 3.22. Current (1980 - 1999) Mean Annual Temperature (°C)

All of North America is likely to experience an increase in average temperature during the next 100 years, and annual mean warming is likely to exceed global mean warming in most areas (Intergovernmental Panel on Climate Change 2007). Temperatures in the planning area are projected to increase substantially by the end of this century (Global Change Research Program 2009). Summer temperatures in the planning area are expected to increase between approximately 7°F and 10+°F by 2080 to 2099. Overall, temperature in the region that includes the planning area is projected to increase between 2.5°F to more than 13°F compared to the 1960 to 1979 baseline, depending on future GHG emissions (Global Change Research Program 2009). This range of temperature increase reflects the current uncertainty in climate change modeling and represents the likely range of model projections, although lower or higher outcomes are possible.

Increasing temperatures in the planning area are likely to contribute to increased evaporation, drought frequencies, and declining water quantity. The warming of lakes and rivers will adversely affect the thermal structure and water quality of hydrological systems, which will add additional stress to water resources in the region (Intergovernmental Panel on Climate Change 2007). The planning area depends on temperature-sensitive springtime snowpack to meet demand for water from municipal, industrial, agricultural, recreational uses and BLM-authorized activities. The USGS notes that mountain ecosystems in the western United States are particularly sensitive to climate change, especially in the higher elevations, where much of the snowpack occurs, which have experienced three times the global average temperature increase over the past century

(USGS 2010). Higher temperatures are causing more winter precipitation to fall as rain rather than snow, which contributes to earlier snowmelt. Additional declines in snowmelt associated with climate change are projected, which would reduce the amount of water available during summer (Global Change Research Program 2009). Rapid spring snowmelt due to sudden and unseasonal temperature increases can also lead to greater erosive events and unstable soil conditions.

Increases in average summer temperatures and earlier spring snowmelt in the planning area are expected to increase the risk of wildfires by increasing summer moisture deficits (Global Change Research Program 2009). Studies have shown that earlier snowmelts can lead to a longer dry season, which increases the incidence of catastrophic fire (Westerling et al. 2006). Together with historic changes in land use, climate change is anticipated to increase the occurrence of wildfire throughout the western United States.

There is evidence that recent warming is impacting terrestrial and aquatic biological systems (Intergovernmental Panel on Climate Change 2007). Warming temperatures are leading to earlier timing of spring events such as leaf-unfolding, bird migration, and egg-laying (Intergovernmental Panel on Climate Change 2007). The range of many plant and animal species has shifted poleward and to higher elevation, as the climate of these species' traditional habitat changes. As future changes in climate are projected to be even greater than those in the recent past, there will likely be even larger range shifts in the coming decades (Lawler et al. 2009). Warming temperatures are also linked to earlier "greening" of vegetation in the spring and longer thermal growing seasons (Intergovernmental Panel on Climate Change 2007). In aquatic habitats, increases in algal abundance in high-altitude lakes have been linked to warmer temperatures, while range changes and earlier fish migrations in rivers have also been observed (Intergovernmental Panel on Climate Change 2007). Climate change is likely to combine with other human-induced stress to further increase the vulnerability of ecosystems to other pests, invasive species, and loss of native species. Climate change is likely to affect breeding patterns, water and food supply, and habitat availability to some degree. Sensitive species in the planning area, such as the Greater Sage-Grouse, which are already stressed by declining habitat, increased development and other factors, could experience additional pressures as a result of climate change.

More frequent flooding events, erosion, wildfires and hotter temperatures all pose increased threats to cultural and paleontological sites and artifacts. Heat from wildfires, suppression activities and equipment, as well as greater ambient daytime heat can damage sensitive cultural resources. Similarly, flooding and erosion can wash away artifacts and damage cultural and paleontological sites. However, these same events may also uncover and lead to discoveries of new cultural and paleontological localities.

Climate change also poses challenges for many resource uses on BLM-administered land. Increased temperatures, drought and evaporation may reduce seasonal water supplies for livestock and could impact forage availability. However, in non-drought years, longer growing seasons resulting from thermal increases may increase forage availability throughout the year. Shifts in wildlife habitat due to climate change may influence hunting and fishing activities, and early snowmelt may impact winter and water-based recreational activities. Drought and resulting stress on vegetation is likely to increase the frequency and intensity of mountain bark beetle and other insect infestations, which further increases the risk of fire and reduces the potential for sale of forest products on BLM-administered lands.

A variety of activities in the planning area currently generate GHGs. Fuels combustion, industrial processes and any number of other activities on public lands result in direct emissions of GHGs.

Direct emissions in the planning area include those related to current and ongoing O&G and other minerals development, fire events, motorized vehicle use (e.g., OHVs), facilities development, and other fugitive emissions. Contributions to climate change also result from land use changes (conversion of land to less reflective surfaces that absorb heat, such as concrete or pavement), and soil erosion (which can reduce snow's solar reflectivity and contribute to faster snowmelt).

In an effort to address climate change impacts and reduce GHG emissions nationally, the EPA proposed a new rule for existing power plants (Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units) on June 18, 2014. Upon implementation, this rule would achieve CO₂ emission reductions from the power sector of approximately 30 percent from 2005 CO₂ emission levels by 2030. The rule would impact existing power plants within the planning area, the Wyodak and Dry Fork stations, and result in considerable CO₂ reductions.

Climate change science and projections of climate change is a continually growing and emerging science. Additional and recent information on climate change and regional projections of climate change for the planning area can be found through the U.S. Global Change Research Program (<http://www.globalchange.gov/>) and the Intergovernmental Panel on Climate Change (<http://www.ipcc.ch/>).

Several federal initiatives have been launched to improve the ability to understand, predict, and adapt to the challenges of climate change. The Secretary of the Interior signed Secretarial Order 3289 on February 22, 2010, establishing a Department-wide, scientific-based approach to increase understanding of climate change and to coordinate an effective response to impacts on managed resources. The order reiterated the importance of analyzing potential climate change impacts when undertaking long-range planning issues, and also established several initiatives including the development of eight Regional Climate Science Centers. Regional Climate Science Centers would provide scientific information and tools that land and resource managers can apply to monitor and adapt to climate changes at regional and local scales (DOI 2010a). The North Central Climate Science Center, which incorporates the planning area, was established in 2011.

Given the broad spatial influence of climate change which requires response at the landscape-level, the Department of the Interior (DOI) also established Landscape Conservation Cooperatives which are management-science partnerships that help to inform management actions addressing climate change across landscapes. These Cooperatives are formed and directed by land, water, wildlife and cultural resource managers and interested public and private organizations, designed to increase the scope of climate change response beyond federal lands.

REAs are one of the tools the BLM uses to monitor and respond to the effects of climate change. Ecoregional assessments are geospatial landscape evaluations that are designed to identify areas of high ecological value within an ecoregion that may warrant conservation, adaptation, or restoration. These assessments can help to identify resources that are being impacted by climate change and provide information to facilitate the subsequent development of an ecoregional conservation strategy for plants, wildlife and fish communities on public lands. Ecoregional assessments can identify areas, species, and ecological features and services that are sensitive to ecosystem instability and changes in climatic conditions. One of the objectives of the BLM REAs is to provide guidance for adaptation and mitigation planning in response to climate change. The Middle Rockies and Northwest Plains REAs which encompass the planning area, have a tentative release date of April 2014.

In addition to efforts being undertaken to better respond and adapt to climate change, other federal initiatives are being implemented to mitigate climate change. The Carbon Storage Project was implemented to develop carbon sequestration methodologies for geological (i.e., underground) and biological (e.g., forests and rangelands) carbon storage. The project is a collaboration of federal agency and external stakeholders to enhance carbon storage in geologic formations and in plants and soils in an environmentally responsible manner. The Carbon Footprint Project is a project to develop a unified GHG emission reduction program for the DOI, including setting a baseline and reduction goal for the Department's GHG emissions and energy use. More information about DOI's efforts to respond to climate change is available at: www.doi.gov/archive/climatechange/.

In addition to DOI's efforts to address this issue, the EPA has undertaken a number of regulatory initiatives in recent years to reduce GHG emissions. This started in 2009 with a finding under the CAA identifying the key constituent gases that threaten public health and welfare and contribute to climate change. An initiative was developed for mobile sources by setting engine and fuel standards to cut GHGs and fuel use for new motor vehicles, and the implementation of a renewable fuel standard aimed at decreasing oil imports and reducing GHGs. Another initiative addresses stationary sources to limit GHGs for power plants and other large industrial facilities. The EPA also initiated a national GHG emissions reporting program for large emitters. Most recently (2012), EPA finalized regulations to reduce pollution from the oil and natural gas industry which is expected to result in substantial reductions in VOC emissions, air toxics, and CH₄, an important GHG. These actions, initiatives, and regulations will impact activities in the planning area, especially those related to oil and natural gas development, in an overall effort to balance growth in resource development with continued reductions in key GHG emissions.

The Council on Environmental Quality's (CEQ) December 2014 Revised Draft Guidance for Federal Agencies' Consideration of GHG Emissions and Climate Change was proposed while final changes to this Proposed RMP were under way. The CEQ guidance will be considered for conducting analyses of GHGs and climate change impacts. (see: <https://www.whitehouse.gov/administration/eop/ceq/initiatives/nepa/ghg-guidance>).

3.1.2. Geological Resources

3.1.2.1. Regional Context

Most of the Buffalo planning area occurs in the Wyoming portion of the PRB. The PRB is bordered to the west by the Big Horn Mountains, to the south by the Casper Arch, Laramie Range and the Hartville Uplift, and to the east by the Black Hills. The PRB is an asymmetrical syncline with an axis that trends in a general northwesterly direction, and extends from northeastern Wyoming north into southeastern Montana. The PRB formed through a combination of structural deformation and infilling. Thick sedimentary deposits, which include some of the largest known deposits of coal in the world, overlie Precambrian-age crystalline basement rock in the PRB; the deepest sedimentary rocks are found along the basin axis (close and approximately parallel to the Big Horn Mountains) and could be more than 18,000 feet thick (Tryhorn 1987). Numerous areas of geological beauty and interest occur in the planning area, including the Red Wall (tilted red sandstone exposed in the southern Big Horns), cave and karst-formations (areas of limestone and dolomite in the southern Big Horns), the Pumpkin Buttes (several largish relatively-flat butte-like erosional remnants near the Powder River), Dry Creek Petrified Tree Environmental Education Area (EEA) (area containing exposed logs and trunk portions of petrified trees), and numerous scoria hills (small butte-like to ridge-like erosional remnants capped by reddish clinker). Refer

to the *Mineral Occurrence and Development Potential Report* (BLM 2009c) for more detailed geological information for the Buffalo planning area.

3.1.2.2. Indicators

None of the geological features occurring on public lands in the Buffalo planning area are considered unique enough to be under special management or conservation measures. However, caves will be managed under cave management plans, as discussed in *Cave and Karst Resources*. The Dry Creek Petrified Tree EEA area is a unique feature, and is under special management due to its special paleontological value, as discussed in *Paleontological Resources*. Coal is not a unique occurrence, however the very large amount of coal present in the PRB is fairly unique (see *Leasable Minerals – Coal* for more information). Crude oil and natural gas are similarly not unique occurrences, but the large volumes of crude oil and natural gas, and especially the volumes of natural gas contained in the coals in the PRB is fairly unique (see *Leasable Minerals – Fluids* for more information).

As there are no key geological features in the planning area, there are no factors that relate their changing condition. However, mass wasting (i.e., rock falls, landslides, slumps, etc.) and other erosional processes can alter external topography and some landforms in the planning area, and coal seam fires often occur in the PRB (see *Health and Safety*). The remaining geological resources in the planning area are minerals (see *Mineral Resources* and the individual mineral resource categories for information regarding indicators for the mineral resources). Mineral resources currently being developed in the planning area include coal, crude oil, natural gas (including CBNG), Wyoming-type bentonite, uranium, aggregate (sand and gravel), clinker (porcellanite; locally called “scoria” due to its sometimes resembling that volcanic rock), moss rock, and stone. Other minerals are known to occur in the planning area (e.g., gypsum, geothermal resources, rare earth elements [REEs], and many others), however these have not been economically feasible to develop. Based on economic forecasts, that situation is not expected to change during the planning period (see *Mineral Resources*).

3.1.2.3. Current Condition

The minerals currently being explored for and developed in the planning area are coal, crude oil, natural gas (including CBNG), Wyoming-type bentonite, uranium, sand, gravel, clinker (porcellanite; locally called “scoria”), and stone. See *Mineral Resources* for more information on these minerals. Coal, oil, and natural gas are extremely important mineral commodities in the PRB; extraction of these minerals and ranching are the biggest income-producing industries in the planning area (see *Social and Economic Resources*). Over 80 percent of all coal mined on federal lands in the United States comes from the Buffalo planning area. See also *Leasable Minerals – Coal* and *Leasable Minerals – Fluids* for more information regarding these resources. Table 3.5, “Some Important Mineral-bearing Formations in the Buffalo Planning Area” (p. 326) lists some of the most important mineral-bearing rock and rock strata in the planning area (generally listed from youngest to oldest, and from least to greatest depth) (Love et al. 1993).

Table 3.5. Some Important Mineral-bearing Formations in the Buffalo Planning Area

Strata Name	Geological Age	Description
Alluvium (sand and gravel deposits)	Quaternary	Sand and gravel eroded from Paleozoic- through Precambrian-aged rocks in the Big Horn Mountains is found in terrace deposits scattered across much of the surface of the planning area. See <i>Salable Minerals</i> .
Clinker (Porcellanite; locally called “Scoria”)		Numerous areas of reddish, relatively resistant clinker (porcellanite; called “scoria” locally) occur across the planning area, often as outcrops capping hills and ridges. Clinker forms when the rock and sediment overlying a burning coal seam become baked by the heat being produced. Clinker's sometimes melted and vesicular (bubbly-looking) texture can make it hard to distinguish from true scoria (a melted-looking and often vesicular volcanic rock), hence its local nickname. See <i>Salable Minerals</i> .
White River Formation	Oligocene	Only a few outcrops of this formation occur in the planning area; these cap the Pumpkin Buttes. Known to contain important fossils and has a high Potential Fossil Yield Classification. See <i>Paleontological Resources</i> .
Wasatch Formation	Eocene	Approximately 45% of the surface outcrops in the planning area.
		Contains numerous coal seams of varying thickness, quality, and areal extent. Natural gas often forms within these coals (coal-bed natural gas, or CBNG), and CBNG can be found almost everywhere in the Powder River Basin where coal is found. See also <i>Leasable Minerals – Coal</i> and <i>Leasable Minerals – Fluids</i> .
		Contains numerous areas of clinker, often as outcrops capping hills and ridges. See <i>Salable Minerals</i> .
		Contains sandstone beds and lenses that can have “roll-front” deposits of uranium; these formed where dissolved uranium carrying along by groundwater solidified, usually where it contacted carbon-rich areas in the sandstones. See <i>Locatable Minerals</i> .
Fort Union Formation	Paleocene	Contains much of the petrified wood found in the Powder River Basin, including that in the Dry Creek Petrified Tree EEA (see <i>Paleontological Resources</i>).
		Approximately 30% of the surface outcrops in the planning area.
Fort Union Formation	Paleocene	Like the Wasatch Formation, also contains numerous coal seams of varying thickness, quality, and areal extent, which also often contain CBNG. Almost 40% of U.S. coal currently mined comes from the Wyodak-Anderson coal zone. See <i>Leasable Minerals – Coal</i> and <i>Leasable Minerals – Fluids</i> .
		Clinker occurs in numerous areas, mostly where coal seams became exposed along the Powder River Basin margins and burned; for example, the Rochelle Hills east of Gillette and Wright formed by natural burning of the Wyodak-Anderson coal zone. See <i>Salable Minerals</i> .
Fox Hills Sandstone	Upper Cretaceous	This sandstone varies in thickness and quality throughout the Powder River Basin, and serves as the major fresh-water aquifer in the planning area. For this reason, it is protected during activities that could adversely affect it, such as oil and gas development. See <i>Water Resources</i> , and <i>Leasable Minerals – Fluids</i> .
Frontier Formation and underlying Mowry Shale	Upper Cretaceous	The Clay Spur Bentonite bed occurring near the contact between these two formations is the main source of Wyoming-type bentonite mined in the planning area; thinner beds in the Frontier Formation are also mined. See <i>Locatable Minerals</i> .
		The lower portion of the Mowry Shale contains crude oil. See <i>Leasable Minerals – Fluids</i> .

Strata Name	Geological Age	Description
Gypsum Spring Formation	Jurassic	Contains numerous gypsum beds of varying thickness, quality, and areal extent. See <i>Locatable Minerals</i> .
Parkman Sandstone	Upper Cretaceous	These formations are the most prolific and most widespread crude oil-producing formations in the Powder River Basin; they can also yield natural gas. However, some of these formations can have “pools” (reservoirs) of crude oil/natural gas that tend to be more localized.
Sussex Sandstone		
Shannon Sandstone		
Muddy Sandstone	Lower Cretaceous	Other formations also yield oil and gas in the Powder River Basin, but the pools within those formations tend to be more localized than in those formations listed.
Dakota and Lakota Sandstones		
Minnelusa/Tensleep Sandstone	Pennsylvanian	See <i>Leasable Minerals – Fluids</i> .
Source: Love et al. 1993		
% percent		
CBNG Coalbed Natural Gas		
EEA Environmental Education Area		

Although there is some potential for geothermal energy development in the planning area, current knowledge of this resource leads to the belief that it is not, and may never be, economically viable for most current commercial uses due to the relatively low temperatures measured even at relatively great depths (120°F or 49 degrees Celsius [°C] at over 8,000 feet near the western PRB margin, to 185°F or 85°C at over 12,000 feet near the PRB axis [WOGCC 2010]). The relatively great thickness of the sedimentary rocks in the PRB (possibly up to 18,000 feet [Tryhorn 1987]) and the non-volcanic/non-igneous formation history of the Big Horn Mountains, leads to the relatively low bottom-hole temperatures seen in deep oil/gas wells. Although some commercial uses of low-temperature geothermal energy (up to 194°F or 90°C) can be economically viable (BLM 2008e), the depth where the higher temperatures occur are likely too deep to make development economically feasible (BLM 2008d; Williams et al. 2008; DOE 2006; National Oceanic and Atmospheric Administration 1983). No commercial low-temperature geothermal energy projects are known to exist in the planning area, although many of these types of projects could be incompatible with current land uses. Most knowledge of this resource comes from bottom-hole temperatures (the temperature measured at the deepest point in a wellbore) in O&G wells, and very little geothermal exploration has been performed in the planning area (Williams et al. 2008; DOE 2006; National Oceanic and Atmospheric Administration 1983). Only with more exploration will the extent of this resource in the planning area, and the likelihood for its development, become more fully understood. To date, no lands in the planning area have been nominated for competitive geothermal leasing, nor have any leases or nominations for leases for geothermal energy been received for the planning area. See *Leasable Minerals – Fluids*.

There is some potential for REEs in the planning area, although current knowledge of this resource is limited to mostly unconfirmed reports of occurrences and geochemical analyses. The likelihood of REE development in the planning area is very low. See *Locatable Minerals* for more information.

Carbon dioxide sequestration projects, also called Carbon Capture and Storage (CCS) projects, are dedicated solely to sequestering carbon by injecting it subsurface for long-term isolation and storage. This is thought to keep GHGs, such as CO₂, from entering the atmosphere, potentially to slow down the rate and severity of global climate change. These projects involve injecting liquefied CO₂ into the underground pore spaces that exist in rocks subsurface, or into other rocks types or conditions that may accept injection of this substance. None of these projects exist on

public lands in the planning area, nor have any proposals for such projects been received by the BFO. However, due to climate change-related legislation, sequestration (long-term storage) of this GHG is being studied and researched. The geological formations currently identified as being most suitable for CO₂ sequestration are unmineable coal seams, depleted O&G reservoirs, and saline geological formations (Burruss et al. 2009; Intergovernmental Panel on Climate Change 2005). There are numerous O&G reservoirs and unmineable coal seams, and several saline geological formations, in the PRB. Wyoming and several other U.S. states are thought to be ideal for CO₂ sequestration projects: they have relatively high potential CO₂ storage capacity in “suitable” formations (such formations tend to be relatively common formations in these states), and they have relatively “quiet” geological settings (they tend to have fewer earthquakes/earth movements, and of lower magnitudes) (Intergovernmental Panel on Climate Change 2005). The current BLM direction regarding CO₂ sequestration projects on public lands is that they would be handled as Land Use Applications and Permits, which are types of rights-of-way (ROWs) (Washington Office [WO] Instruction Memorandum [IM]-2012-035). See *Lands and Realty*.

Injection of CO₂ for the purpose of enhanced oil recovery (EOR) in oil wells has been, and continues to be, a relatively common practice in the PRB and elsewhere. Several CO₂ pipelines exist in the PRB to supply this gas to a number of areas in the basin for this purpose. However, CO₂ used in EOR is recovered and reused, again and again. Most CO₂ used in EOR is recoverable, and relatively little tends to remain in the formation(s) it was injected into, and therefore is not considered a CCS technique. See *Leasable Minerals – Fluids*.

There are a number of geological and other natural hazards in the planning area, including coal seam fires, ground subsidence, H₂S gas, abandoned mine lands (AMLs), and landslides. See *Health and Safety* for more information.

3.1.2.4. Trends

As discussed above, the geological resources managed in the Buffalo planning area consist of mineral resources. See *Mineral Resources* for information regarding trends for the various individual mineral resources.

As the development of alternative energy sources increases in the United States and worldwide, it could become economically viable to develop the low-temperature geothermal resources in the PRB in the future, even at the relatively great depths at which it occurs. If geothermal resources in the planning area become a development target in the future, the BFO would administer this resource in a manner similar to that of other field offices with existing geothermal energy programs (see *Leasable Minerals – Fluids*).

Almost the entire PRB could be targeted for CO₂ sequestration, or CCS, projects. These projects are intended solely to sequester carbon, keeping it out of the atmosphere, which is thought to reduce GHGs. These types of projects do not include those in which injection of CO₂ occurs for EOR purposes (to enhance the recovery of oil from oil wells). The geological formations currently identified as being most suitable for CO₂ sequestration are abundant throughout the entire PRB. Although no CO₂ sequestration projects have been proposed for public lands in the planning area, it is quite likely that such projects may be proposed in the future. The current guidance is that these types of projects would be handled as Land Use Applications and Permits, a type of ROW – see *Lands and Realty*. See *Leasable Minerals- Fluids* regarding CO₂ injection for the purpose of EOR.

The geological and natural hazards in the Buffalo planning area, and their changing conditions and trends, are addressed in *Health and Safety*.

3.1.2.5. Key Features

As discussed under Regional Context and Indicators, above, key geological features are discussed in other sections such as *Paleontological Resources* (Dry Creek Petrified Tree EEA) and *Cave and Karst* (caves and karst areas). Mineral-related features, such as coal, O&G, Wyoming-type bentonite, uranium, aggregate (sand and gravel), and clinker (porcellanite; locally called “scoria”) are discussed in *Mineral Resources*, and the individual mineral sections under that heading (*Leasable Minerals – Coal*, *Leasable Minerals – Fluids*, *Locatable Minerals*, and *Salable Minerals*).

3.1.3. Soil

Information in the following soils section is based on the best available science which is currently available through the Natural Resources Conservation Service (NRCS) soil survey data (NRCS 2011a). On a regional level, general State Soils Geographic Database (STATSGO2) was reviewed and incorporated as appropriate. Smaller scale information Soil Survey Geographic Database (SSURGO) was also reviewed and incorporated as appropriate into document sections below. Additional pertinent information from NRCS, BLM, academic, and regional expert sources on specific soil management issues may be reviewed, verified and incorporated on a project specific basis as needed, but may not be included or referenced in this document.

BLM soil program guidance is established under BLM Manual Section 7100, Soil Resource Management, which focuses on BLM’s relationship with the National Cooperative Soil Survey and describes program goals and objectives, organization, management roles and responsibilities, and applicable authorities and regulations. BLM Handbook H-7100-1 Soil Inventory, Monitoring, and Management (Final Draft September 21, 2010) provides BLM personnel with information, guidance, and direction related to the inventory, monitoring, assessment, and management of soil resources on public lands. To help implement the many laws, rules, and regulations, the BLM Soil Program relies on various guidance documents developed by BLM and other agencies. Additional BLM soil resource information is available in the soil resources section of the BLM Soil, Water, and Air Program (<http://www.blm.gov/wo/st/en/prog/more/soil2/soil2.html>), and the BLM soil web page (<http://www.blm.gov/nstc/Soil2007/index.html>).

3.1.3.1. Regional Context

The planning area’s soils are grouped geographically by Land Resource Regions (LRRs) and Major Land Resource Areas (MLRAs) for descriptive purposes. LRRs are geographically associated MLRAs which approximate broad agricultural market regions. Identification of these large areas is important in statewide agricultural planning and has value in interstate, regional, and national planning. The MLRA concept guides the development of cooperative soil survey work on BLM-administered lands. The planning area is located predominately in LRR G (Western Great Plains and Irrigated Region) and E (Rocky Mountain Range and Forest Region). The dominant MLRA within LRR G is 58B (Northern Rolling High Plains Southern Part) with soils that formed in alluvium, eolian sediments, colluvium, or residuum on fans, terraces, hills, and plateaus. MLRA 43B (Central Rocky Mountains) is dominant in LRR E and is comprised of soils that formed in colluvium, residuum, and glacial till on mountain sideslopes and ridges.

3.1.3.2. Indicators

Indicators are soil characteristics that are sensitive to change in the environment that reflect changes in soil quality. According to the NRCS, oil quality is the capacity of a specific kind of soil to function within natural or managed ecosystem boundaries to do the following: sustain plant and animal productivity; maintain or enhance water and air quality; and support human health and habitation. Soil quality is measured quantitatively and/or qualitatively. The biological, physical, and chemical properties, processes and characteristics as well as plant features are evaluated to determine soil quality.

Soil quality reflects both inherent and dynamic properties. The NRCS defines the inherent soil quality property as the natural ability of the soil to function. Inherent soil properties form over thousands of years with soil-forming processes and change very little as a result of management practices. Many inherent properties are described by soil surveys and can be used to develop local interpretations for suitable uses and limitations. Dynamic soil properties are readily affected by management practices and natural disturbances, including drought, over relatively short time scales. By linking biological, physical, and chemical properties of soil, all of the components and interactions of a soil system are viewed together. The selection of method(s) to assess soil quality will depend on the intended use of the information, the time and resources available, the ease with which the information can be obtained, and any regional, local, or site-specific considerations.

The primary attributes for assessing soil quality currently used in the BFO are soil/site stability, hydrologic function, and biotic integrity described in “Interpreting Indicators of Rangeland Health” (see TR 1734-6). Observed indicator ratings are used to help determine the degree of departure from the Reference Sheet for each attribute. Qualitative and quantitative soil indicators are used to determine if rangeland conditions are achieving the land use plan objectives and Wyoming’s Rangeland Health Standards and Guidelines. Reclamation success is evaluated on a site specific case-by-case basis. BLM’s Wyoming Reclamation Policy also provides guidance to help maintain healthy productive soils, while maintaining an effective multiple-use land management program.

3.1.3.3. Current Condition

Soils in the planning area are diverse; great differences in soil properties can occur within short distances. The distribution and occurrence of soils is dependent on a number of factors including the interaction of relief (slope), parent material, living organisms, climate, and time. These variables create complex and diverse soil patterns that influence the use and management of the soil resource.

Generally, there is not a direct demand for soil resources from public lands in the planning area. Primarily demands placed on soil resources are surface-disturbing activities associated with the development of other resources. The most important regional or national demand placed on soils in the planning area results from the development of mineral resources. Locally other actions that affect soils include a variety of surface uses that loosen topsoil and remove vegetation or other ground cover, such as overgrazing and over browsing by animals, off-highway vehicle (OHV) use, development of trails and campgrounds, ROW, fire-suppression activities, and the use of prescribed fire.

General soils information for the planning area was obtained from the United States General Soils Map (NRCS 2006) which is designed primarily for regional, multi-state, river basin, state,

and multi-county resource planning, management and monitoring. STATSGO2 data provides a general overview of soils distribution and occurrence in the planning area, and is not suitable for site-specific evaluations. Detailed information is available from the SSURGO Database for the individual soil surveys within the planning area. These individual soil surveys include, Soil Survey of Southern Campbell County (WY605), Soil Survey of Northern Campbell County (WY705), Soil Survey of Southern Johnson County (WY619), Soil Survey of Northern Johnson County (WY719) (preliminary data), Soil Survey of Sheridan County (WY 633) and the Soil Survey of Bighorn National Forest (WY 650). These soil surveys were performed by the NRCS according to National Cooperative Soil Survey standards, policies and procedures, and were conducted at the second and third order of detail. For site-specific analysis, onsite soil investigations and detailed soils information should be considered in all resource management decisions.

According to the NRCS (Code of Federal Regulations [CFR] Chapter VI - NRCS, USDA, Subchapter F - Support Activities, Part 657 - Prime and Unique Farmlands Subpart A - Important Farmlands Inventory), prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding. By definition, no prime farmlands currently occur on BLM-administered lands within the planning area. However, some areas could qualify as prime farmland if there is a dependable water supply. Dependable irrigation water is usually lacking on BLM-administered lands. Areas identified as "prime farmland if irrigated" on BLM-administered surface are generally along major drainage in the South Johnson and Sheridan County Soil Survey areas. The BLM Welch Management Area has adjudicated water rights and has the potential to be irrigated. This property will have a management plan developed which may include irrigation as a management option. There are potentially 546 acres, less than 1 percent of the planning area that is described as being "prime farmland if irrigated."

Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods. Examples of such crops are citrus, tree nuts, olives, cranberries, fruit, and vegetables. By definition according to the CFR above, no unique farmlands occur within the planning area.

The storm water discharge requirements under the Wyoming Pollutant Discharge Elimination System (WYPDES) have been imposed for most surface-disturbing activities that would affect one acre or more. Storm water discharge permit requirements have reduced erosional impacts caused by major surface-disturbing activities. (http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_Storm_Water/stormwater.asp)

3.1.3.4. Trends

As stated above, the primary attributes for assessing soil quality are soil/site stability, hydrologic function, and biotic integrity. Most soils in the area are capable of producing forage for

wildlife and livestock, maintaining infiltration and runoff protective of watershed condition, and recovering from impacts associated with surface-disturbing activities. Major soil resource concerns in this region are surface disturbance associated with the development of other resources. Any surface-disturbing activity has a potential to increase annual soil loss beyond a level to which it would be productive for plant growth. The amount of impact to the soil resource is site specific. The anticipated trend for impacts to the soil resources can be inferred with the predicted reasonable foreseeable development discussed in this document. The reasonable foreseeable development for the planning area is shown in Table G.1, “RFA-1A Reasonable Foreseeable Development Assumptions: Oil and Gas” (p. 1938) and Table G.2, “RFA-1B Reasonable Foreseeable Development Assumptions: Other Resource Uses” (p. 1942). Site-specific Best Management Practices (BMPs) and successful reclamation will lessen adverse impacts to the soil resources from the predicted actions.

3.1.3.5. Key Features

Key features are areas that require special management practices to prevent adverse impacts to soil quality. Water and air quality can be impacted by soil quality. For instance, wind-blown soil particles degrade air quality, while excessive sediment in water bodies impairs water quality (BLM 2010a). Key features identified in the planning area include soils with poor reclamation suitability, highly erodible soils, Limited Reclamation Potential (LRP) areas, and soils on steep slopes.

Successful reclamation efforts are critical in maintaining a multiple use land management program. Reclamation suitability is based, in part, on the inherent ability of the soil to recover from impacts; often referred to as soil resilience. Suitability factors include physical and chemical properties to consider for successful reclamation. These limiting features include clayey and sandy textures, drought conditions, shallow depth to bedrock, stones and cobbles, erosion potential, low organic matter content, alkalinity and pH, salinity, and sodium content. (Poor Reclamation Suitability) Sometimes the soil limitations may require additional mitigation to meet reclamation goals and objectives. According to existing NRCS Order 3 soil mapping, 58 percent of the BLM surface (40% of the federal mineral estate) contain some portion of areas having poor reclamation suitability (See Map 5).

There are areas in the planning area that are identified as having highly erodible soils. Highly erodible soils are those soils which are susceptible to wind or water erosion in either their natural or disturbed state (See Map 3.) For purposes of this analysis, elements used to determine highly erodible soils are slope, surface soil K factor, and wind erodibility group (WEG). However, it should be noted that K factors are also assigned to soil horizons deeper in the profile; at the project specific level, it may be useful to evaluate these deeper K factors. Potentially 28 percent of BLM surface and 17.5 percent of the federal mineral estate have surface properties identified as being highly erodible (wind or water).

The K factor (K_f for fine earth fraction or K_w for whole soil) indicates the susceptibility of a soil to sheet and rill erosion by water. This is based on percentage of silt, sand, organic matter, surface soil structure and saturated hydraulic conductivity (K_{sat}). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. Severe water erosion hazards for each Soil Mapping Unit (SMU) were identified using the k-factor and representative slope percentage (Rv Slope) assigned to each SMU. These values are available in the soil characteristic tables in the soil surveys, published by the NRCS. Based on regional experts, SMUs with an erosion index ($k_w \times R_v \text{ Slope}$) greater than or equal to 7.0, are considered to be susceptible to water erosion.

Severe wind erosion hazards for each SMU were identified by using the WEG assigned to each SMU. WEG, is a numerical value indicating the susceptibility of soil to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture, frozen soil layers, slope and other factors may also influence erosion. There are nine WEG groupings: 1, 2, 3, 4, 4L, 5, 6, 7, and 8. The lower the number, the greater the risk of wind erosion. These groupings are also available in the soil characteristic tables in the Soil Surveys, published by the NRCS. SMUs with a WEG of 2 and less are considered susceptible to wind erosion.

LRP areas, according to the BLM statewide reclamation policy, are defined as areas possessing unique landscape characteristics (e.g., sensitive geologic formations, extremely limiting soil conditions, biological soil crusts, badlands, rock-outcrops, etc.) that often make reclamation success impractical and/or unrealistic due to physical, biological, and/or chemical challenges. In the BFO LRP areas are identified through analysis of NRCS SSURGO data, and onsite investigation. LRP areas are displayed thematically in the NRCS soil survey SSURGO data as “miscellaneous areas.” The NRCS SSURGO thematic data display includes, but is not limited to, badlands, gullied lands, and rock outcrop. Other potential LRP’s include areas susceptible to mass movement, areas with biologic soil crusts, very shallow ecological sites or other areas identified through onsite investigation as having properties that make meeting all the requirements of reclamation unrealistic or impossible. Areas that have additive key features, described in this section, that make successful reclamation impractical or impossible may also be considered LRP areas. Current analysis indicates potentially 8 percent of BLM surface and 4 percent federal mineral estate contain LRP areas. Map 6 shows areas that potentially contain a component of LRP areas.

Soils on steep slopes are another key feature in the planning area (Map 4). Slope gradient is the difference in elevation between two points, expressed as a percentage of the difference between those points. Slope is a component in determining water erosion potential, slumping, mass wasting, and landslide potential. Slope impacts total disturbance calculations and potential cut and fill depths for surface-disturbing activities. Current analysis indicates 22% of BLM surface and 10% federal mineral estate have slopes equal to or greater than 25%.

Key features will be identified using NRCS soil survey SSURGO data and onsite evaluations. Criteria used to determine soil sensitivity to surface uses would continually be adapted as conditions change or new information or technology becomes available that enhances the understanding of the above susceptible soils.

3.1.4. Water Resources

3.1.4.1. Regional Context

The planning area is comprised of six major watersheds that collect and convey surface water out of the region. These are the Belle Fourche River, Little Bighorn River, Cheyenne River, Little Missouri River, Powder River, and Tongue River. These rivers are fed by numerous smaller drainages, most of which are ephemeral or intermittent. Groundwater also plays an important role in the planning area. Numerous groundwater aquifers are present in the planning area at a wide range of depths, in varying geologic conditions, and water quality levels. Regulatory issues regarding water in the planning area are largely handled by the Wyoming DEQ and the Wyoming State Engineers Office (WSEO).

3.1.4.2. Indicators

This section identifies indicators of the condition of water resources in the planning area and the sources of those indicators.

Natural processes and human actions influence the chemical, physical, and biological characteristics of water. Water quality varies from place to place, seasonally, and according to the kind of substrate through which the water moves. Indicators of water quality include, but are not limited to:

- Chemical characteristics (e.g., pH, conductivity, dissolved oxygen)
- Physical characteristics (e.g., sediment, temperature, color)
- Biological characteristics (e.g., macro- and micro-invertebrates, fecal coliform/e-coli, and plant and animal species)

Indicators of watershed health include:

- Channel morphology characteristics (e.g., aggradation, degradation, and bank failure)
- Watershed conditions (e.g., soil erosion and vegetation condition)

Water resource monitoring in the planning area is designed and managed to provide the BLM with baseline information on the conditions of water quantity and quality, and changes to those conditions that could be attributable to natural processes or BLM management activities. Monitoring activities include the collection of surface and subsurface hydrological data, and climatological data. As part of the hydrologic assessments, the BLM collects data on water quality, stream channel morphology, streamflow, and groundwater elevation at a variety of locations. Climatological data that is collected includes precipitation, temperature, wind intensity and direction, solar radiation, barometric pressure, relative humidity, and soil moisture.

Additionally, the BLM monitors some stream channels and riparian areas for Proper Functioning Condition (PFC) (see the *Vegetation – Riparian/Wetland Resources* section of this chapter), which are indirect indicators of water quality and watershed health. The BLM uses other survey methodologies, such as Multiple Indicator Monitoring (MIM) (Burton et al. 2008), to provide further detail for the assessment of stream corridor conditions.

3.1.4.3. Current Condition

This section characterizes surface water and groundwater resources and describes water use and current water management practices in the planning area.

Administration of water rights and beneficial use determinations within the planning area are primarily the responsibility of the WSEO, and the Wyoming DEQ, which regulates water quality of groundwater and surface water under the Clean Water Act (CWA) as delegated by the EPA. The BLM is responsible for the management of federal lands and minerals in a manner that maintains or enhances water quality and quantity for other uses. Data collection, resource monitoring, and analysis is performed to evaluate impacts or investigate special concerns related to water resources. Other agencies involved in managing and regulating the water resources of the area are the U.S. Army Corps of Engineers, the EPA, the U.S. Fish and Wildlife Service (USFWS), and Wyoming Game and Fish Department (WGFD).

Surface Water

Information in this section includes:

- Watersheds within the planning area, and a map showing the major streams and lakes in the planning area
- The major tributary waterways in the planning area and their flow conditions
- A description of surface water quality and quantity and a reference to the Wyoming DEQ requirements for water quality in Class 1 and 2 waterway segments
- Identification of watersheds in the planning area with Class 1 or 2 waterways
- A discussion on surface discharge of water (e.g., produced water from CBNG development), including the regulations associated with discharged waters
- Historic and present resources and resource uses that could affect surface water quality
- A description of the state 303(d) list and Total Maximum Daily Load (TMDL) allocation of pollutants
- Waterways in the planning area on the Wyoming DEQ 303(d) list of water bodies with impaired water quality

The planning area is comprised of two distinct hydrologic regions: the mountainous region where snowmelt is the dominant influence on streamflow, and the plains region where runoff from convective storms is the dominant factor controlling peak flow rates (Lowham 1988). Mean annual precipitation in this semi-arid region ranges from about 10 inches to more than 15 inches in the plains region of the planning area, and up to 30 inches in the mountainous region (Lowry et al. 1986). Approximately half of the annual precipitation falls in April, May, and June (Rankl and Lowry 1990). Average annual snowfall ranges from less than 30 inches to more than 100 inches. Annual lake evaporation averages approximately 40 inches, greatly exceeding annual precipitation (Whitehead 1996).

The planning area is within portions of six major watersheds: the Belle Fourche, the Little Bighorn, the Cheyenne, the Little Missouri, the Powder, and the Tongue.

The Powder River is the largest watershed in the planning area, and drains more than half (65%) of the planning area. Other drainages in the planning area include the Little Bighorn and Tongue River, which drain the northwestern area (14%); the Belle Fourche River, which drains the eastern area (11%); the Cheyenne River, which drains the southeastern area (6%); the Little Powder River, which drains most of the northeast area (3%); and the Little Missouri River, which drains a strip along the eastern part of the planning area adjacent to the state line (1%). The Powder River, along with several other larger streams in the planning area, including Clear Creek, Crazy Woman Creek, the Little Bighorn River, and the Tongue River, have headwaters in the Big Horn Mountains. The U.S. Geological Survey (USGS) classifies these as perennial streams. Except for the main stem of the Powder River, which courses through the middle of the PRB, these streams generally flow with clear water, and carry little suspended sediment. The southern Big Horn Mountains contain approximately 50 miles of perennial streams on public land. All of the perennial streams in the planning area and their associated vegetation communities represent important fish and wildlife habitat on both public and private land. Intermittent streams that have enough seasonal flow to support growth of riparian vegetation also provide important wildlife habitat.

Most of the streams and tributaries with headwaters in the plains region are ephemeral, flowing only in direct response to precipitation events or snowmelt. These channels are formed in fine-grained, unconsolidated Tertiary sedimentary units or Quaternary basin fill. This material is easily eroded, especially in areas where vegetation is relatively sparse. These conditions often result in high sediment delivery to the Powder River.

Additional surface water information can be found in the PRB Final EIS page 3-36 (BLM 2003c). This information is specifically incorporated by reference here.

Surface Water Quantity

Major contributions to streamflows in the planning area include direct precipitation, surface runoff, produced water discharges, and releases from surface reservoirs. Evaporation, evapotranspiration, water rights withdrawals and infiltration cause decreases in streamflow (BLM 2003c).

Flow statistics have been compiled from selected USGS stream gauging stations to provide a perspective of perennial streamflow within the planning area. Information gathered prior to 2001 is summarized in Table 3-8 in the PRB Final EIS (BLM 2003c, page 3-41). Information gathered since 2001 is summarized below in Table 3.6, “Mean Monthly Discharge, 2001–2012” (p. 336). Baseflow conditions in the streams are represented by the low of the mean monthly flows, and typically occur in the winter months. Conversely, high flow conditions in the streams are represented by the maximum of the mean monthly flows, and typically occur during periods of snowmelt runoff or major precipitation events (BLM 2003c).

Table 3.6. Mean Monthly Discharge, 2001–2012

River	Mean Monthly Discharge (cfs) 2001–2012		
	Minimum	Maximum	Average
Powder River	0.8	2,560	197
Middle Powder River	0	5,220	415.2
Little Powder River	0.01	365	18
Belle Fourche River	0.02	599	18.9
Cheyenne River	0	1,200	43
Clear Creek	0.24	2,230	146.2
Crazy Woman Creek	0.1	597	30.4
Tongue River	10	5,430	507
Source: USGS 2013			
cfs Cubic Feet per Second			

Streamflow characteristics in the planning area depend on the specific features unique to each drainage basin. These features include geology, topography, vegetative cover, size, and climate. Flow regimes in the Middle Fork Powder River are representative of streams that originate in the mountainous areas of the planning area. Flows in these streams are perennial and influenced by snowmelt in the late spring and early summer (Clark et al. 2001). Base flows are generally sustained by groundwater discharge. Flow regimes in the Little Powder River are representative of the streams that originate in the plains region of the planning area. Flows in these streams generally are more variable than are flows in the mountain streams and are influenced by lowland snowmelt during the late spring and early summer, as well as from rainstorms during the remainder of the summer and fall. These streams are more likely to have little or no flow during the late summer and early winter (Clark et al. 2001). Flow regimes in the Upper Powder River exhibit characteristics of streams originating in both the mountainous and plains regions of the planning area. Flows are generally more variable throughout the year than flows in mountain streams, and periods of little or no flow still occur but with less frequency than for plains streams (Clark et al. 2001). Flows in the planning area are further influenced by irrigation diversions and releases from storage reservoirs. Additional analysis of surface water flows prior to 2001 is included in the PRB Final EIS (BLM 2003c). Monthly mean flows for major water bodies in the

planning area since 2001 are provided in Table W.1, “Monthly Mean Discharge (cubic feet per second) 2001 to 2011” (p. 2627).

A considerable amount of water has been produced as a result of CBNG activities in the planning area. The PRB Final EIS (BLM 2003c) analyzed this development thoroughly. Much of that produced water has been discharged into streams in the PRB. This water was projected in the PRB Final EIS to gradually increase flow rates in the various streams as CBNG development escalated. However, as shown in Table W.2, “Coalbed Natural Gas Water Production” (p. 2642), the actual volumes of water that has been produced by CBNG activities is much less than predicted, primarily because fewer CBNG wells have been drilled than predicted. According to the data collected by the Wyoming Oil and Gas Conservation Commission (WOGCC), actual cumulative water production associated with CBNG through 2011 totaled 754,271 acre-feet, or 26 percent of the 2,912,756 acre-feet of water predicted to be produced in the PRB Final EIS (BLM 2003c). Additionally, since the PRB Final EIS was published, Wyoming DEQ revised its produced water discharge standards, which prompted many producers to store much more water in surface water impoundments or re-inject it to subsurface formations rather than discharge to streams. Therefore, the corresponding water volumes discharged into Wyoming streams has also been substantially less than predicted. Wyoming DEQ is unable to provide summary data of how much water has been discharged on a large scale because the Wyoming DEQ does not track discharge by hydrologic basin (telephone discussion with Wyoming DEQ 11/5/2013). They can provide that data on a site specific basis, but that data would be beyond the scope of this document. Table 3.7, “Comparison of Mean Flows and PRB Final EIS Predicted Flows” (p. 337) shows a comparison of actual flow in the primary sub-basins in the planning area and predictions made in the PRB Final EIS (BLM 2003c).

Table 3.7. Comparison of Mean Flows and PRB Final EIS Predicted Flows

Sub-Watershed	PRB Final EIS Mean Monthly Flow (cfs)	Period of Record	Post 2001 Mean Monthly Flow (cfs)	Post 2001 Percent of Average Flow	PRB Final EIS Predicted CBNG Contribution @ Peak Year (cfs)	PRB Final EIS Predicted Peak Year of Production	Peak Year Flow (cfs)	Peak Year Flow Percent PRB Final EIS of Mean Monthly Flow
Upper Powder River	275.1	1931-2001	212.7	77.3	68	2006	117.6	42.7
Middle Powder River	452.5	1930-2001	364.7	80.6	86	2005	330.8	73.1
Upper Belle Fourche River	23.7	1943-2001	20.13	84.9	61	2006	5.5	23.2
Clear Creek	178.9	1940-1982	169.3	94.6	4	2006	56.3	31.5
Crazy Woman Creek	48.9	1963-2001	35.1	71.8	3	2006	5.8	11.9

Sub-Watershed	PRB Final EIS Mean Monthly Flow (cfs)	Period of Record	Post 2001 Mean Monthly Flow (cfs)	Post 2001 Percent of Average Flow	PRB Final EIS Predicted CBNG Contribution @ Peak Year (cfs)	PRB Final EIS Predicted Peak Year of Production	Peak Year Flow (cfs)	Peak Year Flow Percent PRB Final EIS of Mean Monthly Flow
Upper Tongue River	453.2	1961–2001	379.1	83.6	5	2006	175.1	38.6
Source: USGS 2008 CBNG Coalbed Natural Gas cfs cubic feet per second EIS Environmental Impact Statement PRB Powder River Basin								

Surface Water Storage

Reservoirs in the planning area are used to hold water supplied from precipitation and snowmelt, and to make stored water available during summer and fall, periods of limited precipitation and heavy demand (BLM 2003c). Additionally, numerous small reservoirs or impoundments are used throughout the planning area to manage CBNG produced water.

Produced water impoundments can be constructed on- or off- channel, and the regulatory authority varies based on which type of impoundment they are. Impoundments can be used for a variety of water management options including: disposal by evaporation and/or infiltration; storage prior to another water management option including injection or irrigation; or for beneficial use such as a livestock and wildlife watering (ALL Consulting 2003).

In the State of Wyoming the WSEO, Wyoming DEQ, and WOGCC regulate impoundments. The Wyoming DEQ requires WYPDES permits for the discharge of produced water to unlined impoundments to ensure the quality of the discharged water will meet water quality standards. The WSEO has the responsibility to permit reservoirs relative to water rights, and sets design standards, while the WOGCC regulates off-channel impoundments over private and state mineral leases used for retention of produced water and reserve pits. BLM reviews the facilities relative to siting criteria and environmental impacts as part of site specific NEPA analyses.

All impoundments in the planning area used for containment of CBNG produced water require the posting of a reclamation bond. BLM administers bonds for any impoundment that lies over a federal mineral estate. Wyoming DEQ administers bonds for on-channel impoundments that lie over private or state mineral estates, and WOGCC administers bonds for off-channel impoundments over private or state mineral estates. The bonds are retained by the administering authority until the impoundment is satisfactorily reclaimed or signed over to the landowner.

Most impoundments are permitted by WSEO for multiple beneficial uses. Impoundments used for CBNG are designed not only to manage produced water, but to provide water for livestock and wildlife. In those efforts, the point at which CBNG produced water is discharged to the impoundment usually incorporates a stock tank to allow easy access to the water. The stock tanks are required to be designed to allow birds and other small animals to easily escape.

As of 2011, WSEO had 3106 active permits in the planning area for impoundments to store CBNG produced water. Those permits allow the storage of 39,170 acre-feet of water, with a total

surface area of 7,524 acres. Many of these impoundments have not been constructed, and are unlikely to be constructed; however it is difficult to get an accurate assessment of the number of these. Regulatory restrictions, economics, and an overestimation of needed storage capacity have led some operators to look at alternative water management techniques that require less storage.

Surface Water

The chemical composition of surface water changes continuously. Most changes are related to the amount of water and the source of water flowing in a stream at a given time. Surface water quality is directly influenced by higher amounts of precipitation associated with the mountainous regions and the composition of rocks in the area. Streamflows resulting from snowmelt and precipitation are in contact with soils and rocks for only a limited time; thus, these waters have only small amounts of dissolved minerals. Surface water type also changes with elevation. Streams in the higher elevations are typically calcium bicarbonate type waters. As the streams flow across the lowlands, both as natural flow and irrigation return flow, they change to sodium SO₄ type waters. The waters are typically alkaline and have moderate to high levels of hardness.

Ambient Water Quality

Data on surface water quality summarized from historical water quality records obtained at USGS monitoring stations in the planning area are presented in Table 3-11 of the PRB Final EIS (BLM 2003c, page 3-49). Table 3.8, “Comparison of EC and SAR Data, Pre and Post PRB Final EIS (2001)” (p. 339) shows a comparison of electrical conductance (EC) and Sodium Absorption Ratio (SAR) values compiled for the PRB Final EIS and data collected since the PRB Final EIS was published.

Table 3.8. Comparison of EC and SAR Data, Pre and Post PRB Final EIS (2001)

Sub-Basin	EC, $\mu\text{S}/\text{cm}$				SAR			
	PRB Final EIS*	Post 2001 Data	PRB Final EIS*	Post 2001 Data	PRB Final EIS*	Post 2001 Data	PRB Final EIS*	Post 2001 Data
	@Maximum Monthly Flow		@Minimum Monthly Flow		@Maximum Monthly Flow		@Minimum Monthly Flow	
Upper Tongue River	318	221	731	1,332	0.36	0.31	0.86	2.95
Upper Powder River	1797	603	3,400	3,640	4.76	1.75	7.83	7.49
Crazy Woman Creek	1066	585	1,937	2,945	1.29	0.69	2.26	2.54
Clear Creek	833	234	1,276	1,902	1.07	0.34	1.46	2.07
Middle Powder River	1420	618	2,154	1,930	3.92	1.49	4.62	3.85
Little Powder River	1785	734	3,300	3,730	4.44	2.23	6.94	6.71
Cheyenne River	2271	337	4,127	3,960	5.63	3.77	8.66	8.44

Sub-Basin	EC, $\mu\text{S}/\text{cm}$				SAR			
	PRB Final EIS*	Post 2001 Data	PRB Final EIS*	Post 2001 Data	PRB Final EIS*	Post 2001 Data	PRB Final EIS*	Post 2001 Data
	@Maximum Monthly Flow		@Minimum Monthly Flow		@Maximum Monthly Flow		@Minimum Monthly Flow	
Upper Belle Fourche River	1532	2470	2,755	3,340	3.81	4.39	6.77	6.01
* From PRB Final EIS Table 3-11 (Page 3-49) (BLM 2003c) Source: USGS 2013 (http://waterdata.usgs.gov/wy/nwis/current/?type=flow) $\mu\text{S}/\text{cm}$ MicroSiemens per Centimeter EC Electrical Conductance EIS Environmental Impact Statement PRB Powder River Basin PRB Powder River Basin SAR Sodium Adsorption Ratio								

Salinity

Water quality in surface streams within the planning area is commonly a function of streamflow. Consequently, the streamflow variations presented in Table 3-8 of the PRB Final EIS (BLM 2003c, page 3-41) and Table 3.8, “Comparison of EC and SAR Data, Pre and Post PRB Final EIS (2001)” (p. 339) above, can influence water quality throughout the year. Water quality in most of the drainages varies inversely with streamflow. A general indicator of water quality is salinity. Salinity refers to the amount of dissolved solids in a water sample and is generally expressed as milligrams per liter (mg/L) of total dissolved solids (TDS). EC can also be used as a measure of salinity and is considerably easier to measure and monitor. Results for EC are expressed as microSiemens per centimeter ($\mu\text{S}/\text{cm}$).

Sodium Adsorption Ratio

A second indicator of water quality in streams within the planning area is sodium adsorption ratio (SAR), which can be used to assess the suitability of the water for irrigation of crops. SAR represents the proportion of sodium ions to calcium and magnesium ions in water. SAR is an indicator of the potential for water to affect soil structure. Surface waters with high SARs that are used for irrigation pose a potential hazard to the health of individual plants growing in the irrigated soils, and thus, to the productivity and yield of the irrigated cropland. The application of irrigation waters with high SAR values results in a disproportionate concentration of sodium adsorbed by the soil at the expense of calcium and magnesium, which alters the physical condition of the soil growth medium. The sodium imbalance can cause soil structure to break down and the soil particles to disperse, particularly with clayey soils.

In surface water systems, there is a dynamic relationship between EC and SAR; for a given SAR, potential effects to soil structure decrease as the EC increases. However, when evaluating SAR values for the protection of irrigated agriculture, a number of interrelated factors should be considered, including: the crop or native plant species to be irrigated or exposed to these conditions; the texture of the irrigated soils; predominant clay mineralogy; soil chemistry; water management practices; and the chemistry of the irrigation water. Additional discussion of SAR can be found in the PRB Final EIS (BLM 2003c, page 3-47).

Trace Metals

Concentrations of trace metals in surface waters that drain the planning area are generally low. Levels of iron and manganese that exceed the secondary drinking water standards of 0.3 mg/L for iron and 0.05 mg/L for manganese have been detected occasionally in samples of surface water in the planning area. Manganese and iron can cause staining and bitter tastes but are not present in concentrations that would limit use of the water for stock watering or irrigation.

Concentrations of selenium greater than 10 micrograms per liter ($\mu\text{g/L}$) have been measured in surface water from localized streams in the planning area (Lowry et al. 1986). The drinking water criterion for selenium is 50 $\mu\text{g/L}$; however the chronic criterion for protection of aquatic life is 5 $\mu\text{g/L}$. Sources of selenium within the planning area generally are geologic in origin (Seiler et al. 1999). Although concentrations of selenium exceed the drinking water standard, the streams of concern are not used as public water supplies (EPA 2001). Concentrations of selenium do not limit use of the water for stock watering; however, certain vegetation could become toxic to livestock through uptake of selenium. Concentrations of selenium greater than 2 to 5 $\mu\text{g/L}$ can cause reproductive failure in fish and wildlife (USFWS 1987).

Suspended Sediment

Concentrations of suspended sediment are high throughout the planning area. Concentrations reflect the highly erosive nature of the shale deposits through which the rivers flow. Concentrations of sediment increase in a direct relationship to flow. Suspended sediment particles provide a surface onto which moderately soluble chemical constituents can adsorb and be transported downstream. Thus, chemically enriched sinks can form in sediment deposition areas (Lowry et al. 1986). Quantities of suspended sediment in a flowing stream limit the stream's capability to acquire and transport additional sediment. Suspended sediment loads are often trapped in downstream reservoirs.

Temperature

The temperature of water in streams within the planning area can range from 0 °C during winter to 25°C or more during late summer (Lowry et al. 1986). Water temperatures in streams also vary as a function of elevation. The temperature of water in streams depends on physical conditions, such as shading, stream width, depth and velocity, and can be further altered by groundwater inflows, waste dischargers, and reservoirs (Lowry et al. 1986).

Changes in water temperature can have an effect on water quality. As water temperatures increase, dissolved oxygen concentrations decrease due in part to the lower saturation capacity of the water and additional oxygen consumption by aquatic life (Lowry et al. 1986). The solubility of various chemical constituents in water also change with temperature, which could affect the levels of chemical constituents potentially harmful to aquatic life.

Water Quality Trends

Clark (2012) evaluated trends for the 10-year period of water years 2001–2010 at sites in the Tongue River drainage basin (4 sites); Powder River drainage basin (9 sites); and the Belle Fourche River drainage basin (4 sites). Most of the sites evaluated for trends for water years 2001–2010 are on the main-stem rivers or on primary tributaries in those drainages. In addition to specific conductance and SAR, trends were evaluated for dissolved concentrations of calcium, magnesium, sodium, alkalinity, chloride, and SO_4 to determine which of the primary components may be contributing to a trend in specific conductance or SAR.

Specific Conductance

Clark (2012) did not observe consistent basinwide trend patterns for specific conductance for water years 2001–2010 in the Tongue, Powder, and Belle Fourche River drainage basins. Upward trends in flow-adjusted specific conductance values were determined for 3 sites, a downward trend was determined for 1 site, and no significant trends were determined for 13 sites.

In the Tongue River drainage basin, flow-adjusted specific conductance values for water years 2001–2010 indicated upward trend on the Tongue River at the state line. No trends were determined for flow-adjusted specific conductance values on Little Goose Creek, Goose Creek, and Prairie Dog Creek near Acme.

Upward trends also were observed for flow-adjusted concentrations of calcium, chloride, and SO_4 on the Tongue River at the stateline, which would contribute to the upward trend in specific conductance. An upward trend in flow-adjusted chloride concentrations was observed on Prairie Dog Creek near Acme, which may have contributed to increasing chloride concentrations of the Tongue River. Clark found that determining the source of trends for the Tongue River at the state line for water years 2001–2010 is complicated by several factors. Large concentrations of calcium, chloride, and SO_4 are not directly associated with coalbed waters. The subsurface movement of major ions dissolved from soils as a result of infiltrating CBNG-produced waters is one potential source of calcium, chloride, or SO_4 to streams; however, other land uses also may have contributed to trends in major ions. Irrigation, which occurs in the Tongue River drainage basin, can increase concentrations of dissolved constituents in the soil profile or in return flows as a result of evaporation and transpiration (Hanson et al. 2006). Rural septic systems in the drainage basin may also contribute to dissolved solids (Canter and Knox 1984), as well as the city of Sheridan. Drought conditions that persisted in the Tongue River drainage basin during water years 2001–2006 may have produced an accumulation of salts at the surface and in the near subsurface through evaporation. When precipitation returned to normal (NRCS 2011b), some of these accumulated salts may have been flushed to streams. Quillinan et al. (2012) reported that increased dissolved solids observed in the Tongue River during early spring runoff are likely the result of soluble salts being mobilized from the soil profile in the basin interior.

In the Powder River drainage basin, flow-adjusted specific conductance values for water years 2001–2010 indicated an upward trend on Clear Creek near Buffalo. A downward trend in flow-adjusted specific conductance values was determined for the Powder River below Burger Draw. No trend in flow-adjusted specific conductance values were determined for Salt Creek, Powder River at Sussex, Crazy Woman Creek, the Powder River at Arvada, Clear Creek near Arvada, the Powder River at Moorhead, and the Little Powder River above Dry Creek.

Upward trends in flow-adjusted concentrations of calcium, magnesium, and alkalinity contributed to the upward trend in specific conductance for Clear Creek near Buffalo. Calcium, magnesium, and alkalinity commonly are associated with carbonate rocks, which are present in the upper basin. Trends in these constituents may indicate that groundwater composed a relatively larger part of the streamflow as a result of drought conditions, because concentrations of calcium, magnesium, and alkalinity typically are larger under base-flow conditions compared to surface runoff. Sparse CBNG development has occurred in the upper Clear Creek drainage basin upstream from Clark's study site (based on compilation of data retrieved from WOGCC 2011).

Clark found that a downward trend for flow-adjusted SO concentrations contributed to the downward trend in specific conductance for the Powder River below Burger Draw. The CBNG production occurs in drainages upstream from the study site on the Powder River, including the

Burger Draw drainage basin, which is immediately upstream from the site. Because coalbed waters typically do not contain large SO_4 concentrations, discharges of CBNG-produced waters in the Burger Draw drainage basin may dilute SO_4 concentrations in the Powder River below Burger Draw, particularly during low flows. Because flow is occurring more regularly in some of the plains ephemeral drainages, some flushing of surficial SO_4 salts also may have occurred, which may decrease SO_4 concentrations through time. Precipitation of barium SO_4 also may contribute to the downward trend in flow-adjusted SO_4 concentrations. Barium is a constituent commonly associated with CBNG-produced waters that will precipitate when mixed with SO_4 in drainages (Wyoming DEQ 2000a; Brinck et al. 2008).

Clark noted downward trends in flow-adjusted SO_4 concentrations downstream on the Powder River at Arvada and at Moorhead, as well as on Clear Creek near Arvada; however, no trends were determined for flow-adjusted specific conductance values for these sites. Upward trends in flow-adjusted alkalinity concentrations were determined for the Powder River at Arvada and at Moorhead. The CBNG-produced waters that typically have bicarbonate as their dominant anion may be the source affecting the upward trend in alkalinity on the Powder River at the study sites.

In the Belle Fourche River drainage basin, an upward trend in flow-adjusted specific conductance values was determined for the Belle Fourche River near Piney. No trend in flow-adjusted specific conductance was determined for Donkey Creek or for two sites downstream on the Belle Fourche River.

Clark indicated that an upward trend in flow-adjusted sodium concentrations contributed to the upward trend in specific conductance on the Belle Fourche River near Piney. Water production associated with CBNG development has been declining in the upper Belle Fourche River drainage basin since 2003 when it was at its peak (based on compilation of data retrieved from WOGCC 2011). Specific conductance values and sodium concentrations generally were smaller during water years 2001–2010 compared to values reported by Peterson (1998) for water years 1975–1981. This indicates that CBNG-produced waters may have had a dilution effect on the water quality of the Belle Fourche River near Piney and as a result of declining CBNG production, concentrations are returning to larger levels that occurred prior to CBNG development.

Although no corresponding trends were determined for flow-adjusted specific conductance values, Clark indicated a downward trend in flow-adjusted alkalinity concentrations on the Belle Fourche River below Moorcroft. Upward trends in flow-adjusted concentrations of calcium, magnesium, and chloride concentrations also were determined for Belle Fourche River below Moorcroft. Increases in chloride have been reported for Donkey Creek, and the Belle Fourche River downstream from Donkey Creek has been listed as impaired for chloride (Wyoming DEQ 2012). One source of magnesium and chloride concentrations may be magnesium chloride, which is used as a deicing agent for roads in the winter and, as a dust suppressant applied to roads in the summer.

Sodium Adsorption Ratios

Clark did not observe consistent basinwide trend patterns for SAR values for water years 2001–2010 in the Tongue, Powder, or Belle Fourche River drainages basins. Upward trends in flow-adjusted SAR values were determined at 2 sites and no significant trends were determined for 15 sites.

In the Tongue River drainage basin, flow-adjusted SAR values for water years 2001–2010 indicated no trends for Little Goose Creek, Goose Creek, Prairie Dog Creek near Acme, or the Tongue River at the state line. As previously described for specific conductance trends, an

upward trend in flow-adjusted calcium was determined; however, a corresponding downward trend in flow-adjusted SAR was not determined. A downward trend was observed for unadjusted SAR values at the state Line.

In the Powder River drainage basin, flow-adjusted SAR values for water years 2001–2010 indicated an upward trend on the Powder River at Arvada. The trend in flow-adjusted SAR values was not significant for other sites on the Powder River, including at Sussex, below Burger Draw, and at Moorhead. No significant trends in flow-adjusted SAR values were determined for tributary sites in the Powder River drainage basin, including Salt Creek, Crazy Woman Creek, Clear Creek, and the Little Powder River.

No trends were determined for flow-adjusted concentrations of calcium, magnesium, and sodium for the Powder River at Arvada. Flow-adjusted calcium concentrations indicated the trend in flow-adjusted SAR values may be primarily the result of decreasing calcium concentrations. One of the geochemical effects of adding sodium bicarbonate produced waters to streams is the precipitation of calcium carbonate. This results in a decrease in calcium concentrations and a corresponding increase in SAR (Patz et al. 2004). Decreases in calcium concentrations in CBNG impoundments compared to CBNG outfalls also have been attributed to the precipitation of calcite (Jackson and Reddy 2007). The SAR trend, combined with the upward trend in flow-adjusted alkalinity concentration, is additional evidence that CBNG-produced waters may be causing the water-quality changes to the Powder River at Arvada during water years 2001–2010. Frost et al. (2010) used strontium isotopes and mixing models to show that CBNG-produced waters account for less than 1 percent of the flow of the Powder River, but that it is possible for even a small amount of CBNG-produced waters to affect SAR values of the Powder River.

In the Belle Fourche River drainage basin, flow-adjusted SAR values for water years 2001–2010 indicated an upward trend on the Belle Fourche River near Piney. Trends in flow-adjusted SAR values were not significant for Donkey Creek or downstream on the Belle Fourche River. The upward SAR trend for the Belle Fourche River near Piney corresponded with a significant upward trend in flow-adjusted sodium concentrations at that site. Because trends in flow-adjusted concentrations of calcium or magnesium were not significant, the increase in sodium, which is directly related to SAR, likely is the primary factor affecting the upward trend in SAR for the Belle Fourche River near Piney.

Summary

Data published by the USGS (Clark 2012) summarized water quality for four major watersheds in the PRB for the period between the beginning of full scale CBNG development (2001) through peak production (2008) to 2010. The watersheds evaluated are the Powder, Tongue, Belle Fourche and Cheyenne drainage basins. Clark concluded that CBNG developments may have contributed to some trends in the PRB, with upward trends (concentration of constituents) noted at some locations, and downward trends (dilution of constituents) noted at other locations.

Water Classifications

The Wyoming DEQ, in compliance with the federal CWA, requires that water quality be maintained or improved for outstanding (Class 1) and most of high-quality (Class 2) waters (Wyoming DEQ 2007). Table 3.9, “Surface Water Classes and Uses in Wyoming” (p. 345) describes water quality classes. The Wyoming DEQ manages all surface discharges in the state through the WYPDES permit process. Water produced and discharged in association with any industrial activity, including O&G development, must be permitted

through the WYPDES process. WYPDES permits typically require compliance with specific water quality effluent standards that vary by stream class, and are periodically reviewed and revised for existing uses. Water discharged on the surface must be suitable for existing or planned uses, such as agriculture and livestock, and cannot result in a violation of water quality standards in the receiving stream. The Wyoming DEQ defines stream classes and water quality standards (Wyoming DEQ 2002), and a list of classified segments is maintained and available from the Wyoming DEQ.

Table 3.9. Surface Water Classes and Uses in Wyoming

Surface Water Classes	Surface Water Uses
Class 1, Outstanding Waters	No further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate best management practices.
Class 2, Fisheries and Drinking Water	Support fish or drinking water supplies or where those uses are attainable. Class 2 waters may be perennial, intermittent, or ephemeral.
Class 3, Aquatic Life Other than Fish	Intermittent, ephemeral, or isolated waters and waters that, because of natural habitat conditions, do not support or have the potential to support fish populations or spawning, or certain perennial waters that lack the natural water quality to support fish (e.g., geothermal areas).
Class 4, Agriculture, Industry, Recreation and Wildlife	Aquatic life uses are not attainable. Uses include recreation, wildlife, industry, agriculture, and scenic value.
Source: Wyoming DEQ 2013d	

The Wyoming Nonpoint Source Program operates under the Watershed Management Section of the Wyoming DEQ, Water Quality Division (WQD). Unlike point source pollution, which can be traced back to a single defined source, nonpoint source pollution is caused by surface water runoff diffuse in nature and often widespread, making it difficult to assess the source of the problem. Nonpoint source pollution occurs when runoff from rainfall or snowmelt travels over and/or percolates through the soil and picks up contaminants. These contaminants are deposited into streams, lakes, rivers, and groundwater. While some types of nonpoint source pollution can be natural in origin, Wyoming's Nonpoint Source Program typically only addresses those associated with anthropogenic land-disturbing activities such as urban development, agriculture, recreation, and silviculture. Common nonpoint source contaminants include fertilizers and pesticides from agricultural and residential activity; oil, grease, sediment and toxic chemicals from urban runoff; sediment from construction activity or stream bank erosion; and bacteria and nutrients from livestock and pet waste or failing septic systems (Wyoming DEQ 2012).

Impaired Water Bodies

Section 305(b) of the CWA requires that each state prepare and submit a biennial report to EPA by April 1st of even numbered years. The report must contain a description of the water quality of navigable waters of the state for the preceding year, including the extent to which current conditions allow for the "protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water." Section 305(b) also requires each state to report the water quality and the elimination of pollutants that would be necessary to provide for designated use support. Specifically, each state is to identify waters not meeting the above conditions, recommend strategies to achieve these objectives and to estimate the environmental impacts, economic and social costs and benefits, and the predicted timeline for project completion. Lastly, Section 305(b) requires that the sources and extent of nonpoint

source pollution in each state be estimated, including a description of the current program used to mitigate these pollutants and associated financial costs.

Section 303(d) of the CWA requires that states identify and list waters for which the effluent limits outlined in Section 301 are not effective in attaining designated uses. Section 303(d) also requires that states develop a separate TMDL for each pollutant/segment combination on the 303(d) List. States are required to prioritize waters on the 303(d) List for TMDLs based on the severity of each pollutant/segment combination, or listing. TMDLs are to be completed on these impaired waters "to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife, and allow recreational activities in and on the water." Each state must submit a 303(d) List of impaired waters to EPA by April 1st of each even numbered year. EPA is required to review the 303(d) List within 30 days of submittal.

The quality of water in the rivers and streams within the planning area is protected for designated uses in accordance with the State of Wyoming's water quality standards. The State of Wyoming's 305(b) Report for 2012 lists water-bodies with impairments to water quality in the Tongue River Basin, PRB, and Belle Fourche River Basin (Wyoming DEQ 2012). Listed impairments within the planning area are caused primarily by pathogens, trace metals (arsenic and selenium), chloride, temperature, oil spills, and habitat alterations. Most sources of the impairments are unknown, although some have been attributed to natural background sources. The complete Wyoming Water Quality Assessment and Impaired Waters List (2012 Integrated 305(b) and 303(d) report can be found on Wyoming DEQ's website.

The 2012 303(d) list includes 519 miles of impaired water bodies within the boundaries of the planning area (Wyoming DEQ 2012). Of these 519 miles, 16.4 of these miles pass through or are adjacent to BLM-administered surface. Table 3.10, "Summary of Impaired Water Bodies within the Planning Area" (p. 347) shows a summary of Impaired Water Bodies within the planning area. Additionally, a general description of the impaired water bodies in the planning area is included in Appendix W (p. 2623). To address the issues causing the impairments, the Wyoming DEQ is developing TMDL allocations for impaired water bodies throughout the state. A TMDL is the amount of pollutant which a stream can accept and still meet its designated uses. TMDLs must be established for each pollutant which is a source of stream impairment. They must be measurable and must consider both point and nonpoint source pollutant loads, natural background conditions, and a margin of safety. When the Wyoming DEQ develops TMDLs for the water bodies in the planning area, the BLM will comply with any standards established by the TMDL. Additionally, if BLM has standing in the target water body, they will offer to be a cooperating agency with Wyoming DEQ to help develop and implement the TMDL. In addition to the water bodies directly in the planning area, it is possible that in the future, some impaired stream or river segment may flow out of the planning area into South Dakota or Montana. In such a case the receiving state would coordinate with Wyoming DEQ to implement a TMDL. BLM would work with Wyoming DEQ or the receiving state to manage that TMDL. Conversely, impaired water bodies outside of the planning area may flow into the planning area. This is likely to occur in the southern portion of the planning area. Water quality in these streams and rivers would be under the authority of Wyoming DEQ, therefore, management would vary little. However the management of BLM resources would likely be under the authority of the Casper Field Office. In such a case, the BFO would work directly with the Casper Field Office to implement any TMDL prescriptions.

Wyoming DEQ has conducted studies regarding surface waters used for drinking water supplies as part of their Source Water Assessment and Protection evaluation process. The Source Water Assessment and Protection program defines evaluation and delineation protocols to prevent

impairments to drinking water sources. As of 2013, the Source Water Assessment and Protection program is operated on a voluntary basis in the State of Wyoming and is not subject to regulatory oversight. Therefore, no geographic data is available that defines areas that fall under Source Water Assessment and Protection controls. If in the future Wyoming DEQ or other agencies adopt regulations, or define areas for source water protection, BLM will cooperate with those efforts. If lands identified as source water protection areas are proposed for leasing, BLM will evaluate the offering of those parcels, and their associated surface disturbance or occupancy as part of the review process. During any O&G leasing activities, all split-estate landowners are notified of proposed lease parcels that intersect their surface estate, and are given the opportunity to comment on the leasing of those lands at that time. These processes will allow the BFO to ensure that water quality objectives associated with any federal activity are met. Further information on the Wyoming Source Water Assessment and Protection program can be found on Wyoming DEQ's website (<http://deq.state.wy.us/wqd/www/SWP%20WHP/>).

Table 3.10. Summary of Impaired Water Bodies within the Planning Area

Surface Water Name HUC Number	Location	Water Classification	Impairment	Impairment Cause	BLM-Administered Land	Basin Area (Acres)	Percent BLM-Administered Area in Basin	Listing Date
Donkey Creek HUC1601010106	Planning area boundary upstream to Brorby Boulevard in Gillette	3B	Not supporting designated uses	Fecal Coliform	None	151,757 (Donkey Creek Level 10)	0.24% Surface 63.86% Minerals	2000
Gillette Fishing Lake HUC1601010106	Within the City of Gillette	2AB	Not supporting designated uses	Phosphate and Sediment	None	41,331 (Headwaters Donkey Creek Level 12)	0.00% Surface 92.85% Minerals	1996
Stonepile Creek HUC1601010106	From confluence with Donkey Creek upstream to junction of Hwy 14/15, 59	3B	Not supporting designated uses	Fecal Coliform	None	38,785 (Upper Donkey Creek Level 12)	0.52% Surface 83.37% Minerals	2002
Powder River HUC10090202	Crazy Woman Creek to South Fork Powder (135.8 miles) (multiple listed sections combined)	2ABww	Not supporting designated uses	Selenium and Arsenic	4.8 Miles	1,600,035 (Upper Powder Level 8)	19.28% Surface 88.15% Minerals	2000

Surface Water Name HUC Number	Location	Water Classification	Impairment	Impairment Cause	BLM-Administered Land	Basin Area (Acres)	Percent BLM-Administered Area in Basin	Listing Date
Powder River HUC10090202	Soldier Creek to Salt Creek (19.3 miles)	2ABww	Not supporting designated uses	Chloride	1.8 Miles	31,333 (Two mile Reservoir-Powder River Level 12)	17.85% Surface 66.09% Minerals	1998
Middle Prong Wildhorse Creek HUC1009020208	From Wildhorse Creek Confluence to 4.7 miles upstream	3B	Not supporting designated uses	E. coli	None	16,318 (Lower Middle Prong Wild Horse Creek Level 12)	18.42% Surface 92.69% Minerals	2006
South Fork Powder River HUC10090203	From Cloud Creek Confluence to 47.2 miles downstream	2C	Not supporting designated uses	Selenium	3.1 Miles	114,339 (Murphy Creek – South Fork Powder Level 10, presume just within Field Office boundary)	27.60% Surface 68.21% Minerals	2006
Willow Creek HUC10090020304	South Fork Powder River to 10.5 miles upstream	2AB	Not supporting designated uses	Selenium	None	3,260 (Willow Creek Level 12, presume just within Field Office boundary)	12.30% Surface 41.93% Minerals	2006
Posey Creek HUC100902030404	South Fork Powder River to 8.0 miles upstream	3B	Not supporting designated uses	Selenium	0.04 Miles	38,228 (Wall Creek South Fork Powder River Level 12)	26.93% Surface 58.71% Minerals	2008
Murphy Creek HUC100902030407	Confluence with South Fork Powder River to 12.2 miles upstream	3B	Not supporting designated uses	Selenium	3.2 Miles	35,580 (Murphy Creek Level 12)	27.30% Surface 78.45% Minerals	2008
Salt Creek HUC1009020403	Powder River to 45.3 miles upstream	2C	Designated uses not supported or threatened	Selenium and Oil Spills	2.3 Miles	125,075 (Lower Salt Creek Level 10, presume just within Field Office boundary)	33.98% Surface 79.84% Minerals	2008

Surface Water Name HUC Number	Location	Water Classification	Impairment	Impairment Cause	BLM-Administered Land	Basin Area (Acres)	Percent BLM-Administered Area in Basin	Listing Date
North Fork Crazy Woman Creek HUC100902050100	From Muddy Creek Confluence to 28 miles upstream	2AB	Designated uses are threatened Habitat	Alterations and nutrients	None	87,044 (Combined Middle North Fork Crazy Woman, Upper North Fork Crazy Woman, and Muddy Creek Level 12s)	0.99% Surface 17.81% Minerals	1996
Crazy Woman Creek HUC1009020503	From Powder River Confluence to 9.2 miles upstream	2ABww	Not supporting designated uses	Man-ganese	None	41,000 (The Lake – Crazy Woman Creek Level 12)	12.44% Surface 91.5% Minerals	2002
North Piney Creek HUC100902060303	Confluence with Piney Creek to 6.4 miles upstream	2AB	Not supporting designated uses	E. coli	None	25,199 (North Piney Creek, Level 12)	0.00% Surface 6.11% Minerals	2006
Dalton Ditch HUC100902060303	Within and near the Town of Story	2AB	Not supporting designated uses	E. coli	None	25,199 (North Piney Creek, Level 12)	0.00% Surface 6.11% Minerals	2006
Piney-Cruze Ditch HUC100902060303	Confluence with North Piney Creek to 2.2 miles upstream	3B	Not supporting designated uses	E. coli	None	25,199 (North Piney Creek, Level 12)	0.00% Surface 6.11% Minerals	2008
Little Powder River HUC1009020805	Montana/Wyoming state line to Spring Creek	2AB	Not supporting designated uses	Fecal Coliform	0.7 Miles	866,643 (Little Powder, Level 8)	9.79% Surface 72.61% Minerals	2002
North Tongue River HUC100901010101	Road 171 upstream to Pole Creek	1	Not supporting designated uses	Fecal Coliform	None	58,164 (Combined Upper North Tongue and Lower North Tongue, Level 12s)	0.00% Surface 0% Minerals	2004

Surface Water Name HUC Number	Location	Water Classification	Impairment	Impairment Cause	BLM-Administered Land	Basin Area (Acres)	Percent BLM-Administered Area in Basin	Listing Date
Columbus Creek HUC100901010106	Confluence with Tongue River to 3.1 miles upstream	2AB	Not supporting designated uses	Fecal Coliform	None	36,227 (Columbus Creek – Tongue River Level 12)	1.64% Surface 3.87% Minerals	2002
Smith Creek HUC100901010106	Confluence with Tongue River to 5.8 miles upstream	2AB	Not supporting designated uses	Fecal Coliform	None	36,227 (Columbus Creek – Tongue River Level 12)	1.64% Surface 3.87% Minerals	2002
Little Tongue River HUC100901010107	Confluence with Tongue River to Frisbee Ditch	2AB	Not supporting designated uses	E. coli	None	21,725 (Little Tongue, Level 12)	4.09% Surface 1.29% Minerals	2002
Fivemile Creek HUC100901010108	Confluence with Tongue River to Hanover Ditch	3B	Not supporting designated uses	Fecal Coliform	None	40,735 (Fivemile Creek – Tongue River, Level 12)	1.28% Surface 16.93% Minerals	2002
Wolf Creek HUC100901010110	Confluence with Tongue River to East Wolf Creek	2AB	Not supporting designated uses	Fecal Coliform	None	22,218 (Lower Wolf Creek, Level 12)	0.00% Surface 1.38% Minerals	2002
Tongue River HUC100901010111	Monarch Road upstream to Wolf Creek Road	1	Not supporting designated uses	E. coli	None	77,226 (Combine Slater Creek – Tongue River and Fivemile Creek – Tongue River, Level 12s)	1.86% Surface 31.74% Minerals	2010
Tongue River HUC100901010301	Goose Creek to Montana border	2AB	Not supporting designated uses	Temperature	2.1	23,539 (Beatty Gulch – Tongue River, Level 12)	7.52% Surface 56.36% Minerals	2002
Prairie Dog Creek HUC100901010402	Interstate 90 to 47.2 miles downstream	2AB	Not supporting designated uses	Fecal Coliform, Manganese, Temperature	None	230,916 (Prairie Dog Creek, Level 10)	0.73% Surface 50.83% Minerals	2004

Surface Water Name HUC Number	Location	Water Classification	Impairment	Impairment Cause	BLM-Administered Land	Basin Area (Acres)	Percent BLM-Administered Area in Basin	Listing Date
Prairie Dog Creek HUC100901010400	Confluence with Tongue River to 6.7 miles upstream	2AB	Not supporting designated uses	Manganese, Fecal Coliform, Temperature	None	230,916 (Prairie Dog Creek, Level 10)	0.73% Surface 50.83% Minerals	2002
Meade Creek HUC100901010401	Confluence with Prairie Dog Creek to 1.1 miles upstream to unnamed tributary	2AB	Not supporting designated uses	E. coli and Manganese	None	39,456 (Upper Prairie Dog Creek, Level 12)	0.00% Surface 16.43% Minerals	2012
Wildcat Creek HUC100901010402	Confluence with Prairie Dog Creek to 0.8 miles upstream	3B	Not supporting designated uses	E. coli	None	40,157 (Middle Prairie Dog Creek, Level 12)	0.10% Surface 40.46% Minerals	2012
Dutch Creek HUC100901010405	Confluence with Prairie Dog Creek to 1.9 miles upstream to unnamed tributary	3B	Not supporting designated uses	E. coli	None	20,838 (Dutch Creek, Level 12)	1.56% Surface 32.25% Minerals	2012
Park Creek HUC100901010204	Confluence with Big Goose Creek to 2.8 miles upstream	2AB/4A	Not supporting designated uses, TMDL in effect	Fecal Coliform	None	28,856 (Upper Big Goose, Level 12)	1.51% Surface 3.68% Minerals	2001
Rapid Creek HUC100901010204	Confluence with Big Goose Creek to 3.2 miles upstream	2AB/4A	Not supporting designated uses, TMDL in effect	Fecal Coliform	None	28,856 (Upper Big Goose, Level 12)	1.51% Surface 3.68% Minerals	2006
Big Goose Creek HUC100901010205	Confluence with Little Goose Creek upstream to confluence with Rapid Creek	2AB/4A	Not supporting designated uses, TMDL in effect	Fecal Coliform	None	55,997 (Combined Lower Big Goose and Upper Big Goose Creek, Level 12s)	0.78% Surface 5.16% Minerals	2001

Surface Water Name HUC Number	Location	Water Classification	Impairment	Impairment Cause	BLM-Administered Land	Basin Area (Acres)	Percent BLM-Administered Area in Basin	Listing Date
Beaver Creek HUC100901010205	Confluence with Big Goose Creek upstream to confluence with Apple Run	2AB/4A	Not supporting designated uses, TMDL in effect	Fecal Coliform	None	27,141 (Lower Big Goose Creek, Level 12)	0.00% Surface 6.73% Minerals	2001
Sackett Creek HUC100901010207	Confluence with Little Goose Creek upstream to confluence with East Fork Sackett Creek	2AB/4A	Not supporting designated uses, TMDL in effect	Fecal Coliform	None	35,754 (Middle Little Goose Creek, Level 12)	1.33% Surface 10.25% Minerals	2006
Jackson Creek HUC100901010207	Confluence with Little Goose Creek to 6.4 miles upstream	2AB/4A	Not supporting designated uses, TMDL in effect	Fecal Coliform	None	35,754 (Middle Little Goose Creek, Level 12)	1.33% Surface 10.25% Minerals	2006
Little Goose Creek HUC100901010208	Confluence with Big Goose Creek upstream to Brundage Lane in Sheridan	2AB/4A	Not supporting designated uses, TMDL in effect	Habitat Alterations, Sediment, and Fecal Coliform	None	96,572 (Combined Lower, Middle, and Upper Little Goose Creek, Level 12s)	0.71% Surface 6.99% Minerals	2006
Mc-Cormick Creek HUC100901010208	Confluence with Little Goose Creek to 2.2 miles upstream	2AB/4A	Not supporting designated uses, TMDL in effect	Fecal Coliform	None	27,141 (Lower Big Goose Creek, Level 12)	0.00% Surface 6.73% Minerals	2006
Kruse Creek HUC100901010208	Confluence with Little Goose Creek upstream to confluence with East Fork Kruse Creek	2AB/4A	Not supporting designated uses, TMDL in effect	Fecal Coliform	None	27,141 (Lower Big Goose Creek, Level 12)	0.00% Surface 6.73% Minerals	2006

Surface Water Name HUC Number	Location	Water Classification	Impairment	Impairment Cause	BLM-Administered Land	Basin Area (Acres)	Percent BLM-Administered Area in Basin	Listing Date
Goose Creek HUC100901010209	Confluence with Little Goose Creek downstream to confluence with Tongue River	2AB/4A	Not supporting designated uses, TMDL in effect	Habitat Alterations, Sediment and Fecal Coliform	None	39,075 (Soldier Creek – Goose Creek, Level 12)	0.00% Surface 19.7% Minerals	2006
Soldier Creek HUC100901010209	Confluence with Goose Creek to 3.1 miles upstream	2AB/4A	Not supporting designated uses, TMDL in effect	Fecal Coliform	None	39,075 (Soldier Creek – Goose Creek, Level 12)	0.00% Surface 19.7% Minerals	2006
Soldier Creek HUC100901010209	From 3.1 miles upstream of confluence with Goose Creek to 17 miles upstream	2AB/4A	Not supporting designated uses, TMDL in effect	Flow Alterations	None	39,075 (Soldier Creek – Goose Creek, Level 12)	0.00% Surface 19.7% Minerals	2006
<p>Source: Wyoming DEQ 2012</p> <p>Note: Numerous other water bodies in the Belle Fourche, Cheyenne, Powder, and Tongue River basins are listed in the 2012 Integrated 305(b) and 303(d) report as supporting one or more designated uses but the use support of other uses is unknown.</p> <p>Note: Basin areas calculated National Hydrologic Database HUC drainages. Depending on size of impaired reach, HUC levels 8, 10, or 12 were used as indicated by superscript number. In some cases multiple HUC 12 basins were combined. In many cases listed acreages far exceed the actual contributing area to the impaired water body.</p> <p>% percent BLM Bureau of Land Management HUC Hydrologic Unit Code TMDL Total Maximum Daily Load</p>								

Surface Water Use

Surface water resources within the planning area typically meet existing needs on public lands, but natural climatic fluctuations, such as drought, can make marginally adequate sources unreliable.

Surface water rights in the planning area are permitted through the WSEO. A permittee can apply for water rights on BLM-administered land; if the permittee demonstrates beneficial use, then the WSEO can permit the water right. The issuance of the water right in no way authorizes a permittee to develop water on BLM-administered lands, or any lands that they do not own. This requires independent negotiations between the permittee and the BLM to acquire the appropriate special use permit or ROW. The WSEO does not require that landowner authorization be obtained before it issues the water right.

Surface water withdrawals in the planning area totaled 365 million gallons per day (mgd) in 2005. Table 3.11, “Surface Water Use per County (million gallons per day)” (p. 354) summarizes water use within the three counties that comprise the planning area in 2005 (USGS 2005a). Surface water use in the planning area is predominantly associated with irrigation use. About 95 percent of the surface water withdrawals (347 mgd) are used for irrigation. Mining use accounts for only 3 percent, or 11 mgd of the total surface water withdrawals. About 25,781 people living in the planning area obtained their water supply from surface water sources in 2005, consuming 5.1 mgd, or about 1 percent of the surface water withdrawals (USGS 2005a). Additional discussion about surface water use can be found in the PRB Final EIS (BLM 2003c, page 3-51).

Table 3.11. Surface Water Use per County (million gallons per day)

	Public Supply	Domestic Self Supplied	Industrial Self Supplied	Irrigation	Livestock	Mining
Campbell	0.00	0.00	0.22	36.49	0.38	10.97
Johnson	1.25	0.00	0.07	116.66	0.46	0.03
Sheridan	3.82	0.00	0.03	193.53	0.65	0.01
Source: USGS 2014						

Coal Use

As of 2011, there are 12 active and two proposed surface coal mines in the planning area that occupy over 100,000 acres of reclaimed and unreclaimed surface (BLM 2013j). Each coal lease has been issued after an extensive site specific environmental analysis (as an EIS) is approved which discloses current conditions and presents potential impacts related to the removal of the coal resource and associated mitigation. For additional information, refer to *Leasable Minerals—Coal*.

Initially, surface coal mining requires that any surface water be removed or relocated in preparation for topsoil removal. Perennial streams are diverted in coordination with the Wyoming DEQ as well as the United States Army Corps of Engineers. Other water bodies, such as impoundments or natural surface playas in the mine area have been drained as necessary to facilitate removal.

In the planning area, the volume of water produced through the dewatering procedure averaged between 1,386 to 2,258 acre-feet per year (Hay Creek II Final EIS, pg. 4-11 to 4-12). For the most part, the water is used by the mines for maintenance, dust control or other consumptive uses. If water is discharged to the surface, the mine operator would be required to obtain a WYPDES discharge permit.

Municipal Water Use

Communities in the planning area that use surface water as a municipal water supply include the Cities of Sheridan and Gillette, and the towns of Buffalo and Dayton (Wyoming State Engineer’s Office 2013). Surface water sources in the Tongue River sub-watershed supply the communities of Sheridan and Dayton. Buffalo uses surface water from the Clear Creek sub-watershed. Gillette has municipal surface water rights in Donkey and Stonepile Creeks. The majority of municipal water supplies in the planning area are acquired from groundwater sources and are discussed further in the *Groundwater* Section.

Surface Water Monitoring

In the Record of Decision (ROD) for the PRB Final EIS (BLM 2003c), the BLM committed to cooperate with the Wyoming DEQ, WSEO, USGS and others fund a network of surface

water monitoring sites in the planning area. Currently BLM cooperates with USGS to operate 20 surface water monitoring stations throughout the planning area. These stations continuously record streamflow on major rivers and streams in the area. Many of these sites include periodic water quality analysis as well. This analysis typically includes major cations and ions (calcium, magnesium, sodium, bicarbonate, chloride, and SO_4), selected nutrients (nitrate and phosphorus), and trace metals (arsenic, barium, iron, manganese, and selenium). The USGS compiles the data and presents it to the public on their website (<http://waterdata.usgs.gov/wy/nwis/current/?type=flow>).

Groundwater

Information in this section includes:

- The geological features in which groundwater resources occur
- The major regional aquifers in the planning area and estimates of recoverable groundwater
- Uses of groundwater in the planning area
- Groundwater quality conditions related to TDS and trends in the planning area, and areas that are highly vulnerable to groundwater contamination

Groundwater resources are contained in permeable underground aquifers composed of rock and sediments through which water can flow. Water moves slowly in aquifers in response to the prevailing hydraulic gradient, through tiny open spaces in the rock and sediment. Groundwater is replaced, or recharged, from precipitation that falls directly on the aquifers or by leakage through the beds of streams that intercept aquifers or from adjacent aquifers. Movement of groundwater is from recharge areas down the hydraulic gradient to discharge areas.

Aquifer permeability is directly related to the nature and type of porosity of the material that makes up the aquifer. Primary porosity is the open space between individual grains or rock clasts. Secondary porosity consists of joints and fractures that form after a rock is consolidated (Whitehead 1996). Primary porosity is the porosity type of unconsolidated-deposit aquifers and consolidated sandstone aquifers in the PRB (Whitehead 1996). Coal aquifers in the PRB contain substantial secondary porosity.

Davis (1976) describes groundwater resources as part of a hydrologic system. The components that describe a hydrologic system are the following: aquifer type (or geologic unit); water chemistry; confined (artesian) or unconfined conditions; and groundwater recharge or discharge areas (BLM 2003c).

Regional Characterization

Aquifer Types

The groundwater resources of the PRB are described by Whitehead (1996). Groundwater resources that are at or near the land surface within the PRB are contained in unconsolidated Quaternary alluvial or basin fill deposits or in semi-consolidated to consolidated lower Tertiary sandstones and coalbeds that are the uppermost aquifers in the Northern Great Plains aquifer system. Clinker (porcellanite; locally called “scoria”), which is a geologic formation in locations where sediments have been altered in place by spontaneous combustion of coalbeds, which act as an aquifer, has formed from some of the lower Tertiary sediments (Heffern and Coates 1999). These Quaternary and Tertiary aquifers are described below in more detail (BLM 2003c).

Quaternary Alluvial Aquifers

Aquifers in stream-valley alluvium generally occur along rivers and major drainages within the PRB. The groundwater resources contained in alluvial aquifers are described by Whitehead (1996). These unconsolidated deposits of silt, sand, and gravel occur as floodplains, stream terraces, and alluvial fans. Coarser alluvial deposits occur in valleys of the Belle Fourche, Cheyenne, Powder, Tongue, and Little Powder rivers and in the larger tributaries of the Powder and Tongue rivers. Alluvium overlying formations of Tertiary age in the central part of the PRB is mostly fine to medium grained (Hodson et al. 1973).

The thickness of alluvial deposits within the planning area is mostly less than 50 feet, but may be as much as 100 feet in some valleys near mountains (Hodson et al. 1973). Wells (1982) describes alluvial deposits as commonly 30 feet thick or less, but also reports that deposits 100 feet thick have been measured. Lowry et al. (1986) also describe alluvial deposit thickness and water yield from the PRB. The thickest and coarsest-grained alluvium occurs near the Big Horn Mountains along the western margin of the PRB, where saturated horizons are thick and high yields of water are possible. Mostly fine-grained alluvial deposits with a saturated thickness less than 20 feet occur distant from the mountains, resulting in low yields of water (BLM 2003c).

Northern Great Plains Aquifer System

The Northern Great Plains aquifer system is an extensive sequence of aquifers and confining units arranged in a stack of layers that may be discontinuous locally within the PRB, but that functions regionally as an aquifer system. This system includes the lower Tertiary aquifers that are exposed at the surface in the PRB and underlying, deeply buried regional aquifers that are stacked with intervening confining layers. The deeply buried aquifer systems are composed of upper Cretaceous sandstones and coals, lower Cretaceous sandstones, upper Paleozoic limestones and dolomites, and lower Paleozoic sandstones, limestones, and dolomites (Whitehead 1996). These deeply buried regional aquifers are stratigraphically below, isolated from, and older than the aquifers that may be affected by CBNG development in the PRB (BLM 2003c).

Lower Tertiary Aquifer System

The lower Tertiary aquifer system consists of semi-consolidated to consolidated Oligocene to Paleocene sediments (Whitehead 1996). The Oligocene White River Formation is present in the planning area only as isolated erosional remnants, such as Pumpkin Buttes in southwestern Campbell County (Lewis and Hotchkiss 1981).

The lower Tertiary aquifers consist of sandstones and coal seams contained in the Eocene Wasatch Formation and the Paleocene Fort Union Formation (Whitehead 1996). Both of these geologic units are continental deposits consisting of sandstones, siltstones, claystones, and beds containing lignite and subbituminous coal. Stratigraphically, from youngest to oldest, the Lower Tertiary Aquifer System consists of the Wasatch aquifers, the Fort Union aquifers contained in the Tongue River member of the Fort Union Formation, the Lebo confining layer, and the Tullock aquifer. Clinker has been formed from these geologic formations in locations where these sediments have been altered in place by spontaneous combustion of coalbeds (Coates and Heffern 1999).

Clinker plays an important role as an aquifer in the storage and flow of water within the PRB. Rainfall and snowmelt infiltrate rapidly in clinker exposure areas. The stored water is discharged slowly to springs, streams, and aquifers, which helps maintain flow in perennial streams during dry periods (Heffern and Coates 1999). Clinker outcrops cover about 460 square miles of the planning area and are concentrated in the following areas: along the eastern boundary of the planning area in the Rochelle Hills, within the Powder River Breaks in the northern portion of

the planning area, within the Tongue River Breaks north of Sheridan, within the Lake DeSmet area north of Buffalo, and within the Felix coal outcrop area west of Gillette and northeast of Wright (Heffern and Coates 1997; BLM 2003c).

Wasatch Aquifers

The Wasatch Formation consists of fine- to coarse-grained, lenticular sandstone interbedded with shale and coal (Hodson et al. 1973). Minor constituents include coarse conglomerates occurring along the western margin of the PRB, carbonaceous shales, and thick coalbeds (Seeland 1992). Sandstone layers comprise an estimated one-third of the sequence and are important PRB aquifers. High percentages of sand (from 30 to 50% and more) have been documented along a trend paralleling the western margin of the PRB, beginning east of Buffalo and west of the Powder River and continuing toward the southeast (Seeland 1992). Wasatch coalbeds are thickest in the central and western portions of the PRB (Seeland 1992). Locally, in the northwest part of the PRB near the Big Horn Mountains, the Wasatch is divided into two conglomeratic members.

The Wasatch Formation is as much as 1,800 feet thick in the southern portions of the PRB (Keefer 1974). Southeast of Buffalo, the maximum preserved thickness of the Wasatch Formation is about 3,000 feet (Seeland 1992; BLM 2003c).

Fort Union Aquifers

The Fort Union Formation yields water from fine-grained sandstone, jointed coal, and clinker overlying the Lebo confining layer (Zelt et al. 1999). The sandstone content of the Fort Union aquifer ranges from 21 to 91 percent and is hydrologically confined, except near the land surface (Hotchkiss and Levings 1986). The Fort Union Formation is as much as 3,900 feet thick in the southern part of the PRB (Hotchkiss and Levings 1986).

Numerous thick and laterally widespread coalbeds occur within the Fort Union Formation and are important PRB aquifers (Lewis and Hotchkiss 1981). The thickness of the Fort Union coal aquifers varies greatly within the PRB. The maximum thickness of a single Fort Union coal seam is less than 25 feet along the western margin of the PRB and in the northern portion of PRB in southeastern Montana. The maximum thickness of a single Fort Union coal seam is more than 100 feet near Wright and extending west and northwest of Wright, within the central portion of the PRB in Wyoming (Seeland 1992; BLM 2003c).

Lebo Confining Layer

The lower Paleocene Tullock member of the Fort Union Formation is partially isolated and confined by the overlying Lebo member (Brown 1993). The Lebo confining layer generally retards water movement (Hotchkiss and Levings 1986).

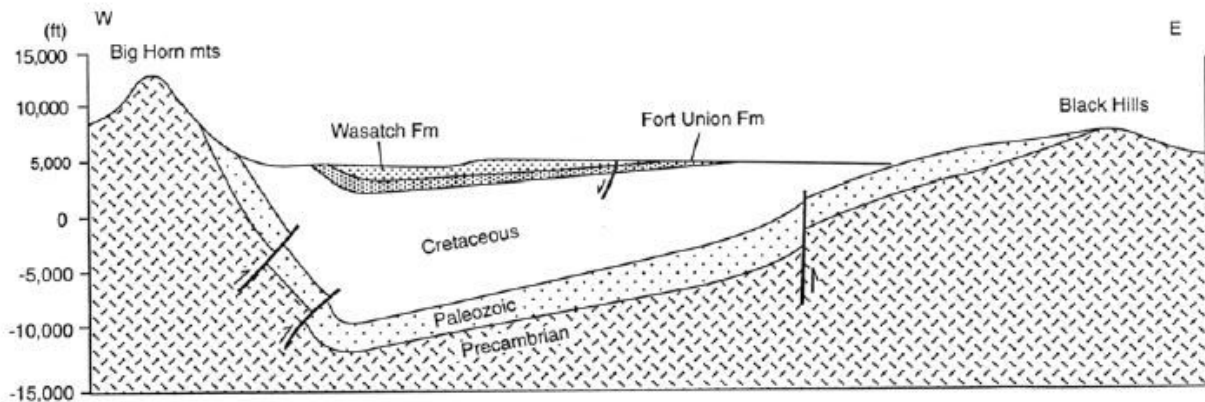
The Lebo confining layer consists predominantly of dark shales containing discontinuous zones of white calcareous banding (paleosol horizons). The Lebo confining layer in the northern portion of the planning area contains rare beds of gray sandstone as much as 10 feet thick. Some coalbeds, a few thicker than 2 feet, occur within the Lebo member and form clinker horizons in the southern PRB. The Lebo member ranges in thickness from about 500 feet in the northwestern portions of the PRB to about 1,700 feet in the southwestern portions of the PRB (Brown 1993; BLM 2003c).

Tullock Aquifer

The lower Paleocene Tullock member of the Fort Union Formation contains alluvial sediments deposited in a continental fluvial environment and is an important PRB aquifer. The Tullock aquifer consists of fine-grained sandstone, sandy siltstone, shale, rare thin limestone, and coal. Sandstone content of the Tullock aquifer ranges from 21 to 88 percent (Hotchkiss and Levings 1986). On average, an estimated one-third of the sequence is composed of channel sandstones. An estimated two-thirds of the sequence is composed of fine-grained overbank deposits containing thin coalbeds (Brown 1993).

Tullock sediments have a maximum thickness of about 370 feet in the north and 1,440 feet in the south (Brown 1993). Tullock sediments are thickest in the southeastern and western portions of the PRB.

Figure 3.23, “Regional Cross Section of the Powder River Basin” (p. 358) displays a generalized cross section of the PRB.



Source: DOE 2002

Figure 3.23. Regional Cross Section of the Powder River Basin

Groundwater Quality

Two systems of differing groundwater chemistry are described within the PRB (Bartos and Ogle 2002; Rice et al. 2002). A shallow, chemically dynamic system, generally 200 to 500 feet deep, exhibits localized flow and consists of groundwater with a mixed composition of ions (charged particles in solution). Shallow groundwater contains calcium, magnesium, and lesser amounts of sodium as cations (positively charged ions) and bicarbonate or SO_4 as the dominant anion (negatively charged ion). A deeper, underlying system that is chemically static exhibits regional flow and consists of groundwater with sodium and bicarbonate as the dominant ions.

Bartos and Ogle (2002) discuss the variation in water chemistry with depth. The zonation appears to be related to geochemical processes such as dissolution and precipitation of minerals, ion exchange, SO_4 reduction, and mixing of waters. Substantial differences in concentrations of SO_4 exist between the coalbed aquifers and the overlying Wasatch aquifer. SO_4 reduction is probably the dominant geochemical process in the coalbed aquifers.

Rankl and Lowry (1990) describe the same change in water chemistry with depth in their overview of water chemistry in water wells within the PRB. Water wells, excluding municipal

water supply wells, generally are shallow (less than 500 feet deep) and yield calcium SO₄ or calcium-sodium-sulfate waters. There is a decrease in calcium, magnesium, and SO₄ an increase in bicarbonate down to a depth of about 500 feet; however, the concentration of dissolved constituents is relatively uniform deeper than 500 feet. Deep wells generally yield sodium bicarbonate type water.

Hydraulic connections among aquifers in the PRB result in some degree of groundwater mixing, affecting groundwater chemistry of the aquifers involved. Hydraulic connections among aquifers in the PRB are not well understood and are subject to interpretation; however, some leakage between layers probably occurs where the hydraulic gradient allows for vertical groundwater flow and where sandstones directly overlie other sandstones or coalbeds (Rice et al. 2002).

Rice et al. (2002) provide the following overview of the chemistry of groundwater in the PRB. Groundwater associated with recharge typically consists of oxygenated water dominant in calcium, magnesium, bicarbonate, and SO₄, with lesser amounts of sodium. Away from the recharge area, interactions among water, aquifer minerals, and bacteria change the chemical composition of the groundwater. The net result of these reactions and processes is a decrease in calcium, magnesium, and SO₄ and a corresponding increase in sodium and bicarbonate as groundwater flows away from the source of recharge.

Rice et al. (2002) also summarize the reactions and processes that affect the composition of groundwater in the PRB. Sodium enrichment likely results from dissolution of plagioclases (feldspar minerals), cation exchange of calcium and magnesium for sodium on clay minerals, or removal of calcium and magnesium by carbonate precipitation. Initially, oxygen-rich water near the recharge area oxidizes pyrite minerals, increasing the relative abundance of SO₄ over bicarbonate. As water moves farther from the source of oxygen at the recharge area, evidence suggests that bacterial SO₄ reduction occurs, depleting the water of SO₄ and enriching it in bicarbonate. The precipitation of gypsum may remove SO₄ along with calcium from the water.

Processes associated with coalification (coal formation) also influence the composition of groundwater (Rice et al. 2002). A series of bacterially mediated processes occurs in a progressively more reducing environment. Reactions include reduction of nitrate, manganese, and iron oxides, SO₄ reduction, and methanogenesis (CH₄ formation), that produce NH₄⁺, Mn²⁺, Fe²⁺, HS⁻, CO₂, and CH₄. The overall effect of coalification processes that produce CH₄ of biological origin in the PRB is to deplete SO₄, increase bicarbonate, and establish a reducing environment in groundwater within the coal zone aquifer.

Analysis of tritium in groundwater in the PRB has been used to date the recharge of the water (Bartos and Ogle 2002; Rice et al. 2002). Groundwater that contains little or no tritium is defined as submodern or older and is referred to as “prebomb” water that was recharged before 1952; modern groundwater contains tritium. Analysis indicates that although the groundwater in the Fort Union coals is meteoric in origin, it is older than 1952. Water samples from springs at two locations provide evidence that they were recharged after 1952. Water samples from Wasatch sandstones at two locations provide evidence that they contain a mixture of submodern and modern water, but are mostly submodern water. Concentrations of tritium in all other samples from coal zones within the Wasatch and Fort Union Formations suggest the water is submodern.

Groundwater data can be found at the USGS website (USGS 2013).

Alluvial Aquifers

Water quality in alluvium within the PRB is variable. Lowry et al. (1986) report concentrations of TDS for alluvial aquifers that vary from 106 to 6,610 mg/L and averaging 2,128 mg/L for 38 samples. Water from surficial deposits that contains less than 600 mg/L TDS may be divided into two chemical types: a calcium magnesium carbonate type, and a calcium-magnesium SO₄ type (Rankl and Lowry 1990). Concentrations of TDS greater than 600 mg/L generally are a result of increased values for sodium and SO₄ (Rankl and Lowry 1990).

Hodson et al. (1973) characterize alluvial groundwater in various geographic areas within and near the PRB. Water in alluvium near the Big Horn Mountains and the Black Hills is of better quality than water in alluvium within the central part of the PRB. Water in alluvium within the southwest part of the basin and the Powder River valley is generally of poorer quality than water in alluvium elsewhere in the PRB. No dominant water type is prevalent (Hodson et al. 1973).

The chemical compositions of water in the Powder River and in the river's alluvium are similar (Ringen and Daddow 1990). Water in the Powder River is dominated by sodium and SO₄ ions, while water in the river's alluvial deposits is dominated by sodium, calcium, and SO₄ ions. The water in the underlying bedrock is dominated by sodium and bicarbonate ions. The quality of water in the alluvium limits its use as a water supply, as it is unacceptable for drinking water, acceptable for most livestock, and marginal for irrigation or industrial use.

Springs and Seeps

Rice et al. (2002) report the results of sampling at two clinker springs. The locations of springs that were sampled are shown in Rice et al. (2002). One spring located north of Gillette was sampled. The other spring that was sampled is located near the southeastern corner of Campbell County. When compared with groundwater conditions in the Wasatch Formation, the clinker springs contain lower concentrations of TDS, sodium, bicarbonate, chloride, and fluoride, and have lower temperatures. When compared with groundwater conditions in the Fort Union Formation, the clinker springs contain lower concentrations of sodium, bicarbonate, chloride, and fluoride, higher concentrations of calcium and SO₄, and have lower temperatures.

Heffern and Coates (1999) describe groundwater conditions in clinker areas within the PRB. The concentration of TDS within clinker varies widely from under 200 mg/L to more than 10,000 mg/L. Water in clinker from recharge areas near the burn line tends to be a calcium SO₄ type, and water in clinker from discharge areas tends to be a sodium bicarbonate type, similar to water in the coal. Ash residue at the base of the clinker may contribute to high concentrations of TDS (Heffern and Coates 1999). The interaction of groundwater with ash and clinker results in higher TDS values for water in coal near clinker areas. Additional information is available in Table 3-1 of the PRB Final EIS (BLM 2003c).

Lower Tertiary Aquifer System

The major dissolved-ion chemistry of water from the Wasatch Formation in the PRB has been described based on information from four wells completed in coals and eight wells completed in sandstones (Bartos and Ogle 2002; Rice et al. 2002). The locations of wells completed in Wasatch coals or sandstones that were sampled are shown in Rice et al. (2002). Wells located in the central portion of Campbell County, north of Buffalo, and north of Sheridan were sampled. Water produced from the Wasatch Formation varies in composition from mixed-type waters (calcium-magnesium-bicarbonate-sulfate) at relatively shallow depths (less than 200 feet) to sodium-bicarbonate waters at greater depths.

The pH of some samples from Wasatch aquifers exceeds the secondary maximum contaminant level for drinking water established by the EPA (Bartos and Ogle 2002). Bartos and Ogle (2002) also report dissolved concentrations of some constituents in groundwater from sandstones and coals within the Wasatch Formation. The median concentration of TDS reported for sandstones is 1,010 mg/L, which also exceeds the secondary maximum contaminant level for drinking water. The median concentration of SO_4 is 130 mg/L, which is below the secondary maximum contaminant level for drinking water. However, the concentration of SO_4 in some samples exceeds EPA's standard for drinking water. The concentration of manganese in some samples analyzed also exceeds the secondary maximum contaminant levels for drinking water. The concentration of manganese likely is relatively high because of its higher solubility as Mn^{+2} in anoxic waters. The median SAR is nine. There are no drinking water standards for SAR.

Hodson et al. (1973) provide an overview of water quality in the Fort Union aquifer. TDS concentrations range from about 200 to more than 3,000 mg/L, but commonly range between 500 and 1,500 mg/L. Water type is mostly sodium bicarbonate, and to a lesser extent sodium SO_4 . The water from deep wells is soft, meaning sodium plus potassium exceeds calcium plus magnesium, and many water samples contain carbonate as well as bicarbonate (Rankl and Lowry 1990). The dominant chemical processes that control the chemistry of Fort Union groundwater are cation-exchange softening and SO_4 reduction (Rankl and Lowry 1990).

Davis (1976) describes the chemistry of groundwater in the Fort Union aquifer within the eastern PRB. Along the coal outcrop the water generally is calcium-magnesium SO_4 type, changing to sodium bicarbonate type westward where confined aquifer conditions exist. There is a relationship between the confined and unconfined state of the aquifer and the chemical quality of water within the aquifer. As a rule, waters within unconfined portions of the coal aquifer are calcium-magnesium-sulfate type and within confined portions of the aquifer are sodium bicarbonate type.

Groundwater Impairments

There are 19 locations in the planning area that are included in the Wyoming DEQ's Voluntary Remediation Plan Program (Wyoming DEQ 2013b) of which, 11 sites are presently active. At most of these sites, the contamination being reclaimed was confined to the surface soil.

One site of groundwater contamination associated with energy development was deemed remediated in 2012. The Hoe Creek Department of Energy (DOE) Insitu Coal Gasification Project was started in 1976, when three "burns" were conducted in a 71 acre site south of Gillette. The pilot tested the potential to convert the coal in place to usable gas through controlled combustion. Groundwater contamination by Benzene, toluene, ethylbenzene and xylene was detected outside the immediate project area perimeter and in 1992, the DOE began a groundwater remediation program. The Hoe Creek aquifer restoration determination from the Land Quality Administrator (Wyoming DEQ) was dated April 9, 2012.

Wyoming DEQ has conducted studies regarding surface waters used for drinking water supplies as part of their Source Water Assessment and Protection evaluation process. The Source Water Assessment and Protection program defines evaluation and delineation protocols to prevent impairments to drinking water sources. As of 2013, the Source Water Assessment and Protection program is operated on a voluntary basis in the State of Wyoming and is not subject to regulatory oversight. Therefore, no geographic data is available that defines areas that fall under Source Water Assessment and Protection controls. If in the future Wyoming DEQ or other agencies adopt regulations, or define areas for source water protection, BLM will cooperate with those efforts.

If lands identified as source water protection areas are proposed for leasing, BLM will evaluate the offering of those parcels, and their associated surface disturbance or occupancy as part of the review process. During any O&G leasing activities, all split-estate landowners are notified of proposed lease parcels that intersect their surface estate, and are given the opportunity to comment on the leasing of those lands at that time. These processes will allow the BFO to ensure that water quality objectives associated with any federal activity are met. Further information on the Wyoming Source Water Assessment and Protection program can be found on Wyoming DEQ's website (<http://deq.state.wy.us/wqd/www/SWP%20WHP/>).

Groundwater Movement

Confined (Artesian) vs. Unconfined Conditions

The groundwater resources contained in alluvial aquifers are under unconfined or water table conditions (Whitehead 1996). Normally, clinker is an unconfined aquifer (Heffern and Coates 1999). Groundwater resources contained in the Wasatch aquifers occur under partially confined conditions (Whitehead 1996). The Fort Union coal zone aquifers are hydrologically confined, except near the land surface (Hotchkiss and Levings 1986). Artesian conditions can exist (Bartos and Ogle 2002). Gas present within the coalbeds and in underlying or overlying sandstone lenses can contribute substantially to the hydraulic head in wells within the PRB, and may cause water levels to rise higher than would be expected if only artesian pressure were present (Bartos and Ogle 2002). The underlying Lebo confining layer generally retards water movement (Hotchkiss and Levings 1986). The lower Paleocene Tullock member of the Fort Union Formation is partially isolated and confined by the overlying Lebo member (Brown 1993). The Tullock aquifer is hydrologically confined, except near outcrop areas (Hotchkiss and Levings 1986).

Groundwater Flow Systems (Groundwater Recharge vs. Groundwater Discharge Areas)

No consensus exists among experts on the interpretations and assumptions that should be used to represent groundwater flow conditions in the PRB. Flow paths, the extent of flow between hydrogeologic units, and the relationship between local and regional flow in lower Tertiary aquifers are not well understood. The results of a number of studies in the PRB are summarized by Bartos and Ogle (2002).

Bartos and Ogle (2002) present two conceptual models for groundwater flow in the lower Tertiary aquifers of the Wasatch and Fort Union Formations within the PRB: (1) separate shallow and deep systems with little vertical migration between them; and (2) substantial vertical flow through the Wasatch Formation and into the underlying Fort Union coal zone. Both of these models, and the clinker recharge model of Heffern and Coates (1999), operate at the basin scale, according to Bartos and Ogle (2002). Either of these groundwater flow models would explain the variations in groundwater chemistry within the PRB.

A similar model for shallow and deep flow of groundwater is summarized by Slagle et al. (1985) in their description of groundwater resources and groundwater flow in the northern PRB within Montana. The groundwater system can be divided into two general flow patterns: an upper localized flow pattern, controlled by topography that occurs in aquifers at depths of 200 feet or less; and a lower, regionalized, northward flow pattern that occurs at depths of 200 to 1,200 feet. Groundwater discharge areas for aquifers less than 200 feet deep primarily coincide with the valleys of perennial and intermittent streams. Water enters the shallow system by infiltration, flows downslope, and discharges to streams and rivers. Discharge areas for deeper aquifers generally coincide with the major drainages. Vertical movement between the aquifers is known to

exist, but the rate of exchange is unknown. Subsurface inflow from Wyoming into the northern PRB enters Montana primarily in three areas: along the Tongue River; along Hanging Woman Creek; and between the Powder and Little Powder Rivers. Total inflow is estimated as 500 to 1,000 acre-feet per year (BLM 2003c).

Rankl and Lowry (1990) summarize the relative amounts of regional and local groundwater flow in the Powder River structural basin of Wyoming and Montana, concluding that alluvial systems that deplete flow in the streams probably are the typical alluvial system in the basin, however, some streams may gain water from alluvial aquifers. Of the three largest streams included in the analysis, the Powder, Belle Fourche, and Cheyenne Rivers, only the Belle Fourche River had identified base flow, which was present only during the period of largest precipitation, but not during the period of minimum evapotranspiration. The loss of water to the alluvium in the reach of the Powder River between Sussex, Wyoming and Locate, Montana is attributed to evapotranspiration from the alluvium. The average loss of flow from the Powder River in the reach from Arvada, Wyoming to Moorhead, Montana and from Moorhead to Locate is about 0.3 cubic feet per second (cfs) during late fall and early winter. This type of system probably is prevalent in the basin (BLM 2003c).

Local Flow Systems

The hydrology of the alluvium along the Powder River between Sussex, Wyoming and Moorhead, Montana is described by Ringen and Daddow (1990). The fine-grained alluvium usually is 10 to 30 feet thick and about one-half mile wide. Flow-duration curves, used to identify groundwater discharge to rivers, indicate that low flows at Sussex are sustained by groundwater discharge that may be 2.8 cfs or greater, however, groundwater discharge is small in the downstream reach between Arvada, Wyoming and Moorhead. The water table is projected to be less than 15 feet below the land surface near the location where Interstate 90 crosses the Powder River.

Ringen and Daddow (1990) conclude that the alluvium of the Powder River has direct hydraulic connection with the river, as evidenced by the response of the static water level in alluvial wells to changes in river stage. The main source of water in the alluvium is seepage from the Powder River, stored during periods of high streamflow and discharged back to the river in some reaches during low flow. Groundwater storage in the alluvium declines during the growing season because transpiration exceeds recharge.

Ringen and Daddow (1990) also conclude that water levels in bedrock aquifers do not respond substantially to changes in river stage or water levels in the alluvium. A thick blue clay or shale at the top of the bedrock sequence isolates the bedrock from the alluvium hydraulically, and therefore, from the river, in some locations. In addition, the hydraulic head in the underlying confined aquifer was much higher than the water level in the alluvium.

Slagle et al. (1985) describe groundwater conditions and the hydrology of the alluvium in the northern portion of the PRB, within southeastern Montana. Alluvium along the streams generally is saturated. However, terrace deposits commonly occur above the saturated zone. Losses from perennial streams recharge the alluvium during periods of high flow. Intermittent and ephemeral streams serve as a major source of recharge during times of runoff. Much of the water recharged as a result of irrigation is recirculated to the stream from which it was obtained. Frequently, water moving downward is retarded or intercepted by relatively impermeable material, causing the water to move laterally. Water that reaches the saturated zone raises the water table in the alluvium to above-normal levels, which induces lateral flow and results in increased groundwater

discharge to the stream. Water in bedrock aquifers that doesn't drain directly into perennial streams, infiltrates the alluvium along intermittent and ephemeral streams.

Lowry and Rankl (1987) describe the alluvium in the White Tail Butte area along and west of the Little Powder River, north of Gillette. The alluvium is estimated to be 30 feet thick. Depth to water in alluvium below the land surface was reported be between 5 and nearly 14 feet, based on records from three wells included in the study.

Lenfest (1987) characterizes the hydrology of the alluvium and its relation to streamflow in ephemeral streams at several sites in the Cheyenne River Basin. Alluvium generally is more permeable and can store and transmit more water than upland soils. Surface water infiltrates into the alluvial aquifer at a relatively rapid rate because of the larger hydraulic conductivity of alluvium, and is transmitted through the bedrock aquifer at a slower rate because of the smaller hydraulic conductivity of the bedrock.

Hydrologic data from 1982-1983 for several sites in the Cheyenne River basin are presented by Lenfest (1987). In the North Fork Dry Fork Cheyenne River area (T37N R75W), the alluvial aquifer is 24 to 83 feet thick and contains silt and fine to coarse-grained sand. The unsaturated thickness of the alluvium is 30 feet or more. Alluvium in the Black Thunder area (T42N R66W) consists of silt, fine sand, and gravel that is about 20 feet thick, and has an unsaturated thickness of about 10 feet or less. In the Black Thunder area, recharge to the aquifers from streamflow is indicated. Water levels in the alluvial aquifer increased within three hours of streamflow in Black Thunder Creek. Some water in the alluvial aquifer leaked into the bedrock aquifer, causing water level rises in the bedrock aquifer. Water levels in the alluvial aquifer slope away from Black Thunder Creek, indicating movement of groundwater away from the creek after recharge. Hydraulic head in the alluvial aquifer increased during recharge; the increased hydraulic head in the alluvial aquifer caused increases in hydraulic heads within the bedrock aquifer.

Lenfest (1987) concludes that surface water infiltrates the alluvium and causes water levels in the alluvial aquifer to rise in response to streamflow. Some of the infiltrated water reaches the bedrock aquifer, causing water-level rises. The remaining water probably is lost to evapotranspiration, horizontal flow down valley, or soil moisture in the unsaturated zone.

Computed streamflow loss along a stream reach could not be equated to groundwater recharge by Lenfest (1987), because not all inflow and outflow of the system could be determined. The computed streamflow losses and lower limit of groundwater recharge along the North Fork Dry Fork Cheyenne River ranged from 0.43 to 1.44 acre feet per mile. The computed streamflow loss may be substantially underestimated because of unmeasured inflow and outflow along the reach. An estimate for recharge of 26.5 acre-feet per mile for the same reach was made using a convolution method. Along Black Thunder Creek, estimates of recharge to the alluvial aquifer ranged from 3.56 to 12.4 acre-feet per mile.

Regional Flow Systems

The regional groundwater model used in this PRB Final EIS (BLM 2003c) emphasized substantial vertical flow through the Wasatch Formation and into the underlying Fort Union coal zone. This flow model was supported by observations in monitoring wells. A downward vertical gradient from the Wasatch aquifer to the Wyodak Anderson coalbed aquifer was measured in three of four monitoring-well clusters that were completed in both zones (Bartos and Ogle 2002). However, many investigators have suggested that downward vertical flow or leakage into the coal zone aquifer is small because of the low hydraulic conductivity of the overlying rocks (Bartos and

Ogle 2002). The regional groundwater model was one representation of the complex hydrologic units and groundwater flow systems within the PRB. This model emphasized regional flow to the north, toward Montana.

The following summary of groundwater flow emphasizes the assumptions used in the groundwater model for the PRB Final EIS (BLM 2003c). The assumptions used in developing the model are not the only that could be applied to the PRB using sound professional judgment.

Groundwater discharge from the planning area is principally by groundwater outflow; by loss to gaining streams, springs, and seeps; by evapotranspiration; and by well pumpage (Hotchkiss and Levings 1986). The regional pattern of groundwater flow is complicated by lenticular (discontinuous) beds and local differences in hydraulic conductivity (how the water moves through the aquifer). Water in the lower Tertiary aquifers generally moves northward from recharge areas at higher elevations toward discharge areas at lower elevations (Whitehead 1996). The regional trend of movement changes locally where the aquifers discharge water to large streams, primarily within the lower portions of the Powder River drainage in the planning area.

Rankl and Lowry (1990) describe groundwater flow systems in the PRB. Northward regional groundwater flow is expected in the PRB from potentiometric data that relate the position of the underground aquifers with respect to the topography of the land surface and streams. Groundwater (potentiometric surface) data suggest most streams in the PRB should receive base flow (groundwater discharge) from a regional groundwater system. However, streamflow records do not support this conclusion. The locations of streams having base flows and the period of time that base flows occur indicate base flows are discharged to surface waters from local groundwater systems rather than a regional system. Additionally, groundwater discharge areas have not been identified in the northern part of the planning area on the basis of chemistry of springs and shallow wells. The chemical quality of shallow groundwater in the northern part of the PRB is affected more by local conditions than by regional flow.

Rankl and Lowry (1990) analyzed data from streamflow gaging stations on streams that originate in the area underlain by the Lower Tertiary Aquifer System and have five or more years of record. Base flow occurring during the period of greatest precipitation, but not after the growing season, indicates that base flow is from a local system dependent upon precipitation for each year's discharge. Much of the groundwater discharge from bedrock aquifers is above stream level and is lost due to evapotranspiration, resulting in no measurable contribution to base flow. Within the planning area, only the Little Powder River had measurable groundwater contribution (1 cfs) during the non-growing season. Groundwater contribution of less than 1 cfs was indicated for the Belle Fourche River and Dead Horse Creek (near Buffalo). No groundwater contribution was indicated for Black Thunder Creek or the Cheyenne River.

The major sources of groundwater recharge are infiltration of water from precipitation, streamflow on areas of outcrops, or losing streams, including some perennial stream reaches along the front of the Big Horn Mountains. Regional groundwater flow simulations performed by Hotchkiss and Levings (1986) indicate recharge by direct precipitation accounted for about 30 percent of the total recharge.

Heffern and Coates (1999) describe the role of clinker in the storage and flow of water in the PRB. Normally, clinker outcrop areas are highly permeable, allowing rapid infiltration of rainfall and snowmelt and then slowly discharging the stored water to springs, streams, and aquifers. This stored water helps maintain flow in perennial streams during dry periods. The rate of recharge is

often limited by a relatively low permeability zone that typically occurs at the contact between the clinker and the underlying coal or shale (BLM 2003c).

Davis (1976) describes groundwater recharge and discharge within the eastern PRB. Most of the eastern PRB is a recharge area for the groundwater system below the Wasatch Formation. There are no perennial streams near the coal outcrop. The scoria (clinker) along the coal outcrop appears to be an area of recharge to the coal aquifers. Stream valleys provide primary recharge areas for the Wasatch Formation.

Springs

Springs and seeps occur where groundwater or overland flow (water that infiltrated the surface and is flowing within about 20 feet of the land surface, in response to topographic relief) are discharged to the surface. The locations of springs are usually controlled by topography, faults, or contacts between rock layers or unconsolidated materials that represent a barrier to water movement.

Slagle et al. (1985) describe the nature of springs within the northern PRB. Numerous contact springs and seeps reflect the discontinuous and lenticular nature of bedding and high topographic relief characteristic of the northern PRB. Slagle et al. (1985) estimated that 2,000 springs and seeps exist within more than 10,000 acres of the northern PRB. The average discharge rate for springs is reported as 5.2 gallons per minute in the northern PRB, north of the planning area (Slagle et al. 1985). The primary source of recharge to springs and seeps in the northern PRB comes from infiltration of precipitation and seepage from streams and rivers (Slagle et al. 1985).

Within the planning area, springs also are most numerous where topographic relief is great and stratigraphic units are discontinuous. In addition, springs and seeps also emerge at the base of clinker deposits, along the contact between the permeable clinker and impermeable layers below (Heffern and Coates 1999). The primary source of recharge to springs and seeps within the planning area is assumed to be the same as is reported for the northern PRB. No comprehensive inventory of springs within the planning area is available.

Groundwater Storage

Prior to development by wells, aquifers are in a state of dynamic equilibrium, where recharge and discharge virtually balance over long periods (Lohman 1972). A natural groundwater flow system approximates steady-state groundwater flow, where there is no change in head over time (Lohman 1972).

The groundwater flow system of the PRB continues to be affected by activities that extract groundwater, preventing the flow equilibrium from being reestablished. Only a portion of the groundwater extracted would be replaced through additional recharge or reduced discharge. The remaining portion of the groundwater extracted would come from storage within the coal aquifer and surrounding aquifers, as groundwater in storage within the PRB would leak between hydrologic units.

The Lower Tertiary aquifers in the PRB consist of sandstone beds and coals within the Wasatch Formation and the Fort Union Formation. The water-yielding sandstones and coals are interbedded with claystones and siltstones. Although numerous studies have been conducted on these Lower Tertiary Aquifers, there have been no previous estimates of the volume of recoverable groundwater they contain.

Recoverable groundwater is the water present within an aquifer that can be extracted using pumping wells. Recoverable groundwater is considerably less than the total volume of groundwater in storage because a portion of the water is retained in the voids of formations by capillary forces and cannot flow to wells.

Most calculations of recoverable groundwater are determined from the specific yield of the aquifers. The specific yield is the amount of water that can be removed from the saturated pores of the aquifer by gravity drainage to wells. The specific yield can be determined or estimated through one or more of the following methods:

- Results for observation wells obtained during pumping tests conducted within the unconfined portion of the aquifer,
- Laboratory analysis of cores of aquifer materials, or
- Literature values for aquifers with similar characteristics.

These calculations of recoverable groundwater do not consider the economics of groundwater recovery. As aquifer storage is depleted, the cost of pumping and the required well spacing would usually need to increase in order to maintain yields. Generally, the recovery of groundwater becomes uneconomic before all recoverable groundwater has been removed. Estimates of recoverable groundwater do not consider the component of groundwater stored in the claystones and siltstones that would leak into the sandstones and coals when these units are pumped for water supply or CBNG production. However, the volume of groundwater released from storage in the claystones and siltstones is small relative to the recoverable groundwater in the sandstones and coals.

Volume of Recoverable Groundwater

The volumes of recoverable groundwater from the sandstones within the Tongue River-Wasatch Aquifer, the Lebo Confining Layer, and the Tullock Aquifer were determined from the volume of sandstone in each of these units multiplied by the 13 percent specific yield value for sandstone. Similarly, the volume of recoverable groundwater from the coals within the Tongue River-Wasatch Aquifer was calculated from the volume of coal multiplied by the 0.4 percent specific yield value for coal. These results are summarized in Table 3.12, “Recoverable Groundwater” (p. 367).

Table 3.12. Recoverable Groundwater

Hydrogeologic Unit	Surface Area (acres)	Average Formation Thickness (feet)	Percentage of Sand/Coal	Average Sand/Coal Thickness (feet)	Specific Yield (percent)	Recoverable Groundwater (acre-feet) ¹
Wasatch-Tongue River Aquifer Sandstones	5,615,609	2,035	50	1,018	13	743,121,790
Wasatch-Tongue River Aquifer Coals	4,988,873	2,035	6	126	0	2,516,519
Lebo Confining Layer Sandstones	6,992,929	1,009	33	250	13	227,137,336

Hydrogeologic Unit	Surface Area (acres)	Average Formation Thickness (feet)	Percentage of Sand/Coal	Average Sand/Coal Thickness (feet)	Specific Yield (percent)	Recoverable Groundwater (acre-feet) ¹
Tullock Aquifer Sandstones	7,999,682	1,110	52	430	13	447,246,784
Source: BLM 2003c						
¹ Calculated by multiplying Surface Area Average Sand/Coal Thickness Specific Yield. These numbers vary slightly from the numbers presented in table 3-5 of the Final Environmental Impact Statement and Proposed Plan Amendment for the PRB Oil and Gas Project.						
PRB Powder River Basin						

These results show the very large volumes of recoverable groundwater that occur in the Lower Tertiary aquifers within the planning area. Most of the recoverable groundwater occurs in the sandstone units. The recoverable groundwater in the coals is only a small fraction of the recoverable groundwater in the sandstones.

Estimates similar to those in Table 3.12, "Recoverable Groundwater" (p. 367) are made by the USGS (1999) in evaluating coal resources of the Wyodak-Anderson coal zone in the PRB. The coal resources in the Wyodak-Anderson coal zone within the Wyoming portion of the PRB are estimated to total 510,000 million short tons of coal, considering coals that are 2.5 feet or more thick. Using the USGS conversion factor of 1,770 short tons per acre-foot of coal, an estimated 288,000,000 acre-feet of coal exist within the Wyodak-Anderson coal zone within Wyoming. The recoverable groundwater resource within the Wyodak-Anderson coal zone can be estimated using a 0.4 percent specific yield (BLM 2003c) or an average value for the porosity of the coals (2 percent), as analyzed in the Montana portion of the PRB (BLM 2003c). Using these two methodologies to bracket the recoverable groundwater within the Wyodak-Anderson coal zone only, values ranging from 1,152,000 acre-feet to 5,760,000 acre-feet are obtained.

Groundwater Use

Rankl and Lowry (1990) describe water wells and groundwater use in the PRB. Water wells generally are less than 500 feet deep and principally support livestock and domestic uses. These shallow wells generally produce calcium SO₄ or calcium sodium sulfate waters. Yields from shallow wells completed in sandstone aquifers generally are about 20 gallons per minute. Deep wells yield larger quantities of water that generally is a sodium bicarbonate type. Water from alluvium has not been developed extensively because the underlying Tertiary aquifers contain better quality groundwater and yield higher volumes.

Lowry et al. (1986) describe the existing conditions in the PRB before CBNG development. Enough water for stock and domestic use can be obtained in most areas from wells that are less than 500 feet deep. The large thickness of saturated rocks provides potential for flowing wells in topographically low areas, such as river valleys. Flowing wells can be developed principally in the valleys of the major streams such as the Powder, Little Powder, and Cheyenne Rivers. Yields that exceed 200 gallons per minute can be developed locally from wells less than 1,000 feet deep. One flowing well often supports an extensive distribution system for stock water.

Groundwater in the planning area is used for a variety of purposes, including domestic, municipal, industrial, and agricultural uses. Domestic and livestock wells are usually low yield (1 to 25

gallons per minute). Water for domestic and livestock use is generally found at depths less than 1,000 feet. Many wells in the PRB have sufficient pressure to flow without being pumped.

Occasionally, flowing springs also provide domestic and livestock water sources in the area. Industrial water wells are used primarily for secondary recovery of petroleum.

According to a search of the WSEO water rights database, there are 6,233 groundwater wells actively permitted for domestic use within the three counties that make up the planning area (Table 3.13, “Groundwater Use Summary in the Buffalo Planning Area” (p. 369)). There are also 3,703 actively permitted stock wells and 125 irrigation wells. Additionally, there are 63 wells actively permitted for municipal use, mostly for the City of Gillette, but also for Wright, Clearmont, Kaycee, and Dayton. Any unpermitted wells are not included in these totals as no comprehensive inventory of unpermitted wells is available. Table 3.14, “Coalbed Natural Gas Water Production Summary in the Buffalo Planning Area” (p. 369) describes the estimated and actual water production from CBNG wells within the planning area between 2002 and 2012. Table 3.15, “Active Well Permits in Campbell, Johnson, and Sheridan Counties, 2001 and 2012” (p. 370) summarizes permitted wells by the planning area counties.

Table 3.13. Groundwater Use Summary in the Buffalo Planning Area

Well Type	Groundwater Use (acre-feet per year)	Number of Wells
Domestic (2000 Census)	3,125	6,233
Industrial (Includes Mining)	426	315
Livestock	N/A	3,703
Irrigation	1,815	125
CBNG	N/A	16,107
Totals	72,187	23,877
Source: USGS 2005a		
Note: Water extracted during coalbed natural gas production accounts for most of the volume. This water might be used for other purposes after extraction.		
CBNG Coalbed Natural Gas		
N/A Not Applicable		

Table 3.14. Coalbed Natural Gas Water Production Summary in the Buffalo Planning Area

Watershed	Predicted Cumulative Total Water Production (2002 through 2012)	Actual Cumulative Total Water Production (2002 through 2012)	Percent of Actual vs Predicted Water Production as of 2012
Antelope Creek	126,894	31,450	24.8
Clear Creek	213,620	14,366	6.2
Crazy Woman Creek	174,391	5,064	2.9
Little Powder River	168,261	71,614	42.6
Middle Powder River	95,511	57,677	60.4
Upper Belle Fourche	672,046	122,057	18.2
Cheyenne River	59,136	48,991	82.8
Upper Powder River	1,263,752	373,782	29.6
Upper Tongue River	188,816	104,386	55.3
Total	2,962,427	829,387	35.8
Source: WOGCC 2013			

Table 3.15. Active Well Permits in Campbell, Johnson, and Sheridan Counties, 2001 and 2012

County	Well Type	2001 Active Permits	2012 Active Permits
Campbell	CBNG	22,543	1,885
	Domestic	1,025	1,611
	Industrial	893	277
	Irrigation	404	26
	Municipal	30	49
	Stock	2,846	1,825
Johnson	CBNG	6,034	2,193
	Domestic	2,205	1,537
	Industrial	50	31
	Irrigation	32	57
	Municipal	4	5
	Stock	2,020	831
Sheridan	CBNG	5,895	2,029
	Domestic	2,693	3,085
	Industrial	3	7
	Irrigation	26	42
	Municipal	5	9
	Stock	1,097	1,047
Source: BLM 2003c; Wyoming State Engineer's Office 2013			
CBNG Coalbed Natural Gas			

Table 3.16, "Wyoming State Engineer's Office Permitted Non-CBNG Water Wells in the Planning Area by Aquifer" (p. 370) summarizes permitted, non-CBNG groundwater wells by aquifer in the planning area. Aquifer formation names were associated with completed wells by Applied Hydrology and Associates (BLM 2003c) wherever well depths were available from WSEO data.

Table 3.16. Wyoming State Engineer's Office Permitted Non-CBNG Water Wells in the Planning Area by Aquifer

Well Type	Aquifer Formation Name	Number of Wells, 2001	Depth	Number of Wells, 2013
Domestic	Wasatch	3,173	0 to 300 feet	3,952
	Fort Union	2,218	301 to 3,000 feet	1,932
	Unknown	1,192	Over 3,001 & Unknown	349
	Total	6,583	Total	6,233
Municipal	Wasatch	42	0 to 300 feet	2
	Fort Union	50	301 to 3,000 feet	18
	Unknown	43	Over 3,001 & Unknown	13
	Total	135	Total	63
Irrigation	Wasatch	92	0 to 300 feet	45
	Fort Union	45	301 to 3,000 feet	22
	Unknown	117	Over 3,001 & Unknown	58
	Total	254	Total	125
Other	Wasatch	9,115	0 to 300 feet	2,078

Well Type	Aquifer Formation Name	Number of Wells, 2001	Depth	Number of Wells, 2013
Stock	Fort Union	6,771	301 to 3000 feet	1,434
	Unknown	4,088	Over 3,001 & Unknown	191
	Total	19,974	Total	3,703
CBNG			0 to 300 feet	268
			301 to 3,000 feet	12,915
			Over 3,001 & Unknown	2,925
			Total	16,107
Industrial			0 to 300 feet	58
			301 to 3,000 feet	140
			Over 3,001 & Unknown	117
			Total	315
TOTAL		26,946		23,877
TOTAL			0 to 300 feet	6,345
TOTAL			301 to 3,000 feet	16,321
TOTAL			Over 3,001 & Unknown	3,536

Source: Wyoming State Engineers Office 2013; Wyoming DEQ 2004a

CBNG Coalbed Natural Gas

Table 3.17, “Trace Elements for CBNG Produced Water (Fort Union Formation)” (p. 371) summarizes the trace elements for CBNG produced water from the Fort Union Formation.

Table 3.17. Trace Elements for CBNG Produced Water (Fort Union Formation)

Element (Symbol)	MRL 1 (µg/L) ³	Maximum (µg/L)	Detection Ratio (detections/total samples)	DWS2 (µg/L)
Aluminum (Al)	<50	<50	0/70	50 to 200
Silver (Ag)	<1	<1	0/70	100
Arsenic (As)	<0.2	2.6	38/70	50
Boron (B)	<0.1	390	24/70	-4
Beryllium (Be)	<0.1	<0.1	0/70	---
Bismuth (Bi)	<20	46	30/70	---
Cadmium (Cd)	<0.1	<0.1	0/70	5
Cerium (Ce)	<0.1	14	2/70	--
Cobalt (Co)	<0.1	0.24	19/70	---
Chromium (Cr)	<1	1.8	10/70	---
Cesium (Cs)	<0.1	0.78	30/70	---
Copper (Cu)	<0.1	29	70/70	1,000
Mercury (Hg)	<0.1	0.25	1/70	2
Lanthanum (La)	<10	<10	0/70	---
Lithium (Li)	<10	208	70/70	---
Molybdenum (Mo)	<0.2	4.1	32/70	---
Nickel (Ni)	<0.5	35	66/70	100
Lead (Pb)	<0.1	0.43	5/70	---
Rubidium (Rb)	<0.1	38	70/70	---
Antimony (Sb)	<2	<2	0/70	6
Scandium (Sc)	<0.1	3	66/70	---
Selenium (Se)	<2	<2	0/70	50

Element (Symbol)	MRL 1 (µg/L) ³	Maximum (µg/L)	Detection Ratio (detections/total samples)	DWS2 (µg/L)
Tin (Sn)	<0.1	5.5	7/70	---
Strontium (Sr)	<0.1	1,900	70/70	---
Thorium (Th)	<20	<20	0/70	---
Thallium (Tl)	<0.2	0.34	1/70	---
Uranium (U)	<0.1	<0.1	0/70	---
Vanadium (V)	<0.2	1.1	1/70	---
Tungsten (W)	<20	51	4/70	---
Yttrium (Y)	<20	<20	0/70	---
Zinc (Zn)	<1	80	39/70	5,000
Zirconium (Zr)	<50	<50	0/70	---

Source: Modified from Rice et al. 2002

Note: No recommended values CBNG coalbed natural gas

CBNG Coalbed Natural Gas

DWS Drinking Water Standard (Primary or Secondary Maximum Contaminant Level)

MRL minimum reporting level

µg/L micrograms per liter

The median value for TDS (838 mg/L) reported by Rice et al. (2002) exceeds the secondary maximum contaminant level for drinking water established by EPA. The TDS values reported by Rice et al. (2002) indicate that the concentration of TDS increases from south to north and from east to west in the PRB. This increase generally results from an increase in sodium and bicarbonate within the water.

The SAR, a calculation of the abundance of sodium relative to calcium and magnesium in water, also increases toward the west and north, with the lowest values reported near and south of Gillette (Rice et al. 2002). The SAR values range from 5 to 69 and the median value is 8.8 (Rice et al. 2002).

The BLM has summarized and modeled SAR and specific conductance (EC) values for CBNG produced water by sub-watershed (BLM 2003c). The SAR and EC are physical properties of water that indicate the relative suitability of water for beneficial and state-designated uses. In the near-surface environment, water that contains high SAR values would cause an exchange of ions in clay minerals within soils. In this case, calcium and magnesium are exchanged for sodium, creating sodium-rich clays with an increased swelling potential and greatly reduced permeability (Rice et al. 2002). The EC is a measure of the capacity of the water to conduct an electric current and indicates the degree of mineralization of the water (Bartos and Ogle 2002).

Beginning in the early 1990s with the onset of CBNG development, the BLM in concert with WSEO and USGS, began a groundwater monitoring program to document the changes in water levels in the producing coal zones. The PRB Final EIS (BLM 2003c) modeled the extent of drawdown in the Ft. Union coalbeds based on this historic production and groundwater levels. Since 1989, the monitoring program has been expanded to include most of the areas of current CBNG production (62 sites). The anticipated effects of CBNG production on groundwater were summarized as follows: "Because coal mining and CBM operations are dynamic, the maximum areal extent of drawdown may change over time and may increase in some areas of the PRB while it recovers in others. The maximum drawdown in any sub-watershed generally coincides with or closely follows the period of peak water production in the watershed." PRB Final EIS p. 4-15 (BLM 2003c).

Ongoing groundwater monitoring by the BLM has been documented and summarized by the Wyoming State Geological Survey in several updates available on their website at <http://www.wsgs.uwyo.edu/public-info/onlinepubs/PRB-Drawdown.aspx>. The updated data summary through 2012 will be available by the end of 2013. This summary validates the statement that the maximum area of drawdown will be the areas of peak water production. In the report, drawdown results are compared with aggregate CBNG production volumes (gas and water) within 1.5 miles of the monitoring well. In general, water levels have dropped where CBNG water production has been highest. Gas pressures at the monitor wells have increased as gas production in the surrounding area increases and water production generally decreases.

The PRB Final EIS also predicted that there could be impacts to shallow groundwater sources due to infiltration at or near surface discharge points and containment impoundments, but made no predictions regarding changes to quality or quantity (BLM 2003c). In the early days of CBNG development, BLM began monitoring shallow groundwater at selected locations around the planning area. Results from this and other monitoring eventually led the Wyoming DEQ to apply additional requirements for testing through “Compliance Monitoring for Groundwater Protection Beneath Unlined Coalbed Methane Produced Water Impoundments” June 2004. Wyoming DEQ requires that prior to new impoundment construction, the proponent must determine the class of any groundwater located below the site of installation and estimate the volume of water by drilling an investigative well to at least 150 feet below ground surface or to bedrock, depending on the proposed size of impoundment. Depending on the designated class of use determined, the operator may be required to relocate the impoundment, monitor impacts to the groundwater or perform no additional monitoring (Wyoming DEQ 2006). Table W.3, “Summary of Wyoming DEQ WQD Coalbed Natural Gas Groundwater Database: 4th Quarter 2011” (p. 2648) in Appendix W (p. 2623) presents the data collected by the Wyoming DEQ regarding the shallow groundwater protection program as of the end of 2011.

Existing Development

Coal Mining

In response to statutory requirements and concerns, several studies and a number of modeling analyses have been conducted to help predict the impacts of surface coal mining on groundwater resources in the Wyoming portion of the PRB. Some of these studies and modeling analyses are discussed below. Much of this information is derived from the Hay Creek II Coal Lease Application Final EIS (BLM 2013c).

In 1987, the USGS, in cooperation with the Wyoming DEQ and Office of Surface Mining (OSM) conducted a study of the hydrology of the eastern PRB. The resulting description of the cumulative hydrologic effects of all current and anticipated surface coal mining (as of 1987) was published in 1988 in the USGS Water-Resources Investigation Report, *Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming*, referred to herein as the USGS Cumulative Hydraulic Impact Assessment (Martin et al. 1988). This report evaluates the potential cumulative groundwater impacts of surface coal mining in the area and is incorporated by reference into this RMP. The USGS Cumulative Hydraulic Impact Assessment analysis considered 16 current mines and six proposed mines in the PRB as of 1987. It did not evaluate potential groundwater impacts related to additional coal leasing in this area, and it did not consider the potential for overlapping groundwater impacts from coal mining and CBNG development.

Each mine must assess the probable hydrologic consequences of mining as part of the mine permitting process. The Wyoming DEQ must evaluate the cumulative hydrologic impacts associated with each proposed mining operation before approving the mining and reclamation plan for each mine, and they must find that the cumulative hydrologic impacts of all anticipated mining would not cause material damage to the hydrologic balance outside of the permit area for each mine. Additionally, each project must undergo a site specific NEPA analysis by the BLM. In response to these requirements, each existing approved mining permit includes an analysis of the hydrologic impacts of the surface coal mining proposed at that mine. If major amendments to mining and reclamation permits are proposed, then the potential cumulative impacts of the revisions must also be evaluated. If the proposed tract or an alternative tract configuration is leased to the respective applicant, the existing mining and reclamation permit for the mine must be revised and approved to include the new lease before it can be mined.

The PRB Final EIS (BLM 2003c) includes a modeling analysis of the groundwater impacts if an additional 39,000 new CBNG wells are drilled in the PRB by the end of 2011. The planning area for this RMP, which covers all of Campbell, Sheridan, and Johnson counties, as well as the northern portion of Converse County, is similar to studies conducted for the Hay Creek II Final EIS.

The coal mine groundwater monitoring data are published each year by the Gillette Area Groundwater Monitoring Organization (GAGMO), a voluntary group formed in 1980. Members of GAGMO include most of the companies with operating or proposed mines in the Wyoming PRB, Wyoming DEQ, WSEO, BLM, USGS, and OSM. GAGMO contracts with an independent firm each year to publish the annual monitoring results. GAGMO also periodically publishes reports summarizing the water monitoring data collected since 1980 in the Wyoming PRB (e.g., Hydro-Engineering 1991; Hydro-Engineering 1996; Hydro-Engineering 2001; Hydro-Engineering 2007).

Another source of data on the impacts of surface coal mining on groundwater is the monitoring that is required by the Wyoming DEQ and administered by the mining operators. Each mine is required to monitor groundwater levels and water quality in the affected coal aquifers, in the shallower aquifers (overburden and alluvium), and in the subcoal aquifers in the area surrounding their operations. Monitoring wells are also required to record water levels and water quality in reclaimed areas. Hydrologic monitoring data and analyses are submitted to the Wyoming DEQ annually.

The cumulative impacts on groundwater resources associated with large-scale surface coal mining in the eastern PRB have been identified as five major issues:

1. The extent of the temporary lowering of static water levels in the aquifers around the mines due to dewatering associated with removal of aquifers within the mine boundaries.
2. Potential overlapping drawdown due to proximity of coal mining and CBNG development.
3. The effect of the removal of the coal aquifer and any overburden aquifers within the mine area and replacement of these aquifers with backfill material.
4. Changes in groundwater quality as a result of mining.
5. The effects of the use of water from the subcoal Fort Union Formation by the mines.

The first major issue is the extent of water level drawdown in the coal and shallower aquifers in the area surrounding the mines. In general, the saturated sand aquifers in the Wasatch Formation overburden have limited extent and, as a result, the drawdowns in the Wasatch Formation are much smaller and cover much less area than the coal drawdowns.

The GAGMO 25-year report provides actual groundwater drawdown information after 25 years of mining (Hydro-Engineering 2007). Of the 530 monitoring wells included in the GAGMO 25-year report, 195 are completed in the Upper Fort Union (or Wyodak) coalbeds and 193 are completed in the overlying sediments or interburden between the coalbeds located within and near the mine sites in the eastern PRB. The balance of the monitoring wells are completed in local alluvial aquifers or in strata below the lowest coal seam mined. Since 1996, some BLM monitor wells have been included in the GAGMO reports.

The USGS Cumulative Hydraulic Impact Assessment predicted the approximate area of 5 feet or more water level decline in the Wyodak coal aquifer which would result from “all anticipated coal mining.” All of the currently producing mines, including the three applicant mines in the Wright area, were considered in the USGS Cumulative Hydraulic Impact Assessment analysis (Martin et al. 1988). The study predicted that water supply wells completed in the coal may be affected as far away as 8 miles from mine pits, although the effects at that distance were predicted to be minimal

As drawdown propagates to the west, available drawdown in the coal aquifer increases. Available drawdown is defined as the elevation difference between the potentiometric surface (elevation to which water will rise in a wellbore) and the bottom of the aquifer. Proceeding west, the coal depth increases faster than the potentiometric surface declines, so available drawdown in the coal increases. Since the depth to coal increases, most stock and domestic wells are completed in units above the coal. Consequently, with the exception of CBNG wells, few wells are completed in the coal in the areas west of the mines. Those wells completed in the coal have considerable available drawdown, so it is unlikely that surface coal mining would cause adverse impacts on wells outside the immediate mine area.

Wells in the Wasatch Formation were predicted to be affected by drawdown only if they were within 2,000 feet of a mine pit (Martin et al. 1988). Drawdown occurs farther from the mine pits in the coal than in the shallower aquifers because the coal is a confined aquifer that is really extensive. The area in which the shallower aquifers (Wasatch Formation, alluvium, and clinker) experience a 5-foot drawdown would be much smaller than the area of drawdown in the coal because the shallower aquifers are generally discontinuous, of limited areal extent, and often unconfined.

When the USGS Cumulative Hydraulic Impact Assessment was prepared in 1988 there were about 1,200 water supply wells within the maximum impact area defined in that study. Of those wells, about 580 were completed in Wasatch aquifers, about 100 in the Upper Fort Union (or Wyodak coal) aquifer, and about 280 in strata below the coal. There were no completion data available for the remainder of the wells (about 240) at that time.

The coal, overburden and interburden has been permanently removed and replaced with unconsolidated backfill in a mined area will eventually become an unconfined aquifer. Mining would also cause a moderate, short-term reduction in groundwater in aquifers beyond the mined area as a result of seepage into, and dewatering from mine excavations. The extent of drawdown depends on how long the mine excavations were open, the distance of the aquifers from the mined tract, and the extent of dewatering.

Eventually, groundwater is expected to rise to similar levels as observed prior to mining, but it would not have all of the same characteristics because of the more homogeneous nature of the backfill. It is likely that recharged groundwater would be adequate for post-mining land uses such as water sources for livestock and wildlife. Mining would not disturb the aquifers below the coal. (Hay Creek II Final EIS pg. ES-27.) Wyoming DEQ requires that the water quality

in the reclaimed areas of the mines meet the class of use determined for the zones prior to the mining activity.

Uranium

An additional groundwater use in the planning area is related to in situ uranium recovery (ISR). There are several locations in the PRB where uranium is currently being solution mined (see Buffalo Draft RMP and EIS Locatable Minerals pgs. 244-257). Potential surface and groundwater issues could arise from the development of ISR uranium. However, ISR development is under the regulatory authority of the Nuclear Regulatory Commission (NRC), and water quality impacts would be under the authority of Wyoming DEQ. In these active mining areas, the ambient groundwater is circulated as mining solution when oxidants are added for dissolving the uranium in the target formation. Mine areas are maintained in an under balanced condition with respect to water quantity, which means that slightly more water is removed than the amount injected to prevent excursion of the solution from the targeted areas. The mined area is ringed with groundwater monitor wells in the target zone as well as above and below to monitor for leakage of the mine solution. Additionally, the mines are required to determine pre-mining baseline water quality which serves to set the goal for groundwater restoration after mining is complete. The Wyoming DEQ Land Quality Division (LQD) and WQD have authority over the restoration of the groundwater in a mined area, in concert with the requirements of the NRC. BLM's only nexus to the mining of uranium would be the management of BLM surface land within the mine boundary.

In areas where there is potential for conflict between O&G development of federal minerals and potential uranium extraction, BLM requires that the operator's project includes design features to minimize impacts to the fluid mineral (O&G) as well as the locatable mineral (uranium).

Water supplied through groundwater wells are almost always a component of uranium exploration drilling operations. Groundwater for is typically supplied from existing wells from previous uranium exploration activities, converted O&G wells, or in some cases, new purpose-built water wells drilled onsite by the uranium exploration operator. Generally, impacts from these types of wells are limited because of the relatively small amounts of groundwater required for exploration operations. However, improperly completed or abandoned water wells or monitoring wells can contribute to degraded groundwater quality where waters of differing quality are allowed to communicate through the borehole.

Conventional Oil

Processes for the development of conventional oil resources is described in Appendix V (p. 2599). Water for drilling and well completion of the associated wells may be hauled or piped to drilling locations. Water sources are usually commercial water sources that may have been derived from groundwater resources or recycled water if drilling is below the surface casing and fresh water aquifer zones. When drilling commences, and as long as it progresses, water is continually transported to the rig location. Depending on the type of well being drilled anywhere from 5,000 barrels to 100,000 barrels of water is needed for drilling and completion activities. More water would be required if circulation is lost, or permeable zones that cannot withstand the pressure of the drilling fluid are encountered.

Appendix V (p. 2599) thoroughly describes procedures used to protect groundwater resources, including casing and cementing wellbores in proximity to fresh water aquifers. Such measures are designed to ensure wells cannot contribute to degraded groundwater quality by communication through the borehole.

As presented in Table G.2, “RFA-1B Reasonable Foreseeable Development Assumptions: Other Resource Uses” (p. 1942) in Appendix G (p. 1937) there are 6421 total conventional O&G wells in the planning area, of which 3090 are actively producing from 30 zones. Cumulative water production from these wells is estimated at 3,505,145,196 barrels or 45,761 acre-feet of water. On average, for each barrel of oil produced, that means that 2.8 barrels of formation water were co-produced.

Water quality in the PRB varies by producing formation as well as location in the basin. TDS concentrations (salinity) range from very fresh (300 mg/l) to saturated brine (over 300,000 mg/l). Given the variety in water quality, there are also a number of water management strategies in use. For many fields in the planning area, produced water is used to increase oil and/or gas production by re-injecting into the producing formation as a waterflood or for formation pressure maintenance. Where the water quality is acceptable, many operators discharge water to the surface under a WYPDES permit. Water quality criteria for conventional production permits are normally set as listed in Table 3.18, “Conventional Oil Produced Water Quality Limits” (p. 377). with limitations on the amount of specific components that can be discharged to the surface. Wyoming DEQ regulates the WYPDES discharge program and enforces compliance.

Additionally, the Wyoming DEQ applies limits to the volume of water that may be discharged at a permitted outfall on a site specific basis. Both Wyoming DEQ and BLM would monitor surface impacts such as erosion at and downstream of water discharge points and require mitigation as necessary.

Table 3.18. Conventional Oil Produced Water Quality Limits

Effluent Characteristic	Daily Maximum
pH, standard units	6.5-9.0
Oil and Grease, mg/L	10
Total Recoverable Radium 226, pCi/L	60
Specific Conductance, micromhos/cm	7,500
Chloride, mg/L	2,000
Sulfate, mg/L	3,000
Source: Wyoming DEQ 2004a	
mg/L milligram per liter	
pCi/L picocuries per liter	

Groundwater Trends

Continued groundwater monitoring has documented that in areas of continuing CBNG production, water levels continue to decline. The Big George Coal is currently the most prolific coals, showed continued decline in groundwater levels as gas production increased. The Upper Wyodak showed areas of groundwater recovery where gas production has ceased or is declining. Big George production is primarily concentrated in the middle of the basin closer to the basin axis with well completions generally deeper (depths ranging from 1,000 to 2,500 feet). The PRB Final EIS predicted that all the recoverable groundwater stored in the coal zone could feasibly be produced by the end of 2009 (pg. 4-12). The groundwater model predicted the drawdowns for four coal bearing intervals, as well as the Wasatch sandstone aquifers above the coals. Maximum drawdown in any zone would generally coincide with peak water production. For the Big George coal drawdown, the model predicted that “in deep areas of the basin, such as the central and northwestern portions, maximum drawdowns would exceed 800 feet.” Pg. 4-16. In general, the

water in the Big George is not utilized as drinking or stock water source in areas of development due to depth and poorer water quality.

The drawdown magnitude as documented in the BLM Groundwater Monitoring report results for the Big George coal ranges from a recovery of 65 feet to maximum drawdown of 1,445 feet (Juniper). There are 5 locations where drawdown exceeded 900 feet as shown in Table 3.19, “CBNG Well Production and Drawdown” (p. 378).

Table 3.19. CBNG Well Production and Drawdown

Well Site	Initial Date	Producing Wells within 1 1/2 mile radius	CBNG Cumulative Production, mcf	Water Cumulative Production, bbls	Maximum Drawdown, ft.
Big Cat	10-Jul-03	51	7,700,038	14,729,862	1131.1
Bullwhacker	11-Apr-02	47	14,422,781	17,941,550	1070.7
Carr Draw	26-Sep-07	45	517,330	21,785,000	909.3
Juniper	21-Mar-01	76	65,438,526	24,334,287	1445.5
Wild Turkey	16-Nov-04	68	23,444,881	27,943,462	929.5

Source: Wyoming State Geological Survey 2013; WOGCC 2011

bbl Billion Barrels
 CBNG Coalbed Natural Gas
 mcf Million Cubic Feet

The Wyodak coals have shown recent recovery in water level (formation pressure) due to decline in CBNG production in the eastern and southern edges of the basin. Gas production has decline to the economic cut off in many cases. Offset producing wells are being shut in and abandoned. Water production has also declined substantially as the wells are shut in.

3.1.5. Cave and Karst Resources

3.1.5.1. Regional Context

The Federal Cave Resources Protection Act of 1988 (16 United States Code [U.S.C.] 4301-4309) Section 3(1) defines a cave as any naturally occurring void, cavity, recess, or system of interconnected passages beneath the surface of the earth or within a cliff or ledge (including any cave resource therein, but not including any mine, tunnel, aqueduct, or other man-made excavation), and is large enough to permit an individual to enter, whether or not the entrance is naturally formed or man made. Ritter et al. (2002) defines karst as “terrain with distinctive landforms and drainage arising from greater rock solubility in natural water than is found elsewhere.” There are millions of acres of cave and karst resources within the Rocky Mountain West. Cave and karst resources provide habitat for common and Endangered species, research potential for numerous scientific disciplines, and challenges for recreationists. Cave and karst resources in the region are generally in good condition. Challenges to resource managers that oversee cave and karst resources vary by planning area and include: mineral exploration and extraction, recreational activity, looting, and vandalism.

3.1.5.2. Indicators

Previously, the BFO did not actively manage the cave and karst resources within its jurisdiction. Nothing is known about the prior condition of these resources and there are no established indicators for cave and karst resources in the planning area.

3.1.5.3. Current Condition

There is substantial karst topography throughout the Big Horn Mountains. However, most of Buffalo planning area karst in the Big Horn Mountains, is concentrated in the southern end of the range. This area extends from the Natrona County line, west to the Washakie County line, and north to Highway 16, east to Crazy Woman Road, and south along the face of the Big Horns to the Natrona County line. This karst region is primarily comprised of Madison and Amsden limestone layers overlying Bighorn dolomite and constitutes about 456,266 acres. In this same area Tensleep, Gallatin, and Deadwood sandstones provide for the formations of rock shelters. To the east of the Big Horn Mountain range, Wasatch sandstone frequently outcrops in the short-grass plains. Rock shelters also occur in this environment. Karst features, caves and rock shelters contain various types of cave-adapted animal and plant life. These formations are also frequently associated with significant cultural resources. There are numerous caves, karst features, and rock shelters in the planning area. BLM specialists developed descriptions of karst lands, primarily based on regional geographic features. Map 7 displays cave and karst formations in the planning area. Files for each cave or sensitive location on BLM surface are being compiled and will be maintained at the BFO.

Cave and karst resources in the planning area are generally in remote and extremely rugged terrain. These areas have limited options for access. Most cave and karst resources are well protected by virtue of their locations. Remote cave and karst resources are at greatest risk from the secondary effects of management decisions. At present, accessing most of the cave and karst resources in the planning area requires a substantial expenditure of time and effort. Generally, only those who are specifically interested in seeking out caves will utilize most of the area's cave and karst resources. These individuals are likely to be aware of Tread Lightly and Leave No Trace principles that will minimize impacts to cave and karst resources. Caves near access roads and recreation areas are the most vulnerable to casual use and vandalism. These caves are often well known and heavily visited. Graffiti, accumulations of trash, and damage to cave resources (e.g., plants, animals, and formations), are all common results of frequent casual use. It is expected that visitation to all cave and karst resources, remote and easily accessible alike, will increase. White-nose syndrome (WNS) has not been detected in the state of Wyoming. WNS is a concern, but it is not an immediate threat to cave resources.

The Federal Cave Resource Protection Act of 1988 directs the Secretary of the Interior to prepare and maintain a listing of significant caves. The criteria for listing of significant caves are found at 43 CFR 37.11(c). It has been determined that seven caves on BLM-administered public land in the planning area meet one or more of the significant-cave criteria. Section 5(a) of the Federal Cave Resource Protection Act requires that the location of significant caves be kept confidential to protect these resources from unauthorized use and vandalism.

3.1.5.4. Trends

There are no available quantitative and qualitative trend data for cave resources in the planning area. Given the lack of condition or trend data for caves in the planning area, forecasts for the area's resources are likewise not available. The BFO is now collecting data to enable the successful management of cave and karst resources within its jurisdiction. However, as Wyoming populations grow and more people recreate in the planning area, impacts to cave and karst resources will increase. In addition, given the large amount of karst topography in the planning area, future cave discoveries are very likely. WNS has not yet been detected west of Oklahoma. It is impossible to gauge whether or not caves in the planning area will be affected by WNS; however, currently, WNS has not been detected in Wyoming.

3.1.5.5. Key Features

Key features in the planning area are limited to geological formations likely to produce or contain cave and karst resources. These formations are useful for planning purposes as they highlight areas that require careful scrutiny prior to permitting or allowing activities that may impact cave and karst resources.

3.2. Mineral Resources

The federal government classifies minerals into three categories: locatable minerals, leasable minerals, and salable minerals. Locatable minerals are the mining claim minerals, and these are typically uncommon minerals, such as sodium bentonite (also called Wyoming-type bentonite), gypsum, uranium, most metals, and gemstones, among others. Leasable minerals are typically specific minerals, such as crude oil, natural gas, coal, oil shale, trona, geothermal energy, and others. Salable minerals (also called mineral materials) are typically common minerals, such as common varieties of stone, sand, gravel, clinker (locally called "scoria"), and many clays, among others. The location of, exploration on and development of mining claims (and mill or tunnel site claims), the exploration for and leasing of leasable minerals, and the exploration for and disposal of salable minerals on federal lands are authorized by a number of Congressional Acts, and regulated under the CFR. The appropriate sections of the CFR include: for O&G – 43 CFR 3100; for geothermal energy — 43 CFR 3200; for coal – 43 CFR 3400; for solid leasables other than coal — 43 CFR 3500; for salables – 43 CFR 3600; and for locatable minerals – 43 CFR 3800. See the *Mineral Occurrence and Development Potential Report* (BLM 2009c), or the statutes and regulations themselves, for more information.

The following sections describe the locatable, leasable, and salable minerals that occur in the planning area. Each mineral resource is addressed individually in accordance with BLM Manual 3031, *Energy and Resource Assessments* (BLM 1985a). Three other reports associated with this RMP provide more in-depth discussions of certain minerals: the *Mineral Occurrence and Development Potential Report* (BLM 2009c), the *Reasonable Foreseeable Development (RFD) Potential for Oil and Gas* (Stilwell et al. 2012), and the *Summary of the Analysis of the Management Situation* (BLM 2009h).

Most of the planning area lies within the Wyoming portion of the PRB, a major energy development area. It is the largest coal-producing region in the United States. Almost all of this coal is used to generate electricity inside and outside the region. Large quantities of crude oil and natural gas are also produced in the PRB. The only leasable minerals known to occur in the

planning area in economically viable quantities are coal, crude oil, and natural gas. Although geothermal energy exists in the planning area, the known depths at which temperatures potentially useful for commercial application to occur are too deep to be economically viable to develop at this time. Other leasable minerals also occur in the planning area, but are also uneconomical to produce (often quantity and/or quality is insufficient for commercial production, and/or the material is prohibitively far from the nearest market area). Locatable minerals occurring in the planning area include bentonite (Wyoming-type sodium-containing bentonite), gypsum, and uranium; of these three, sodium bentonite and uranium are economically viable to develop. Gypsum has not been economically viable to develop to date, and is expected to remain uneconomical well into the future given current technology, market conditions, and its' remote location. Other locatable minerals are either not known to occur in the planning area or do not occur in quantities currently economically viable to produce. Salable minerals occurring in the planning area include sand, gravel, clinker (locally called "scoria"), moss rock, and stone (building and decorative). Other salable minerals are either not known to occur in the planning area or do not occur in quantities currently economically viable to produce.

Although development of the various mineral resources in the planning area tends to decrease their overall quantity over time, the quantities of many of these resources remaining after many years of mining and development are still quite plentiful (see the various sections below). In addition, erosion and weathering are not anticipated to affect these resources to a material degree; average erosion rates for the major rock types occurring in the planning area range from 0.74 inch to 3.51 inches per 1,000 years (Ferrier et al. 2007; Allred 2004; Riebe et al. 2001).

Determination of the ownership of the mineral estate (the subsurface under a given parcel of land) can often be relatively simple, but can sometimes be more difficult. Mineral ownership is determined based on the content of land patent documents. For leasable and salable minerals, the owner of the mineral estate also administers that mineral estate, meaning they determine if, how, and when the minerals in that land may be developed. The specific minerals under federal ownership for a given parcel of land are determined by the type of federal mineral ownership. The following abbreviations (and their meanings) are used on DOI BLM Master Title Plats (MTPs): "All Min" (all minerals are federally owned), "Coal" (only coal is federally owned), "Coal OG" (only coal, oil, and gas are federally owned), "OG" (only O&G are federally owned), and "Coal OG Sod Pot" (only coal, oil, gas, sodium, and potassium are federally owned). A number of other federal minerals ownership abbreviations are also used on MTPs to denote minerals reserved to the federal government other than through the Homestead Acts (see Appendix A (p. 1771), and the *Mineral Occurrence and Development Potential Report* [BLM 2009c], for more information regarding these acts). Two examples are "All Lsbl Min" (federal government owns only the leasable minerals) and "Min Only 50%" (federal government owns 50% interest in the minerals, and the surface owner owns the other 50% interest). Lands that have no federal mineral ownership have no mineral descriptors on their MTPs. Whether the federal mineral estate for a given parcel is administered by the federal agency that also administers the federally owned surface depends on the mineral classification. For example, locatable and salable minerals are administered by USFS on lands within USFS administrative boundaries (including non-USFS surface), but BLM administers the leasable minerals such as O&G for those lands. All federally owned leasable and salable minerals occurring under private, State of Wyoming, or BLM surface outside USFS administrative boundaries are administered by the BLM. Whether BLM administers the federally owned locatable mineral resource for a given parcel is a bit more complex; see below for more information.

Below are listed the main federal mineral ownership types which comprise the main BLM-administered minerals in the planning area:

- The total acres of the federal locatable minerals resource (federally owned locatable minerals) are lands with federal mineral estate ownership type “All Min,” no matter who owns the surface estate (except those lands under administration of the USFS). However, BLM has administrative authority over locatable minerals projects (exploration and development) only on those lands that contain all federally owned mineral estate (“All Mins”) and BLM-administered surface estate. Only those lands that contain the combination of both this surface ownership type and mineral ownership type comprise the federal locatable minerals resource that BLM administers. All lands with mineral ownership type “All Mins,” though, are open to mineral entry — mining claim location, and exploration and development of locatable minerals. Mining claims (lode and placer mining claims, as well as mill and tunnel site claims) may be located on any acreage with mineral ownership type “All Min,” and BLM records these claims. However, BLM only administers the exploration and development of locatable minerals on those lands with both “All Mins” and BLM surface; these are the acres in the planning area analyzed in Chapter 4. These are the acres for which a Notice would be required to be accepted (for five acres or less disturbance for exploration) or a Plan of Operations (POO) approved (for more than five acres exploration disturbance, or any size development) by BLM before those intended exploration/development activities could occur. The other acres of “All Mins,” those with non-BLM surface estate, or those administered by USFS, are administered for locatable minerals by those respective surface estate owners, or USFS, respectively. See *Locatable Minerals* below for more information.
- The total acres of federal salable minerals resource are lands with federal mineral ownership type “All Min,” and occurring under any surface ownership type (not including USFS-administered lands). These lands comprise the total federal salable minerals resource as analyzed in Chapter 4.
- For leasable minerals, a number of federal mineral ownership types could apply, depending on the particular mineral:
 - The total acres of federal coal resource are lands with federal mineral ownership types “All Min,” “Coal,” “Coal OG,” and “Coal OG Sod Pot.”
 - The total acres of federal O&G resource are lands with federal mineral ownership types “All Min,” “Coal OG,” “OG,” and “Coal OG Sod Pot.”
 - The total acres of federal geothermal energy resource are lands with federal mineral ownership type “All Min.”
 - For all other leasable minerals, it depends on the specific mineral. For example, the total acres of federal phosphate resource are lands with federal mineral ownership type “All Min,” while the total acres of federal sodium resource includes those with ownership types “All Min,” and “Coal OG Sod Pot.” As another example, minerals that would ordinarily be locatable are in one specific circumstance leasable; this only occurs on acquired lands. Therefore, the total acres of federal leasable uranium resource are only those acquired lands with federal mineral ownership type “All Lsbl Min.”

For the analyses summarized in the *Mineral Resources* sections of Chapter 4, the various acreages listed as impacted or potentially impacted by the various management actions indicated are the acreages with the federally owned mineral types appropriate to that particular mineral (as identified and explained above). For example, the federal coal acres (acres of federal coal resource) impacted are acres of federally owned coal (lands with federal mineral ownership types “All Min,” “Coal,” “Coal OG,” and “Coal OG Sod Pot”) in the areas impacted or potentially impacted by the management decision(s) proposed or enacted on behalf of another resource. The

percent of federal coal acres impacted is calculated by dividing the total acres of federal coal by the acres of impacted federal coal, and then multiplying by 100. However, there may be other factors that alter the number of acres likely to be impacted. For many minerals in the planning area, especially those that tend to be explored for and/or developed here, there are areas that are more likely to contain potentially commercial amounts than other areas. Federal coal acreage is somewhat different from other minerals in that there are areas currently identified as acceptable for further coal leasing consideration (BLM 2001a). These areas are selected for coal leasing based on a number of factors (the coal screening process — see *Leasable Minerals– Coal*). One such factor is an increased likelihood in those areas of encountering coal subsurface that is of quantity and quality suitable for mining. The federal coal acreage outside these areas would very likely not be development targets during the life of the RMP, depending on the specific alternative for coal management that is selected in this RMP. Therefore, although another resource's management action may impact some number of the total federal coal estate acres, its impact on those acres of federal coal estate most likely to be developed during the life of the RMP may be greater or lesser. The percentage of acres of federal coal most likely to be developed may be more greatly impacted, or less impacted, than that of the total federal coal acres. Similar situations are likely with all minerals analyzed in Chapter 4, and are discussed as appropriate there.

3.2.1. Locatable Minerals

3.2.1.1. Regional Context

The primary locatable minerals developed in Wyoming are sodium bentonite (also called Wyoming-type bentonite), gypsum, uranium, and decorative building rock. The locatable minerals occurring in commercially viable quantities in the planning area are sodium bentonite, gypsum, and uranium (see Map 9 for the locations these minerals are most likely to be found in the planning area). Sodium bentonite and uranium are currently economic to produce; gypsum is not, nor is it likely to be during the life of the RMP. Other locatable minerals are known to exist in the planning area, but are currently uneconomic to produce. See below and also refer to the *Mineral Occurrence and Development Potential Report* (BLM 2009c) for more information.

3.2.1.2. Indicators

Indicators used to describe resource condition and assess the status of the locatable minerals resources in the planning area include currently known quantities (both actual known and estimated quantities), historic and forecasted demand, and historic and forecasted production. See the subsections below for more information by mineral. Often there is a production time lag; it takes time for mines to increase production to meet an increase in demand, or for planned mines to come into production. Therefore, previously stockpiled amounts can be quickly depleted when demand increases quickly.

Changes in prices (actual and forecasted) over time for these resources also can be indicators. However, because a change in commodity price often drives changes in supply and/or demand for that commodity, the changes in production and/or demand over time often closely either mirror or parallel price changes. Price changes are usually more volatile, occurring much more quickly and frequently, than changes in demand or production, and can occur for numerous reasons possibly unrelated to the actual supply or demand for the commodity itself. Therefore, price changes are not addressed here.

Additionally, changes in price and/or demand for a particular commodity (either increases or decreases) can lead to additional materials being introduced into the market as suppliers attempt to remain economically solvent. This factor, the introduction of substitute materials into the marketplace, often makes the accurate predictions of demand, supply, and price for individual minerals extremely difficult, both in the short term and in the long term. Development and/or use of substitute materials is not as common for energy minerals like uranium (as well as coal, oil, and natural gas), due to the sometimes vast and capital-intensive infrastructure needed to utilize these minerals as energy sources. However, it can be common for industrial minerals, even those with very special properties such that of sodium bentonite; new materials are being tested and developed continually in efforts to find cheaper, more abundant materials with similar properties.

The levels of mineral exploration and development activities, and the areas where they take place, are integrally linked to supply and demand for these commodities. This often involves local, national, and international economics and politics, and is therefore difficult to predict on the scale of the planning area. Note also that societal, political, and economic priorities, decisions, and events can affect locatable minerals activities through increases or decreases in exploration and/or development activities, and where they occur. Conversely, increases or decreases in locatable minerals activities could impact societal, political, and economic priorities, decisions, and events. As it is difficult to accurately predict future trends in mineral demand and production on the scale of the planning area, only the indicators quantity, demand, and production, and the trends they might reveal, are discussed here, and in relatively general terms.

3.2.1.3. Current Condition

Locatable minerals (both metallic and nonmetallic) are those that are open to mining claim location under the provisions of the *General Mining Law of 1872*, as amended. This and other laws and regulations (such as 43 CFR 3800) outline the requirements for mining claim location and maintenance, for submitting exploration and/or development plans, and for obtaining a patent on a mining claim. Note that provision for obtaining mining claim patents has been under a moratorium by Congress since 1994, and the backlog of pending decisions from that date is quickly reaching an end. See for more information the *Mineral Occurrence and Development Potential Report* (BLM 2009c), or contact the BLM field office closest to the area desired for locating a mining claim and/or conducting exploration and/or developing operations on a claim.

Locatable minerals known to exist in the planning area include sodium bentonite (also called Wyoming-type) and uranium, both currently economic to produce. The only other locatable mineral known to exist in the planning area in commercial quantities (quantities large enough to support a commercial mining operation) is gypsum. Gypsum however, has not historically been, nor is currently, economic to produce; this is not likely to change during the planning period. Other locatable minerals are known to exist in the planning area, including gold, silver, platinum, copper, and many other metals, as well as gemstones, and REEs. Like gypsum, none of these are currently economic to produce, and are not likely to be during the planning period. Unlike gypsum, these minerals are not known to exist in commercial quantities. Limestone deposits occur in the southern Big Horns (see *Cave and Karst Resources*), and some metallurgical-grade limestone (95% or greater purity) is suspected to exist in this area. Economically viable production is unlikely for this commodity, however, due to the remoteness of the area, and long distance to markets. See the *Mineral Occurrence and Development Potential Report* (BLM 2009c) for more information. See also *A Citizen's Guide to Uranium*, for more information regarding uranium occurrences, use, regulations, and potential health impacts (Wyoming Mining

Association 2013). There are several reports (many unconfirmed) of the occurrence of REEs in the planning area: in the Big Horn Mountains (in areas administered by the USFS), and in southwestern Johnson County (King and Harris 2002; Sutherland et al. 2013).

Unless formally withdrawn from (closed to) mineral entry, all federal lands in the planning area (including federally administered surface/federal minerals and split estate), are open to the location of mining claims and mill or tunnel site claims, as well as exploration for and development of locatable minerals; this includes other “operations” as defined at 43 CFR 3809.5. To explore for and develop locatable minerals (excluding casual use), either an accepted Notice or an approved Mine POO is required, depending on the amount of surface disturbance, the particular mining activity, and other factors. To develop locatable minerals, an approved Mine POO is required. See 43 CFR 3809.10. More than one locatable mineral may be located on a mining claim (see Table 3.20, “Active Mining Claims in the Buffalo Planning Area” (p. 387)) and explored for and/or developed on the same land at the same time; therefore, the plural, “locatable minerals,” is used. Mining and reclamation plans and reclamation bonding requirements are developed in cooperation with the State of Wyoming DEQ LQD; these items are also required and mutually developed by the NRC for uranium development projects. All locatable minerals projects are reviewed to ensure that no undue or unnecessary degradation would occur, and for compliance with bonding policy for reclamation during and after cessation of project activities.

Areas withdrawn from locatable mineral entry are not available to the location of mining claims or the exploration or development of locatable minerals under a Notice or POO; casual use may likely still be allowed. Section 103 of FLPMA defines the term “withdrawal” to mean “withholding an area of Federal land from settlement, sale, location, or entry, under some or all of the general land laws, for the purpose of limiting activities under those laws in order to maintain other public values in the area or reserving the area for a particular public purpose or program.”

Section 204 of FLPMA identifies the process to withdraw areas from locatable mineral entry. The Secretary of the Interior (but not the BLM) is authorized to withdraw lands from operation of the mining laws following certain procedures. These vary depending on whether the proposed withdrawal is less than 5,000 acres or greater than 5,000 acres. The primary difference between the two processes is that a withdrawal greater than 5,000 acres requires the preparation of an extensive report to support the withdrawal, including a specialist’s analysis of the area’s mineral potential, and notification to Congress of the proposed withdrawal. Congress may then choose to terminate the withdrawal by concurrent resolution.

Withdrawals aggregating more than 5,000 acres made after FLPMA’s enactment in 1976 cannot be for a period longer than 20 years. The process of requesting or applying for the Secretary of the Interior to withdraw certain lands can be started by the identification of those lands in the RMP for which to pursue a withdrawal. In order to make a withdrawal determination, a mineral potential report must be prepared to include all of the information required by FLPMA, 43 CFR 2310, and BLM Manual 3060. The withdrawal request, including the mineral potential report, is ultimately submitted to the Secretary, who then determines if it should be sent to Congress, withdrawn, or denied.

The RMP is not the decision that withdraws the lands from the mining laws. Rather, the RMP recommends lands for withdrawal. It is possible that areas proposed for withdrawals identified in the RMP’s ROD will not ultimately be withdrawn. For purposes of this analysis, however, lands proposed for withdrawal under the different alternatives are identified in this document as “recommended for withdrawal” and the different process for a withdrawal of less than 5,000

acres is not separately discussed. It is assumed in this analysis that areas identified for proposed withdrawal under the different alternatives will actually result in those withdrawals occurring. In addition, unless a withdrawal of public domain land specifically provides otherwise, the land withdrawn is presumed to be available for O&G leasing on a discretionary basis as specified in the Mineral Leasing Act of 1920 (as amended), and any other applicable land use decisions, including remaining open to casual use.

The following three areas in the planning area are not open to mining claim location, or locatable minerals exploration/development (except casual use) as they have been withdrawn from mineral entry through formal Congressional actions:

- Amsden Creek Big Game Winter Range – This area was originally named the Tongue River Deer Refuge and Winter Pasture. Withdrawn are 523 acres of BLM-administered surface/federal mineral lands in northwestern Sheridan County. The Amsden Creek Wildlife Habitat Management Area (WHMA) overlaps this area, and is administered by the WGFD.
- Kerns Big Game Winter Range – Also called the Kerns WHMA, this area was originally named the Sheridan County Elk Winter Pasture. Withdrawn are 155 acres of BLM-administered surface/federal mineral lands in north central Sheridan County.
- Ed O. Taylor Big Game Winter Range – Also called the Ed O. Taylor WHMA, this area was originally named the Middle Fork Powder River Area. Withdrawn are 10,955 total acres of BLM-administered surface/federal mineral lands; approximately 10,695 acres in southwestern Johnson County in the Buffalo planning area, and approximately 260 acres in southeastern Washakie County in the adjacent Big Horn planning area.

There are three areas in the planning area that remain open to mineral entry (location of mining claims, and locatable mineral exploration and development; casual use is also still allowed) while they are under review by Congress for formal designation as Wilderness Study Areas (WSAs). However, such activities must be conducted under the purview of 43 CFR 3802, which includes stringent requirements for maintaining non-impairment of the suitability of these lands for inclusion in the wilderness system. There are no 43 CFR 3802 locatable minerals operations occurring or planned in the three WSAs, likely due to the low potential for commercial amounts of locatable minerals in these areas. See the *Mineral Occurrence and Development Potential Report* (BLM 2009c) for more information. These areas are also currently restricted from leasable and salable minerals exploration and development, unless such activities would also not impair these areas' suitability conditions. If Congress acts to have any of these areas formally designated as WSAs, then withdrawal from mineral entry (closure to mining claim location, and locatable minerals exploration and development) will be pursued for that area. If Congress denies formal designation for any of these areas, then that area will still remain open to mineral entry, although management of the area would likely include requirements to maintain much of the areas' unique features. The BLM's recommendation for all three areas is to not become wilderness. None of these three areas are known to contain locatable minerals in currently commercially viable quantities. See *Special Designations – WSAs* for more information. These three areas are (see Map 75):

- Fortification Creek WSA – This area consists of 12,419 acres of BLM-administered surface/federal mineral lands in northeastern Johnson and northwestern Campbell counties.
- Gardner Mountain WSA – This area consists of 6,423 acres of BLM-administered surface/federal mineral lands in southwestern Johnson County.
- North Fork WSA – This area consists of 10,089 acres of BLM-administered surface/federal mineral lands in southwestern Johnson County.

Sodium bentonite, gypsum, and uranium are the only locatable minerals for which the BFO has received Notices or POOs since the Buffalo RMP ROD was signed in 1985. These minerals are known to occur in the planning area in commercial quantities; however, only bentonite and uranium have been or are currently economic to produce. There are five authorized POOs in the planning area: three for developing sodium bentonite, and two for developing uranium. There is also one pending POO: for developing uranium (see Table 3.22, “Current Authorized and Pending Bentonite Plans of Operation in the Buffalo Planning Area” (p. 391) and Table 3.23, “Current Authorized and Pending Uranium Plans of Operation (all ISR operations) in the Buffalo Planning Area” (p. 395)). See Table 3.20, “Active Mining Claims in the Buffalo Planning Area” (p. 387) for a listing by mineral(s) of active mining claims located on federal lands (both federal surface/federal minerals and split estate) in the planning area.

Table 3.20. Active Mining Claims in the Buffalo Planning Area

Mineral	Number of Claims
Bentonite	47
Gold	3
Gypsum	1
Uranium	3,604
Two or more minerals (minerals not identified) ^{1, 2}	4,793
Total Active Mining Claims	8,448
Source: BLM 2012f	
¹ Based on known exploration interest and production, it is assumed that most of these claims were located for bentonite and uranium.	
² Mining claimant(s) are not required to indicate what mineral(s) they are locating their claim(s) for.	

Most bentonite mining in the planning area is concentrated west to southwest of Kaycee; gypsum also occurs in this area. Uranium mining is currently occurring in the Pumpkin Buttes Uranium District between Kaycee and Wright. This district surrounds the Pumpkin Buttes, in southeastern Johnson and southwestern Campbell counties. Some historic mining of uranium occurred in the Kaycee Uranium District, just east of Kaycee; no uranium mining occurs there currently. More information is provided in the following subsections by mineral. As mentioned earlier, other locatable minerals exist in the planning area, such as base and precious lode metals (such as gold, silver, platinum, and copper), and metallurgical-grade limestone, gemstones, and REEs. However, as these minerals are not known to occur in commercial quantities in the planning area, they are not discussed further or analyzed in Chapter 4. See the *Mineral Occurrence and Development Potential Report* (BLM 2009c) for more information.

As with all mineral resources, the actual or potential occurrence of a locatable mineral in a given area does not mean that a “deposit” of that mineral exists there. Nor does it mean that any existing mineral deposit might be economically viable to produce, either now or in the future. Actual occurrence of a mineral means that the mineral is known to occur in that area; potential occurrence of a mineral indicates an increased probability of finding the mineral in that area, due to the occurrence of a rock type or geological structure that is likely to contain that mineral. The number of mining claims located, accepted Notices, and pending and approved POOs in the planning area may lead one to presume that the minerals indicated (such as sodium bentonite, gold, gypsum, uranium, etc.) are profitable to mine here. However, the numbers of these claims may be more suggestive overall of the public's interest in these minerals and demand for them than their profitability or probability to be mined here. Due to the greater financial investment needed to conduct activities described in a Notice or POO, the numbers of each of these types

of projects are greater indicators of the likely probability and profitability in developing those minerals in the planning area.

3.2.1.4. Trends

Bentonite is used in hundreds of products, ranging from household and beauty products, food products, in ore processing, and in the O&G and construction industries. According to the Wyoming Mining Association (WMA), bentonite deposits appear to be abundant in Wyoming, comprising approximately 70 percent of the world's known supply (Wyoming Mining Association 2002). Worldwide demand for bentonite (including the high-swelling sodium-containing “Wyoming-type” bentonite) has been rising nationwide, and worldwide production has been rising to meet the rising demand (USGS 2005b; USGS 2009). The current economic downturn (beginning in late 2008) could see worldwide demand for all types of bentonite decrease over the long term, although production of Wyoming-type bentonite might not keep pace with demand (Global Information, Inc. 2009). Nationwide bentonite production increased 30 percent between 2000 and 2008 (USGS 2005b; USGS 2009), while planning area bentonite production increased 92 percent during that period, and 45 percent between 2000 and 2012 (Wyoming Office of the State Inspector of Mines 2000 - 2010). Wyoming-type bentonite will likely continue to be in demand, due to its unique high-swelling property, which few other materials can match (Global Information, Inc. 2009). Table 3.21, “Annual Production of Bentonite and Uranium From All Mines in the Buffalo Planning Area” (p. 388) lists amounts of bentonite produced in recent years from all mines in the planning area (on BLM surface/federal mineral lands, and split estate).

Table 3.21. Annual Production of Bentonite and Uranium From All Mines in the Buffalo Planning Area

Year	Bentonite (tons)	Uranium (pounds U ₃ O ₈)
2000	312,482	63,381 ^a
2001	400,309	37,990 ^a
2002	338,507	33,284 ^a
2003	431,718	23,693 ^a
2004	458,770	8,174 ^a
2005	492,368	3,104 ^a
2006	491,188	0 ^a
2007	548,066	0 ^a
2008	600,000	0 ^a
2009	497,796	0 ^a
2010	506,034	29,666 ^b
2011	549,379	215,635 ^b
2012	453,287	643,892 ^b
2013	461,888	940,000 ^b
2014	435,567	N/A ^b
Sources: ^a Wyoming Office of the State Inspector of Mines 2000 - 2014. ^b Uranium One USA, Inc. 2015.		
U ₃ O ₈ Triuranium Octoxide		

Gypsum is used in numerous products, including construction materials, fertilizer, as a water softener and clay binder, and for some medicinal purposes. There is no history of commercial gypsum mining in the planning area. Although gypsum occurs in the planning area near where sodium bentonite does, the development potential for gypsum is considered low. Despite fairly easy access to the deposits along the same roads used for bentonite mines, gypsum's low price,

the relatively long distance from outcrops to the nearest processing facility in Casper, and the plentiful availability of gypsum elsewhere, has made development of gypsum in the planning area not cost-effective to date. This combination of factors is likely to continue well into the future, at least through the duration of the planning period.

The amount of uranium resources occurring worldwide, nationwide, and statewide (including the planning area), is substantial. Deposits can be identified and defined through exploration; interpretation of certain well logs from O&G wells can also provide information. Various worldwide uranium resources (as measured in pounds of triuranium octoxide(U_3O_8)) are anticipated to supply the forecasted rising worldwide demand through 2045, or longer. These include identified (and speculated) deposits, and uranium obtained from secondary sources (World Information Service on Energy 2007; World Nuclear Association 2013). Conventional uranium production (mining uranium deposits) has varied greatly over the last 25 years, but has steadily risen worldwide. Since 1993, all uranium production in Wyoming has been from mines using ISR methods (Wyoming State Geological Survey 2009), and 45 percent of uranium is produced worldwide from ISR methods (World Nuclear Association 2013). However, two conventional mines (open-pit and/or underground) have been recently proposed in Wyoming, although neither are in the planning area. Secondary sources include reprocessing and re-enrichment of partially spent fuel rods and other products from military programs; processing and enrichment of lower grade deposits and mine tailings; and from inventories held by utilities, other fuel cycle companies, and governments (World Information Service on Energy 2007; World Nuclear Association 2013).

For several years before the somewhat recent economic downturn beginning in late 2008, the price of U_3O_8 increased dramatically, leading to increased interest in uranium development and increased staking of mining claims (including in the planning area). Since then, the price has been quite volatile, and is now still relatively low. However, worldwide demand still remains high, and is projected to continue increasing (World Nuclear Association 2013). Statewide production has experienced an overall decline between 1980 and 2006, with recent resurgence in production beginning in 2010 (Uranium One, Inc., 2015; Wyoming Office of the State Inspector of Mines 1980, 2006 – 2014; Wyoming State Geological Survey 2009). There are three uranium ISR POOs in the planning area: 2 approved (Willow Creek and Ruth), and one pending (Hank). Willow Creek began groundwater restoration and partial mine reclamation in one portion in 2000 (Irigaray), while the other portion (Christensen Ranch) was placed on standby status, awaiting an increase in price; operations at both portions restarted in 2010. Ruth has been inactive since about 1990, and will need major refurbishment and expansion to become operational again. Although the price has varied widely in recent years, it still remains too low for some operations to produce uranium economically. Some of these operations have decreased their production to just that needed to maintain their previously contracted production figures, and some others have begun arranging to have larger operations process their uranium until the price rebounds enough for them to finance building their own processing facilities. Amounts of uranium produced in recent years from all mines in the planning area (on BLM surface/federal mineral lands, and split estate) are given in Table 3.21, “Annual Production of Bentonite and Uranium From All Mines in the Buffalo Planning Area” (p. 388). Increased commercial use of fast breeder reactors and commercial use of neutron efficient reactors may help reduce the worldwide demand of uranium (World Nuclear Association 2013).

3.2.1.5. Key Features

Three locatable minerals occur in the planning area in quantities sufficient for commercial production: bentonite, gypsum, and uranium. However, only bentonite and uranium are currently mined; there is no history of gypsum production from the planning area, and it is not likely that gypsum will be mined during the planning period. Bentonite is volcanic ash-based clay, and is widely used as an absorbent and/or thickener in many products. The type of bentonite being mined in the planning area is a unique high-swelling sodium-containing type (also called Wyoming-type) that can absorb up to 10 times its own weight in water, and swell up to 16 times its original size. Gypsum is a water-soluble mineral used primarily in the construction industry. Both bentonite and gypsum occur in the planning area along the western PRB margin, and near the base of the Big Horn Mountains in southwestern Johnson County. The bentonite layers being mined occur in Cretaceous sedimentary rocks west to southwest of Kaycee, where the bentonite is relatively close to the surface. Gypsum occurs in Jurassic sedimentary rocks just west of the bentonite-containing strata. Uranium is a radioactive metallic element used primarily as a fuel for nuclear power generation, in various military applications, and in medicine and biology. Uranium deposits are found in scattered “roll-front” deposits in relatively shallow Eocene and Paleocene sedimentary rocks in southeastern Johnson and southwestern Campbell counties. See the subsections below by individual mineral for more information.

3.2.1.6. Locatable Minerals – Bentonite

3.2.1.6.1. Regional Context

Refer to *Regional Context* under the *Locatable Minerals* section above.

3.2.1.6.2. Indicators

Indicators that could be used to describe resource condition and assess the status of the bentonite resource in the planning area include the currently known quantities (actual and estimated quantities), historic and forecasted demand, and historic and forecasted production. As indicated earlier, these indicators, and the trends they reveal, are discussed here in relatively general terms.

3.2.1.6.3. Current Condition

Bentonite is a type of light-colored clay that is soft and plastic, and formed through chemical alteration of volcanic ash that was deposited millions of years ago. See the *Mineral Occurrence and Development Potential Report* (BLM 2009c) for more detailed information on bentonite formation. Three prominent bentonite beds are exposed in the planning area. The lowermost is the Clay Spur bed in the upper part of the Lower Cretaceous-age Mowry Shale, and ranges from 3 to 5 feet thick. Two other bentonite beds, averaging 2 feet each in thickness, are exposed in the Upper Cretaceous-age Frontier Formation above the Clay Spur bed. These three beds exhibit the very distinctive characteristics of bentonite deposits: they lack vegetation, the dry, weathered surfaces appear popcorn-like, and the fresh, unweathered surfaces appear waxy. Hard bentonite (chip material) occurs in scattered areas of both formations. These three beds are exposed near the western edges of the PRB, along the eastern flank of the Big Horn Mountains (Map 9).

Bentonite's property of absorption is largely due to its ion-exchange characteristics. Wyoming-type bentonite is a unique high-swelling sodium-containing type, which can absorb up to 10 times its own weight in water and swell up to 16 times its original size (Wyoming Mining Association 2002). Because sodium is a readily exchangeable ion, the sodium in many Wyoming bentonite deposits allows it to swell by absorbing water. This absorptive capacity is desirable for many uses, and few other materials can mimic this property. Bentonite is used in hundreds of products. Uses include absorbents, animal feed, drilling fluids, foundry, iron-ore pelletizing, sealants, and cat litter. It is used in drilling mud to lubricate oil-field drilling equipment, to hold back formation pressure, and to help prevent caving of the drill hole. It is used in the foundry industry for binding iron pellets which are later processed into a variety of metal alloys. Bentonite also provides the water-tight seal engineered into the layers placed under reservoirs and landfills. Other uses include crayons, medicine, cosmetics, and as both a food and non-food thickener.

All active bentonite production in the planning area is occurring in southwestern Johnson County, west to southwest of Kaycee (Map 9). Bentonite production varies from year to year with market demand and available stockpiles. Table 3.21, "Annual Production of Bentonite and Uranium From All Mines in the Buffalo Planning Area" (p. 388) provides annual bentonite production from the planning area for recent years (2000 through 2014). Currently, there are three authorized active open-pit bentonite mines (Table 3.22, "Current Authorized and Pending Bentonite Plans of Operation in the Buffalo Planning Area" (p. 391)), and 47 active bentonite mining claims (see Table 3.20, "Active Mining Claims in the Buffalo Planning Area" (p. 387)) on federal lands in the planning area. The three mines and the claims are on both federal surface/federal minerals and split estate.

Table 3.22. Current Authorized and Pending Bentonite Plans of Operation in the Buffalo Planning Area

Operator	Legal Description
Authorized:	
Black Hills Bentonite (Kaycee Area Mine; includes Petersen Draw, Willow, Wall and Posey Creek areas, and Tisdale area)	T. 41 N., R. 81 W., Sections 2, 3, 4, & 14* T. 42 N., R. 81 W., Sections 26, 27, 28, 33, 34, & 35* T. 41 N., R. 82 W., Sections 18, 19, 30, & 31* T. 41 N., R. 83 W., Sections 13, 24, 25, & 36 T. 42 N., R. 83 W., Sections 2, 3, 10, 11, 12, 13, 14, 15, 22, 23, & 24* T. 43 N., R. 82 W., Sections 6, 8, 18, 23, 28, & 31*
Black Hills Bentonite (Mayoworth Area Mine)	T. 44 N., R. 83 W., Sections 1, 2, 3, 10, 11, 12, 13, 14, & 15 T. 45 N., R. 82 W., Sections 19, 30, & 31 T. 45 N., R. 83 W., Sections 22, 23, 24, 25, 26, 27, 34, 35, & 36*
Black Hills Bentonite (North Fork Area)	T. 43 N., R. 83 W., Sections 15, 22, 23, 24, 26*
Source: BLM 2012f	
___ * Contains BLM surface.	
N North R Range T Township W West	

3.2.1.6.4. Trends

Wyoming bentonite deposits (known and estimated) appear to be abundant, comprising approximately 70 percent of the world's known supply, and Wyoming is the primary producer of high-swelling sodium-type bentonite in the world (Wyoming Mining Association 2002).

Demand for bentonite (including Wyoming-type) has been somewhat steady nationwide between 2000 and 2010 (USGS 2005b; Virta 2011). However, the current economic downturn beginning in late 2008 could see worldwide demand decrease over the long-term, as construction and O&G development continues to slow; alternative materials may also be discovered (Global Information, Inc. 2009). However, new uses for bentonite continue to be found, and worldwide dips in demand for some uses may be countered by increases for others. A modest worldwide increase in demand of 2.2 percent per year through 2012 is forecast (Global Information, Inc. 2009). Although worldwide demand for Wyoming sodium-type bentonite is expected to decrease, it is likely production may not keep pace, leading to tighter supplies in the short term (Global Information, Inc. 2009). It is likely that Wyoming-type sodium-containing bentonite will continue to be in demand, due to its unique high-swelling capability, which few other currently-known materials can match (Global Information, Inc. 2009).

The nationwide production of bentonite has been somewhat steady, with 4.5 billion tons produced in 2000 and 4.4 billion tons in 2010 (USGS 2005b; Virta 2011). During the same period, Wyoming bentonite production remained somewhat steady, from 4.18 million tons to 4.04 million tons, and was 4.98 million tons in 2014 (Wyoming Office of the State Inspector of Mines 2000 - 2014). Production of bentonite in the planning area has risen 62 percent during that period, from 312,482 tons to 506,034 tons, and more currently was 435,567 tons (Wyoming Office of the State Inspector of Mines 2000 - 2014). Wyoming bentonite production has steadily risen over the years, from 1,141 tons in 1927 to 4.98 million tons in 2014 (Wyoming Office of the State Inspector of Mines 2000 - 2014). During the economic downturn that began in late 2008, Wyoming production is anticipated to slow (Global Information, Inc. 2009). Production in the planning area is currently only occurring west to southwest of Kaycee; this is likely to remain the main producing area, with one new POO received for this area. Table 3.21, "Annual Production of Bentonite and Uranium From All Mines in the Buffalo Planning Area" (p. 388) lists production amounts for bentonite mines in the planning area between 2000 and 2014.

3.2.1.6.5. Key Features

Bentonite beds are exposed along the western edge of the PRB near the eastern flank of the Big Horn Mountains (Map 9). There are three prominent bentonite beds in the planning area: lowermost is the 3- to 5-foot thick Clay Spur bed in the upper part of the Lower Cretaceous age Mowry Shale; the other two beds average 2 feet thick each and each occur in the Upper Cretaceous age Frontier Formation, above the Clay Spur bed. Although it is likely that some amount of bentonite can be found in these two formations all along the western edge of the PRB, the quantity and quality in a given area might not be sufficient to make it economically viable.

3.2.1.7. Locatable Minerals – Gypsum

3.2.1.7.1. Regional Context

Refer to *Regional Context* under the *Locatable Minerals* section above.

3.2.1.7.2. Indicators

There is no history of gypsum mining in the planning area. The long distance from outcrops to the nearest processing facility, gypsum's relatively low price, and plentiful availability elsewhere has made development of gypsum in the planning area not cost-effective. This combination of factors is likely to continue well into the future (including the duration of the planning period).

3.2.1.7.3. Current Condition

Gypsum is a water-soluble mineral used in numerous products, including drywall (also known as wallboard or sheetrock), plaster, cement, and fertilizer, and as a water softener and clay binder, and for some medicinal purposes. See the *Mineral Occurrence and Development Potential Report* (BLM 2009c) for more information on the formation of gypsum. There is no history of gypsum mining in the planning area. The development potential for gypsum in the planning area is considered low. Despite fairly easy access to these deposits along the same roads used for bentonite mines, the low price of gypsum, the long transport distance to the nearest processing plant (in Casper, approximately 150 miles), and abundant occurrences of gypsum elsewhere, combine to make gypsum not cost-effective to develop in the planning area. This set of circumstances is not likely to change during the planning period. There is only one active mining claim for gypsum in the planning area (see Table 3.20, “Active Mining Claims in the Buffalo Planning Area” (p. 387)).

3.2.1.7.4. Trends

As noted above, the development potential for gypsum in the planning area is considered low. This is due to the low price of gypsum, the long distance to the nearest processing facility, the remoteness of the area, and abundant occurrence elsewhere. This situation is not likely to change well into the future.

3.2.1.7.5. Key Features

Gypsum occurs in the same areas in the planning area as bentonite – all along the western edge of the PRB near the eastern flank of the Big Horn Mountains (Map 9). Most gypsum in the planning area occurs within three formations: the redbeds of the Goose Egg and Chugwater Formations, and in the Gypsum Springs Formation. These gypsum beds vary in thickness, quality, and areal extent throughout these formations, making it difficult to estimate the amount of this resource.

3.2.1.8. Locatable Minerals – Uranium

3.2.1.8.1. Regional Context

Refer to *Regional Context* under the *Locatable Minerals* section above.

3.2.1.8.2. Indicators

Indicators that could be used to describe resource condition and assess the status of the uranium resource in the planning area include currently known quantities (known and estimated quantities),

historic and forecasted demand, and historic and forecasted production. As indicated earlier, these indicators, and the trends they reveal, are discussed here in relatively general terms.

3.2.1.8.3. Current Condition

Uranium is a radioactive metallic element used primarily as a fuel for nuclear power generation, in various capacities in military arms and armor production, and in certain fields of medicine and biology. In the planning area, uranium is known to occur in economically viable quantities in two formations: the Paleocene age Fort Union Formation, and the Eocene age Wasatch Formation. Uranium is also known to occur in a number of other formations in the PRB, but the quantity and/or quality is generally very low and these will not be discussed further. There are two uranium districts in the planning area: the larger Pumpkin Buttes Uranium District in southeastern Johnson and southwestern Campbell counties between Kaycee and Wright, and the smaller Kaycee Uranium District in south-central Johnson County (Map 9). Most uranium in the planning area has been produced from the larger Pumpkin Buttes District; all current mining is occurring in this district. These two areas contain “roll-front” type uranium deposits in a number of the sandstones occurring in the Fort Union and Wasatch formations. These deposits form when water carrying dissolved and oxidized uranium (picked up while passing through uranium-containing rocks and sediments) encounters a chemically reducing environment (created by the presence of sulfides such as pyrite or H_2S) and/or organic matter (such as plant matter, coal, crude oil, or natural gas), or even certain bacteria, in the sandstone and the uranium precipitates out of solution. These deposits accumulate over millions of years, as very large amounts of groundwater containing small amounts of uranium pass through the sandstones. Typical ore bodies in the planning area contain only 1 to 2 percent uranium (this equates to 10,000 to 20,000 ppm uranium). See the *Mineral Occurrence and Development Potential Report* (BLM 2009c) for more detailed information on the formation of this deposit type. See also *A Citizen’s Guide to Uranium*, for more information regarding uranium occurrences, use, regulations, and potential health impacts (Wyoming Mining Association 2013).

Uranium is mined using surface mining, underground mining, or ISR techniques (also sometimes called in-situ leaching). Since 1993, all uranium production in Wyoming has been from mines using ISR methods (Wyoming State Geological Survey 2009), although two recently proposed mines in Wyoming (not in the planning area) will be mined via surface and/or underground methods. In the ISR method, the uranium is dissolved back into the groundwater of the sandstone aquifer using an oxidizing chemical, such as sodium bicarbonate, gaseous CO_2 , or sulfuric acid. This is a reversal of how the uranium was deposited in the aquifer via reduction as it encountered organic material or certain bacteria. The groundwater containing the dissolved uranium is pumped to the processing facility on the surface. Using ion exchange columns containing tiny beads of polymer resin, the uranium is “stripped” out of the groundwater solution by converting it to a solid once again. The solid uranium is flushed from the ion exchange column with water into large collection vessels. The uranium is now much more concentrated than it was in the aquifer. The water gained during the flushing from the column is removed by dewatering, and the solid uranium is dried and packaged for shipment. The resulting uranium ore (called yellowcake, as it’s a bright yellow) is shipped to an enrichment facility to concentrate the radioactive isotopes of uranium to a level useful for the desired application. The quantity of uranium resources in Wyoming, including the planning area is substantial. Deposits are identified and defined through exploration and from information interpreted from certain well logs from O&G wells, and then evaluated for economic potential.

The price of U_3O_8 increased dramatically over the past several years before the recent economic downturn beginning in late 2008, resulting in increased staking of mining claims, including in the planning area's Pumpkin Buttes District. Table 3.21, "Annual Production of Bentonite and Uranium From All Mines in the Buffalo Planning Area" (p. 388) provides production amounts from all uranium mines in the planning area for recent years (2000 through 2013), those containing BLM surface/federal mineral lands and split estate. In the planning area, there are two uranium ISR POOs approved by BLM and one pending authorization. One authorized POO (Willow Creek) is currently producing uranium (see Table 3.21, "Annual Production of Bentonite and Uranium From All Mines in the Buffalo Planning Area" (p. 388)); they began producing again in 2010 after nearly 9 years on standby status. The second authorized uranium POO (Ruth) remains inactive since approximately 1990; it is uncertain when this mine will restart operations. The pending uranium POO pending authorization (Nichols Ranch/Hank Unit) has already obtained an NRC Source Material License and a Wyoming DEQ LQD Mine Permit; production of uranium has begun from the already constructed portion of the POO not on BLM-administered lands (Nichols Ranch portion). See Table 3.23, "Current Authorized and Pending Uranium Plans of Operation (all ISR operations) in the Buffalo Planning Area" (p. 395) for the list of uranium POOs in the Buffalo Planning area.

Table 3.23. Current Authorized and Pending Uranium Plans of Operation (all ISR operations) in the Buffalo Planning Area

Operator	Legal Description
Authorized:	
Uranium One USA, Incorporated (Willow Creek Mine; formerly Christensen Ranch/Irigaray Mine)	T. 44 N., R. 76 W., Sections 3, 4, 5, 6, 7, 8, 9, 10, 16, 17, 18, 19, 20, 21, 28, 29, & 30 T. 44 N., R. 77 W., Sections 1, 2, 3, 10, 11, & 12* T. 45 N., R. 76 W., Sections 19, 30, 31, 32, & 33 T. 45 N., R. 77 W., Sections 5, 8, 9, 16, 24, 25, 34, & 35*
Cameco, dba Power Resources, Inc. (Ruth Mine)	T. 42 N., R. 77 W., Sections 13, 14, 23, 24, 25, & 26*
Pending:	
Uranerz Energy Corporation (Nichols Ranch/Hank Unit Mine)	T. 43 N., R. 75 W., Sections 5, 6, 7, & 8* T. 43 N., R. 76 W., Sections 7, 8, 17, 18, & 20 T. 44 N., R. 75 W., Sections 30, & 31*
Source: BLM 2012f	
Note that with approval of this RMP Revision, BLM accepts and incorporates by reference the following: U.S. NRC Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities (May 2009); U.S. NRC Environmental Assessment for Uranerz, U.S.A., Inc., Ruth and North Butte Commercial In-Situ Leach Operations Located in Johnson County and Campbell County, Wyoming, Docket No. 40-8958, Source Material License SUA-1539 and Docket No. 40-8981 SUA-1540 (December 1990); Final Environmental Statement Related to Operation of Irigaray Uranium Solution Mining Project, Wyoming Mineral Corporation, Docket No. 40-8502 (September 1978); and Final Environmental Assessment for the Renewal of U.S. Nuclear Regulatory Commission License No. SUA-1341 for Uranium One, USA, Inc., Irigaray and Christensen Ranch Projects (Willow Creek Project), Wyoming, Docket No. 40-8502 (July 2011).	
* Contains BLM surface.	
N North R Range T Township W West	

3.2.1.8.4. Trends

The amount of uranium resources worldwide, nationwide, and statewide (Wyoming; including the planning area), is substantial. However, estimates of these resources and reserves can vary widely, depending on many factors that may be taken into account during estimation calculations. Deposits can be identified and delineated through drilling, and interpretation of certain well logs from O&G wells can provide some information as well; the deposits are then evaluated for economic potential. Known recoverable worldwide uranium resources from conventional mineral deposits (as measured in pounds of U_3O_8) were estimated to range from 6.6 to 20 billion pounds (World Information Service on Energy 2007), before the 2011 Fukushima nuclear reactor accident. A more recent study estimates the range to be from 14 to 34 billion pounds from conventional mineral deposits (primary sources), and further estimates that unconventional mineral sources (certain secondary sources) may yield another 4.7 billion pounds (World Nuclear Association 2013). Other secondary sources include reprocessing and re-enrichment of partially spent fuel rods and other products from military programs; processing and enrichment of mine tailings; and from inventories held by utilities, other fuel cycle companies, and governments (World Information Service on Energy 2007). At around current spot prices, the current known recoverable world resource (14 to 34 billion pounds) is believed to last for about 80 years, if used only in conventional reactors and at current usage rates; at increased usage rates, these resources could last as little as 30 years (World Nuclear Association 2013). However, if the price were to double, measured economic resources would likely increase over time 10-fold, due to increased exploration and delineation of deposits, and the reclassification of currently uneconomic resources as economic due to the increased price (World Nuclear Association 2013). Total U.S. uranium reserves are estimated to range from 0.54 to 1.23 billion pounds at the end of 2008, and from 52 to 304 billion pounds at the end of 2012, depending on the forward cost used in the calculations, whose typical cutoffs are 30 U.S. dollars (\$), \$50, and \$100 per pound, and even up to \$250 per pound for some unusual secondary sources (Energy Information Administration 2010, 2013). Total Wyoming uranium reserves at the end of 2012 were estimated to be approximately 32.4 percent of the U.S. total, which equates to a range of 16.8 to 98.5 million pounds, depending on forward costs (Energy Information Administration 2013). See Table 3.23, “Current Authorized and Pending Uranium Plans of Operation (all ISR operations) in the Buffalo Planning Area” (p. 395) for a list of the current uranium Plans of Operation in the planning area.

Uranium production has experienced many ups and downs worldwide, nationwide, and statewide since the existing RMP was implemented in 1985. Production worldwide has steadily risen, and the domestic uranium market faces strong competition from foreign sources (World Information Service on Energy 2007; World Nuclear News 2013). Total nationwide and worldwide (respectively) uranium mine production in 2005 was 2.70 and 108.5 million pounds, and despite yearly ups and downs, in 2012 was 4.15 and 151.8 million pounds (World Nuclear Association 2013; World Nuclear News 2013). Statewide production has experienced an overall decline between 1980 and 2010, with a high of 2.5 million pounds in 2000, down to 0 pounds for years 2006 through 2009 (Wyoming State Geological Survey 2009; Wyoming Office of the State Inspector of Mines 1980, 2006 — 2012). However, one of the two authorized POOs in the planning area (see Table 3.23, “Current Authorized and Pending Uranium Plans of Operation (all ISR operations) in the Buffalo Planning Area” (p. 395) for a list of the current uranium POOs in the planning area) has been producing uranium since 2010: Willow Creek (Uranium One USA, Inc. 2013). A portion (Irigaray) of this uranium ISR project began groundwater restoration and partial mine reclamation in 2000, while the other portion (Christensen Ranch) was placed on standby status, awaiting an increase in price. Operations at both portions restarted in 2010

(Uranium One USA, Inc. 2013). The other authorized POO in the planning area, Cameco's Ruth, has been inactive since around 1990; due to the age of this operation and how long it's been inactive, it will need major refurbishment and expansion to be brought up to operational and production status. The POO pending authorization, Uranerz' Hank, is the second portion of a larger project: the Nichols Ranch/Hank. Both portions of the project were approved by NRC and Wyoming DEQ in 2011, and the Nichols Ranch portion has been constructed and is now producing uranium. The Nichols Ranch portion contains no BLM-administered lands, while the Hank portion does. Therefore, the Hank portion will only begin construction after receiving BLM's approval. There are numerous other uranium ISR projects in the planning area, in all stages from proposed to producing uranium, but none of these incorporate any BLM-administered lands, except one. This one project is a planned expansion of the Willow Creek project, originally set to begin in late 2013. Uranium One installed water wells for water monitoring purposes in the expansion area under a BLM ROW (on BLM-administered lands). Submission of the POO for this expansion has been delayed due to the recent downturn in price, leading to the company resetting some priorities; they hope to submit the POO to BLM in another two to three years' time.

Since 1993, all uranium production in Wyoming has been from mines using ISR methods (Wyoming State Geological Survey 2009). However, two conventional mines (open-pit and/or underground) have been recently proposed in Wyoming, with neither in the planning area. Worldwide, 45 percent of uranium is now being produced from ISR methods (World Nuclear Association 2013). For several years before the somewhat recent economic downturn beginning in late 2008, the price of U_3O_8 increased dramatically, leading to increased interest in uranium development and increased staking of mining claims (including in the planning area). Just those few years of increased price (roughly 2006–2009) led to the discovery and delineation of vast new resources. Since then, the price has been quite volatile, and is now still relatively low. The 10/21/2013 spot price for U_3O_8 was \$35.25 per pound, while the highest ever price of \$136.00 per pound was seen in 2007 (Ux Consulting Company 2013). Although the price has varied widely in recent years, it still remains too low for some operations to produce uranium economically. Some of these operations have decreased their production to just that needed to maintain their previously contracted production figures. Others, mostly smaller, independent companies, are considering, and some have even contracted with other companies, to utilize larger uranium operations for processing their uranium until the price rebounds enough for them to finance building their own processing facilities. Many new and existing projects are intended to be developed as or switched to "satellites" to existing operations with processing facilities; this reduces costs for these "satellite" projects, making more projects more likely to be economically viable. Amounts of uranium produced in recent years from all mines in the planning area (on BLM surface/federal mineral lands, and split estate) are given in Table 3.21, "Annual Production of Bentonite and Uranium From All Mines in the Buffalo Planning Area" (p. 388).

Despite the fact that public and governmental fears were rekindled by the 2011 Fukushima accident, projected worldwide demand for nuclear energy is still high. Demand in 2005 was 133.7 million pounds, and projected to be up to 166 millions pounds per year by 2020, and to range from 350 to 530 million pounds per year by 2050 depending on how much electrical generation capacity is transferred from conventional fuels (such as coal) to nuclear power plants (World Information Service on Energy 2007). Demand in 2012 was 137 million pounds, and more recent projections are that demand will range from 214 to 262 million pounds per year by 2030 (World Nuclear News 2013). There are 435 operational nuclear reactors worldwide (the Fukushima reactor is on long-term shut down and not included in this total), 100 of which are in the US and 18 in China, while there are 147 reactors in permanent shut down, with 32 of these in the US and zero in China (International Atomic Energy Agency 2013). There were slightly more operational

reactors in 2009: 443 worldwide, 104 of these in the US (Nuclear Regulatory Commission 2009). In 2013, there were 69 reactors under construction worldwide, with three of these in the US and 29 in China (International Atomic Energy Agency 2013).

Although worldwide demand for uranium has been increasing, and is likely to continue increasing in the near future given the number of reactors under construction, there are two important developing technologies that might temper the longer term future demand. First, fast breeder reactors utilize uranium more efficiently; the initial reaction is started using plutonium, then the reaction is continued using uranium. Widespread use of these reactors could result in up to a 50-fold increase in the efficiency of uranium utilization as a nuclear energy source (World Nuclear Association 2013). Second, thorium can be used as a nuclear reactor fuel, although it is not yet in commercial use. Neutron efficient reactors, which are designed specifically to utilize thorium, are started using uranium or plutonium, and then continued using thorium (World Nuclear Association 2013). As thorium is about three times more abundant in Earth's crust than uranium, thorium-fed reactors may be a viable alternative to supplement or increase the production of nuclear—derived energy, and potentially reduce dependence on uranium (World Nuclear Association 2013).

3.2.1.8.5. Key Features

In the planning area, commercial amounts of uranium are known to be found in the sandstones in the Fort Union and Wasatch formations. There are two uranium districts in the planning area: the Pumpkin Buttes Uranium District in southwestern Campbell and southeastern Johnson counties between Kaycee and Wright, and the Kaycee Uranium District in south-central Johnson County (Map 9). Most historic, and all current, production in the planning area has been from the larger Pumpkin Buttes District. Since 1993, all uranium production in Wyoming has been from mines using ISR methods (Wyoming State Geological Survey 2009), although two recently proposed mine plans to produce using conventional methods (open-pit and/or underground), though neither of these are in the planning area. These two uranium districts contain “roll-front” type deposits of uranium in sandstones. Ore-grade mineralization generally averages a few tenths of one percent uranium, up to 2 percent uranium (20,000 ppm uranium) near the center of the ore body. See the *Mineral Occurrence and Development Potential Report* (BLM 2009c) for more information regarding the formation of these types of deposits.

3.2.2. Leasable Minerals – Coal

3.2.2.1. Regional Context

The PRB in Wyoming and Montana contains some of the largest accumulations of low-sulfur sub-bituminous coal in the world. Being aware of the value of these coal deposits, as the lands were settled in the early 1900s, the federal government retained the mineral rights to the coal. As part of the Federal Coal Management Program, the PRB of Wyoming and Montana was designated a federal coal production region in the 1970s.

Thick coal deposits occur at or near the surface along the eastern boundary of the planning area, along a north-south trend situated east of both Gillette and Wright, and in the northwestern portion of the planning area. Coal occurs at depth, below the surface, throughout most of the remainder of the planning area. Coal from the PRB in Wyoming is valued for its clean-burning properties. The majority of the coal activity within the Wyoming PRB lies within the BFO administrative boundary.

The PRB is the Nation's largest coal-producing region, and coal from the region is shipped nationwide. Most PRB coal production comes from the Buffalo planning area. In 2011, the 426.1 million tons of coal produced from the planning area represented 38.8 percent of U.S. domestic coal production. While both PRB and U.S. production began to decrease in 2009 in response to a national recession, Buffalo planning area production still accounts for approximately one-fifth of total U.S. production.

The PRB also has been the nation's fastest growing coal producing region. U.S. coal production increased 6.0 percent from 1,029 million tons in 1990 to 1,095 million tons in 2012. PRB coal production increased from 184.0 million tons in 1990 to 426.1 million tons in 2011, an increase of 232 percent.

Coal Resource Description

Glass (1997) describes important coal seams of the Powder River Coal Field in Wyoming. The following paragraphs summarize these descriptions. Important coal seams in the Wasatch Formation, from oldest to youngest, include the School, Badger, Felix, and Lake DeSmet coals. Important coal seams in the Fort Union Formation, from oldest to youngest, include the Canyon, Anderson, Wyodak, and Big George coals. Thousands of CBNG holes drilled during the past decade have given us a much more comprehensive idea of where the coalbeds are. More current assessments of coal stratigraphy are now available. According to Flores et al. (2010), for example, the Anderson and Canyon, as well as the Badger and School coalbeds, are splits of the Wyodak coal zone and the Big George is also associated with the Wyodak. Luppens et al. (2008) consider the Big George to equate with the Smith coal deposit above the Wyodak. Coalbeds split and merge in a more complex fashion than previously recognized, and even may “corkscrew” above themselves on a regional basis according to Goolsby and Finley (2000). Individual coal layers are the most continuous rock units in the Fort Union and Wasatch Formations and may extend for tens of miles, splitting and merging with other coal layers, before pinching out, or burning to form clinker or eroded away where exposed along an outcrop. The Wyodak coal deposit consists of both the Anderson and Canyon, and is not a separate deposit of coal. Tongue River Member coals in the Fort Union that are mined include from youngest to oldest are – Roland; Wyodak Rider-Smith (also known as Big George); Upper Wyodak – Anderson; Lower Wyodak – Canyon.

The Wyodak coal zone has the largest strippable reserve base of any coal in Wyoming. It lies near the top of the Fort Union Formation, and formed from decay of plants that lived and died in swamps about sixty million years ago. The coal mines east of Gillette and Wright produce from the Wyodak, near its outcrop where the overburden thickness is lowest, and therefore most profitable to mine. As-received quality of this coal generally ranges from 8,200 to 8,800 British thermal units (BTU) per pound (higher towards the south). Sulfur content averages 0.2 to 0.4 percent, and ash content averages 5 to 7 percent; the low sulfur content makes it attractive to supply power plants nationwide. In the Gillette coal field, the main Wyodak beds (Anderson, Rider, Anderson, Dietz, and Canyon beds) contain a total of 125 billion tons of in-place resources, of which 6 billion have been mined as of 2008 (Luppens et al. 2008). The overlying Smith and Roland beds contain an additional 38 billion tons. Where the beds have merged in the areas of Gillette and Wright, the Wyodak (Anderson) is as much as 202 feet thick, but generally averages 45 feet thick (Luppens et al. 2008). The merged Wyodak coal splits to the north, west and south into several beds, including the Anderson and Canyon, and is eroded or burned to the east (Flores et al. 2010). There are extensive clinker (scoria) deposits east of the coal mines, which resulted from the natural burning of the Wyodak coal near its outcrop in prehistoric to recent times.

The School and Badger coals were developed in the Dave Johnston deposit in the southern part of the PRB. Mining in this area is no longer active. The Felix coal is a persistent coal deposit in the northern and central portions of the planning area, and varies from 5 to 20 feet thick, but is up to 50 feet thick in the central and southern portions of Campbell County. Felix coal exposures east of the Powder River in southern Campbell County have been burned to form reddish clinker-capped hills in the vicinity of Gillette and Wright (Coates and Heffern 1999). The Felix coal is not currently mined.

The Lake DeSmet coal is the thickest known coal deposit in the contiguous United States. Although limited in areal extent, in the northwestern portion of the planning area the Lake DeSmet coal is 250 feet thick. The Lake DeSmet coal is not currently mined, and the uppermost portions of this coal deposit are burned over much of its area of occurrence. Lake DeSmet itself occupies a basin formed by the natural burning of this thick coal.

The Big George coal is not exposed at the surface. It occurs in the subsurface of the west central portion of the PRB at depths between 1,000 and 2,000 feet and is not currently mined. The Big George is up to 216 feet thick and is correlative with the Smith coal, this coal is mined north of Gillette as part of the Wyodak Rider coal zone.

In 2012 the USGS completed their resources assessment of the Wyoming and Montana PRB coal fields (Scott and Luppens 2013). They estimate that the PRB contains approximately 1.07 trillion tons of in-place coal resources. Assuming a maximum 10:1 stripping ratio and minimum five feet of thickness for economically recoverable coal, they further estimate that the PRB contains approximately 25 billion tons of economically recoverable coal resources under present economic conditions and assumptions.

3.2.2.2. Indicators

PRB coal is a very important commodity and plays a large role in the economy of the State of Wyoming and the U.S., and an important role in determining electric power prices and availability nationwide. Demand for PRB coal relates directly to national electric power demand. Historically, PRB coal production has increased at a more rapid rate than national electric demand, because environmental and cost factors make PRB coal favored in the competitive coal market. PRB coal is sulfur compliant; therefore, it costs less to reduce SO₂ emissions, the coals are surface mined in high volume (efficient mines resulting in low production costs), and reclamation has been demonstrated effective and reliable. These advantages indicate the PRB coal will maintain or improve its presence in the domestic coal production mix.

The BLM role in PRB coal production is to lease coal reserves in an environmentally responsible manner at a rate that will maintain reserves under lease to reliably meet coal demand. The BLM also must conduct its coal leasing program to ensure that the public receives fair and full value for the coal resources and that leasing for speculation does not occur.

3.2.2.3. Current Condition

Development Activity

There has been small scale coal mining throughout the Buffalo planning area since the early 1900s, primarily in Sheridan and Campbell counties. There was substantial coal leasing activity between 1955 and 1970; however, much of the leasing was speculative because actual coal production

decreased during this period. In the early 1970s, there was an extensive period of major mining starts and production growth. Almost all of this development was in Campbell County where 16 major coal mining operations opened. The 1980s were a time when these operations matured into major national coal producers. During the 1990s, one additional mining operation opened and three were consolidated with existing mines. After 2000, there were three more consolidations.

There are currently 12 (13 counting the Jacobs Ranch mine which was recently consolidated with the Black Thunder mine) operating mines in the planning area. All are in Campbell County (part of the Antelope Mine is in Converse County). There are presently two mining operations proposed to be opened on existing federal coal leases or on privately owned coal. One of these proposed mining operations is located in Sheridan County. All of the existing or proposed mining operations would be surface coal mines, using truck/shovel or dragline mining methods. Table 3.24, “Status and Ownership of Wyoming Powder River Basin Coal Mines ” (p. 401) lists the names of these mining operations and the 2009 coal production from each.

Table 3.24. Status and Ownership of Wyoming Powder River Basin Coal Mines

Mine	1994 Mine Owner	2009 Mine Owner	2009 Coal Production (million metric tons) ¹	Permitted Production Level (million metric tons) ²	Status and Additional Comments
Buckskin	SMC (Zeigler)	Buckskin Mining Properties	25.4	42	Active
Dry Fork	Phillips/WFA & Fort Union Ltd	Western Fuels - Wyoming	5.2	15	Active (includes former Fort Union Mine)
Eagle Butte	Cyprus-Amax	Alpha Coal West	21.5	35	Active
Rawhide	Carter (Exxon)	Caballo Coal LLC	15.8	24	Active
Wyodak	Wyodak Resources	Wyodak Resources	6.0	12	Active (includes former Clovis Point Mine)
Belle Ayr	Cyprus-Amax	Alpha Coal West	28.7	45	Active
Caballo	Carter (Exxon) & Western Energy	Powder River Coal Co.	23.3	50	Active (includes Rocky Butte and West Rocky Butte leases)
Cordero Rojo	Kennecott & Drummond	Cloud Peak Energy LLC	39.4	65	Active (consolidation of former Cordero and Caballo Rojo Mines)
Coal Creek	ARCO	Arch Coal Inc.	9.8	50	Active
Antelope	Kennecott	Cloud Peak Energy LLC	34.0	42	Active
Black Thunder	ARCO	Arch Coal Inc.	81.1	100	Active
Jacobs Ranch	Kerr-McGee	Arch Coal Inc.	29.3	50	Active (purchased in 2009 by Arch – being consolidated with Black Thunder)
N. Antelope/Rochelle	Peabody	Powder River Coal Co.	98.3	140	Active (consolidation of former North Antelope and Rochelle Mines)

Mine	1994 Mine Owner	2009 Mine Owner	2009 Coal Production (million metric tons) ¹	Permitted Production Level (million metric tons) ²	Status and Additional Comments
School Creek		West Roundup Resources	0		Inactive, new mine, permitted by Wyoming DEQ
N. Rochelle	SMC (Zeigler)	Arch Coal Inc.	0	35	Inactive since 2005, leases split between Black Thunder and North Antelope Rochelle Mines
Youngs Creek		Consol and P&M Coal	0		Proposed mine in Sheridan county, permit application pending at Wyoming DEQ
Total			417.8	705	
Source: Wyoming Office of the State Inspector of Mines 2009					
¹ Wyoming State Inspector of Mines (2009)					
² Wyoming DEQ air quality permit levels					
DEQ Department of Environmental Quality					

Coal Management

Congress enacted the Mineral Leasing Act in 1920. As a result, coal was no longer subject to mineral location (mining claims). Coal became a leased commodity, with development by a federal coal lessee in compliance with the terms and conditions of the lease. The BLM is the DOI agency responsible for mineral leasing under the Mineral Leasing Act.

Under the Mineral Leasing Act, coal was leased both competitively and non-competitively. Competitive leasing occurred in areas identified as “known coal leasing areas” (KCLAs) based on the knowledge that minable coal was in these areas. Non-competitive leasing was allowed outside KCLAs, based on a party obtaining a prospecting permit, and through prospecting, establishing a preference right to a lease by proving that the lease area contained coal in commercial quantities.

The 1976 Federal Coal Leasing Amendment Act (FCLAA) amended the Mineral Leasing Act specific to coal. The FCLAA eliminated new non-competitive coal leasing. It required diligent development and continued operations on coal leases, required the public get fair market value for leases sold, and required that the BLM ensure maximum economic recovery. The FCLAA further required that lands available for federal coal leasing be identified as the result of a multiple-use, interdisciplinary land use planning process.

The Federal Coal Management Program was adopted in 1979 in line with the above legislation, and the contemporaneously enacted FLPMA and Surface Mining Control and Reclamation Act. The 43 CFR 3400 regulations guide the BLM coal program management, setting requirements for land use planning, leasing (whether by regional, lease-by-application, and lease modifications), and post lease maintenance.

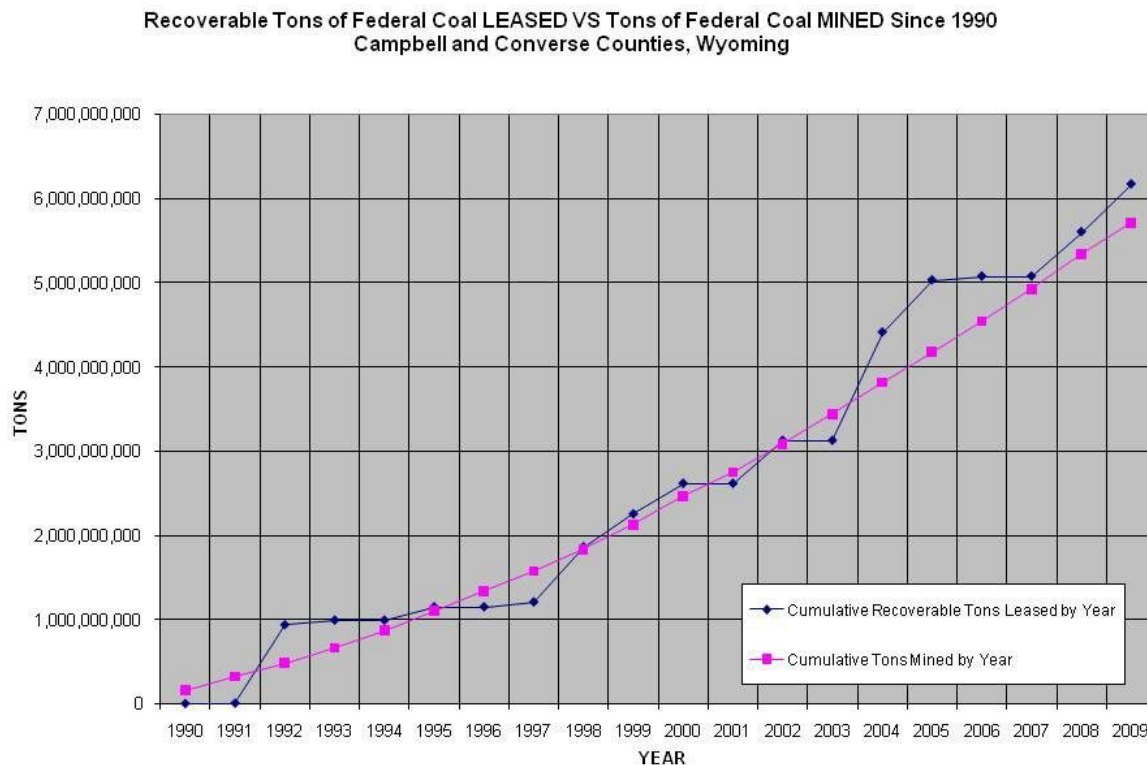
Since 1985, federal coal resources in the Buffalo planning area have been managed under the guidelines of the existing Buffalo RMP, including a major update in April 2001. The RMP

provides a framework for coal resource management, including exploration and leasing. The RMP includes specific land use planning and coal screening, and direction on competitive coal leasing. All pending preference right lease applications (PRLAs) have been processed under the RMP's direction. The BLM goal for coal resource management in the Buffalo planning area is to meet reserve needs to maintain currently operating mines, consistent with environmental protections, coal resource conservation, and fair market value return to the government and public.

On February 9, 1989, the DOI proposed to decertify all or a portion of the PRB Coal Production Region. This notice described the process the Regional Coal Team (RCT) would follow if total decertification was implemented (54 *Federal Register* [FR] 6339) and added “The RCT [Regional Coal Team] would recommend to the Secretary of the Interior to revise its charter to allow it to guide lease-by-application within the region.” After the decision to decertify the Powder River Coal Production Region was published on January 9, 1990 (55 FR 784), the Secretary of the Interior signed the new Charter for the Powder River Regional Coal Team on June 6, 1990.

The PRB coal production region had reached production maturity by 1989. As noted earlier, new mining operations were not starting, and producing mines were well established, with some consolidation. Several existing mines had substantially depleted the reserves that the mine had opened on, and created a need for leasing so that existing mines could maintain production capability. Such production maintenance leasing could only work effectively in a decertified coal production region. In a coal production region where the regional lease sales mechanism was required, all tracts had to be offered in one large regional lease sale, with sales scheduled not in response to reserve depletion, but instead based on a single sale date. This works in an area where new mines will be developed, and for competition for new coal mining properties, but is unworkable where existing mines compete for sales in an open coal market, deplete their existing leases at market rates, and need to replace reserves throughout time. Regional leasing, if continued in the PRB, would have resulted in a reduced return to the public from coal sales (due to sale timing), a higher potential for bypass, and likely speculation in leases.

Aware that production maintenance leasing must be actively managed, the BLM has timed and sized the offering of leasing by application (LBA) tracts so that leasing new reserves parallels depletion of leased reserves. This is important to ensure that coal operators have adequate reserves to compete in the open coal market into which PRB coal is sold, while not offering coal resources in amounts that would encourage speculation. Figure 3.24, “Recoverable Tons of Federal Leased vs. Tons of Federal Coal Mined since 1990, Campbell and Converse Counties, Wyoming” (p. 403) shows the results of this management since 1990.



Source: BLM 2013j

Figure 3.24. Recoverable Tons of Federal Leased vs. Tons of Federal Coal Mined since 1990, Campbell and Converse Counties, Wyoming

Coal Planning

For federal coal resources, there are specific planning requirements beyond the BLM land use planning regulations. These coal planning regulations are found in 43 CFR 3420.1. Specifically, under 43 CFR 3420.1-4, federal coal lands must be: (1) screened for development potential; (2) reviewed against specific coal unsuitability criteria (see 43 CFR 3461); (3) screened for multiple use constraints; and (4) where the surface is privately owned (as in the PRB), surface owners must be consulted. This process results in a determination of areas acceptable for further consideration for coal leasing, under 43 CFR 3420.1-8. Leasing during the lifetime of the RMP is limited to those acceptable areas, unless the RMP is amended.

Coal planning was originally done in 1977 as part of a Management Framework Plan (a predecessor of RMPs), then done again for the 1985 RMP, and was done once again for the 2001 RMP update. In addition, as part of each coal leasing environmental assessment (EA) or EIS, coal planning is reviewed and updated using the most recent site-specific data for the application area.

In the 1985 RMP, the priority areas available for consideration of coal leasing covered approximately 484,000 acres. After the coal screening process, approximately 378,000 acres

containing approximately 26 billion tons of coal remained. All areas available for coal leasing consideration was limited to the high-priority area. Coal lands available for leasing in the Thunder Basin National Grasslands is constrained by USFS land use plans.

As presented in the April 2001 update of the Buffalo RMP, the four coal planning screens were applied and coal decisions updated in coordination with the USFS and other cooperators. The area of coal development potential was revised, the application of the 20 unsuitability criteria was reviewed and revised based on current data and policy, multiple use decisions were carried forward, and surface owner consultation was conducted (BLM 2001a).

The 2001 coal planning update is the basis for current coal management in the planning area. In this update, BLM reviewed 567,200 acres in two areas identified as acceptable for further coal leasing consideration in the BFO (494,000 acres in Campbell County and 73,200 acres in Sheridan County). These areas contain an estimated 50.25 billion tons of coal. As a result of the update, 63,600 acres over 6.2 billion tons of coal were determined to be unsuitable for surface coal mining operations, while the remainder of the coal lands in these areas remained available for further consideration for coal leasing. Areas were found unsuitable for surface coal mine operations. The primary multiple use conflict was between O&G operations and coal mining, which is resolved by a special condition on leases. Surface owner consultation was completed and documented.

In 2002, there were three plan maintenance actions to clarify the 2001 updated description of existing management.

Preference Right Lease Applications

As explained in the 1985 Buffalo RMP, there were a number of pending PRLAs. The PRLAs covered more than 76,000 acres and about 5.7 billion tons of coal. The RMP directed that existing PRLAs be processed. All remaining PRLAs were processed (they were either rejected or withdrawn) and the cases closed.

Regional Sales

After the PRB federal coal production region was established in 1979, federal coal lands were available for leasing through the competitive process outlined in 43 CFR 3420. This method required leasing regional sales. A number of coal tracts are identified based on industry interest and the tracts addressed in a regional EIS. After the EIS process is completed, a number of sale tracts are chosen and all offered in one sale. The first regional sale was in 1982; six tracts were offered and sold. Most of the tracts sold during the sale had one bidder. One tract did not receive the minimum bid value and was later re-offered and sold. One tract had two bidders.

The second sale referred to in the 1985 RMP had been proposed in a 1984 PRB regional coal Draft EIS issued in 1984. Several tracts were identified in this round of leasing. The Round II (1984) sale was canceled. This was partly due to allegations of misconduct by government officials stemming from the 1982 lease sale, partly from concerns that regional sales were causing increased socioeconomic impacts, and partly due to a flattening coal market. The sale was suspended by a Federal Bureau of Investigation and other law enforcement investigation of some of the persons involved in the Round I (1982) sale for criminal wrongdoing. No individual was indicted or prosecuted because there was no evidence of criminal intent; however, the investigation and attention identified vulnerabilities in the regional sale process. The investigation triggered the Linowes Commission, which studied the regional sale process and made several findings and recommendations for improvement that were integrated into the program by Secretarial decision.

Between 1985 and 1990, the coal lands outlined as priority for coal leasing in the existing plan were the only lands considered for competitive leasing. These lands were available for leasing through the regional sale process. There was no leasing between 1982 and 1989 because there was not enough industry interest or regional need for a second regional sale. However, existing operators were running short on reserves in many cases.

Leasing by Application

The PRB began operating in 1990 as a decertified coal production region, and continues to operate in that way. The RCT is still in place and meets periodically to review regional activity and make recommendations on coal leasing. Since decertification to present, 21 LBA tracts have been offered for competitive lease sale in the PRB and 20 leased. At present 12 LBA tracts are pending, all of which have been recommended for processing by the PRB RCT and are in various stages of processing. Table 3.25, “Successful Lease Sales” (p. 406) lists successful production maintenance sales since 1990. Table 3.26, “Lease by Application Pending, Powder River Basin, Wyoming” (p. 407) lists pending LBAs that have been reviewed by the RCT.

Table 3.25. Successful Lease Sales

Lease by Application Name	Lease Number	Effective Date	Acres	Tons	BID	Cost per Ton
Jacobs Ranch	WYW 117924	10/1/1992	1,708.62	161,216,000	\$20,114,930.00	\$0.125
West Black Thunder	WYW 118907	10/1/1992	3,492.495	429,048,216	\$71,909,282.69	\$0.168
North Antelope/Rochelle	WYW 119554	10/1/1992	3,064.04	403,500,000	\$86,987,765.00	\$0.216
West Rocky Butte	WYW 122586	1/1/1993	463.205	55,000,000	\$16,500,000.00	\$0.300
Eagle Butte	WYW 124783	8/1/1995	1,059.175	166,400,000	\$18,470,400.00	\$0.111
Antelope	WYW 128322	2/1/1997	617.2	60,364,000	\$9,054,600.00	\$0.150
North Rochelle	WYW 127221	1/1/1998	1,481.93	157,610,000	\$30,576,340.00	\$0.194
Powder River	WYW 136142	9/1/1998	4,224.225	532,000,000	\$109,596,500.00	\$0.206
Thundercloud	WYW 136458	1/1/1999	3,545.503	412,000,000	\$158,000,008.50	\$0.383
Horse Creek	WYW 141435	12/1/2000	2,818.695	275,577,000	\$91,220,120.70	\$0.331
North Jacobs Ranch	WYW 146744	5/1/2002	4,982.24	537,542,000	\$379,504,652.00	\$0.706
Naro South	WYW 154001	9/1/2004	2,956.7	297,469,000	\$274,117,684.00	\$0.922
Little Thunder	WYW 150318	3/1/2005	5,083.5	718,719,000	\$610,999,949.80	\$0.850
West Hay Creek	WYW 151634	1/1/2005	921	142,698,000	\$42,809,400.00	\$0.300
West Antelope	WYW 151649	3/1/2005	2,809.13	194,961,000	\$146,311,000.00	\$0.750
Naro North	WYW 150210	3/1/2005	2,369.4	324,627,000	\$299,143,785.00	\$0.922
West Roundup	WYW 151134	5/1/2005	2,802.510	327,186,000	\$317,697,610.00	\$0.971
Eagle Butte West	WYW 155132	5/1/2008	1,427	255,000,000	\$180,540,000.00	\$0.708
Maysdorf South	WYW 174407	8/1/2008	2,900	288,081,000	\$250,800,000.00	\$0.871
Maysdorf North	WYW 154432	5/1/2009	445.89	54,657,000	\$48,098,424.00	\$0.880
Total			49,172.458	5,793,655,216	\$3,162,452,451.69	
Source: BLM 2013j						
\$ U.S. Dollars						

Table 3.26. Lease by Application Pending, Powder River Basin, Wyoming

LBA (Applicant Name)	Acres as Applied For	Estimated as Applied for Coal (million metric tons)
West Antelope II (Antelope) ¹	4,109	430
Belle Ayr North (Belle Ayr)	1,579	200
West Coal Creek (Coal Creek)	1,151	57
Caballo West (Caballo)	777	88
Maysdorf II (Cordero Rojo)	4,654	434
North Hilight Field (Black Thunder)	4590	588
South Hilight Field (Black Thunder)		
West Hilight Field (Black Thunder)	2,371	440
West Jacobs Ranch (Jacobs Ranch)	5,944	957
North Porcupine (North Antelope Rochelle) ² South Porcupine (North Antelope Rochelle) ²	5,117	598
Hay Creek II (Buckskin) ²	1,447	148
Total	31,739	3940
Source: BLM 2013j		
¹ The West Antelope II North tract was offered for lease May 2011– an adequate bid was received		
² Application subsequently modified.		
LBA Lease by Application		

Coal leased in the planning area using the LBA process must conform to the Buffalo RMP. If the application is determined to conform, the applicant must supply detailed environmental and coal resource information before the BLM addresses the application. The BLM then completes two separate but concurrent evaluations of the application before a lease is offered for competitive sale.

Detailed coal data is necessary prior to processing a LBA. Coal exploration on federal coal requires an exploration license from the BLM. The BLM reviews exploration programs to ensure they will provide sufficient data to meet adequacy standards for leasing. Licenses are issued after a site inspection, an environmental analysis to consider the impacts of exploration, and public notice inviting other interested parties to participate in the exploration program. Licenses are conditioned as necessary to mitigate impacts. Licensees post a bond to ensure damages and disturbances are repaired. Exploration data are considered confidential and are available only to the BLM, the licensee, and any participating parties. The PRB is the most actively explored federal coal region. This area accounts for as many open licenses and newly issued licenses as the rest of BLM-administered lands nationwide. Table 3.27, “Coal Exploration Licenses” (p. 407) lists recent license activity.

Table 3.27. Coal Exploration Licenses

Year	New Licenses	Open Licenses
2003	2	6
2004	2	4
2005	5	6
2006	4	8
2007	3	7
2008	1	10
2009	2	6
Source: BLM 2013g		

All actions and evaluations of coal lease applications must use data that meets or exceeds the PRB coal region data adequacy standards. This includes environmental and geological data standards.

All lease applications undergo an environmental analysis with full public involvement, including public scoping, completion of an EA or EIS, a public hearing, issuance of a decision and an appeal period.

All lease applications also undergo an analysis to determine fair market value, including the BLM determining in-place reserve; determining an optimum mine plan; determining mining costs, revenues, and net present value; accepting and considering fair market value comments at a public hearing; determining an adjusted comparable sale from other valid sales; preparing a sealed pre-sale estimate; and evaluating bids after the sale before accepting any bid.

In addition, lease tracts in response to a lease application are configured by the BLM to achieve maximum economic recovery and to promote competition. To ensure this, the BLM establishes a study area to encompass all reasonable economic reserves, requires geologic data to meet or exceed data adequacy standards for the study area, and considers maximum economic recovery comments at a public hearing. The BLM independently delineates the sale tract to be offered.

All leases are offered competitively by sealed bid, and successful lease tract bonus bids must meet or exceed fair market value as established by the BLM.

Existing leases can be modified, and reserves and acreage added. The process is similar to LBA, with a limit on the amount of acreage that can be added and the requirement that the BLM find the coal added to be non-competitive. Lease modifications are offered to the existing lessee at the presale fair market value as determined by the BLM.

A federal coal lease conveys the right to explore, develop, and remove the coal leased. The BLM offers coal leases on a deferred-bonus basis. Sealed bids are accepted before the lease sale. The successful high bidder (lessee) is required to submit the first installment, representing 20 percent of the total bid, with their bid before the lease sale. The balance of the bid is paid in equal annual installments on the next four anniversary dates of the lease. The lessee must pay the bonus bid in the first 5 years in equal annual payments. Since the mining in this planning area is surface mining, the lessee must pay a royalty of 12.5 percent of the sale value of coal severed and sold (underground mine leases have an 8% royalty rate). The lessee must comply with the requirements of the Mineral Leasing Act, the Surface Mining Control and Reclamation Act, any relevant state and federal laws, and the terms and conditions of the lease. The lessee has 10 years to achieve diligent development (produce 1% of the recoverable reserve as established by the BLM) and must maintain continued operations in each subsequent year (continue to produce 1% per year). Advanced royalty may be paid in lieu of continued operations for up to 10 years during the initial 20-year term of the lease. The BLM currently requires the lessee to post an annual bond to cover 25 percent of their annual estimated royalty, and 100 percent of annual rental. The BLM also requires a bonus bond unless the lessee requests a waiver and has maintained their payments to the Office of Natural Resources Revenue (ONRR) in good standing. A reclamation bond is required at the time the lease is permitted for mining. That bond amount is established by the Wyoming DEQ.

Mining operations are permitted under the authority of the Surface Mining Control and Reclamation Act. A different DOI agency than the BLM, the OSM, has authority under the Surface Mining Control and Reclamation Act. Before mining may commence on a federal lease, the DOI Assistant Secretary must approve a mine plan. For mine plan approval on a federal lease, the OSM requires a mine and reclamation plan prepared by the lessee; a State Decision Document

from the Wyoming DEQ LQD approving the mine and reclamation plan under Surface Mining Control and Reclamation Act requirements; a Resource Recovery and Protection Plan approved by the BLM establishing the recoverable reserve on the lease, mining limits, and recovery methods; and the BLM findings that the mine and reclamation plan complies with the Mineral Leasing Act; an EA or EIS prepared by the OSM as lead agency for compliance under NEPA for the mine plan approval; concurrence from any federal surface management agency to implement the mine and reclamation plan on surface they administer; and compliance with the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and any other applicable federal law.

Coal Exchanges

Coal is a public commodity that lends itself to use for exchanges in the public interest. Coal reserves can be accurately measured and tested, and have considerable value. A lease exchange is authorized either by special acts of Congress or under the authority of the Surface Mining Control and Reclamation Act for alluvial valley floors designated critical to farming. An exchange results when coal lease rights on lands for which Congress has deemed coal mining an undesirable use are exchanged for equal valued lease rights in an area acceptable for further consideration for coal leasing. An exchange requires a NEPA analysis, an appraisal of value, and a finding that the exchange is in the public interest. Several lease exchanges were completed under the Interstate 90 Lease Exchange Act to eliminate coal lease rights under the routing of Interstate 90, and a recent lease exchange to eliminate the lease rights on an alluvial valley floor called Gold Mine Draw.

Coal Lease Management

The BLM administers coal leases. Lease administration includes setting lease bonds, lease readjustment, relinquishment, assignment, advance royalty, and royalty rate reductions. The lessee is required to produce commercial quantities (1% of the established reserve) annually from each lease, starting before the tenth year after lease issuance. Annual production is monitored to verify that each lessee is meeting diligent development and continued operations. The BLM inspects active leases at least every three months and inactive leases annually to determine and enforce compliance with lease terms and conditions. Any coal trespass is resolved under trespass rules. The BLM verifies production and attainment of maximum economic recovery on producing leases every three months. Reported production is compared to independently calculated production based on survey data. Any irregularities are reported to the ONRR, formerly the Minerals Management Service. Reported production during the three-month period is compared to the coal volume mined during the three-month period to determine the effectiveness of recovery practices and to verify the lessee is recovering coal consistent with the recoverable reserves available.

3.2.2.4. Trends

The BLM reviewed projected development activity and related environmental and social effects for the PRB. The PRB Coal Review, Task 2 (AECOM 2011) projected development activity in five-year increments to 2030. Chapter 3 – Past, Present and Reasonably Foreseeable Development – is complete and posted to the BLM website.

The lands determined acceptable for consideration for coal leasing under the coal screening performed for the April 2001 updated description of existing management were estimated to contain about 26 billion tons of coal reserves. Since 1985, about 10.8 billion tons have either been leased or are under consideration for leasing. Coal reserve demand has been projected to

2030 in the Task 2 report for the PRB Coal Review (AECOM 2011) and can be met within the lands currently screened and acceptable.

Coal forecasts for the PRB through 2030 indicate total production is expected to grow at an annual rate of 0.1 to 1.1 percent, consistent with electric power demand. It is expected that interest and demand for new leasing will continue through 2030 based on forecasting. The forecasts indicates a slower rate of increase in PRB coal demand compared with previous forecasts, primarily due to new natural gas discoveries, a greater national priority given to nuclear and renewable energy generation, and potential impacts to coal-fired electric generation from regulation of GHGs. These forecast are consistent with the Energy Information Administration 2012 Energy Outlook Report (Energy Information Administration 2012). Therefore, by 2030 the BLM expects PRB coal production to be between 400 and 500 million tons annually.

3.2.2.5. Key Features

Key features are the areas identified as acceptable for further coal leasing consideration.

3.2.3. Leasable Minerals – Fluids

O&G resources are often found in the pore spaces of sedimentary rocks such as sandstone and limestone, having migrated there from source rocks rich in organic material, such as marine shales. When rocks containing organic material are subjected to heat and pressure, the organic compounds break down over time, resulting in oil and natural gas. As the O&G are generated, they migrate through the pore spaces of the rock or along fractures until they encounter a structural or stratigraphic trap with an impermeable layer. Another mode of occurrence for natural gas is CBNG, where the gas is trapped in the coal where it was generated. A well-known hazard in coal mines, CBNG has become economically important with some of the largest reserves found in the PRB.

3.2.3.1. Regional Context

The PRB is an area of 14 million acres in northeastern Wyoming and southeastern Montana that is roughly bounded by the Big Horn Mountains in the west, the Black Hills in the east, the Miles City Arch in the north, and Wyoming's Laramie Mountains, Casper Arch, and Hartville Uplift in the South. It is managed by four BLM offices in two states; the BFO, the Casper Field Office, and the Newcastle Field Office in Wyoming, and the Miles City Field Office in Montana.

Oil: Wyoming ranks seventh in the United States in the production of oil. Collectively in Wyoming, more than 38,000 wells produced 52.9 million barrels of oil in 2006. In the three counties in the planning area, approximately 9.8 million barrels of oil were produced in 2007.

Natural gas: Wyoming ranks second in the United States in the production of natural gas. Collectively in Wyoming, more than 38,000 wells produced 2.11 trillion cubic feet of natural gas in 2006. In the three counties in the planning area, approximately 13.2 billion cubic feet were produced in 2007.

Coalbed Natural Gas: The PRB CBNG field ranks eleventh in proven gas reserves in the United States (DOE 2008). Proven reserves are (1) the portion of an oil or gas reservoir delineated by drilling and defined by oil/water, gas/oil/water, or gas/water contacts, if any, and (2) the immediately adjoining portions not yet drilled, but that can be reasonably judged as

economically productive based on available geologic and engineering data. In the planning area, the PRB CBNG covers portions of Campbell, Johnson, and Sheridan counties. Map 24 depicts the CBNG potential in the planning area. Collectively in the three counties in the planning area, approximately 429 billion cubic feet of CBNG were produced in 2007.

3.2.3.2. Indicators

The planning area has very few surface geologic structures (anticlines, faulted anticlines, and domes), which was the most successful method of discovering new reservoirs in Wyoming through the earliest periods of exploration. Most of the O&G fields have been and continue to be found using subsurface geologic techniques. These techniques mostly involve 2D seismic and more recently 3D seismic. The data from the seismic reveals the structures underground that may hold the fluid minerals. This data is then used to develop an exploratory drilling program to verify the data.

Another leasable mineral in the Buffalo planning area with some potential for development is geothermal energy. Geothermal energy is not being developed in the Buffalo planning area at this time, and it is not likely to be developed during the planning period.

3.2.3.3. Current Condition

There were few documented test wells drilled until the mid 1900s, when subsurface geologic techniques and acquisition of seismic reflection data began to be employed in Wyoming. The first oil field discovered in the planning area was Billy Creek in 1923. The Adon and Sussex fields were discovered in 1948, and the North Tisdale field in 1952. More fields have since been discovered and developed. Conventional (non-CBNG) fields in the planning area most often are considered to be stratigraphic traps, but structural and combination structural/stratigraphic trap types are also common. Most fields are considered to be oil fields. Gas fields were rarely discovered in the planning area until CBNG exploration began in recent years. The RFD provides a more detailed description and history of O&G development in the Buffalo planning area (Stilwell et al. 2012). For the context of this document, the term conventional well is used to describe those wells that occur at a greater depth than the CBNG wells. This includes vertical wells, directional wells and horizontal wells that are drilled into both conventional and unconventional reservoirs.

Exploration

O&G reservoirs can be discovered by direct or indirect exploration methods. Direct methods include mapping of surface geology, observing seeps, and gathering information on hydrocarbon shows observed in drilling wells. Indirect methods, such as gravity, magnetic, and seismic surveys, are used to delineate subsurface features that could contain O&G that are not directly observable. The petroleum industry utilizes two-dimensional and three-dimensional seismic technology to gather subsurface stratigraphic information to aid in the search for O&G reserves. Seismic technology utilizes explosives in drilled shot holes for source points along linear survey lines and vibroseis or shaker trucks and buggies for source points in a grid pattern over a large area that can cover hundreds of square miles.

Leasing and Production

The BLM reviews and approves Notices of Intent, applications for permits to drill (APDs), and applications from companies to lease, explore, develop, and produce oil, gas, and geothermal

resources on federal lands. The BLM also is responsible for inspection and enforcement of oil, gas, and geothermal wells and other development operations, to ensure that lessees and operators comply with lease requirements and BLM regulations.

The main objectives of the O&G program are to foster a fair return to the public for its resources, ensure environmentally acceptable activities within the program, and provide for conservation of the fluid mineral resources without compromising the long-term health and diversity of the land. BLM management of the O&G program accomplishes several functions in support of the main objectives, including: (1) supporting the domestic need for energy resources, (2) making eligible lands available for leasing through proper planning, (3) timely processing of applications and notices for exploration and development, and (4) inspecting operations and ensuring compliance with lease terms and regulations.

As of October 1, 2008, federal O&G leases covered approximately 2,533,975 acres in the planning area (Map 12) (BLM 2008g). Table 3.28, “Number of Oil and Gas Leases by County in the Planning Area” (p. 412) lists the number of leases and total number of acres under lease by county in the planning area. Federal mineral estate in coal-bearing areas of the PRB has not been offered for lease since 2004 as a result of a Tenth Circuit Court of Appeals ruling (*Pennaco Energy v. Department of the Interior*, 377 F.3d 1147). O&G leasing within coal bearing areas is being analyzed in this RMP revision, and leasing will resume on completion of the RMP revision if O&G leasing is determined to be an appropriate use within the planning area. With the majority of the planning area currently leased, the actions in this document are subject to valid existing rights. These leases are an existing contract between the lessee and the federal government and the stipulations as part of that cannot be changed unless an exemption, modification, or waiver of the lease stipulations occur. The management actions in this document are not an exemption, modification or waiver of the original stipulations. However, based on site specific analysis and the management actions of this document, conditions of approval (COAs) may be placed on the approved APD to mitigate the effects of the proposed action to be in compliance with the management actions of this document.

Due to No Surface Occupancy (NSO) restrictions, three areas in the Buffalo planning area are not open to leasable mineral development (unless those activities cause no surface disturbance) – the Fortification Creek WSA in northeastern Johnson County and northwestern Campbell County, and the Gardner Mountain and North Fork WSAs in southwestern Johnson County in the southern Big Horn Mountains. Three other areas are not open to mineral location (and also not open to leasable mineral development due to their NSO restrictions), because they have been officially withdrawn through Congressional Acts from such activities – Amsden Creek Big Game Winter Range in Sheridan County, part of the Ed O. Taylor Big Game Winter Range in Johnson and Washakie counties, and part of the Kerns Big Game Winter Range in Sheridan County.

Table 3.28. Number of Oil and Gas Leases by County in the Planning Area

County	Number of Leases	Acres Under Lease
Campbell	3,149	1,428,517
Johnson	1,092	803,511
Sheridan	255	301,947
Source: BLM 2008f		

Table 3.29, “Well Statistics for Campbell, Johnson, and Sheridan Counties, November 2008” (p. 413) lists well statistics for the planning area. After the BLM approves an APD on federal O&G leases, the developing company may proceed with drilling in accordance

with applicable regulations, Onshore Oil and Gas Orders, Notices to Lessees, lease terms and conditions, and the approved APD (with the COAs attached to the permit).

Table 3.29. Well Statistics for Campbell, Johnson, and Sheridan Counties, November 2008

	Federal	Fee or State	Total
Campbell County			
Number of Plugged and Abandoned Wells	3,911	5,236	9,147
Number of Dormant Wells	105	136	241
Number of Completed Wells	7,582	12,085	19,667
Number of Monitoring Wells	11	23	34
Notice of Intent to Abandon	204	415	619
Number of Spuds	385	513	898
Number of Expired Permits	9,079	8,825	17,904
Number of Permits To Drill	1,349	480	1,829
Permits Issued (Total of all the above)	22,626	27,713	50,339
Total (Permits Issued and Waiting on Approval)	22,653	27,729	50,382
Johnson County			
Number of Plugged and Abandoned Wells	1,000	698	1,698
Number of Dormant Wells	95	14	109
Number of Completed Wells	2,995	1,745	4,740
Number of Monitoring Wells	17	9	26
Notice of Intent to Abandon	34	39	73
Number of Spuds	219	113	332
Number of Expired Permits	4,075	2,854	6,929
Number of Permits To Drill	875	226	1,101
Permits Issued (Total of all the above)	9,310	5,698	15,008
Waiting On Approval	19	16	35
Total (Permits Issued and Waiting on Approval)	9,329	5,714	15,043
Sheridan County			
Number of Plugged and Abandoned Wells	104	366	470
Number of Dormant Wells	0	9	9
Number of Completed Wells	457	3,976	4,433
Number of Monitoring Wells	6	13	19
Notice of Intent to Abandon	2	91	93
Number of Spuds	18	125	143
Number of Expired Permits	1,187	4,631	5,818
Number of Permits To Drill	173	200	373
Permits Issued (Total of all the above)	1,947	9,411	11,358
Waiting On Approval	13	22	35
Total (Permits Issued and Waiting on Approval)	1,960	9,433	11,393
Source: WOGCC 2008			

Geothermal Energy

Geothermal energy is energy derived from the natural heat of the earth. Typically, geothermal resources consist of underground reservoirs of hot water and steam; subsurface areas of dry hot rock also occur, although more rarely (BLM 2008e). Geothermal reservoirs can have temperatures well over 450°F (235°C), and can be found at various depths below Earth's surface (BLM 2008e). Often, it is either the temperature or depth of a geothermal resource that can determine whether it might be viable to develop; both hotter resources and resources closer to the surface are more likely to be developed for their geothermal energy. Although the potential for geothermal development is defined as heat flow above 140°F (60°C) (BLM 2008e), geothermal resources of lower temperatures are also utilized.

A geothermal lease is for the Earth's heat resources where there is federal mineral estate (BLM 2008e). The BLM has the delegated authority to issue geothermal leases on federal mineral estate, including those underlying lands whose surface is administered by the USFS (BLM 2008e). See the *Mineral Occurrence and Development Potential Report* (BLM 2009c) or contact the BFO for more detailed information regarding mineral leasing.

Geothermal steam and hot water often naturally reach Earth's surface due to the often high subsurface pressures created by the hot steam and hot water. Hot springs, geysers, mud pots, and steam vents all result from hot water and steam that are under pressure and reach the surface (BLM 2008e); typical examples of these features can be seen in Yellowstone National Park, Wyoming. Hot water and steam often can be directly used for their heat energy. However, the heat energy of dry hot rock reservoirs often is captured by injecting cool water, allowing the water to absorb heat from the rock, with extraction as either hot fluid or steam (BLM 2008e). The cooled water is disposed of either on the surface, or injected back into the geothermal reservoir to be reheated for capturing more heat energy (BLM 2008e). Some geothermal resources are deficient in water and permeability, but can be enhanced to increase their productivity. These are called enhanced geothermal reservoirs, and treatments involve increasing the size and connectivity of the rock fractures, allowing the hot water or steam to more easily move through the rock (BLM 2008e).

Geothermal resources are often accessed by wells, with the extracted heat energy being directly used as heat energy, or indirectly used to generate steam to produce electricity (BLM 2008e). Today, geothermal reservoirs of low- to moderate-temperature water (68°F to 302°F [20°C to 150°C]) provide numerous opportunities for direct and indirect use (BLM 2008e); those with even higher temperatures are often used only for indirect use (BLM 2008e). Some direct uses of geothermal resources are heating pools, spas, greenhouses, aquaculture facilities, and buildings; melting snow on sidewalks and driveways; and drying agricultural products. Direct use applications in the United States have been growing at about 6 percent per year (BLM 2008e). These lower-temperature resources are fairly abundant throughout the western United States; a recent survey of 10 western states identified more than 9,000 geothermal wells and springs, more than 900 low- to moderate-temperature geothermal resource areas, and hundreds of direct-use sites (BLM 2008e). In general, indirect use for commercial electrical generation requires geothermal reservoirs with temperatures above 200°F (93°C), although newer technologies can utilize lower temperatures (as low as 165°F [74°C]) (BLM 2008e).

A number of publications (e.g., Williams et al. 2008; DOE 2006; National Oceanic and Atmospheric Administration 1983) state that the PRB has potential for the occurrence of geothermal resources. The potential for the existence of low-temperature geothermal resources (less than 212°F [100°C]) has been rated "good" (DOE 2006), and for moderate- to high-temperature geothermal resources, "low" (Williams et al. 2008). However, to date there has been very limited geothermal exploration; almost all existing information about subsurface

temperatures in the planning area consist of bottom-hole temperatures of O&G wells (Williams et al. 2008; DOE 2006; National Oceanic and Atmospheric Administration 1983). This data suggest that the basin (including the western edge near the Big Horn Mountains and northeastern edge near the Black Hills) might be overall too cool to provide the temperatures needed for geothermal development, except at excessive depths. Development of this resource could either be too costly to be economically feasible or require technologies not yet in existence. The level of this resource remains largely unknown (Williams et al. 2008; DOE 2006), and only with further exploration will the level of this resource become more fully understood.

3.2.3.4. Trends

The earliest recorded test well in the planning area was drilled in 1886 on the Tisdale Structure (Biggs and Espach 1960). From 1902 to 1923 there were at least 30 conventional wells that are known to have been drilled and abandoned. The Billy Creek Field was discovered in 1923. The next field discoveries were in the Adon and Sussex Fields in 1948. In 1952 the North Tisdale Field was discovered. In 1960 the amount of drilling increased reaching a peak in 1969 with 779 conventional wells drilled. The drilling then declined until 1973. From 1974 to 1984 there was a small increase with the peak in 1977 with 405 wells drilled. From 1984 to 1995 drilling decreased to its historical lows. In 1995 and 1996 there was a slight increase in drilling, but since then drilling has occurred at a rate of less than 100 new wells per year with 2007 and 2008 averaging 40 new wells a year. This is expected to continue into the future with possibly a slight increase. Beginning in 2009 horizontally drilled wells began increasing and are forecasted to be the main type of conventional drilling in this planning period.

The earliest suspected CBNG well occurred in 1916, perhaps earlier (DeBruin and Jones 1989). However, there was very little interest in CBNG prior to 1987. There were only 12 wells specifically targeting CBNG prior to 1987 with the first modern well drilled in 1979. From 1987 to 1998 drilling increased from 19 new wells in 1987 to 653 new wells in 1998. There were 1,642 wells drilled during this time period. Starting in 1999 a rapid increase in the number of CBNG wells drilled began. A method called “blanket drilling” was the dominant method of drilling. This resulted in 2507 wells drilled in 1999, more than were drilled in all previous years combined. A gradual change from blanket drilling should be expected in the next five to ten years as development will become more localized and require more geologic and engineering analysis.

There is geothermal energy in the Buffalo planning area; however, the known depths at which the required temperatures exist are too great to make this area an attractive target for current exploration. There are economically viable geothermal energy resources in many areas outside the planning area. With future technological advancements, this resource could become more viable to pursue in the planning area. However, this is not likely during the planning period given the current state of technology.

3.2.3.5. Key Features

Key features for conventional O&G development include oil seeps to surface, mapping of surface and subsurface geologic structures, and exploratory drilling to define the limits of the fields. For CBNG the key feature is drilling within the outcrops of the coal bearing formations. Key features for geothermal energy would include hot springs at the surface or geothermal vents of which there are none in the planning area.

3.2.4. Leasable Minerals – Other

The leasable mineral resources currently being developed in the planning area are coal, crude oil, and natural gas. Although geothermal energy occurs in the planning area, the depths of occurrence for temperatures useful for many commercial applications make it uneconomic to develop currently, or in the near future given the state of technology and market trends. Coal, O&G, and geothermal energy are discussed separately in the subsections above. Although leasable minerals other than these (“other leasable minerals”) are known to occur in the planning area (e.g., potassium, sodium, and phosphate, among others), none of these are known to exist in commercially viable quantities, and this situation is not likely to change during the planning period given market trends.

3.2.4.1. Regional Context

A number of other leasable minerals (e.g., trona, oil shale, and tar sands) are under development in other parts of Wyoming and the western United States.

3.2.4.2. Indicators

As discussed under *Current Condition* below, no other leasable minerals are known to occur in the planning area in quantities sufficient for commercial production. There have never been any requests submitted for leasing of other leasable minerals in the planning area, and this is not likely to change during the planning period.

3.2.4.3. Current Condition

Other leasable minerals, as used in this document, are leasable minerals other than coal, crude oil, natural gas, and geothermal energy. Other leasable minerals in the planning area include potassium, sodium, and phosphate, among others. However, from well logs, well cores, and other information, no other leasable minerals are known to exist in the planning area in commercially viable quantities. There is no history of the development of (or requests for the leasing of) other leasable minerals in the planning area; this is not likely to change during the planning period.

3.2.4.4. Trends

The current situation in the planning area regarding other leasable minerals is not likely to change during the planning period. Therefore, these resources are not discussed further in this chapter, and are not analyzed in Chapter 4.

3.2.4.5. Key Features

There are no known other leasable minerals present in the planning area in quantities sufficient for commercial production.

3.2.5. Salable Minerals

3.2.5.1. Regional Context

The main salable minerals (also called mineral materials) developed in Wyoming are aggregate (e.g., sand, gravel, and rip rap), building stone, common clay, decorative stone (including moss rock), clinker (or porcellanite, locally called “scoria”), and soil. The salable minerals currently being developed for commercial purposes in the planning area are aggregate (sand, gravel, and rip rap), clinker (scoria), building stone, and decorative stone.

3.2.5.2. Indicators

Indicators used to describe resource condition and assess the status of the salable minerals resource in the planning area include currently known quantities (including both actual known and estimated quantities), historic and forecasted demand, and historic and forecasted production. Often there is a production time lag: it takes time for mines to increase production to meet an increase in demand, or for planned mines to come into production. Therefore, previously stockpiled amounts can be quickly depleted when demand increases quickly.

Changes in prices (actual and forecasted) over time for these resources also could be indicators. However, because a change in commodity price often drives changes in supply and/or demand for that commodity, the changes in production and/or demand over time often closely mirror or parallel price changes. Price changes are usually more volatile, occurring much more quickly and frequently, than changes in demand or production, and can occur for numerous reasons possibly unrelated to the supply or demand for the commodity itself. Therefore, price changes are not addressed here.

Additionally, changes in price and/or demand for a particular commodity (either increases or decreases) can lead to additional materials being introduced into the market as suppliers attempt to remain economically solvent. This factor, the introduction of substitute materials into the marketplace, often makes the accurate predictions of demand, supply, and price for individual minerals extremely difficult, both in the short and long term. Use of substitute materials can be quite common for industrial minerals, even for relatively common and abundant ones such as sand, gravel, and clinker (scoria).

The levels of mineral exploration and development activities, and the areas where they take place, are integrally linked to supply and demand for these commodities. This often involves local, national, and international economics and politics, and is therefore difficult to predict on the scale of the planning area. Note also that societal, political, and economic priorities, decisions, and events can affect salable minerals activities through increases or decreases in exploration and/or development activities, and where they occur. Conversely, increases or decreases in salable minerals activities could impact societal, political, and economic priorities, decisions, and events. As it is difficult to accurately predict future trends in mineral demand and production on the scale of the planning area, only the indicators quantity, demand, and production, and the trends they might reveal, are discussed here, and in relatively general terms.

3.2.5.3. Current Condition

Salable minerals are typically used in everyday construction, road building and repair, mining, agriculture, and decorative applications. Most of the federal salable minerals resource in the planning area occurs on split estate lands; these lands have federally owned mineral estate, but its' surface estate component is most often owned by private parties, but also state and other entities – see Appendix X (p. 2661). Salable minerals are disposed of according to the *Materials Act of 1947* (as amended), and other laws and regulations. The regulations at 43 CFR 3600 outline the requirements for obtaining a sales contract for commercial operations or a free-use permit (FUP) for government entities or non-profit organizations. See Chapter 2 or the *Mineral Occurrence and Development Potential Report* (BLM 2009c) for more information.

Unless closed to salable minerals activities, all federal lands in the planning area (including federally administered surface/federal minerals and split estate) are open to the exploration and development of salable minerals. To explore for salable minerals (excluding casual use), a letter of authorization is required. To develop a salable minerals deposit, an appropriate mining and reclamation plan is required. Mining/reclamation plans and reclamation bonding requirements are developed in cooperation with the State of Wyoming DEQ LQD. All salable minerals projects are reviewed to ensure that no undue or unnecessary degradation would occur, and for compliance with bonding policy for reclamation after cessation of project activities.

Three areas in the planning area are not open to salable minerals activities, as they are under review by Congress for formal designation as WSAs. These areas also are currently restricted from leasable mineral activities, unless such activities (salable or leasable minerals activities) would not impair the areas' suitability conditions for designation as wilderness. If Congress acts to have any of these areas formally designated as a WSA, then the restriction on salable minerals activities for that area will become a permanent prohibition. If Congress denies formal designation for any of these areas, then that area will then become open again to salable minerals activities, although management of the area would likely include requirements to maintain much of the areas' unique features. The BLM recommendation for all three areas is to not become wilderness. See *Special Designations – WSAs* for more information. These three areas are (see Map 75):

- Fortification Creek WSA – This area consists of 12,419 acres of BLM-administered surface/federal mineral lands in northeastern Johnson and northwestern Campbell counties. Clinker (scoria) is the only salable mineral known to occur in commercial quantities in this area, and adequate quantities are available outside its boundaries.
- Gardner Mountain WSA – This area consists of 6,423 acres of BLM-administered surface/federal mineral lands in southwestern Johnson County. Moss rock and building stone are the only salable minerals known to occur in commercial quantities in this area, and adequate quantities of each are available outside its boundaries.
- North Fork WSA – This area consists of 10,089 acres of BLM-administered surface/federal mineral lands in southwestern Johnson County. Moss rock and building stone are the only salable minerals known to occur in commercial quantities in this area, and adequate quantities of each are available outside its boundaries.

Those salable minerals useful for road construction and maintenance (sand, gravel, clinker [scoria], and rip rap) are in greatest demand in the planning area. Most clinker (scoria) in the planning area is used by the coal mines near Gillette to keep their haul roads passable. They need large volumes of mineral materials for this, and scoria is relatively abundant in and near the coal mine areas, while sand and gravel are much less abundant in those areas. Sand and

gravel are used mostly for O&G development, general construction purposes, and non-mine road surfacing and maintenance (highways, county roads, etc.). Some sandy shale deposits occur in the planning area, and two current sales contracts are for this material, for use on nearby oil/gas and bentonite mine roads. Building and decorative stone (including flagstone and moss rock) and other mineral materials have typically experienced much less demand from public lands in the planning area than sand, gravel, and clinker (scoria). Disposals of these materials are typically small (fewer than 5 tons), although occasionally a larger sale has been requested. There is one Common Use Area (CUA) in the planning area (comprised of seven small collecting areas scattered across Johnson County), and currently all moss rock and flagstone sales from public lands occur from the CUA. Because the demand for and production of these mineral materials from public lands in the planning area are typically very low (especially as compared to that of sand, gravel, and clinker (scoria)), they are only briefly addressed below. For the same reason (typically very low volumes), they are not addressed or analyzed in Chapter 4. See the *Mineral Occurrence and Development Potential Report* (BLM 2009c) or Chapter 2 of this RMP for more information regarding these mineral materials.

Sand and gravel are typically the same substance: fragments or particles of rock, but of different sizes. In addition, they more often occur as mixed deposits (mixed sand and gravel), rather than just one or the other. Most importantly, these, and the sandy shale, are used for generally the same purposes in the planning area. For these reasons, they are not discussed or treated separately in this chapter, nor are they separately addressed and analyzed in Chapter 4. Clinker (scoria), though, is a very different material from sand and gravel. Table 3.30, “Current Authorized Salable Mineral (Mineral Materials) Disposals in the Buffalo Planning Area” (p. 419) lists the current authorized disposals (both contracted sales and FUPs) for salable minerals (mineral materials) on BLM-administered lands in the planning area. Note that the table lists only sand and gravel and clinker (scoria) disposals. Recent and current sales of other salable minerals are typically very small (1 to 5 tons per year total), and only from the CUA; due to the small volumes sold, these are not included here or in the analysis and discussion in Chapter 4. The Buffalo planning area has the greatest number of mineral material sales and FUPs of any field office in Wyoming, nearly twice that of the field office with the next largest number.

Table 3.30. Current Authorized Salable Mineral (Mineral Materials) Disposals in the Buffalo Planning Area

Operator	Legal Description
Hilcorp Energy Co. (s&g, ct) ¹	T. 41 N., R. 81 W., Section 3, NWNW, and Section 4, NENE
Fuller Construction, Inc. (s&g, ct)	T. 42 N., R. 76 W., Section 11, NENW
Sierra Construction Co (sc, ct)	T. 42 N., R. 78 W., Section 12, SENWSE
Black Hills Bentonite, LLC (sh, ct)	T. 42 N., R. 81 W., Section 34, SWSWSW
Dan Hart Patrol Service, LLC (s&g, ct)	T. 43 N., R. 73 W., Section 18, NWNE
Cole Lumber & Construction Co. Inc. (s&g, ct)	T. 43 N., R. 77 W., Section 3, S2SWNW
Lone Hart, LLC (s&g, ct)	T. 43 N., R. 77 W., Section 3, SWSE
Johnson County (s&g, fup)	T. 43 N., R. 79 W., Section 3, E2NWSE and W2NESE
Sussex Sand & Gravel (s&g, ct)	T. 43 N., R. 79 W., Section 3, NESESE and SENESE
Chapman Contracting (s&g, ct)	T. 43 N., R. 79 W., Section 3, S2N2SENWNESE and S2SENWNESE
Fuller Construction, Inc. (s&g, ct)	T. 43 N., R. 79 W., Section 3, S2SWSENE and N2NWNESE
Johnson County (s&g, fup) ¹	T. 43 N., R. 79 W., Section 9, NENE
Bell's Restoration & Roustabout Service (s&g, ct)	T. 44 N., R. 73 W., Section 5, NWNW

Operator	Legal Description
Johnson County (s&g, fup)	T. 44 N., R. 78 W., Section 18, NWSENE of Lot 16, W2NE, and SWNE
Campbell County (sc, fup)	T. 45 N., R. 70 W., Section 4, NWSWSE
Campbell County (s&g, fup)	T. 45 N., R. 73 W., Section 11, S2NESE, and N2NESE
Fuller Construction, Inc (s&g, ct)	T. 45 N., R 73 W Section 11, SWSWSE
Johnson County (s&g, fup) ¹	T. 45 N., R. 84 W., Section 26, N2SESE
Quality Aggregate & Construction, Inc. (s&g, ct)	T. 46 N., R. 77 W., Section 31, SENW and NESW
Dull Knife Dirtwork (s&g, ct) ¹	T. 46 N., R. 85 W., Section 10, SWNW and NWSW
Caballo Rojo, LLC (sc, ct)	T. 47 N., R. 71 W., Section 2, Lots 7 and 10
Cordero Mining, LLC (sc, ct)	T. 47 N., R. 71 W., Section 13, E2NE, NENE, N2SE, and SESE
Fuller Construction, Inc. (s&g, ct)	T. 47 N., R. 78 W., Section 1, NENENE
Johnson County (s&g, fup)	T. 47 N., R. 85 W., Section 23, S2NWNWSE
Johnson County (s&g, fup) ¹	T. 47 N., R. 85 W., Section 33, E2SWNWNW
Washakie County (s&g, fup) ¹	T. 47 N., R. 85 W., Section 33, N2NESENE
Peabody Caballo Mining, LLC (sc, ct)	T. 48 N., R. 71 W., Section 26, W2 of Lot 2, E2 of Lot 3, and Lots 6 and 7
Alpha Coal West, Inc. (sc, ct)	T. 48 N., R. 71 W., Section 34, Lot 4, and SE of Lot 11
Hettinger, LLC (sc, ct)	T. 48 N., R. 72 W., Section 27, Lot 13, and Section 34, Lot 4
Magna Energy Services, LLC (s&g, ct)	T. 48 N., R. 77 W., Section 7, NESW and SWNWNE
Johnson County (s&g, fup) ¹	T. 48 N., R. 77 W., Section 7, SESW
Johnson County (s&g, fup)	T. 48 N., R. 81 W., Section 23, NESW
Johnson County (s&g, fup) ¹	T. 48 N., R. 81 W., Section 25, SENWNE
Johnson County (s&g, fup)	T. 49 N., R. 81 W., Section 4, W2SENW
Campbell County (s&g, fup)	T. 49 N., R. 81 W., Section 5, W2 of Lot 2, NE of Lot 3
CCC Services, LLC (s&g, ct)	T. 49 N., R. 81 W., Section 6, Lot 2, Lot 3, NWSE, and NESW, and T. 50 N., R. 81 W., Section 31, Lot 4, SESW and SWSE
City of Buffalo (s&g, fup)	T. 49 N., R. 82 W., Section 3, S2SE
Eldridge Excavating (sc, ct)	T. 50 N., R. 73 W., Section 14, NESE
Powder River Construction, Inc. (sc, ct)	T. 50 N., R. 73 W., Section 30, E2SESW
Melgaard Construction Co., Inc. (s&g, ct) ¹	T. 50 N., R. 77 W., Section 7, NWNW
Earth Work Solutions (s&g, ct)	T. 50 N., R. 79 W., Section 19, SWNE
Johnson County (s&g, fup) ¹	T. 50 N., R. 82 W., Section 30, SENWNE
Campbell County (sc, fup)	T. 51 N., R. 71 W., Section 34, NWSE
Alpha Coal West, Inc. (sc, ct)	T. 51 N., R. 72 W., Section 18, SESW
Stinson Aggregate, LLC (s&g, ct)	T. 51 N., R. 80 W., Section 29, NW of Tr 88
Fuller Construction, Inc. (s&g, ct)	T. 51 N., R. 80 W., Section 32, SW of Tr 88
Frontier Stone Co. (sc, ct)	T. 52 N., R. 72 W., Section 2, W2SWNW
Twenty Mile, LLC (sc, ct)	T. 52 N., R. 75 W., Section 11, E2NESW
Quality Aggregate & Construction, Inc. (sc, ct)	T. 55 N., R. 73 W., Section 1, S2 of Tr 39H
Sheridan County (sc, fup)	T. 55 N., R. 82 W., Section 20, W2NESWNE and E2NWSWNE
DCM Construction, LLC (sc, ct)	T. 55 N., R. 83 W., Section 22, S2NESW
Hettinger, LLC (sc, ct)	T. 56 N., R 73 W., Section 8, SENWSW, NWSESW
Quality Aggregate & Construction, Inc. (sc, ct) ¹	T. 56 N., R. 73 W., Section 15, SWSW
Earth Work Solutions (sc, ct)	T. 57 N., R. 74 W., Section 18, SWSW
Wood Group Production Services, Inc. (sc, ct)	T. 57 N., R. 75 W., Section 18, SWNESW, NWSESW, SE of Lot 8, and NE of Lot 9
Pee Gee Ranch (sc, ct)	T. 57 N., R. 76 W., Section 22, NWNW
Bighorn Services, LLC (s&g, ct)	T. 57 N., R. 83 W., Section 6, W2, and NENE of Lot 6

Operator	Legal Description
Summit Gas Resources, Inc. (sc, ct)	T. 58 N., R. 76 W., Section 27, SESW
Source: BLM 2008f	
¹ BLM-administered surface/federal minerals. The remaining mines are on private surface/federal minerals ct sales contract E East fup= free-use permit N North R Range s&g sand and gravel S South sc clinker (scoria) sh silty shale T Township W West	

3.2.5.4. Trends

Sand and gravel deposits tend to occur along major drainages throughout the planning area and along the eastern flank of the Big Horn Mountains, but can occur in more isolated deposits across nearly the entire planning area (Map 10). Although the areal extent of clinker (scoria) in the planning area is fairly well known (Map 10), the thickness and quality of these rocks is not. The thickness and quality of sand and gravel and clinker (scoria) deposits can often only be determined through exploration, usually by trenching and sometimes by drilling. Note that where sand and gravel and clinker (scoria) deposits have been identified as occurring or likely to occur (Map 10) is not necessarily where they are likely to be mined. Such common, low-priced, bulk commodities are most likely to be developed as near the point of use as possible, to keep transportation costs low. The demand for sand and gravel is moderate in the planning area, and the largest consumers have been O&G companies for use in development of those resources. Given the estimated areal extent of these deposits and somewhat lower demand for these minerals, it is very likely that there is enough sand and gravel in the planning area to meet local demand during the planning period. The demand for clinker (scoria) in the planning area is high, and the coal mines along the eastern edge of the PRB are the main users of this mineral. Given the areal extent of clinker (scoria) in the planning area (a total of 350 square miles), there is very likely enough to meet local demand during the planning period.

Building and decorative stone of various types also occurs in the planning area, but the demand for and production of these minerals is typically of a much lower volume than that for sand, gravel, and clinker (scoria). Due to low demand and production, trends for these minerals are not discussed. Moss rock consists of lichen-encrusted scoria, limestone, and sandstone. Moss rock occurs in various areas of often limited size and extent, scattered across the planning area. Flagstone is the main building stone of interest in the planning area, and this consists of light tan to reddish to purplish sandstone layers that tend to break into predominantly flat pieces. Flagstone outcrops typically occur along the edges of the PRB.

Table 3.31, “Authorized Amounts for Salable Mineral (Mineral Materials) Disposals in the Buffalo Planning Area” (p. 422) lists amounts for recent (2000 through 2010) authorized salable minerals (mineral materials) disposals on BLM-administered lands in the planning area. The indicated amounts are only of sand, gravel, and clinker (scoria), as discussed above. These disposal authorizations are separated into contracted sales to private entities and FUPs to

government entities; no nonprofit organizations currently have approved free use of mineral materials in the planning area. All amounts authorized (cubic yards or tons) in each year for each type of mineral and by type of authorization are presented below as summations. Converting between cubic yards and tons is not always straightforward and there are a number of factors to consider; therefore, the table lists the volumes (cubic yards) and weights (tons) separately to maintain accuracy of reporting.

Table 3.31. Authorized Amounts for Salable Mineral (Mineral Materials) Disposals in the Buffalo Planning Area

Year	FUPs (cubic yards)	FUPs (tons)	Sales (cubic yards)	Sales (tons)
2000	60,000	57,500	745,100	6,450
2001	100,000	222,000	550,450	8,600
2002	60,000	182,000	897,250	18,000
2003	62,800	423,650	1,122,650	14,900
2004	37,000	121,500	881,100	107,200
2005	73,000	290,000	679,935	22,000
2006	30,000	275,000	698,650	158,000
2007	400,000	113,000	1,306,050	87,800
2008	45,000	100,500	950,000	50,000
2009	60,000	225,000	650,000	85,000
2010	58,000	185,000	800,450	65,000
2011	0	0	382,092	0
2012	200,000	0	482,075	0

Source: BLM 2008f

Note: The amounts listed in this table are the amounts that had been authorized to be produced, not actual produced amounts; actual production may have been less than the amounts authorized.

fup free-use permit

Demand for salable minerals nationwide has been increasing in recent years due to an increase in construction and general growth. However, this trend has slowed very recently due to the economic downturn beginning in late 2008, and the also decreasing price for natural gas. Matching this trend, BLM had seen a consistent increase in the amount of salable minerals sold and in the number of contracts and requests for contracts for salable minerals over recent years (Table 3.31, “Authorized Amounts for Salable Mineral (Mineral Materials) Disposals in the Buffalo Planning Area” (p. 422), above), with this trend starting to slow in the last few years. Scoria comprises the largest portion of the salable minerals mined in the planning area – approximately 75 percent of the amount (cubic yards plus tons) of all mineral materials disposals. Coal companies use most of the scoria mined in the planning area on their haul roads to allow year-round safe access in and around the coal mining areas; all from just five scoria mines. Private entities operate 13 scoria mines in the planning area. Most of these mines sell the scoria to CBNG and oil companies, mostly for use in local O&G development; and one scoria mine provides materials solely for use on a very large ranch. Three scoria mines are operated by county governments via FUPs, and this material is used for county road maintenance. The demand for scoria should remain high into the future because coal production in the PRB is expected to grow 2 to 3 percent annually (see *Leasable Minerals – Coal*) and coal companies will continue to need scoria to maintain their haul roads. Scoria is also used in O&G development, which also is anticipated to continue at a good pace (see *Leasable Minerals – Fluid*).

Sand and gravel are mined in less substantial quantities, constituting approximately 25 percent of the amount (cubic yards plus tons) of all mineral materials disposals in the planning area.

Private entities operate 16 sand and gravel mines for sales in the tri-county area to CBNG and oil companies for use in O&G development, and to construction companies for use in general construction purposes. Local counties operate 14, and a local city operates one sand and gravel mine. These agencies tend to use more sand and gravel for road maintenance than scoria, because scoria tends to break down more rapidly and often creates more dust than sand and gravel. Although sand and gravel production has decreased somewhat very recently as O&G development began to slow, production in the future will likely be at a lower volume than the current level, but is anticipated to be sufficient to meet demand.

The demand for building stone and moss rock is very low. These materials are typically sold to residents from across the planning area in small quantities, five or fewer tons, from the CUA's seven small collecting areas in Johnson County. This amount of demand is not likely to change significantly over the planning period.

3.2.5.5. Key Features

The salable minerals being developed in the planning area tend to occur at or very near the surface (Map 10). As the prices of most of these minerals are relatively low, operators look for deposits that will have lower mining, preparation, and transportation costs. This means that the deposits being explored for and developed either occur at the surface or have relatively thin overburden (the rock, sediment, and/or soil on top of a deposit and which needs to be removed prior to mining the deposit), and as near as possible to the area of use. The formations in which these minerals occur are summarized here; see *Geological Resources* or the *Mineral Occurrence and Development Potential Report* (BLM 2009c) for more information regarding these minerals.

Most aggregate (sand, gravel, and rip rap) in the planning area were derived from alluvial deposits consisting of detritus (eroded rocks) exposed in the Big Horn Mountains, or from other formations such as the Wasatch and Fort Union Formations in the PRB. Gravel deposits in the Kingsbury Conglomerate and Moncrief Members of the Wasatch Formation are especially predominant along the western and southern edges of the PRB. Aggregate from more eastern areas comes from other portions of the Wasatch and Fort Union Formations. A relatively small amount of aggregate is mined from stream beds. Clinker (scoria) is reddish- to brownish-colored to black rock, that often breaks into thinnish slabs although some areas can be vesicular (bubbly-looking). It is the vesicular portions that gave rise to the local name of scoria, as these portions can look nearly identical to that volcanic rock. Clinker formed in the PRB when rocks and sediment overlying a coal seam were baked and/or melted as the coal seam burned. Scoria is found in the Wasatch and Fort Union Formations where coal seams had caught fire along their surface outcrops or exposures along river and stream courses. It is especially prominent in the Rochelle Hills east of the coal mines in eastern and northern Campbell County, as well as north-central and south-central Sheridan County, and north-central Johnson County near Lake DeSmet, and east of Buffalo (Heffern and Coates 1997). Building and decorative stone of various types (including moss rock and flagstone) typically outcrop in localized areas, where these harder layers of sedimentary rock are exposed through erosion. Moss rock occurrences are usually limited in size and extent, and consists of lichen-encrusted scoria, limestone, dolomite, and sandstone. These are found in the Wasatch and Fort Union Formations, Madison Limestone, Bighorn Dolomite, and Lance Formation (respectively). Flagstone is the main building stone of interest in the planning area, and consists of light tan to reddish to purplish sandstone layers in the Lance Formation which tend to break into predominately flat pieces.

3.3. Fire and Fuels Management

The goals of fire management are to protect life and property; protect or enhance natural resources; and restore or maintain landscape-level fire regimes and associated vegetation characteristics. These goals are broadly defined through federal fire policy, with specific objectives identified in the local RMP.

There are two types of wildland fire: unplanned ignitions (wildfire), and planned ignitions (prescribed fire). Unplanned ignitions occur from an act of nature such as lightning, or from accidental or intentional human causes. Planned ignitions are management actions which are developed and implemented to meet resource and fire management objectives. With safety a priority, both types of fire are managed to achieve the objectives of this RMP whether those objectives are for protection or for resource benefit, or both.

Fire management on BLM-administered lands in the BFO planning area is guided by the goals and objectives in the 1985 RMP and 2001 RMP update, and is implemented by the current Wyoming High Plains District (WHPD) Fire Management Plan (FMP). Safety receives the highest priority in every situation and the costs of operations must be commensurate with the values being protected. To meet resource objectives in the RMP, fire and fuels management strategies are based on resource constraints, land and vegetation characteristics, fire histories, fire regime condition classes (FRCC) values at risk, and wildland urban or industrial interface areas.

Table 3.32, “Total Acres of Planned and Unplanned Fires in Different Vegetative Types in the Planning Area from 1990 through 2007” (p. 424) lists the acres of planned and unplanned fires from 1990 to 2007 that have occurred in different vegetation types in the planning area. For unplanned fire the data include only fires in which BLM responded or assisted, and for planned fire the data are from BLM-administered projects. In both cases, land status may include mixed surface ownership.

A summary of the 18 years of fire data show 89 fires burned about 150,000 total acres with an average of 8,300 acres burned per year. For BLM-administered lands exclusively in that same period, 79 fires burned about 25,000 total acres with an average of 1,400 acres burned per year. Years with the most fires reported were 1996 (21 fires) and 2006 (12 fires). The most acreage burned in a single year was in 2006, with approximately 58,000 acres burned across the planning area and about 7,770 acres burned on BLM surface (BLM 2007d). Lightning causes the most wildfires in the planning area. Human-caused fires are usually accidental from fireworks, open-air burning, wood cutting, railroad and vehicle malfunction, cigarette smoking, escaped campfire, and escaped prescribed fire.

Table 3.32. Total Acres of Planned and Unplanned Fires in Different Vegetative Types in the Planning Area from 1990 through 2007

Vegetation Type	Unplanned Fire	Planned Fire
Agriculture	72	0
Aspen	109	0
Ponderosa pine	9,726	470
Lodgepole pine	3,891	63
Douglas-fir & limber pine	1,787	438
Spruce/Fir	518	0
Mixed grass prairie	93,033	4,308
Mountain shrub	1,622	47

Vegetation Type	Unplanned Fire	Planned Fire
Riparian forest-dominated	173	0
Riparian herbaceous-dominated	5	0
Riparian shrub-dominated	298	0
Sagebrush	36,296	1406
Other (sparse vegetation or no record)	2,445	138
Total	149,974	6,869
Source: BLM 2012f		

In areas with scattered parcels of BLM surface estate, suppression response to small (1 to 100 acre) wildfires is often managed unilaterally by the county fire resources. These fires are oftentimes not reported to BLM or the Casper Interagency Dispatch Center and are likely not included in BLM's fire database. BLM estimates that within the planning area an annual average of 15 wildland fires burning 120 acres are not included in the database.

The counties in the planning area have each developed Community Wildfire Protection Plans (CWPP) which identify fire prevention and protection needs and establish priorities for fire mitigation projects in wildland urban interface (WUI) areas. The county Fire Mitigation Coordinators and Wyoming State Forestry Division (WSFD) guide collaboration among agencies to produce and implement the plans. In the CWPPs, areas of concern such as WUI, are identified and prioritized based on fuel hazards, risk from wildfire, FRCC assessments, infrastructure, and other values such as view-sheds and watersheds. The Healthy Forest Restoration Act (HFRA) facilitates federal involvement by requiring interagency collaboration, especially when counties have completed CWPPs.

Fire management activities must comply with the smoke management requirements of the Wyoming DEQ-AQD. For planned ignitions, BLM projects are usually large enough that they must be registered with the Wyoming DEQ AQD, and air quality must be visually monitored and reported. For unplanned ignitions in which the BLM has jurisdictional authority, there are communication, monitoring, and reporting requirements when the fire exceeds 50 acres.

Emergency stabilization and rehabilitation ES&R projects are implemented where undesirable effects from wildfire have caused resource damage or threaten public safety. Repair of firelines is not funded through the ES&R program, and must be included as part of the emergency management of the wildfire.

3.3.1. Unplanned Fire (Wildfire)

Where geographically allowed within an RMP planning area, current federal fire strategies allow a naturally caused unplanned ignition to be managed for both protection and resource benefit (multiple objectives). Currently there are no geographic areas designated in the planning area to manage unplanned ignitions for multiple objectives, so the single objective is suppression. However current and past suppression strategies include where appropriate, conditional or limited actions (indirect tactics such as burning out or holding at natural barriers) which may indirectly benefit resources by allowing more acres to burn while minimizing suppression damages. These actions are generally safer and typically reduce costs as compared to more aggressive actions such as direct fireline construction.

BMP or standard operating procedures (SOP) are applied to wildfire response strategies in sensitive areas or habitats. For example, BLM has developed nationwide BMP for Greater

Sage-Grouse habitat conservation for wildfire and fuels management (BLM 2011e). The WHPD has developed district-level fire suppression BMP to reflect objectives in the field office's RMPs. These district BMPs address heavy equipment and fire retardant use, Greater Sage-Grouse habitat and leks, big game winter ranges, bald eagle winter roosts, cultural and historic properties, historic trails, highly erosive soils, range allotments, and noxious weed areas.

The BFO emphasizes minimal use of heavy equipment for fireline construction, except where protection from wildfire is critical for safety or to preserve sensitive resources. In special management areas with BLM surface restrictions, the BLM attempts to coordinate actions with interagency cooperators. Currently, special management areas include the Welch Management Area, the Weston Hills Recreation Area, the Burnt Hollow Recreation Area, the Fortification Creek WSA, the Gardner Mountain WSA, the North Fork Powder River WSA, the Dry Fork Petrified Tree Education Area, Cantonment Reno, and the Middle Fork Management Area. In areas where mineral resources have been developed, road networks offer fuel breaks and access to wildfires.

There are several coal seam fires in and near the planning area which pose unique management issues and concerns. Coal seam fires may ignite wildfires and wildfires may ignite coal seam fires. Where ignitions can be prevented by removing vegetation, fire and fuels management strategies can be effective. Where these fires are discovered, fire personnel document and report the fires. Otherwise, coal seam fires are beyond the capabilities of wildland fire management and are discussed further in the *Health and Safety* sections of the RMP.

3.3.1.1. Regional Context

The BFO coordinates its fire suppression resources and operational support for pre-suppression planning and suppression actions at the WHPD level with the USFS, the WSFD, county fire departments, and local fire protection districts. The BLM maintains Interagency Annual Operating Plans (AOP), which include operating agreements with county fire organizations and the WSFD, Medicine Bow National Forest, Bighorn National Forest, Crow Tribal Agency, and neighboring BLM offices. The WHPD fire program coordinates activities through the Rocky Mountain Area Coordination Center (RMACC), which includes most of Wyoming and South Dakota, and all of Colorado, Nebraska, and Kansas.

3.3.1.2. Indicators

Fire as a disturbance mechanism on the landscape affects vegetation communities in terms of structure and species composition. For most vegetation settings, natural or historic fire frequency and severity maintain a characteristic range of seral stages on the landscape. If these fire effects are altered, some seral stages may become too abundant, underrepresented, or disappear. This in turn may affect future fire size or severity. Other factors such as invasive plants, or other types of disturbances may contribute to uncharacteristic conditions.

FRCC methodology is a standardized interagency process to assess and monitor fire disturbance regimes and associated vegetation conditions. FRCC uses five fire regime groups (Fire Regime Condition Class 2008) as shown in Table 3.33, "Fire Regime Condition Class System" (p. 427), and three condition class categories (see bullets below the table) that indicate the departure of a plant community/setting from its historic fire regime. If a plant community/setting has missed fire cycles, there may be changes to key ecosystem components such as species composition, richness, and structure; fuel load characteristics; fire size, severity, and burn pattern; and other associated disturbances such as insect or disease-related mortality.

Table 3.33. Fire Regime Condition Class System

Group	Frequency	Severity	Severity Description
I	0 to 35 years	Low/mixed	Generally low-severity fires replacing less than 75% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the over story.
II	0 to 35 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation.
III	35 to 200 years	Mixed/low	Mixed-severity with less than 75% of the overstory vegetation replaced.
IV	35 to 200 years	Replacement	High stand replacement-severity fires with greater than 75% of the dominant overstory vegetation replaced.
V	200 or more years	Replacement/any severity	Any (stand replacement) severity.

Source: Havlina 2010

Condition class describes ecosystem health as follows:

- **Condition Class 1 (CC1):** Fire regimes on these lands are mostly within historical ranges. Vegetation composition and structure are intact. Therefore, the risk of losing key ecosystem components from the occurrence of fire is relatively low.
- **Condition Class 2 (CC2):** Fire regimes on these lands have been moderately altered from their historical range by increased or decreased fire frequency. A moderate risk of losing key ecosystem components has been identified on these lands.
- **Condition Class 3 (CC3):** Fire regimes on these lands have been substantially altered from their historical return interval. The risk of losing key ecosystem components from fire is high. Fire frequencies have departed from historical ranges by multiple return intervals. Vegetation composition, structure, and diversity have been substantially altered. Consequently, these lands verge on the greatest risk of ecological loss.

Regardless of disturbance mechanism, some lands fall into the CC3 category if they exhibit uncharacteristic vegetation such as non-native invasive plant species. For example, areas of high density annual bromes would be classified as CC3.

3.3.1.3. Current Condition

One of the goals of the fire program is to improve CC3 and CC2 conditions by implementing fire and fuels treatments, including appropriate management of unplanned ignitions. A district-wide FRCC assessment has been done for the planning area utilizing LANDFIRE National layers. Though there may be inaccuracies in the data inputs for this planning area, the coarse-scale results are helpful to broadly identify current conditions and the priority settings in which management actions could focus efforts. For BLM-administered lands in the BFO, Table 3.34, “Fire Regime Condition Class Assessment for the Buffalo Field Office” (p. 428) outlines the most common LANDFIRE BioPhysical Settings, the fire regime group of each setting, and the acres of each condition class. As improved or local data become available, the assessment will be updated and monitored via the WHPD FMP.

In the assessment it is important to view the general results rather than specifics such as names and exact acres. In general the fire regime groups and condition classes agree with local knowledge and experience, particularly in conifer settings where stand structures have generally become more dense or closed-canopy in the past 20 to 40 years. The assessment is helpful to prioritize, in conjunction with other land health assessments, areas where planned and unplanned

fire might be managed to improve FRCC in forest settings, wildlife habitats, WUI areas, and other resource objectives. See the *Planned Fire* section for further discussion about FRCC in relation to vegetation treatments.

Based on localized project data in conifer settings of the planning area, FRCC closed stand structures are generally overrepresented on the landscape and open stand structures are generally underrepresented. In plain terms there are too many thick conifer stands and not enough open stands, which is likely due to interactions among natural disturbances, climate change, and human activities such as fire suppression, grazing, and forest management in the last several decades (Brown and Sieg 1999; Meyer et al. 2005). Management actions can directly improve this situation through vegetation treatments such as thinning or prescribed fire to create more open structured stands. Conversely in some lower elevations of the planning area, it is likely that early seral structures of ponderosa pine have become overrepresented on the landscape due to recent and repeated occurrence of high severity stand-replacement fire. Thinning or prescribed fire treatments in this latter situation can indirectly improve landscape conditions by preserving mature stands while early seral stages establish pine seedlings and continue to mature.

In sagebrush settings, due to current and anticipated levels of disturbance from human actions and wildfire, management actions must prioritize preservation of Greater Sage-Grouse habitat over FRCC objectives. Prescribed fire or other treatments may be used to protect or enhance sagebrush stands which in turn would likely improve FRCC.

Where annual bromes occur on the landscape, in FRCC terms it is considered uncharacteristic and is classified as CC3 and the associated fuel loading may shift fire regimes (Balch et al. 2013) and further jeopardize resource loss from wildfire. It is estimated that 50 percent of the planning area has a moderate to high probability of annual bromes presence (Meinke et al. 2009) due to past and current human activities such as mineral development, livestock grazing, vegetation treatments, and wildfire.

Table 3.34. Fire Regime Condition Class Assessment for the Buffalo Field Office

LANDFIRE BioPhysical Setting Name	Fire Regime Group	Stand FRCC Acres for BLM-Administered Lands			
		Condition Class 1	Condition Class 2	Condition Class 3	Total Acres
Northwestern Great Plains Mixed grass Prairie	2	217,566	155,575	15,021	388,161
Inter-Mountain Basins Big Sagebrush Steppe	4	99,578	83,577	3,258	186,413
Inter-Mountain Basins Montane Sagebrush Steppe	4	61,764	777	8,277	70,817
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	1	9,679	0	23,160	32,838
Southern Rocky Mountain Ponderosa Pine Woodland	1	2,416	16,501	3,978	22,894
Northwestern Great Plains-Black Hills Ponderosa Pine Woodland and Savanna - Savanna	1	9,571	15,647	8,759	18,977
Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	3	3,790	2	7,083	10,875
Source: LANDFIRE 2011					
Assessment at HUCs 4, 5, & 6 for Wyoming High Plains District and joined to BLM-administered lands within the Buffalo Field Office.					
BLM Bureau of Land Management FRCC Fire Regime Condition Class HUC Hydrologic Unit Code					

3.3.1.4. Trends

Wildland fire management has been shaped by several forces in the past 100 years. Nationally, catastrophic fires (loss of life and property) at the beginning of the 20th Century resulted in 100 percent suppression policies for much of the next 70 years. This approach came into question as fuel loads increased in forests across the country. As a result some land management agencies instituted a let-burn policy in the 1980s. In the late 1980s, several of these fires became larger than intended. These fires, followed by another intense season in 1994, caused another shift in management toward prescribed burning as a way to reduce fuel loads and prevent such high severity fires. The focus on prescribed fire remained strong until several prescribed-fire disasters in 2000. After the 2000 wildfire season, the National Fire Plan (National Fire Plan 2009) was developed, with emphasis on developing firefighting resources; rehabilitation of fire-damaged lands; hazardous fuels reduction treatments; community assistance for fire mitigation and education projects; and accountability. In recent years, land managers have recognized the benefits of a wide range of fire management strategies, including not only prescribed fire and other vegetation treatments but managing wildfires where possible to meet fuels reduction and other resource objectives. These strategies are reflected in the Guidance for Implementation of Federal Wildland Fire Management Policy (USDA and DOI 2009).

Across most of the US, fire seasons are generally lasting longer with larger and higher severity fires becoming a common occurrence. It is anticipated that climate change will further extend fire seasons. Invasive plants such as annual bromes have expanded to create extensive areas of fine fuels (Balch et al. 2013; Meinke et al. 2009), through which fire moves quickly and thoroughly. WUI and industrial interface areas have become more complex and extensive than previously considered in the 1995 and 2001 Federal Fire Policy reviews. To ensure firefighter and public safety, fire management activities in developed areas have required close coordination among all agency fire managers, including federal, state, local, and tribal lands. The National Fire Plan's guiding documents, and the Healthy Forest Initiative and Restoration Act address and facilitate this coordination.

Within the planning area, new or expanding concerns have changed the focus of wildland fire management. Energy development and human activity in the PRB will expand industrial interface areas and likely increase human-caused fires. Urban residential development is expanding throughout the planning area, especially in the southern Big Horn Mountains and foothills. With the potential listing of the Greater Sage-Grouse as a Threatened species, response to wildfires in Greater Sage-Grouse habitat has changed from limited or conditional suppression (indirect, least-cost tactics) to full protection. All of these changes increase costs and add complexity to wildland fire management.

3.3.1.5. Key Features

Key features are sensitive resources or important areas in the planning area that outline objectives for fire management. Specific to unplanned fire, other important features are BLM developed sites, industrial interface areas, and urban interface areas identified in the CWPPs. These areas would receive priority for wildfire protection and for hazardous fuels reduction treatments.

Depending on the alternative selected, unplanned ignitions may eventually be managed for multiple objectives in predefined areas. Key resource features in these future areas would indicate circumstances and strategies to meet resource benefit objectives with unplanned fires.

The Campbell County CWPP encourages BLM to consult and coordinate the development of resource benefit fires in areas with larger blocks of federal lands.

3.3.2. Planned Fire (Prescribed Fire)

Prescribed fire is a wildland fire intentionally ignited by management under an approved plan to meet specific objectives. Implementation of prescribed fire projects is subject to the same policies, practices, and constraints that guide all fire management actions. As a planned activity, prescribed fire projects are subject to NEPA analysis, BLM policies, and Wyoming state requirements. In the planning area, mechanical treatments and chemical treatments are used in conjunction with fire or instead of fire to meet resource objectives.

Developed sites on or adjacent to BLM-administered lands receive highest priority for fuels management activities. The counties in the planning area have each developed CWPP which identify and establish areas of concern such as WUI or industrial interface, and prioritize the areas for treatments or other actions. The BLM fuels and forestry programs have worked with other agencies and fire authorities to collaborate hazard fuels assessments, mitigation plans, and treatments in urban interface areas. The BLM has initiated and funded cooperative agreements in the southern Big Horn Mountains to support defensible space protection for structures adjoining public lands.

Fuels treatments in non-interface areas are based on interdisciplinary objectives such as forest and rangeland health, and wildlife habitat protection or improvement. In forest treatments, prescribed burning typically follows mechanical treatments to reduce activity fuels such as slash piles, but sometimes fire treatments may include broadcast burning to reduce surface fuels and encourage shrub, grass, and forb regeneration. To complete some forest treatment projects, several years may be required to implement all phases of mechanical and prescribed fire treatments.

Fuels management objectives in Greater Sage-Grouse habitat reflect current guidance for Greater Sage-Grouse habitat conservation, including maintenance and protection of existing habitat, and restoration of previous habitat. BMPs for fuels treatments would be applied to project design, including required habitat assessments.

Limber pine was listed as a Wyoming BLM sensitive species in 2010 because of high mortality from white pine blister rust and bark beetle epidemics in the central and northern Rockies. In addition, there is incomplete understanding of the species' potential ecotone shift and future range as climate change progresses. In the past several decades, limber pine and juniper have expanded into mountain shrub communities and foothill sagebrush communities and have affected important wildlife habitat. Prescribed fire treatments and more recently mechanical treatments have targeted removal of conifers in these shrubland habitats. Other vegetation treatments in limber pine stands have included forest health projects in the southern Big Horns, which have attempted to alleviate insect and disease problems and hazardous fuel loadings. With limber pine listed as a BLM sensitive species, projects must consider the limber pine and maintain an appropriate limber pine component on the site. To assist with these assessments, the BLM has developed statewide management guidelines for whitebark pine and limber pine (five needle pines) which include general guidelines for fire management, and general silvicultural prescriptions for mechanical treatments in a wide range of limber pine settings.

3.3.2.1. Regional Context

The BFO coordinates implementation of prescribed fire projects at the district level and uses nearest available resources such as adjacent BLM districts, the USFS, the WSFD, county fire departments, and qualified contractors. Where non-BLM-administered lands are included in treatment areas, the BLM enters into MOUs with affected parties.

3.3.2.2. Indicators

See the *Unplanned Fire (Wildfire)* section for the discussion of the FRCC system used to classify ecosystem fire characteristics and prioritize areas for treatments.

3.3.2.3. Current Condition

See the *Unplanned Fire (Wildfire)* section for further discussion of the FRCC assessment and current conditions in the planning area. In the assessment it is important to view the general results rather than specifics such as BioPhysical Setting names and exact acres. In general the fire regime groups and condition classes agree with local knowledge and experience, particularly in conifer settings where vegetation treatments may focus attention on CC3 acres. In Greater Sage-Grouse habitat, sagebrush preservation and protection would be prioritized over FRCC objectives and restoration of fire regimes. Alternatively, in forest and woodland settings, especially where there are interface developments, treatments would be prioritized to reach CC1 conditions. Elsewhere, the assessment is helpful to prioritize, in conjunction with other land health assessments, areas where vegetation treatments could improve FRCCs in forest health treatments, wildlife habitat projects, and other resource improvement projects.

3.3.2.4. Trends

The BFO has maintained a prescribed fire program since the early 1980s. From 1985 through 2001, most prescribed fires were broadcast burns of sagebrush/grass fuels performed to meet livestock and big game wildlife forage objectives. Secondary objectives were to reduce or break the continuity of fuels, thereby reducing the risk of high severity or uncharacteristic effects from wildfire. Most of the prescribed burns were implemented in cooperation with individual grazing lessees and WGFD-managed habitat units. During the 17-year period, the BLM had the lead role in performing 12 prescribed fires covering an estimated 6,000 acres, of which approximately 30 percent was public land surface.

With passage of the National Fire Plan (National Fire Plan 2009) and subsequent Congressional actions and Executive Orders (EOs), the emphasis on prescribed fire shifted toward hazardous-fuel reduction, especially in the WUI. Hazardous-fuel reduction objectives have been accomplished in the planning area using both prescribed fire and mechanical treatments. From fiscal years 2003 through 2008, the BFO implemented 15 prescribed fire projects within WUI to treat approximately 3,100 acres of public land, and 17 prescribed fire projects outside WUI to treat approximately 5,200 acres of public land. During that same period, the BFO implemented 13 mechanical fuel treatments within WUI to reduce hazardous fuels on approximately 224 acres of public land. Outside WUI in that period, eight mechanical fuel treatments were applied to 582 acres of public land. Most of the non-WUI mechanical treatments were associated with forest management treatments, or salvage actions following wildfire. Two mechanical projects were implemented to improve rangeland conditions.

With the warranted but precluded listing of the Greater Sage-Grouse and the expansion of annual bromes in the planning area, prescribed fire treatments have declined in sagebrush settings. Fuels treatments have focused on reducing conifer expansion in Greater Sage-Grouse habitat, and will trend towards treatments that protect or restore sagebrush habitats from fire damage or invasive plant species.

An important part of future treatments in any site will utilize native plant materials developed through BLM's Seeds of Success program. This program facilitates local seed collections that may be grown out as seedlings or seed stock for use in rehabilitation or restoration projects.

3.3.2.5. Key Features

Key features are important areas or sensitive resources that outline objectives for fire and fuels management. Relative to planned fire and fuels treatments, key features could be vegetation situations which do not meet management objectives and may require treatments. Examples include fire, mechanical, or chemical treatments in shrubland habitats to remove conifer expansion, or forest health treatments to reduce the risk of insect and disease infestations.

Specific to hazardous fuels management, key features include the WUI areas of concern identified in the CWPPs. These areas are considered at risk from wildfire and have been prioritized in the WUI to receive fuels treatments and fire education efforts. Where BLM-administered lands intermix with these areas of concern, BLM prioritizes treatments to match the priorities of the WUI. In Johnson County, BLM-administered lands in the Clear Creek watershed and lands accessed by the Hazelton Road are current priorities for BLM treatments. Current priorities in Sheridan County are the BLM-administered lands along Red Grade Road; and in Campbell County, the BLM is encouraged to continue hazardous fuels reduction and resource improvement projects in general.

3.3.3. Stabilization and Rehabilitation

Repair of firelines is part of the fire suppression emergency response and should be done with suppression or contract resources as soon as possible after fire containment. ES&R projects are done after fire containment to repair damages from the fire itself. ES&R projects must compete for funding at the national level.

Emergency stabilization actions are implemented soon after the fire to protect life and property; to stabilize soils and watersheds; to protect unique biological resources; and significant heritage sites. These stabilization actions include project planning and NEPA documentation, and must be implemented within 1 year of fire containment.

Burned-area rehabilitation projects are developed to restore fire-damaged lands which are unlikely to recover naturally. In rehabilitation plans there is no immediate threat to safety or a specific resource, and treatments may include repair or replacement of minor facilities such as fences and campgrounds. These plans must undergo NEPA analysis and must be completed within 3 years of fire containment.

3.3.3.1. Regional Context

Until 2005, the WHPD has reported only four ES&R burned-area rehabilitation projects; three in the Newcastle Field Office and one in the BFO. In contrast hundreds of projects have been

reported in other western states since 2005, where annual bromes have altered fire behavior and severity, or where damaged watersheds affect WUI areas.

3.3.3.2. Indicators

Large fires in conifer settings, important habitats, critical watersheds, WUI areas, or areas at risk from invasive plants could be cause to initiate formal ES&R planning.

3.3.3.3. Current Condition

The current RMP and update provide for ES&R of any area affected by wildfire. ES&R projects are implemented to stabilize slopes which threaten public health or safety or to rehabilitate lands that are unlikely to recover from undesirable wildfire effects.

See *Unplanned Fire (Wildfire)* and *Planned Fire (Prescribed Fire)* for a discussion of the FRCC assessment. Condition Class 3 (CC3) situations in forested settings or from annual brome expansion could create large fire size or undesirable fire effects which require ES&R treatments.

3.3.3.4. Trends

From 1985 to 2003, the BFO developed only one ES&R plan for the 2003 Big Spring Fire, which was in the southern Big Horn Mountains adjacent to the Billy Creek area where there is a high density of summer cabins. The plan included emergency actions such as hazardous tree felling, and non-emergency rehabilitation actions such as road grading and facilities replacement. With the warranted but precluded listing of the Greater Sage-Grouse and the probable expansion of annual bromes in the planning area (Meinke et al. 2009), it is likely there will be increased need for rehabilitation of burned areas and restoration of sagebrush/grasslands after wildfire. In fact, since 2011 two additional ES&R plans have been developed to treat annual bromes and other weeds in Greater Sage-Grouse habitat, and other funding will follow up with sagebrush seeding treatments. Although other large fires in 2012 burned Greater Sage-Grouse priority habitat (Core Population Areas and Core Population Connectivity Corridors), ES&R plans were not developed primarily because funding was not available in that program. Weed treatments and restoration of Greater Sage-Grouse habitat have been and will be done as possible with other funding sources.

Approximately 50 percent of the wildfires in the planning area have required repair of suppression damages on BLM-administered lands, consisting primarily of re-contouring slopes along blade lines and water barring fire lines. Occasionally fire lines require weed treatments or are reseeded. It is anticipated that repair needs in the future will require more actions to prevent the spread of invasive plants in important habitats.

With the development of BLM's national Seeds of Success program, native and local native plant materials will become more widely available for ES&R work.

3.3.3.5. Key Features

Key features are sensitive resources or important areas in the planning area that outline objectives for fire management. Specific to unplanned fire and ES&R treatments, important areas would include WUI watersheds, high severity burns in forested settings, areas with important wildlife habitat, and areas where invasive plant species threaten the burned area.

3.4. Biological Resources

3.4.1. Vegetation – Forests and Woodlands

This section describes existing conditions for forest and woodland vegetation communities within the planning area. Table 3.35, “Distribution of Forests and Woodlands on BLM-Administered Land in the Buffalo Planning Area” (p. 434) lists the acreages of forests and woodlands in the planning area.

Table 3.35. Distribution of Forests and Woodlands on BLM-Administered Land in the Buffalo Planning Area

Classification	Planning Area (Acreage)	BLM Acreage
Forests	651,000	51,224
Woodlands	26,147	26,005
Total	670,225	77,229
Source: BLM 2012f		
Note: Acreages do not sum to total because of resource overlap.		
BLM Bureau of Land Management		

3.4.1.1. Regional Context

The planning area lies on the east side of the Big Horn Mountain and extends into the PRB. The ecoregions for the forest lands are the Granite Subalpine Zone, the Dry Mid-Elevation Sedimentary Mountains, and the Pryor Bighorn Foothills. There are seven major forest management units and smaller units that are scattered tracts from the north end of the planning area west of Sheridan, Wyoming on the Red Grade Road and larger contiguous tracts that extend from Mosier Gulch to the Hole in the Wall campground in the South Big Horns. The geographical area includes the Billy Creek forest management area at the North end of Hazelton Road on the east facing slopes of the Big Horns, the Powder River Management Area, Hazelton Road Management Area, the Horn, Bear Trap Management Area, Garden Mountain Management Area, and the Graves Corral Management Area on the southern end.

There are scattered woodlands throughout the tri-county area with concentrations of woodlands in Campbell and Johnson counties. They are concentrated in the Pine Scoria Hills, the Casper Arch, the Mesic Dissected Plains, and the PRB Ecoregions. The woodlands in Campbell County, extend from Dead Horse Creek to Bitter Creek on the Montana border, on the east side from Homestead Draw to Horse Creek, and in the southeast from Corral Creek to 7 Prong Creek. The woodlands extend on the east side of the south Big Horns to the Middle Fork Powder River in Johnson County.

3.4.1.2. Indicators

The forest and woodlands need to be managed for ecosystem health and integrity, for the purpose of discussion in this RMP, the following are considered characteristics of forest and ecosystem health: the resources that play a role in the forest and woodland health, such as soil and water should be conserved and maintained. Indicators of forest and woodland health are the amount, diversity, and age class structure of the forest and woodland communities. The goal is for

healthy forest and woodland communities sustained in their desired ecological conditions while also considering clear management objectives of each forest and the supply and demand of the communities. These forest and woodland communities should be resilient, diverse, and able to recover from natural and human disturbances.

The BLM uses the Forest Vegetation Information System for storage, retrieval, and analysis of both tabular and spatial data about forest lands. Outputs of this system include descriptions of existing vegetation, classifications of sites relative to current conditions, potential vegetation and site productivity, data to run forest growth and structure models, inputs for wildlife habitat models, landscape descriptions, quantification of forest products, aids for developing silviculture or forest restoration treatments, and records of treatments and disturbance events.

3.4.1.3. Current Condition

The BFO administers 77,229 acres of forests and woodlands. Forests and woodlands are distinguished by type (species composition) and the physical environment in which they grow.

Forest Communities

The dominant forest species include lodgepole pine, ponderosa pine, Douglas fir, Engelmann spruce, subalpine fir, and aspen. Forest composition ranges from pure single species stands, to stands of mixed species. Ponderosa pine dominates at the lower elevations and on the northern aspects, Douglas fir and lodgepole pine are often present. As the elevations rise, ponderosa pine forests become scattered and less frequent while lodgepole pine and Douglas fir forests increase and become dominant.

Aspen stands are influenced by soil moisture and fertility. Therefore aspen stands are often small and scattered throughout the lodgepole pine and Douglas fir zone. Aspen is an early successional species, intolerant of shade, and therefore is replaced by the shade tolerant conifers.

Forests support, define, and create stability for a multitude of resources, including watersheds (soil and water), wildlife (provide protection, food, and habitat), recreation, air quality (carbon sequestration), other plant communities, products for mankind (e.g., homes and paper products), and are aesthetically pleasing. Forest communities and forest management areas in the planning area are displayed on Map 26. Forest products are discussed further in their own section.

Past harvesting activities, fire suppression, and natural succession have promoted the development of dense forest stands throughout these mountains. Lodgepole pine, ponderosa pine, and Douglas fir stands are unnaturally dense and dominated by a single canopy layer from mid-age to over-mature trees. Consequently, competition among trees for water, light, and nutrients is pronounced.

The distribution of aspen and limber pine is declining. Aspen is a successional species that benefits from fire and other disturbances. Reduced burning and competition from conifers has decreased the number, the health, and the vigor of aspen clones. According to a report on forest health published by the WSFD, the average age of aspen forests is 68 years (Wyoming State Forestry Division 2001). The limber pine is being infected by blister rust disease that is resulting in mortality. The USFS (2008) estimates blister rust has caused a 60 percent mortality rate. Limber pine, though not a desirable commercial species, is favored by the Clark's nutcracker and many small rodents for its seeds.

Woodland Communities

Woodland communities are scattered throughout the three-county planning area (Map 26). They range from small monotypic stands to large mixed stands of quaking aspen, limber pine, ponderosa pine, Rocky Mountain juniper, and Utah juniper. The largest woodland stands occur in the southern Big Horn Mountains. Woodlands differ from forests because woodlands typically grow as a savannah. The trees are widely dispersed with grasses, forbs, and shrubs in the understory. Because of the open growing conditions, woodlands exhibit different growth characteristics from forests. The tree crowns extend from the base of the bole to the top of the crown. Woodlands play an important role in the landscape as they provide cover, food, and protection for many wildlife species.

Woodland communities typically do not produce wood that is desirable for high-quality wood products. However, woodlands play an important role in the woody biomass market. They are utilized as firewood, furniture, decorative, and hobby wood products.

Fire suppression and other human management activities have enabled the expansion of woodlands into meadows. This is desirable in some locations, but undesirable in others. Concerns with encroachment include woody fuel buildup, especially in the wildland-urban interface, and the loss of open meadows. Woodland encroachment into meadows typically reduces biological diversity and available forage.

3.4.1.4. Trends

Stressed trees have poor resistance and are therefore vulnerable to attacks by the mountain pine beetle, ips engraver beetle, Douglas fir beetle, rust, and diseases. The USFS Forest Health Protection report indicates a growing Douglas fir beetle problem and an increase in acres affected by insects and disease in the Big Horns.

Increased pressure on forest and woodland communities will continue with increasing energy development. Woodland communities would be affected most with their greater distribution within the planning area; the predominant threat to forest communities would be the introduction of renewable energy development to the southern Big Horn Mountains and restrictions placed on forest and woodland management by other resource values. The Middle Rockies and Northwest Plains Rapid Ecological Assessments, which encompass the planning area, will be released in 2014.

3.4.1.5. Key Features

Aspen and limber pine communities are key features due to their declining trend within the planning area and across their geographic ranges. Table 3.36, “Acres of Dominant Tree Species in the Planning Area” (p. 436) portrays the acreage of dominant tree species in the planning area.

Table 3.36. Acres of Dominant Tree Species in the Planning Area

Dominant Tree Species	Acres on BLM-Administered Land
Ponderosa pine	28,521
Lodgepole pine	10,289
Douglas fir/Limber pine	12,208
Spruce/Fir	3,045
Aspen and Riparian mix	1,759

Dominant Tree Species	Acres on BLM-Administered Land
Juniper	3,716
Ponderosa woodlands	17,485
Source: BLM 2012f	
BLM Bureau of Land Management	

3.4.2. Vegetation – Grassland and Shrubland Communities

Grasslands and shrublands are the most productive grazing land in the planning area. These two community types can be found from the foothills of the Big Horn Mountains to the east boundary of the planning area (Map 25). These communities symbolize the “open” prairie landscapes that typify Wyoming. Grasslands represent most of the topographical positions, from the open plains to the foothills, to dry mountain slopes. Grasslands in the plains are dominated by cool-season grasses, sedges, and shrubs, mainly sagebrush. The warmest and driest grasslands can also have warm-season species with few shrubs. Sagebrush is the most dominant shrubland type within the planning area, found primarily on the open plains, but also in mountain settings. It is dominated by Wyoming big sagebrush, mountain big sagebrush, mountain mahogany, and greasewood. Wyoming big sagebrush tends to grow in the low to mid elevations on the drier sites, while mountain big sagebrush occurs in upper elevations in moister conditions, in the southern Big Horn Mountains. Vegetation supports clean water, soil health, fish and wildlife habitat, livestock forage, recreation, natural carbon sequestration, and scenery.

Vegetation characteristics that are common indicators of vegetation health include cover, composition, amount of bare-ground and litter, structural diversity, species diversity, and the presence or the ability to maintain unique or special status species, and density of invasive species. These indicators are associated with ecological sites and with Standards 1, 3, and 4 of the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the BLM in the State of Wyoming* (BLM 1997). Ecological sites are determined from NRCS for MLRA (geographically associated land resource units): 58B – Northern Rolling High Plains.

Grassland and shrubland communities account for approximately 6,293,727 acres of the planning area, of which 718,636 acres are BLM surface. Most of the grassland and shrubland communities in the planning area have been influenced by livestock grazing, fire or fire suppression activities, and surface-disturbing activities.

3.4.2.1. Regional Context

The BFO lies within one MLRA: the Northern Rolling High Plains, Southern Part – 58B (NRCS 2008). This area is characterized by grasses and shrubs with gently rolling to steep slopes and occasional flat-topped, steep sided buttes rising above the plains. Elevations range from 3,800 to 11,000 feet, with elevation increasing gradually from north to south.

3.4.2.2. Indicators

The condition of the grassland and shrublands in the planning area was evaluated utilizing the ecological site inventory. Any land inventory, analysis, and resulting management decisions require knowledge of these individual sites and their interrelationships to one another on the

landscape. The ecological site description contains information about the individual ecological sites.

The data comprising an ecological site description is presented in four major categories:

- Site Characteristics – Identifies the site and describes the physiographic, climate, soil types and limitations, and water features associated with the site.
- Plant Communities – Describes the ecological dynamics and the common plant communities comprising the various vegetative states of the site. The disturbances that cause a shift from one state to another are also described.
- Site Interpretations – Interprets information pertinent to the use and management of the site and its related resources.
- Supporting Information – Provides information on sources of information and data utilized in developing the site description and the relationship of the site to other ecological sites.

Congress mandated natural resource inventories in Section 201(a) of the FLPMA. Congress reaffirmed this mandate in Section 4 of the Public Rangelands Improvement Act of 1978 – in particular, to develop and maintain an inventory of range conditions and trends on public rangelands, and to keep that inventory updated. The BLM does and will continue to use land health status to report conditions and trends of rangelands in compliance with FLPMA and the Public Rangelands Improvement Act of 1978. Ecological Site Descriptions will be used as the foundation for determining rangeland health status by identifying the soil types and potential vegetation communities. The process spelled out in BLM Handbook H-4180-1, Rangeland Health Standards, will be used to assess and evaluate land health status.

3.4.2.3. Current Condition

Livestock grazing is the largest and most historic use of grasslands and shrublands in the planning area (see the *Livestock Grazing Management* section of this chapter for more information).

The second largest impact on grasslands and shrublands, in the planning area, is mineral development. This impact occurs throughout the ecosystems in northeastern Wyoming and involves the extraction of gas, oil, coal, uranium, bentonite, and other minerals. Extraction of these minerals has resulted in direct removal of sagebrush and grasslands. Mine excavation, roads, drill pads, fences, powerlines, pipelines, and other mining activities fragmented habitat. Surface-disturbing and other activities caused removal or mechanical damage to plants, invertebrates, and biological soil crusts. Damage occurred in terms of both the amount (overall biomass, density, and cover) and diversity (species presence and richness). These activities can be associated with the recent increases in the introduction and spread of invasive species, and compaction of soils.

The continuation of CBNG and energy development drives conditions on grasslands and shrublands. Conditions include the number of acres of soil and vegetation disturbance from construction of roads, trails, well sites, and utility corridors. Disturbance also includes the number of water-holding impoundments, which often are in the most productive vegetative areas (draw bottoms) and their associated seeping, which provides a premium medium for the establishment of invasive species. Reclamation practices on these disturbed sites included the introduction of non-native species to stabilize soils, which out-competed native species, disrupted grazing systems during site development and reclamation, and provided opportunities for invasive species, including the annual brome species, to occupy exposed soils. Other drivers include disposal of CBNG produced water, which altered soil capabilities and functions and the

vegetative community, moving the vegetative community from a natural xeric plant community to a mesic community.

The impacts to grassland and shrubland communities from drought has varied widely. The primary impacts of extended drought were reduced vegetative production, cover canopy, diversity, microbial function, and heights of grasses, and increased soil erosion. Drought also provided a growing advantage to annual bromes because even low amounts of snowfall were adequate to provide enough moisture to initiate growth in late winter through seedset in spring. Additional factors that brought change to the planning area included the occurrence or lack of wildfires, climate change, development of recreational sites and opportunities, and sprawl of human dwellings in rural settings.

Management challenges for grassland and shrubland communities include the spread of invasive species; lack of a natural fire regime; integrating treatments of multiple resource programs to achieve landscape-level objectives; future energy development; the potential impacts of climate change; competition for forage between native ungulates and livestock; habitat fragmentation; restoration of areas damaged by surface-disturbing activities to mitigate potential impacts related to erosion and water quality; competition between resource users; and maintaining a distribution and diversity of these communities sufficient to support wildlife, special status species, livestock, and other competing multiple-use demands on BLM-administered lands.

Table 3.37, “Distribution of Grasslands/Shrublands on BLM-Administered Land and BLM-Administered Mineral Estate in the Buffalo Planning Area” (p. 439) lists the acreages of grasslands and shrublands in the planning area.

Table 3.37. Distribution of Grasslands/Shrublands on BLM-Administered Land and BLM-Administered Mineral Estate in the Buffalo Planning Area

Vegetation Class	BLM Surface Acres	Percent of BLM-Administered Land within the Planning Area	BLM-Administered Mineral Acres	Percent of BLM-Administered Minerals Land within the Planning Area
Mixed Grass Prairie	93,349	11	765,546	16
Short Grass Prairie	453,153	58	2,454,815	51
Other Shrubland (Mesic Upland Shrub Steppe and Xeric Upland Shrub Steppe – Mountain Mahogany)	14,250	2	21,988	0.5
Sagebrush shrubland (Wyoming Big Sagebrush and Grassland and Mountain Big Sagebrush and Grassland)	167,884	21	1,320,672	28
Source: BLM 2012f				
BLM Bureau of Land Management				

See the *Livestock Grazing Management*, *Fire and Fuels Management*, and *Invasive Species and Pest Management* sections of this document for additional information.

The following sections describe the grassland and shrubland vegetation communities in the planning area.

Grasslands

Short-grass Prairie

This vegetative type represents very sparse, sparse, and thin dry herbaceous rangeland types, as defined by the WGFD. The 453,153 acres of short-grass prairie comprises approximately 58 percent of the BLM surface in the planning area. This vegetative type occurs on drought-prone, mildly alkaline, medium-textured, and fine-textured soils. Few shrubs grow consistently in short-grass prairie because the soils are too dry and compacted to support them. In the planning area, short grass prairie habitats are most common in the south, occurring as the dominant plant community from the southern foothills of the Big Horn Mountains to the eastern boundary of the planning area. The topography consists of gentle rolling plains occasionally dissected by draws, creeks, and rivers. Pine-covered ridges with numerous draws are common. According to NRCS MLRA 58 B Northern Rolling High Plains, this area is mapped in the 10-inch to 14-inch precipitation zone. Precipitation is an important determinant of the composition of plant species in grasslands. The dominant vegetation species are blue grama, western wheatgrass, sand dropseed, needle and thread, scarlet globemallow, and four-wing saltbush.

Mixed-grass Prairie

This vegetative type is a combination of low, medium, and high herbaceous rangeland types, as defined by the WGFD. The 83,349 acres of mixed-grass prairie comprises about 11 percent of the BLM surface in the planning area. The topography consists of gentle rolling plains occasionally dissected by draws, creeks, and rivers. Precipitation is an important determinant of the composition of plant species in grasslands. Mixed-grass prairie can be divided into several types and is characterized by several common species, including needle and thread, western wheatgrass, blue grama, pricklypear cactus, and scarlet globemallow. Wyoming big sagebrush is a common shrub of this grass community in the PRB (Knight 1994). In the planning area, mixed-grass prairie habitats are most common along the eastern foothills of the Big Horn Mountains and occur throughout much of the northern and central portions of the planning area. According to NRCS MLRA 58 B Northern Rolling High Plains (NRCS 2008), the foothills area is mapped in the 15-inch to 19-inch precipitation zone and the northern and central areas are mapped in the 10-inch to 14-inch precipitation zone, but generally receives 8 inches to 12 inches of precipitation annually, the majority of the precipitation comes in late winter and early spring.

Shrublands

Sagebrush Shrubland

This vegetative type includes a combination of sparse, moderately dense, and dense big sagebrush crown closure with a variety of understory grasses and forbs. The sagebrush shrubland is widely distributed and occupies a large portion of the planning area — approximately 167,884 acres (21%). Generally, Wyoming big sagebrush communities are found below 6,000 feet and mountain big sagebrush communities above 7,000 feet. However, between 6,000 and 7,000 feet the two plants often are found growing together and are difficult to discern. Black sagebrush is generally found at mid elevations, between 5,000 and 7,000 feet, on shallow to very shallow rocky soils, in areas with 10 to 14 inches of precipitation. Black sagebrush grows in association with both

Wyoming and mountain big sagebrush. Basin big sagebrush is generally restricted to moderately deep to deep soils in drainage bottoms and stream terraces. Basin big sagebrush communities do not cover much area and are mostly components of other shrub communities. Silver sagebrush is usually found at lower elevations on sandy soils. It is more abundant in the southern part of the planning area and is the principal shrub on sand dunes.

Sagebrush communities are important sources of food and cover for numerous wildlife species in Wyoming. Sagebrush-obligate species include the sage sparrow, Brewer's sparrow, sage thrasher, Greater Sage-Grouse, sagebrush vole, sagebrush lizard, and pronghorn. See the *Fish and Wildlife Resources – Wildlife* and *Special Status Species – Wildlife* sections of this chapter for more information.

Wyoming Big Sagebrush and Grassland

Wyoming big sagebrush is usually found on drier sites, occurring throughout the lower elevations across the majority of the planning area. Shrub height varies from as little as 8 inches on shallow soils to approximately 30 inches on deeper soils. The canopy cover for Wyoming big sagebrush communities usually does not exceed 20 percent.

Wyoming big sagebrush often appears as the dominant plant in mosaic communities intermixed with other shrubs and open grasslands. On shallow or rocky to gravelly soils, Wyoming big sagebrush may be co-dominant with black sagebrush and yellow rabbitbrush. On lighter-textured soils, such as sandy loams, Wyoming big sagebrush may be co-dominant with silver sagebrush, yellow rabbitbrush, and winterfat. Grass and forb species vary depending on soil texture, aspect, and slope. Common grass and grass-like species include bluebunch wheatgrass, western wheatgrass, Sandberg bluegrass, muttongrass, Indian ricegrass, needle and thread, green needlegrass, prairie junegrass, threadleaf sedge, and squirreltail. Common forbs include phlox, sandwort, buckwheat, penstemon, Indian paintbrush, scarlett globemallow, milkvetch, and pricklypear cactus.

Many of the Wyoming big sagebrush communities consist of even-aged stands of mature and often decadent plants. This presents a problem on winter ranges because of the poorer forage quality of the plants and lack of recruitment of younger plants.

Mountain Big Sagebrush and Grassland

Mountain big sagebrush is found on shallow to deep soils at elevations above 7,000 feet. It occurs along the western edge of the planning area, throughout the Big Horn Mountains. In areas where it grows in conjunction with Wyoming big sagebrush, it generally grows on the deeper soils and in areas that receive more moisture either through runoff or snow accumulation. At lower elevations, annual precipitation levels average 15 inches to 19 inches, and at higher elevations annual precipitation averages more than 20 inches.

At higher elevations, mountain big sagebrush occurs as smaller plant communities in mountain areas and is often intermixed with aspen and conifer woodlands. Shrub height will vary from 10 to 30 inches, with canopy cover reaching 20 to 40 percent.

Other shrubs that can be found in mountain big sagebrush communities are antelope bitterbrush, Saskatoon serviceberry, threetip sagebrush, and snowberry. Grasses present include Idaho fescue, spike fescue, green needlegrass, Colombia needle grass, muttongrass, western wheatgrass, and

basin wildrye. Common forbs found in these areas include Indian paintbrush, lupine, larkspur, ragwort, and violets.

Mountain big sagebrush is palatable to wildlife, although browsing is limited during winter when these habitats become unavailable due to snow. Mountain big sagebrush provides hiding and nesting cover for various wildlife species. Following fire, mountain big sagebrush reestablishes as the dominant species more quickly than do other sagebrush types, often resuming dense canopy cover after only 20 to 30 years.

Other Shrubland

This vegetative type is composed of shrub-dominated vegetation communities – mountain mahogany and greasewood shrubland. Mountain mahogany shrubland is the largest component of the other shrubland vegetation type and occurs primarily in the foothills of the Big Horn Mountains in southwestern Johnson County. Mountain mahogany grows on xeric (drier) sites, usually in isolated, pure patches that are often very dense on rocky areas with shallow, poorly developed soils derived from sandstone, limestone, and shale. Their ability to use nitrogen from the soil enables these shrubs to establish on relatively infertile soils. They grow most vigorous on sites without forest canopy and provide important browse for wildlife and livestock. The sustained protein levels of the plants through the winter provide considerable value as forage (Knight 1994). Plant species in the undergrowth of this community include fringed sage, sulfurflower buckwheat, bluebunch wheatgrass, and junegrass.

Greasewood-dominated shrublands occur primarily on lowland positions adjacent to streams, playas, and ponds. They usually occur in areas that receive lower amounts of precipitation and on soils that are at least moderately saline or alkaline. Greasewood does well in very saline soils; however, it needs more soil moisture than most of the local shrub species. Where greasewood is the dominant shrub, subdominant shrubs include Gardner saltbush, shadscale, rubber rabbitbrush, Wyoming big sagebrush, and basin big sagebrush. The understory is limited to salt-tolerant herbaceous vegetation, such as inland saltgrass, western wheatgrass, alkali sacaton, squirreltail, Sandberg bluegrass, spiny phlox, and pepperweed. Although greasewood is not considered to be very palatable to livestock or big game animals, pronghorn and sheep will eat the spiny twigs and leaves in spring and early summer, and cattle use this species in summer and fall as a source of salt. Greasewood contains soluble oxalates that can be poisonous to both sheep and cattle. Greasewood does provide food and cover for small animals and birds.

Mesic Upland Shrub Steppe

Chokecherry is the primary shrub in this community. It often grows in conjunction with snowberry, currant, Woods' rose, and serviceberry. This community type is usually present at lower to mid elevations in areas that receive greater moisture due to snow accumulation, runoff, or subsurface flow. These areas include drainage bottoms, north slopes, and leeward sides of hills and are primarily located in the northern portions of the planning area. This community usually exists as dense but scattered stands of shrubs and is often adjacent to aspen and willow communities. Chokecherry and Saskatoon serviceberry can grow to 15 feet high. Herbaceous understory vegetation includes basin wildrye, green needlegrass, Columbia needlegrass, bluebells, columbine, common yarrow, and violet. Precipitation ranges from 15 inches to 19 inches annually.

This community provides hiding and thermal cover for deer, elk, and other wildlife species. The dominant shrubs provide excellent forage for browsing animals when their softer leaves and shoots stay within reach. These shrubs will reestablish following fire, often in less dense patches,

making them more accessible to wildlife and livestock. The new growth is highly palatable and is sought by browsing animals.

Xeric Upland Shrub Steppe – Mountain Mahogany

Mountain mahogany is present in the southern portions of the planning area along the southern slopes of the Big Horn Mountains. The species grows on dry sites, usually rocky slopes and ridges with very shallow soils. Mountain mahogany usually occurs as the dominant shrub but sometimes grows in conjunction with juniper, antelope bitterbrush, currant, snowberry, yellow rabbitbrush, and Wyoming and mountain big sagebrush. Grass species present in the understory include bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, muttongrass, and western wheatgrass. Forb species present in the understory include phlox, locoweed, and milkvetch.

Mountain mahogany can grow to a height of 5 to 7 feet, depending on the amount of browsing and the soil depth. Fire generally decreases the density of the shrub stands, allowing grasses and other herbaceous plants to increase, while still providing wildlife browse. If cheatgrass is present, fire can lead to an increase of this species. Mountain mahogany is an important fall and winter forage for deer and elk, and also is utilized by livestock. Mountain mahogany communities usually provide crucial winter range for mule deer. Many of these communities consist of mature and often decadent plants with little recruitment of young plants.

3.4.2.4. Trends

It is estimated that the trend for grasslands and shrublands will remain about the same. Range trend data from the RMP (BLM 1985c) in the South Big Horns area and the Powder River Breaks area combined, was 18 percent of rangeland acres in an upward (improving) trend, 73 percent of acres in a static (stable) trend, and 14 percent of acres in a downward (degenerating) trend. The most recent cumulative trend date (BLM 2007l) shows 20 percent of rangeland acres in an upward trend, 45 percent in a static trend, one percent in a downward trend, and 34 percent undetermined. Some areas, especially those subject to CBNG development, will likely experience a slight downward trend in vegetative health due to the number of associated impacts, as described in the preceding sections. In other areas, the health trend will be upward due to monitored grazing practices, conservation use, deferred rotation for a portion of the ranch, and set asides for wildlife habitat.

Impacts to grasslands and shrublands from drought will vary widely. Other impact trends to these vegetative communities include division of ranches into smaller, more affordable, smaller acreage ranchettes. Impacts from this include increased fencing of property, increased roads and trails, intensified grazing management, and increased wildfire costs. Other secondary impacts include habitat fragmentation and an increase in the presence of invasive species.

3.4.2.5. Key Features

Key features include shrublands currently in Greater Sage-Grouse Priority Habitat (Core Population Areas and Core Population Connectivity Corridors); potential habitat for sensitive, Threatened, or Endangered species, including black-tailed prairie dog colonies; and important wildlife habitats that contain mountain mahogany.

3.4.3. Vegetation – Riparian/Wetland Resources

Riparian and wetland areas occur throughout the planning area. They are influenced by adjacent creeks, streams, rivers, lakes, and ponds. Riparian areas are often called riparian corridors or riparian zones because of the dependency of the ecosystem on water. Riparian communities vary considerably from small, sedge-dominated wetlands to large, willow-dominated stream corridors, to spruce bogs and alpine wet meadows. Riparian aspen communities are scattered on streams and springs.

Riparian and wetland communities are defined as having persistent water or obligate vegetation (e.g., sedges, rushes, and willows) reflecting the availability of surface water or groundwater. Healthy riparian areas provide vertical structural complexity, canopy, and subcanopy layers and a ground layer that supports species diversity. In addition to being an integral part of watershed health, riparian areas are prized for their cultural, historical, and recreational values, fish and wildlife habitat, water supply, and their economic values stemming from their use in livestock production, forest production, and mineral extraction.

The USFWS (Cowardin et al. 1979) developed and uses the scientific definition of a wetland as follows: Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is nonsolid is saturated with water or covered by shallow water at some time during the growing season of each year.

Functions

Riparian and wetland communities provide important functions, such as improving water quality, sustaining base flows, decreasing the impacts of floods, and providing wildlife habitats and forage, shade, and water for livestock. Vegetation in riparian and wetland areas influences stream communities by shading the stream (lowering water temperature), controlling dissolved nutrient inputs, stabilizing stream banks, and contributing organic matter. Streamside vegetation provides cover for fish by creating quiet, shaded resting areas beneath overhanging vegetation. The roots of riparian vegetation are crucial to the development and maintenance of undercut banks that also provide cover for certain fish species and help to stabilize the stream banks. Root stabilization of stream banks also allows soils to absorb extra water during spring runoff that is later released during drier months, thereby improving late summer streamflows.

3.4.3.1. Regional Context

Wetlands and riparian areas between the Rocky Mountains and the Sierra Nevada are incredibly diverse and valuable habitats. Wetlands are regionally sparse and very few are located within Wyoming. More than 80 percent of the wildlife species in this intermountain region depend on these wetlands—which account for less than two percent of the land area—for their survival. At the same time, the wetlands also serve the water needs of ranchers and farmers, recreationists, vacation communities, and cities. It is no exaggeration to call water the "liquid gold" of the West, and the burgeoning human demands on this scarce resource make it imperative to understand and properly manage the wetlands and riverine areas of the Intermountain West (McKinstry et al. 2004).

3.4.3.2. Indicators

All riparian habitats depend on a balanced combination of physical (stream bank, channel, and soil characteristics), hydrologic (regular occurrence of surface water), and vegetative (hydrophytic communities) components. When any of these three components – soils, water, or vegetation – are adversely affected, the functional capacity of a riparian habitat can be degraded. Riparian-wetland areas are properly functioning when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high-water flows and flooding, thereby reducing erosion and improving water quality. Vegetation filters sediment and aids in floodplain development, improving floodwater retention and groundwater recharge. Deep soil-binding root masses stabilize stream banks against erosion. Stream channels develop to provide diverse ponding and channel characteristics that support enhanced water quality, fish production, waterfowl breeding, and greater biodiversity.

Due to the importance of riparian and wetland areas, the BLM performs assessments of the functional condition of these areas using a method referred to as the assessment of PFC (Prichard 1998). The qualitative assessment process consists of an approach that considers the hydrology, vegetation, and erosion and deposition (water, soil, and vegetation) attributes of riparian-wetland areas. The on-the-ground condition (called PFC) refers to how well the physical processes that have been assessed are functioning. PFC is a state of resiliency that will allow a riparian-wetland area to hold together during high-flow events with a high degree of reliability. This resiliency allows an area to then produce desired values, such as fish habitat, neotropical bird habitat, or forage, over time. Riparian-wetland areas that are not functioning properly cannot sustain these values.

A riparian-wetland area is considered to be in PFC when adequate vegetation and landforms are present to:

- Dissipate stream energy associated with high-water flow, thereby reducing erosion and improving water quality
- Filter sediment, capture bedload, and aid floodplain development
- Improve flood-water retention and groundwater recharge
- Develop root masses that stabilize stream banks against cutting action
- Develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses
- Support greater biodiversity

For areas that are not functioning properly, changes have to be made that allow them to recover (e.g., acquire adequate vegetation). A change such as acquiring vegetation leads to other physical changes, which allows the system to begin to function. If a riparian-wetland area is not in PFC, it is placed into one of three other categories:

- Functional at-risk – Riparian-wetland areas that are in functional condition, but an existing soil, water, or vegetation attribute makes them susceptible to degradation.
- Nonfunctional – Riparian-wetland areas that clearly are not providing adequate vegetation or landforms to dissipate stream energy associated with high flows, and thus are not reducing erosion, improving water quality, etc.
- Unknown – Riparian-wetland for which there is not sufficient information on to make any form of determination.

3.4.3.3. Current Condition

Riparian habitats in the planning area are generally dominated by willow or aspen communities along foothills streams, and usually represent stringers of habitat extending below forested areas into sagebrush and grassland habitat. Most riparian habitat on public land is between higher elevation habitats on USFS lands and lower elevation private lands in the major river bottoms. Habitats occur on wetlands and streams throughout the planning area at elevations from approximately 4,000 feet to alpine areas more than 9,000 feet.

There are four types of riparian ecosystems, in the planning area – forest-dominated riparian, willow and wet site shrub riparian, moist grass/sedge/rush/riparian, and wet meadow. On the open plains, riparian systems can be found adjacent to the Powder River and Clear Creek in Johnson County, Little Powder River and Cow Creek in Campbell County, and the Tongue River, Clear Creek, and Powder River in Sheridan County. These systems contain a variety of species, including plains cottonwood, some willow, currant, chokecherry, and sedges and rushes. The mountain systems for most of these are in the south Big Horn Mountains and include the North, Middle, and South Forks Powder River, the multiple forks of Red Fork, Big Creek, Little Eagle Creek, Buffalo Creek, Poison Creek, and many more. These systems generally have more species variety, both in composition and in structure, than their plains counterparts. Species include a variety of willows, aspen, and shrub species, including gooseberry and chokecherry, and bluegrass species, sedges, and rushes. Approximately 88 percent of the riparian areas in the planning area are on private lands. The proportions of riparian areas in the planning area on BLM-administered public lands are 2.5 percent forest dominated riparian, 1.3 percent willow and wet shrub riparian, 3.6 percent herbaceous riparian, and 0.5 percent wet meadow.

Riparian areas support more wildlife diversity than any other habitats and are the most productive wildlife habitat type in Wyoming. Many wildlife species depend on these habitats for all or part of their life-cycles; some are present in no other habitat types (for example, certain plant and bird species, amphibians and turtles), while other wildlife species such as shorebirds, waterfowl, and weasels frequent these habitat types. These small but important ecosystems serve as a biological oasis and represent a vegetative structure, soil, and hydrology that is unique relative to the vast expanses of sagebrush and prairie grass that dominate the landscape of the region. Riparian habitats support extended forb production and diversity in vegetation and structural complexity that provides for biological communities rich in insect composition. Emerging aquatic insects are a large part of the diet of birds using riparian areas. These factors make riparian areas the most important habitats to avian biodiversity across the West. Upland game birds, raptors, and migratory birds do not depend solely on riparian systems for cover or as a direct food source, but do depend on those areas as sources of water for consumption. Greater Sage-Grouse, for instance, depend on riparian areas in the summer for late brood-rearing habitat. After upland forbs have expired, Greater Sage-Grouse move into riparian habitats, as forbs generally are still available in these areas for several more months. Small mammals residing close to water sources provide a secondary food source for upland game birds, raptors, and migratory birds. Raptors will inhabit these areas if cottonwoods, alive or dead, are present for perching and nesting.

Riparian areas are ecosystems that have distinct vegetation and soil characteristics. Riparian ecosystems are uniquely characterized by the combination of high species diversity, high species densities, and high productivity. Typical plant species present in riparian and wetland communities in the planning area include cottonwoods, willows, rushes, sedges, reedtop, bluegrass, saltgrass, horsetail, dock species, iris, wild licorice, arrowgrass, bulrushes, and cattails. In addition to these native plant species, several invasive species are prevalent in riparian areas in

the planning area, including Russian knapweed, Canada thistle, musk thistle, houndstongue, tamarisk (salt cedar), and leafy spurge. Invasive species have been shown to decrease biological diversity, affect stream functions, degrade the quality of wildlife habitat, and decrease forage production for livestock and wildlife. See the *Invasive Species and Pest Management* section of this chapter for more information.

Forest Dominated Riparian

In the planning area, forest dominated riparian areas are usually characterized by plains cottonwood species, but can also be aspen, boxelder, green ash, balsam poplar, or a variety of conifer species. Deciduous tree species generally dominate at lower elevations in the planning area, whereas conifers and aspen dominate the higher elevations. Trees must occupy more than 25 percent of the vegetative cover within the riparian zone to be considered forest dominated riparian.

Willow and Wet Site Shrub Riparian

These riparian areas are characterized by areas where shrubs comprise more than 25 percent of the vegetative cover and where trees occupy less than 25 percent of the total vegetative cover. Shrubs often include willow species, sagebrush species, or greasewood. Other shrubs (e.g., hawthorn, American plum, birch, alder, tamarisk, and shrubby cinquefoil) could be present or dominant. These areas include alpine riparian zones dominated by willow species or other shrubs.

Moist Grass/Sedge/Rush Riparian

This vegetative type consists of a variety of riparian moist grasses, sedges, and rushes. The herbaceous riparian vegetative type occurs near drainages, including rivers, streams, and creeks.

Wet Meadow

This vegetative type is a combination of green and very green herbaceous rangeland types as defined by the WGFD, including bluegrass, salt grass, horsetail, bulrushes, and cattails. Wet meadow is a grassland community that typically occurs on fine-textured soils. In addition, this community commonly occurs where springs emerge, along reservoirs, and in irrigated pastures (Knight 1994).

Ecosystem Types

For management purposes, the BLM separates riparian-wetland areas into those associated with flowing water (lotic) or those associated with non-flowing water (lentic).

Examples of lotic systems are creeks, streams, rivers, springs, and channels. Examples of lentic systems are ponds, basin marshes, reservoirs, seeps, lakes, and pools. Table 3.38, “Wetland Inventory Data, 2007” (p. 447) lists the results of the wetland inventories that were performed in the planning area.

Table 3.38. Wetland Inventory Data, 2007

	Lentic Wetlands (acres)	Lotic Wetlands (miles)
Wetlands evaluated	533	110
Proper functioning condition	24	74

	Lentic Wetlands (acres)	Lotic Wetlands (miles)
Functioning at-risk, upward trend	0	7
Functioning at-risk, downward trend	0	2
Functioning at-risk, no apparent trend	22	17
Non-functioning	103	11
Unknown	384	0
Source: BLM 2007a		

Management Challenges/Management Objectives

The BLM goal for riparian and wetland areas is to maintain, rehabilitate, and improve riparian ecosystems to achieve maximum long-term benefits in conformance with the *Buffalo Resource Area Wetland Habitat Management Plan (HMP)*. This plan was developed in cooperation with WGFD. Management challenges for riparian and wetland communities include balancing the sometimes conflicting demands of livestock grazing and wildlife habitats; managing for PFC; protecting water quality; avoiding improper livestock grazing, especially during dry summer months without sufficient alternative water supplies; and fencing or other livestock exclusion options along riparian areas and wetlands. Placement of livestock supplements near riparian areas and wetlands could result in impacts to terrestrial, wetland, and aquatic habitats. One of the greatest challenges is managing for PFC when riparian areas and wetland systems involve different landowners with different resource objectives, and public lands are the minority surface. Because riparian and wetland areas provide all the basics for vegetation to thrive, they are also prime locations for the invasion and spread of invasive species.

Livestock grazing is the most widespread activity that influences riparian habitat conditions in the planning area. Energy development, roads, forest management, dispersed recreation, and localized wildlife impacts also affect the functional capability of riparian-wetland areas. The cumulative impacts of overlapping uses complicate the effectiveness of applying management constraints to a single activity to achieve riparian objectives.

When CBNG development reaches its peak, lentic and lotic systems in the planning areas also will reach their peak acreages. Once all the permitted wells are developed and the excess water disposed of, these CBNG-created “wet” systems will decline. When impoundments are no longer needed for excess water holding and disposal, most of these structures will be reclaimed and the artificial riparian-wetland systems created by these temporary structures will dissipate.

Because of all the benefits riparian-wetland areas offer, there needs to be more emphasis on these systems. Past restoration projects have proven these communities are quick to recover if they are currently not functioning properly. Resource programs need to analyze and adjust projects and management to minimize potential adverse impacts.

3.4.3.4. Trends

Habitat potential has been altered on many riparian areas where channel alteration has lowered the water table and reduced the extent of riparian habitat. This has altered riparian vegetation communities and allowed the encroachment of upland herbaceous species, such as sagebrush and juniper. Overcrowded woodland and forest conditions could be contributing to lower water yields and shrinking riparian zones in some areas, particularly during drought cycles. Riparian-wetlands in the planning area are anticipated to increase in acreage so long as impoundments are the primary way to address disposal of CBNG produced water. As the number of impoundments and

the use of natural drainages for CBNG produced water transportation and disposal increase, the acreage of lentic and lotic systems also will increase.

3.4.3.5. Key Features

Because of the multiple high values of these systems, all riparian and wetland areas are considered key features and will be managed according to each system's values.

3.4.4. Invasive Species and Pest Management

3.4.4.1. Regional Context

In Wyoming, as in other western states, invasive species are considered the single most serious threat to natural habitats. The spread of invasive species contributes to the loss of rangeland productivity, increases soil erosion, reduces water quantity and quality, reduces species and structural diversity, the loss of wildlife habitat, and in some cases invasive species pose an important threat to multiple-use management of public land. There are currently 25 Wyoming State designated noxious weeds and six designated pests (mostly insects) (Table 3.39, "Wyoming Weed and Pest Control Act Designated List" (p. 449)). Table 3.40, "Declared List of Weeds and Pests by County in the Planning Area for 2012" (p. 449) lists the declared invasive species and pests by county in the planning area for 2012.

Table 3.39. Wyoming Weed and Pest Control Act Designated List

Noxious Weeds			
Canada thistle	Field bindweed	Perennial sowthistle	Scotch thistle
Common burdock	Hoary cress (whitetop)	Plumeless thistle	Skeletonleaf bursage
Common St. Johnswort	Houndstongue	Purple loosestrife	Spotted knapweed
Common tansy	Leafy spurge	Quackgrass	Yellow toadflax
Dalmatian toadflax	Musk thistle	Russian knapweed	-
Diffuse knapweed	Ox-eye daisy	Russian olive	-
Dyers woad	Perennial pepperweed (giant whitetop)	Saltcedar	-
Pests			
Beet leafhopper	Grasshopper	Mountain pine beetle	-
Black-tailed prairie dog	Mormon cricket	Wyoming ground squirrel	-

Source: Wyoming DOA 2008b

Table 3.40. Declared List of Weeds and Pests by County in the Planning Area for 2012

Campbell County	
Black henbane	Common cocklebur
Buffalobur	Mosquito
Johnson County	
Buffalobur	Puncturevine
Common cocklebur	Tall mountain larkspur
Common mullein	Wild licorice
Curly dock	Varroa mites
Mosquito	-
Sheridan County	
Alfalfa weevil	Mosquito

Black henbane	Plains pocket gopher
Buffalobur	Puncturevine
Common cocklebur	Showy milkweed
Common mullein	Wild licorice
Curly dock	-
Source: Wyoming DOA 2008b	

3.4.4.2. Indicators

The indicators of management success would be the trend of invasive species or pest persistence. Monitoring, field observation, agency input, field counts, and reporting findings are important in measuring management success.

The FLPMA and the *Wyoming Standards for Healthy Rangelands* direct the BLM to manage vegetative resources toward the maintenance or restoration of the physical function and biological health of vegetative ecosystems. On public lands, the degree of impact from an invasive species depends on the type of invader (e.g., plant, insect, and parasite), the specific specie(s), the growth characteristics of that specie(s), density, size of infestation, the land cover type being invaded, the resources threatened, and the potential economic impacts to the resources and the cost of control or eradication of the invader. Some of the repercussions of weed proliferation are reduced forage, desertification of upland and riparian habitats, decreased animal health and increased mortality, devaluation of animal commodities, equipment decontamination, and reduced land values.

3.4.4.3. Current Condition

Invasive species are plants that can cause serious problems when introduced into a new environment. They have the potential to disrupt or alter the natural ecosystem function, the composition, or the diversity of the sites they occupy. Non-native species often have a competitive advantage that results from the lack of natural controls in their new environments. In areas where these species have invaded, the ecology of the area is altered, native plants that provide habitat and forage for animals are reduced or eliminated. These species can complicate the use of local natural resources and can interfere with management objectives for a site. Organisms that have been moved from their native habitat to a new location (often in a different country) are typically referred to as non-native. Most invasive species are non-native, but a distinction is made in this document because they can and do include undesirable native plants. Noxious weeds are native or non-native plants invasive species that are undesired in a particular area at a particular time, as “designated” by the State of Wyoming or “declared” by Weed and Pest Control Districts. With the exception of vascular plants classified as invasive species, a pest can be any biological life form that poses a threat to human or ecological health and welfare. To date, and only occasionally, the BFO has dealt with grasshoppers, Mormon crickets, mosquitoes, and predator control.

The primary invasive species being targeted on public lands include leafy spurge, tamarisk, Russian knapweed, spotted knapweed, diffuse knapweed, Scotch thistle, Canada thistle, houndstongue, Russian olive, halogeton, black henbane, dalmation toadflax, and hoary cress (whitetop). Some species, including annual bromes, plains pricklypear, and Canada thistle, have become so ubiquitous throughout the planning area that it is considered economically unfeasible to attempt to control them, and they are considered part of the vegetative landscape despite their adverse impacts to other vegetation. Canada thistle, although common throughout the planning area, is not treated on a plant-by-plant basis, but is treated when plant populations reach densities

high enough to make it the majority species, when it is present in the bottom of dry reservoirs, on recreational sites, and along established roads and undeveloped vehicle trails.

Two non-native annual bromes – cheatgrass and Japanese brome – have populations that have steadily increased, invaded every type of plant community, and received minimal control treatments. These annual bromes, particularly cheatgrass, are invading grassland, sagebrush grassland, mixed grass prairie, and mountain shrub community types. These plant species are very competitive with native plants for soil nutrients and available water. Using currently approved available herbicides, funding, and methodologies, it is not economically feasible to initiate large-scale control efforts on non-native annual bromes at this time but may be feasible for small-scale acreages and specific projects.

In addition to invasive plant species, there also are invasive insects (called pests) in the planning area. These insects include slant faced grasshoppers, Mormon crickets, mosquitoes, and the mountain pine beetle. See the *Vegetation – Forests and Woodlands* and the *Fire and Fuels Management* sections for more information about the mountain pine beetle and other forest and woodland pests.

Invasive plants are present throughout the planning area. In general, road corridors and water systems (rivers and creeks) are the main sources of infestation. Infestations can occur or spread when seeds are spread by vehicles, carried by livestock or wildlife, or dispersed by water or wind. In addition, ground-disturbing activities provide open sites for these plants to invade. Control methods vary as site conditions vary and often several treatment methods are used for the same infestation. Different types of invasive species control can be found in the *Invasive Plant Species Control* section, including grazing as a method. Further discussion of grazing as a means for invasive plant control can be found in Chapter 4.

Any vegetative community is susceptible to invasive species, but sites that are especially vulnerable include areas where soils have been disturbed and the native plant community has been displaced or destroyed. The occurrence of invasive species expansion is very high in areas of CBNG development. Roads, trails, and O&G locations constructed or created for energy development created new areas of disturbance and acted as vectors for transporting seeds to other locations. Utility corridors and their soil-disturbing activities also acted as a prime medium for invasive species to establish. All these disturbances occur on a variety of soils, soil depths, slopes, and in differing plant communities, making management of invasive species difficult. Construction of reservoirs and ponds and other produced-water disposal methods for CBNG development provided areas of soil disturbance and the perfect medium for establishment of invasive species, especially tamarisk. To date, approximately 400 reservoirs have been constructed on public land in association with CBNG development. These reservoirs and ponds provide breeding habitat for mosquitoes carrying West Nile virus (WNV). The use of mulch to stabilize disturbed areas is a common practice in areas of energy development; this mulch is sometimes infested with invasive species seeds. Mining areas are also disturbance locations for invasive species to establish, and transporting solid minerals can move unwanted seeds. Reclamation of energy sites provide opportunities for invasive species, as does the planting of weed-infested seed on reclamation projects. Riparian corridors also provide the perfect growing medium, including nutrient-rich soils, ample moisture, remote locations, and a moving medium to transport plants and seed. Areas of livestock confinement, wildfires, recreational sites, undeveloped vehicle trails, range improvement projects, and OHV use also can create disturbances or result in total removal of native vegetation, which makes sites and landscapes more susceptible to invasive species. Other means of invasive plant species establishment can

result from plant and seed transport with purchased forage and hay for supplemental livestock feeding that is not certified weed seed-free. Expansion of ranchettes and small-acreage dwellings in rural areas also increases the opportunity for invasive species to expand onto the public lands.

Although Weed and Pest Control Districts in Johnson, Campbell, and Sheridan counties, and other BLM permitted entities are controlling invasive plant species, invasive species management objectives are not being fully met due to the scale of infestations and lack of appropriate resources.

Invasive Plant Species Control

The weed management program continually changes as a result of new weed introduction, additional inventory, and the ongoing implementation of weed management projects. The invasion and proliferation of weeds increases the costs of invasive species control. If invasive species become established, treatment can be difficult and expensive, and eradication is often impossible. Areas might require several treatments over many years with mechanical equipment, biological controls, and herbicides designed to kill the invasive species, with possible loss of native vegetation. The BLM uses a full range of integrated pest management in the planning area. Basic management involves the following:

- Early detection and rapid response (new invasive species)
- Containment and management (widespread infestations)
- Inventory, monitoring, and evaluation
- Public awareness, education, and outreach

A full inventory of invasive plant species in the planning area has never been completed. In some areas, efforts have gained substantial control and reduced the spread of certain species, such as leafy spurge. Other species, especially diffuse knapweed, Russian knapweed, white top, Russian olive, and tamarisk, which have continued to expand their populations and the number of infested acres is increasing. In addition, new invasive plant species such as Dalmatian toadflax and black henbane are beginning to appear in multiple locations in the planning area.

The BLM controls invasive plant species on public lands through cooperative agreements with the Johnson, Sheridan, and Campbell County Weed and Pest Control Districts, and with commercial applicators. In addition to the County Weed and Pest Control Districts, the BLM works in cooperation with other federal and state agencies, private landowners, and energy production companies for management of both invasive plants and pests. Control methods used include chemical, mechanical (hand pulling and mowing), biological (insects, diseases, and grazing), and cultural (revegetation, mowing, reseeding). The BLM also addresses invasive plant species management by incorporating prevention and control measures in realty, wildlife, range, recreation, and O&G and other mineral-related actions.

All primary invasive plant species continue to colonize new areas. Invasive plants are typically present in sagebrush-grassland, mixed grassland, and riparian-wetland community types. It is not likely that most of these invasive plant species will ever be eradicated. Large-scale energy development in the planning area will require intensive invasive species management to keep populations and infested sites to a minimum. The present goal is to contain and reduce densities of invasive species populations to levels considered manageable. The tolerance level depends on the species, location, and resources at risk. Generally, the County Weed and Pest Control Districts, and BLM have not been able to meet all the BLM invasive species management needs. According to the BLM Wyoming 2012 reclamation policy (BLM 2012i), all ground-disturbing activities will require an invasive plant management plan.

Management of annual brome species will depend on the cost and feasibility of available treatment methods. Resource management strategies, minimizing adverse impacts from wildfires, reducing wildfire fuels, constructing fuel breaks, minimizing surface disturbance and surface-disturbing activities, and other preventive measures will all contribute to maintaining current levels or reducing the expanse of annual brome species communities. Research into developing new herbicide formulations continues, as does research into the existence and effectiveness of biological agents, including pathogens, to serve as future tools in controlling annual brome species and other species that create a similar threat, such as medusahead.

Table 3.41, “Treatment of Invasive Plant Species in the Planning Area” (p. 453) lists the acreages of invasive plant species being treated annually in the planning area.

Table 3.41. Treatment of Invasive Plant Species in the Planning Area

Species Treated	Acres of Treatment per year
Leafy spurge	212
Diffuse knapweed	27
Scotch thistle	32
Halogeton	38
Salt cedar	62
Canada thistle	43
Houndstongue	21
Common mullein	19
Source: BLM 2005 - 2008	

Pest Control

Pests – Pest species such as grasshoppers can be detrimental to all ecological sites because they chew grass stems, break the stalks, remove reproductive structures, destroy seeds, and leave the forage to die to dry matter. In addition to reducing plant production, pests can reduce the nutrient content, palatability, and serve as vectors to introduce threatening pathogens such as bacteria, spores, and viruses. Forbs and shrubs also can be directly and adversely affected if pest populations exceed their natural threshold. Control treatments are designed to reduce pest populations to natural or economic thresholds, not complete eradication. In an average year, pests are negligible; however, populations above economic thresholds cycle every 7 to 10 years and can last approximately 3 years. The effects of these cycles can be minor to moderate. Insecticides are effective in controlling pest populations.

The mountain pine beetle is native to the forests of western North America. Outbreaks develop regardless of property lines, and are equally evident in wilderness areas, mountains, back yards, and windbreaks. Landscape pines many miles from the mountains can succumb to beetles imported in infested firewood. Mountain pine beetles develop in pines, particularly ponderosa, lodgepole, Scotch, and limber pine. Attacks are limited largely to trees under stress from injury, unhealthy ecological states, fire damage, overcrowding, root disease, or old age. A key part of the infestation is the ability of mountain pine beetle (and other bark beetles) to transmit bluestain fungi. Spores contaminate the bodies of adult beetles and are introduced into the tree during attack. Fungi grow in the tree and help the beetle kill the tree. The fungi give a blue-gray appearance to the sapwood. Once mountain pine beetles infest a tree, nothing practical can be done to save that tree. Chemical control options for mountain pine larvae have been greatly limited in recent years. At present, there are no labeled pesticides for use on the mountain pine beetle (Leatherman et al. 2011).

West Nile Virus – WNV is a mosquito-borne disease that can cause encephalitis or brain infection. WNV is expanded from infected mosquitoes that produce their young in standing water.

Since its discovery in 1999 in New York, WNV has become established and spread across the United States. Birds are the natural vector host and serve not only to amplify the virus, but to spread it. Though less than one percent of mosquitoes are infected with WNV, they still are very effective in transmitting the virus to humans, horses, and wildlife. *Culex tarsalis* appears to be the most common mosquito to vector WNV.

Although most of the attention focused on human health issues, WNV had an impact on vertebrate wildlife populations. In 2003, at the Smithsonian Environmental Research Center, scientists disclosed WNV had been detected in 157 bird species, horses, 16 other mammals, and alligators (Marra et al. 2004). In the eastern U.S., avian populations have incurred very high mortality, particularly crows, jays, and related species. Raptor species also appear to be highly susceptible to WNV. In 2012, seven human, four avian, and five equine cases were reported in Wyoming (Wyoming Department of Health 2012). Although the number of fatal cases reported for bird species was low in Wyoming, actual mortality is likely to be greater.

The avian WNV cases reported in Wyoming in 2012 included Greater Sage-Grouse, red-tailed hawk, and Swainson's hawk (Wyoming Department of Health 2012). Population impacts of WNV on raptors are unknown at present, yet the species may be quite susceptible to the disease (Wesenberg et al. 2012). The Wyoming State Veterinary Lab determined 22 Greater Sage-Grouse in one study project (90% of the study birds), succumbed to WNV in the PRB in 2003. Current evidence demonstrates that Greater Sage-Grouse have little biological resistance to the virus and the effects are usually fatal.

Surface water issues from CBNG-related water disposal, livestock water facilities, and natural ponds have complicated (WNV) control efforts. These pits, which number in the thousands, were created to hold CBNG produced waters. The most common control method in the planning area is the use of bacteria in biological control, which has proved to be quite successful. *Bacillus thuringiensis israelensis* has been very effective as a larvicide. It was approved by the EPA in 1981 as effective on 30 species of mosquitoes. The bacterium does not harm other aquatic life or mammals, but results in a 90 percent to 100 percent kill on most types of mosquito larvae. Larvae eat *Bacillus thuringiensis israelensis* when it is sprayed over water. Knockdown activity begins within a few hours, and total kill takes place within 24 hours. *Bacillus thuringiensis israelensis* will remain active in the water for up to 3 days; after that, it too will die. *Bacillus thuringiensis israelensis* does not endanger the ecology of the area by persisting and reproducing and it is effective only on larvae. Altosid® is a commonly used larvicide that contains the active ingredient methoprene, an insect growth regulator. It commonly comes in a briquette, pellet, or granular form and is designed to release effective levels of methoprene over a period of up to 150 days as the briquettes dissolve. Larvae in treated waters continue to develop normally to the pupal stage, but at this stage, they are affected by the chemical and die.

Quagga and Zebra Mussels – Aquatic invasive species are non-native organisms that can cause great harm to an ecosystem. Aquatic invasive species like quagga mussels and zebra mussels are small organisms that could have major adverse effects on Wyoming's waters, boaters, and anglers. These species are able to multiply quickly and form thick, dense clusters that can impede water delivery and increase maintenance costs to power plants, municipalities, irrigation systems, and other water users by clogging pipes, pumps, turbines, and filtration systems. Fisheries are destroyed by the presence of these invasive filter-feeding mussels. Quagga and zebra mussels

remove plankton from the water; plankton are the primary food source for forage fish, and forage fish are the food of sport fishes. Treatment options are few and expensive; the best treatment is prevention. This species has not yet been found in the State of Wyoming, but due to their potential adverse impacts, large-scale education and awareness efforts are ongoing. The mussels are most likely to be found in larger waterbodies, but could be found in ponds and reservoirs on public lands.

Pest management depends on whether there is a health or economic risk due to the presence of pests. In February 2003, the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) and the BLM signed a MOU detailing cooperative efforts between the two entities on suppression of grasshoppers and Mormon crickets on BLM-administered lands (BLM 2009f). This MOU clarifies that APHIS prepares and issues to the public site-specific environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BLM. The MOU further states that the responsible BLM official will request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on BLM-administered land is necessary. The BLM must also approve a Pesticide Use Proposal (Form FS-2100-2) for APHIS to treat infestations. According to the provisions of the MOU, APHIS can begin treatments after the appropriate decision document is issued and the BLM approves the Pesticide Use Proposal.

The preferred method for treating grasshoppers and Mormon crickets is by Reduced Agent Area Treatments (RAATs). RAATs are a grasshopper suppression method in which the rate of insecticide is reduced from conventional levels, and treated swaths are alternated with swaths that are not directly treated. The RAATs strategy relies on the effects of an insecticide to suppress grasshoppers within treated swaths while conserving grasshopper predators and parasites in swaths not directly treated. Grasshopper and Mormon cricket treatments occur on a 7- to 10-year cycle and occur for 1 to 3 years concurrently in the planning area.

Management challenges for invasive species include managing BLM-authorized activities in the planning area that disturb the soil or otherwise create an opportunity for the establishment of invasive species, especially in the CBNG development areas, the interstate corridors, the larger river and creek corridors, and other watersheds. Other challenges include educating resource specialists and users, early detection for rapid response, and diminishing funding. These challenges require coordination across all of BLM resource programs to develop, integrate, and implement aggressive management techniques and the strategies for controlling the adverse impacts and the spread of invasive species in the planning area.

See the *Vegetation – Forests and Woodlands* and the *Fire and Fuels Management* sections of this document for more information on mountain pine beetle and other forest and woodland pests.

3.4.4.4. Trends

Mosquito control will continue in an effort to reduce the transmittal of (WNV) to wildlife and human health and safety.

Historically, the highest populations of grasshoppers and Mormon crickets are south of Kaycee, Wyoming, from Salt Creek west to the Hole-In-the-Wall. Grasshopper populations have also been

at levels capable of forage destruction northeast of Buffalo, Wyoming, between Clear Creek and Crazy Woman Creek.

3.4.4.5. Key Features

Key features for invasive species include areas of known infestations identified on County Weed and Pest Control Maps, and areas of potential infestations, including CBNG and associated developments, riparian zones, and transportation and utility corridors.

3.4.5. Fish and Wildlife Resources – Fish

3.4.5.1. Regional Context

Riparian and wetland habitat conditions in the planning area are described under *Vegetation – Riparian/Wetland Resources*. The *Water* section of this chapter provides information about surface-water bodies, water quality, and water quantity.

There are approximately 46 fish species in the planning area (Table 3.42, “Fish Species Known to Occur and Their Preferred Habitat in the Planning Area” (p. 456)). The planning area is centrally located within the distribution ranges for fourteen of these species (yellow perch, walleye, rainbow trout, smallmouth bass, green sunfish, golden shiner, common carp, channel catfish, brown trout, brook trout, bluegill and black crappie), on the eastern edge of the distribution ranges for ten of these species (Yellowstone cutthroat trout, Snake River cutthroat trout, sand shiner, mountain whitefish, mountain sucker, longnose sucker, longnose dace, lake chub, and Arctic grayling), and on the western edge of the distribution ranges for 22 of these species (white sucker, white crappie, western silvery minnow, sturgeon chub, stonecat, shovelnose sturgeon, sauger, rock bass, river carpsucker, plains topminnow, plains minnow, shorthead redhorse, grass carp, goldeye, flathead chub, finescale dace, fathead minnow, emerald shiner, creek chub, brook stickleback, brassy minnow, and black bullhead). There are few fish-bearing streams on BLM-administered lands due to the fragmented land ownership pattern. Most fish-bearing streams occur on lands under state or private ownership. Where fish-bearing streams do occur on public lands, they generally occur on small isolated land parcels. The *Special Status Species – Fish* section of this chapter describes special status fish species, including federally listed fish species. Species identified by the WGFD as a priority for management include 16 fish species classified as Native Species Status (NSS) 1 to 4 (see Appendix K (p. 2161)).

Table 3.42. Fish Species Known to Occur and Their Preferred Habitat in the Planning Area

Common Name	Preferred Habitat
Arctic grayling	Alpine lakes and streams
Black bullhead	Small muddy lakes; pools in large and small streams
Black crappie	Lowland lakes, pools, and backwaters in rivers
Bluegill	Lowland lakes, pools, and backwaters in rivers
Brassy minnow	Weedy streams; clear creeks with sand and gravel bottoms; lakes (occasionally)
Brook stickleback	Lowland lakes, pools, and backwaters in rivers
Brook trout	Small, cold stream and beaver ponds; mountain lakes and plains lakes (occasionally)
Brown trout	Larger foothill streams with slower moving waters
Channel catfish	Large clear rivers (can tolerate turbid water)
Common carp	Lakes, pools, and backwaters in rivers

Common Name	Preferred Habitat
Creek chub	Clear, gravel bottomed creeks
Emerald shiner	Lowland reservoirs
Fathead minnow	Slow-flowing, weedy streams, and shallow lakes and ponds
Fine scaled dace	Small streams and lowland ponds
Flathead chub	Large silty rivers
Golden shiner	Lowland lakes, pools, and backwaters in rivers
Goldeye	Lakes and streams (adapted for turbid conditions)
Grass carp	Reservoirs
Green sunfish	Pools in small to medium-sized streams; small lakes, ponds, and sloughs
Lake chub	Cool streams and lakes
Lake trout	Cold, deep lakes and reservoirs
Largemouth bass	Ponds and reservoirs
Longnose dace	Riffle areas in streams and rivers
Longnose sucker	Clear, gravel bottomed creeks
Mountain sucker	Clear, gravel bottomed creeks
Mountain whitefish	Prefers deep, fast water in large, clear cold rivers. Sometimes abundant in lakes.
Shorthead redhorse	Large, turbid streams and rivers
Northern plains killifish	Large, turbid streams and rivers
Plains minnow	Large, turbid streams and rivers
Plains topminnow	Lowland streams
Pumpkinseed sunfish	Pools in small to medium-sized streams; small lakes, ponds, sloughs, and lakes.
Rainbow trout	Large foothill streams, ponds and reservoirs
River carpsucker	Large, turbid streams and rivers
Rock bass	Streams, pond, and reservoirs
Sand shiner	Large, turbid streams and rivers
Sauger	Large, turbid streams and rivers
Shovelnose sturgeon	Large, turbid streams and rivers
Smallmouth bass	Streams, ponds, and reservoirs
Snake River cutthroat trout	Relatively clear, cold creeks, rivers, and lakes at temperatures between 4 and 15°C
Splake	Alpine and lowland lakes and reservoirs
Stonecat	Turbid streams and rivers
Sturgeon chub	Large, turbid streams and rivers
Tiger musky	Lowland lakes and reservoirs
Tiger trout	Cold streams, ponds, lakes, and reservoirs
Walleye	Lowland lakes, reservoirs, and larger lowland streams
Western silvery minnow	Large, turbid streams and rivers
White crappie	Lowland lakes, pools, and backwaters in rivers
White sucker	Streams, ponds and reservoirs
Yellow perch	Lowland lakes, pools, and backwaters in rivers
Yellowstone cutthroat trout	Relatively clear, cold creeks, rivers, and lakes at temperatures between 4 and 15°C
Source: WGFD 2012	
°C degrees Celsius	

3.4.5.2. Indicators

Vegetation in riparian zones serves to dissipate stream energy, store water for later release, provide areas for groundwater infiltration, and provide rearing areas for juvenile fish. Riparian vegetation occurring along drainages also serves to moderate water temperatures, control erosion by adding structure and stability to stream banks, provide in stream habitat for fish, and provide organic

material and nutrients to aquatic biota. In addition to physical habitat features such as vegetation, water quality also influences aquatic habitats. Specifically, water temperature, turbidity, dissolved oxygen, and TDS or salinity determines the quantity and quality of aquatic habitats. Other factors influencing aquatic habitats in the planning area include adjacent land uses and the locations of such habitats in relation to natural landscape features.

Fishery habitat conditions are closely tied to riparian conditions and water quality. Riparian vegetation moderates water temperatures, increases bank stability, supports insects used as important food source, filters sediment, provides in stream habitat for fish, and provides organic material for aquatic invertebrates. Water development that alters discharges, turbidities, water temperatures, and sediment transport will likely result in a change to the endemic fish community. The following are indicators of the overall health of fisheries: population densities, water quality, water quantity, bank cover, insect/macrobenthic populations, habitat quality, gain or loss of important habitats, rangeland health standards, riparian PFC ratings, and/or disease occurrence/impacts.

Development of energy and mineral resources in the Powder River (Energy) Basin of northeastern Wyoming and southeastern Montana includes rapid expansion of CBNG development in Wyoming. Changes in flow regime and water quality wrought by CBNG development in the upper Cheyenne River basin have the potential to affect stream and riparian environments (Barrineau et al. 2007). Small irrigation diversion structures and impassable road crossings fragment habitat and could be interfering with some life-cycle requirements of some native fish species. Improving and maintaining water quality in streams and rivers, and improving the conditions of riparian habitats are key components to managing aquatic resources throughout the planning area.

The Aquatic Task Group developed a monitoring plan to meet two main objectives: (1) establish current ecological conditions for aquatic biota and their habitat, and (2) determine existing and potential effects of CBNG-produced water on aquatic life (Peterson et al. 2011). In response to this monitoring effort, an ecological assessment of streams in the PRB was performed by the USGS in cooperation with the BLM, the Wyoming DEQ, the WGFD, the EPA, the Montana DEQ, and Montana Fish Wildlife and Parks to determine current (2005 to 2008) status and to establish a baseline for future monitoring and reporting (Peterson et al. 2010). On the basis of the 2005 to 2008 results, sampling of the macroinvertebrate and algae communities was conducted at 18 sites on the mainstem Powder River and six sites on the mainstem Tongue River in 2010. The data collected (and incorporated in the previous sections) provides a snapshot of conditions in streams of the PRB during 2005 to 2008, and again in 2010, and can be used in conjunction with future monitoring to assess the impacts of CBNG and other development. Additional data analysis tools might also warrant further investigation (Peterson et al. 2010).

3.4.5.3. Current Condition

The planning area encompasses all or parts of 15 fourth-order watersheds (sub-basins). The USGS National Hydrography Dataset was used to identify these basins and the rivers, streams, and reservoirs within them (Table 3.43, “Basins and Corresponding Sub-Basins” (p. 459)). Portions or all of these sub-basins are included in WGFD Water Basin Management Plans. The *Water* section of this chapter provides additional details about the sub-watersheds. Descriptions of the existing conditions for the PRB, Tongue River Basin, Belle Fourche River Basin, Little Bighorn River Basin, Little Missouri River, and Cheyenne River Basin follow.

Table 3.43. Basins and Corresponding Sub-Basins

Basin (Acres BLM Surface) (Third-Order HUC)	Corresponding Sub-Basins in the Planning Area (Fourth-Order HUC)
Powder River 594,277	Upper Powder Salt Middle Powder South Fork Powder Middle Fork Powder Crazy Woman Clear Little Powder
Tongue River 150,772	Upper Tongue
Cheyenne River 34,856	Antelope Upper Cheyenne
Belle Fourche River 29,307	Upper Belle Fourche
Bighorn River 1,788	Little Bighorn River Nowood
Little Missouri River 407	Upper Little Missouri
Source: EPA 2012	
BLM Bureau of Land Management HUC Hydrologic Unit Code	

Powder River Basin

The Powder River is a rare example of a free-flowing prairie stream. There are no dams over its entire length. There are, however, areas identified as potential hydroelectric sites along the Powder River. Including tributaries, the drainage basin encompasses 8,000 square miles. There are eight fourth-level hydrologic unit codes (HUCs) for the PRB in the planning area. The Powder River is formed by the confluence of the North Fork Powder River and the Middle Fork Powder River near Kaycee, Wyoming (WGFD 2008c). Fifty-two additional intermittent or ephemeral tributaries drain into the Powder River.

The Powder River is a low-gradient meandering stream with highly fluctuating flows, high turbidity, and a very unstable sand bottom (Hubert 1993). It is naturally turbid and saline because of its flows through erodible sedimentary material. The Powder River has a typical snowmelt hydrograph, driven by accumulations in the southern Big Horn Mountains. The river is generally shallow and contains portions of a shifting streambed composed of fine sands and clays that provide minimal habitat for aquatic invertebrates. Low light penetration through the turbid water also contributes to low aquatic invertebrate production by inhibiting vegetation growth (W.H. Bradshaw 1996).

Virtually all of the bottomland and riparian areas of the PRB are privately owned. Public lands, consisting mainly of sagebrush or grasslands in uplands adjacent to the river, are managed by the BLM and are concentrated in the PRB about midway down the Powder River and in the upper reach of the South Fork Powder River (W.H. Bradshaw 1996). Historically, the PRB was used extensively and almost exclusively for cattle and sheep grazing. O&G developments and recently developed coal mines have become dominant land uses over the past 80 years (W.H. Bradshaw 1996).

Twenty-eight fish species are present in the PRB. The game species in the Powder River and its tributaries include black bullhead, channel catfish, stonecat, small-mouth bass, rock bass, green sunfish, shovelnose sturgeon, sauger, and walleye (Hubert 1993). Native stream-dwelling game fish in the PRB are channel catfish, sauger, shovelnose sturgeon, and stonecat. Stonecat are rarely targeted for angling, and virtually all fishing is directed at the other three species. Channel catfish, sauger, and shovelnose sturgeon occur most commonly below the mouth of Crazy Woman Creek as seasonal migrants from Montana. There is little information about angling on streams in the Powder River (proper), but it is assumed that virtually all effort is expended on channel catfish, sauger, and shovelnose sturgeon on the lower Powder River. Gerhardt and Hubert (1991) estimated the annual exploitation rate of channel catfish to be only two percent, indicating very low overall fishing pressure.

The preservation of historical flows, turbidity, and water quality in the Powder River is an important factor in preserving the unique species assemblage. The endemic species have evolved life histories that enable them to survive in these unique conditions (Hubert 1993). Within the Powder River proper, extreme fluctuation of streamflow and temperature, low aquatic invertebrate production, high turbidity and dissolved solids, and an unstable streambed limit the population of most game fish. Consequently, sport fish management options are limited.

Some intermittent or ephemeral tributaries to the Powder River have received more constant flows since CBNG produced water discharges began. Salt Creek is a major tributary of the Powder River and during low-flow periods contributes most of the flow to the Powder River. Streamflows in Salt Creek are augmented by water discharged from O&G wells drilled in the Salt Creek Field near Midwest, Wyoming. This water contains elevated levels of TDS, chlorides, sulfates, and sodium. Depending on the time of year, these constituents can be diluted quickly after Salt Creek joins the Powder River or could retain elevated levels during low-flow periods. Although fish in Salt Creek apparently do not suffer from elevated chemical constituents or the small amounts of oil in the water, toxicity for zooplankton (*Ceriodaphnia spp.*) and fathead minnows has been documented (W.H. Bradshaw 1996). According to the WOGCC website, CBNG development has increased most dramatically in the PRB.

Standing waters in the PRB consist mainly of small (fewer than 10 acres) reservoirs and farm ponds. Many of these ponds were created with federal funds during and after the drought of the 1930s (Mueller and Rockett 1958). Some ponds were stocked privately before World War II, but stocking increased later as federal hatcheries began producing more warm-water fish. The WGFD began stocking farm ponds in 1950 where “reasonable” public access was agreed to by the landowner. Because of inconsistency among landowners providing public access to WGFD-stocked reservoirs, cutbacks in the WGFD culture system, and availability of fish from commercial sources, the WGFD generally discontinued stocking of farm ponds in 1995. Various trout species, channel catfish, and largemouth bass are the most common species privately stocked, but green sunfish and black bullhead have undoubtedly been introduced to some ponds where they probably support very little angling.

The WGFD PRB Management Plan identified that the primary concern for the Powder River was the abundance and proliferation of invasive plant species in the riparian corridor and along adjacent upland terraces. Primary invasive species included tamarisk, Russian olive, leafy spurge, and Russian knapweed. Exotic annual grasses (Japanese brome and cheatgrass) were abundant in upland sites on river terraces. Cottonwood regeneration was sporadic, but evident in many segments of the corridor. Active down-valley meander migration processes are evident along the corridor (WGFD 2008c).

The Little Powder River covers 1,836 square miles in Northern Campbell County and is host to native and non-native warm-water fishes, comprising a sub-sample of Powder River fishes. Larger-bodied native game species may occupy the main stem Little Powder River only seasonally (Barrineau et al. 2007). The Little Powder River was classified as having an expected fish community and relatively intact habitat with minimal human influence (Barrineau et al. 2007; Peterson et al. 2010). Barrineau et al. (2007) identified the biggest concern for native species conservation as the establishment of non-native piscivorous fishes (e.g., green sunfish). Ten percent of the basin is public land, including National Grasslands, BLM-administered land, and State of Wyoming land. Land use in the basin is primarily livestock grazing with hay production in the valleys (Stewart 1996).

Tongue River Basin

The Tongue River Basin covers 1,579 square miles and includes 145 streams; the Tongue River flows for 588 miles. There is one fourth-level HUC from this basin in the planning area. In addition to numerous small tributaries, there are five major streams in the basin – North Tongue River, South Tongue River, Little Goose Creek, Big Goose Creek, and Prairie Dog Creek. Most of the basin is in Sheridan County, but a few headwater streams of the Little Goose and Big Goose drainages are in Johnson County. Elevations in the Tongue River basin range from 11,700 feet in the Cross Creek drainage to 3,470 feet where the Tongue River leaves Wyoming.

The headwaters of the Tongue River drainage originate on the east side of the hydrographic divide of the Bighorn National Forest. After the North and South Tongue rivers join to form the main stem Tongue River, the flow is primarily east and north until the Tongue River enters Montana. The area surrounding the North and South Tongue rivers is predominantly conifer and alpine meadows with extensive willow complexes in some riparian areas. The Tongue River flows through a canyon for several miles before it exits onto the plains near the Bighorn National Forest boundary at the town of Dayton. From Dayton to the state line, it flows through an alluvial floodplain. Land use on this floodplain is predominantly agriculture, but there also is residential development and one coal mine (WGFD 2008d).

Land ownership in the headwaters of the Tongue River Basin primarily consists of Bighorn National Forest, of which 55 square miles are Cloud Peak Wilderness. As the basin progresses north and east, land ownership comprises a mixture of state, BLM, and private lands. Standing waters in this basin are primarily privately owned ponds, many of which are unsuitable for supporting fish populations.

The assemblage of fish in the Tongue River Basin in north-central Wyoming is diverse. Thirty-four fish species have been documented in the Tongue River Basin. Seventeen fish species have been introduced to the basin as sport fish or forage to support the sport fisheries (the Snake River cutthroat and arctic grayling are native to Wyoming, but not to the Tongue River Basin). Streams in the headwaters contain Snake River cutthroat, Yellowstone cutthroat, rainbow, brown, and brook trout, whereas a reach of the lower river contains sauger and smallmouth bass. The South Tongue and North Tongue rivers are conducive to natural reproduction of trout. There is suitable spawning habitat for sauger, smallmouth bass, channel catfish, stonecats, rock bass, mountain whitefish, and other native and non-native nongame species in the Lower Tongue River (WGFD 2008d). Although some of these streams support suitable trout spawning habitat, much of this drainage basin supports native and non-native game fish.

Stocking plays a large role in the Tongue River Basin and most waters in the basin have been stocked at one time. North Tongue River and Bull Creek are currently stocked with Yellowstone cutthroat and Snake River cutthroat trout to augment natural reproduction. Both strains of cutthroat are stocked to determine which strain will perform the best. Before 2006, the Auburn strain of Snake River cutthroat trout was stocked in the North Tongue River and Bull Creek. This strain became established (they did not leave this stretch of river), grew large, and provided excellent fishing. However, the Auburn strain Snake River cutthroat trout became domesticated and homogenized; therefore, stocking efforts were abandoned.

The absence or scarcity of deep pools in several of the headwater tributary streams limits the habitat diversity and potential for populations of larger fish. Sedimentation limits natural production of fish and macroinvertebrates in many streams, especially the Upper North Tongue River. In the Goose Creek drainage, riparian areas and stream habitat conditions vary widely from excellent to very poor and are determined largely by individual landowners. Impacts occur from livestock grazing, irrigation withdrawals, irrigation return flows, and real estate and road development. Big Goose Creek, Little Goose Creek, and Goose Creek are channelized through Sheridan. The ability of streams to support trout becomes progressively less as they approach the downstream end of the basin.

Several irrigation and municipal water supply reservoirs have been built in the Tongue River Basin to support Sheridan and surrounding communities. Fluctuations from these reservoirs limit fisheries potential in the reservoirs and could act adversely on the wild populations of trout in the streams below these reservoirs (i.e., when flows are turned off, it adversely affects downstream fisheries).

Irrigation diversions reduce flows on many streams, and these reduced flows usually occur during critical life stages of fish and macroinvertebrates. From Interstate 90 downstream to the Montana border, irrigation diversions form barriers impede seasonal upstream movements of channel catfish, sauger, smallmouth bass, and certain nongame species. Fish, especially channel catfish, move downstream in fall and winter to the Tongue River Reservoir in Montana, and the barriers impede upstream movement during spring (WGFD 2008d).

Construction of Tongue River Reservoir, several other diversions in Montana along the Tongue River, and the Welch diversion has altered sauger migrations in the Tongue River. It is assumed that sauger historically migrated from the Yellowstone River up the Tongue River and possibly as far as Goose Creek. Walleye introductions in Tongue River Reservoir might eventually contribute to the demise of this isolated population as well, but it is not known if the walleye and sauger in Tongue River Reservoir hybridize.

Several habitat improvement projects involving instream structures, boulder placement, and protection of eroding banks have been completed in the Tongue River Basin with the main goal of improving survival of stocked and wild fish and to increase wild trout production. Streams where habitat improvements have been completed include Bull Creek, the North Tongue River, the South Tongue River, Big Willow Creek, and Fool Creek (refer to Binns 2004 for more description of these projects). Recently, stream habitat improvements have been completed on the South Tongue River at the Dead Swede campground.

Logging, improper livestock grazing, and road building have accelerated the natural erosion process that contributes silt to the system. As the major streams flow off of the Big Horn Mountains and onto the plains, land use is primarily agricultural (hay, crops, and pastureland),

but residential development, coal mining, and CBNG extraction are also present in the basin. According to the [WOGCC](#) website, CBNG development has increased in the Tongue River Basin.

Little Bighorn River Basin

The Little Bighorn River Basin, encompassing 298 square miles, contains some of the most remote waters and fish populations in the planning area. There are two fourth-level HUCs from this basin in the planning area. Elevations in the basin range from almost 10,000 feet at Boyd Mountain to less than 4,000 feet near the Montana State line on Pass Creek. The Little Bighorn River sub-watershed in the planning area is at the northern tip of the basin and is exclusively located in the lower elevations. It contains portions of a few small watercourses, such as Lodgegrass Creek, Stockade Creek, East Pass Creek, West Pass Creek, and East Twin Creek.

The topography of the Little Bighorn River Basin is variable. The upper drainage is mountainous, with deeply incised canyons, coniferous forest, and alpine meadows. At lower elevations, the topography consists of rolling hills and valleys used primarily as irrigated hay and livestock pasture (McDowell 1996). The Little Bighorn River Basin is mostly comprised of public lands (79% between BLM, state, and USFS) and only 21 percent private lands. Land use practices in the basin include cattle grazing, forest management, recreational gold mining, fishing, and hunting. The privately owned, lower elevations in the basin are primarily used for irrigated hay meadows and livestock pastures. Nine fish species have been documented in the Little Bighorn River Basin. Of those, three are non-natives introduced as game species. Six species are native to Wyoming; however the Snake River cutthroat is not native to the Little Bighorn River Basin.

Most streams in the Little Bighorn River Basin have been stocked at one point. Early records indicate that brook trout were stocked in 1895 from the Sheridan Branch Hatchery on Wolf Creek (Bradshaw et al. 2008). Stocking records from the WGFD dating back to the 1930s indicate that several streams were stocked annually. Previous stockings included brook, brown, rainbow, lake, Snake River cutthroat, and Yellowstone cutthroat trout, and grayling.

Lodgegrass Creek has been historically stocked with rainbow trout, cutthroat trout, and brook trout. East Pass and West Pass creeks have historically been stocked with rainbow trout, brook trout, and brown trout. Gay Creek, a tributary to West Pass Creek, might be capable of supporting trout, but none were found during the last recorded survey in 1982 (McDowell 1996). Stockade Creek, a tributary to Gay Creek, has limited habitat for trout because of high turbidity and warm water. Flow in Twin Creek, a tributary to East Pass Creek, is insufficient to support trout. Electrofishing surveys in 1958 found small dace, fathead minnows, and numerous suckers and cyprinids (McDowell 1996).

Fish habitat enhancements and improved livestock management in the Dayton Meadows portion of the Little Bighorn River and Lick Creek have substantially increased fish habitat availability. On the Little Bighorn River at Dayton Meadows, the USFS installed a series of 21 stream improvement structures in 1980. Past mining, heavy livestock use, and public use affected the stream channel and increased sediment deposition. The deeper water and overhead cover provided by the structures was beneficial in increasing the wild brook trout population (Rockett 1983). From 1995 through 1996 new habitat improvements were completed that added to, and improved upon, the 1980 work, and expanded the area treated. Phase two of the Dayton Meadows project added 1.25 miles of improved stream habitat with the addition of 33 structures (Binns 2004). From 1984 through 1986, in the meadow area of Lick Creek just downstream of USFS Road 15, 4,276 feet of stream was improved with the installation of 47 habitat structures. In

1993, the USFS installed cattle exclosures in three segments of stream to minimize impacts from cattle. The combination of habitat structure installation and protection from the impacts of livestock has increased the potential trout production of this stream (Binns 2004). In the fall of 2007, Red Gulch Creek was treated with rotenone to remove brook trout and to increase Yellowstone cutthroat trout occupation. Approximately 1.3 miles of creek was treated, with the goal of increasing Yellowstone cutthroat trout occupation from 0.3 mile to 1.6 miles. Livestock grazing, agriculture, irrigation, and O&G development have had the greatest impact on selected segments of the basin, particularly the riparian meadows of the Little Bighorn River, Dry Fork of the Little Bighorn River, and Lick and Lake creeks.

Cheyenne River Basin

The Cheyenne River Basin includes 6,807 square miles of the northern two-thirds of Converse and Niobrara counties, the southern two-thirds of Weston County, and the southeast corner of Campbell County. Two fourth-level HUCs from this basin are in the planning area. The basin encompasses the southern end of the Black Hills, the breaks of the Rochelle Hills south of Gillette, and the rolling hills and grasslands north of Lusk. Elevations range from 3,500 feet, where the river enters South Dakota, to 6,000 feet, in the sand hills of Converse County. The drainage basin contains four sub-watersheds (Antelope Creek, Upper Cheyenne River, Dry Fork Cheyenne River, and Lightning Creek) within Campbell and Converse counties. The Cheyenne River is free-flowing in Wyoming, but dammed at Angostura Reservoir in South Dakota. There are no natural lakes in the basin, but ponds and reservoirs are common.

Sagebrush and grasslands are the predominant vegetative types in the basin, with ponderosa pine in the Black Hills and Rochelle Hills (B. Bradshaw 1996). Most of the Cheyenne River and its tributaries flow through erodible shales, claystones, sandstones, and bentonite deposits of the Belle Fourche, Arikaree, White River, and Pierre formations (Lageson and Spearing 1988). Consequently, most streams are turbid, especially during runoff or after storm events. Turbidity prevents light penetration needed for growing aquatic vegetation, channel instability, and high temperatures probably inhibiting aquatic macroinvertebrate production and creating an environment hostile to fish species that are not adapted to such conditions (e.g., game fish) (B. Bradshaw 1996). Exceptions to this general condition are streams originating in the western Black Hills, which is an area composed of less erosive formations. The hydrograph for the Upper Cheyenne River is driven by low-elevation accumulations of snow, seasonal rainfall, and periodic storms. Flows cease during most years near the South Dakota state line. The repeated withdrawal, warming, and return of irrigation water undoubtedly contributes to high water temperatures that reach 70°F to 80°F during summer.

About 75 percent of the Cheyenne River Basin is in private ownership, 11 percent is in the Thunder Basin National Grasslands, eight percent is owned by the state, six percent is BLM-administered land, and less than one percent is in the Black Hills National Forest. CBNG development, recreation, forest management, bentonite mining, O&G production, and livestock grazing are dominant uses of public lands, while grazing and hay production are the major uses of private lands. Streams on public lands are typically small, intermittent, or do not support game fish, and provide very little fishing opportunity. Most fishing occurs on small ponds in the Thunder Basin National Grasslands (e.g., Turner and East Iron Creek reservoirs and Upton ponds) and private reservoirs where unrestricted public access is provided (Black Hill Power and Light reservoir) or where free permits are used to control access (LAK and MW reservoirs).

The Cheyenne River basin supports 30 fish species, 11 of which are native. Creek chub were expected but not sampled from the basin, while mountain sucker were unexpectedly collected from Indian Creek but not from Stockade Beaver Creek, where they were previously sampled. A single brassy minnow was collected in Beaver Creek, and Barrineau et al. (2007) collected the first channel catfish and shorthead redhorse reported from the Cheyenne River Basin. Sand shiner, fathead minnow, and introduced green sunfish comprised 76 percent of all fish by number collected by Barrineau et al. (2007). Green sunfish (common), largemouth bass (uncommon), and yellow perch (rare) are non-native species present in the drainage.

Native fish species diversity is high throughout the basin, but introduced species provide virtually all of the sport fishing opportunity. Trout, largemouth and smallmouth bass, walleye, and tiger muskie are the most important game fish. The Lower Cheyenne River becomes intermittent in most years. Because the Cheyenne River and its major tributaries are intermittent most years, the drainage has been considered unsuitable for game fish, but the presence of green sunfish and black bullhead in Beaver Creek has been confirmed (BLM 2003c). These two species are abundant in the basin, but are regarded as nuisance species rather than important game species.

WGFD stocking records document the wide variety of salmonids and cool-water species stocked in standing waters since at least the 1930s. Most fishing in the basin occurs on ponds and reservoirs that are typically managed for trout, bass, or both. Standing waters primarily support local angling interests.

Stream intermittency is a historically expected basin condition (Druse et al. 1990), but increased frequency or duration of zero flow periods during drought or long-term climate change is likely to affect fish communities (Barrineau et al. 2007). Barrineau et al. (2007) details the most recent stream habitat conditions throughout the basin. Unsuitable habitat limits opportunities for salmonid fisheries. Illegally or intentionally introduced non-native fish pose predatory or competitive threats to native species throughout the Cheyenne River Basin (Barrineau et al. 2007).

Belle Fourche River Basin

The Belle Fourche River Basin covers over 3,762 square miles (WGFD 2008b). There is one fourth-level HUC from this basin in the planning area. Elevations in the basin range from 3,100 feet in the northeast corner of Crook County at the Wyoming-South Dakota state line to 6,645 feet at Warren Peak. The Upper Belle Fourche River sub-watershed is entirely within Campbell County in the western portion of the Belle Fourche River Basin.

Vegetation consists of mostly rolling grasslands and sagebrush, with the exception of ponderosa pine-dominated forestlands of the Black Hills National Forest. The principle land use of the drainage is livestock grazing and hay production. Water diversions for irrigation are common. Other land uses common to the drainage are O&G production, forest management, bentonite and coal mining, and recreation (predominately hunting, with the exception of fishing and water sports at Keyhole Reservoir) (WGFD 2008b).

The Belle Fourche River Basin is mostly comprised of private lands (82%), with only 18 percent being a mixture of state, BLM, National Forest, Thunder Basin National Grasslands, and state parks.

Thirty-six fish species have been documented in the Belle Fourche River Basin. Nineteen fish species have been introduced to the basin as sport fish or as forage to support the sport fisheries. Sixteen fish species are native to Wyoming, but the Snake River cutthroat is not native to the Belle

Fourche River Basin (WGFD 2008b). Comparisons of data collected in the 1960s and the 1990s suggest that of the fish species present in the Belle Fourche River Basin, nine have declined over this 30-year period. The fine scale dace, flathead chub, fathead minnow, lake chub, mountain sucker, shorthead redhorse, plains minnow, river carpsucker, and stonecat have declined on spatial scales described by Patton as site, stream, sub-drainage, and drainage levels, compared with that of the 1960s sampling performed by Baxter and Simon (WGFD 2008b).

Most of the streams are unsuitable for cold-water fish and offer limited potential for warm-water game fish because of water diversion and lack of suitable habitat. Beaver ponds on some minimal-flow streams provide localized trout habitat, and many of the small streams in the Black Hills depend on beaver ponds to provide habitat for fish; however, flash floods or heavy sedimentation periodically eliminate these ponds for fisheries (WGFD 2008b).

Most of the potential for game fish exists in the numerous farm ponds and reservoirs, but many are subject to periodic winter or summer kills because of limited water availability. Many of the farm ponds and privately owned reservoirs contain stunted populations of bullhead or green sunfish. The largest lentic fishery in the drainage is Keyhole Reservoir (McDowell 1995).

Urban fisheries are very important in the Belle Fourche River Basin. Gillette Fishing Lake, Panther Pond, Medicine Lake, and Sundance Fairground Pond provide fisheries where little or no fishing opportunity would otherwise exist. Several thousand fish are stocked in the Belle Fourche River Basin every year. Catchable rainbow trout, Snake River cutthroat trout, and sub-catchable brook trout are used quite frequently on public waters such as Gillette Fishing Lake, Panther Pond, Spotted Tail Pond, and Sundance Fairgrounds Pond and on private waters that allow public access, such as Medicine Lake and Driskill Reservoir (when water is available). Warm- and cool-water species are stocked quite frequently as well, not only to provide anglers with more diverse fishing opportunities but also to help control undesirable species such as green sunfish and black bullheads (WGFD 2008b).

In general, suitable habitat for game fish is rare in the Belle Fourche River Basin. Due to the small size and low flow of the Belle Fourche River and its tributaries, sport fish potential is low. Most of the basin is very arid, as indicated by negative water balances ranging from 6 to 17 inches (Marston et al. 1990). Small reservoir impoundments are abundant in the Belle Fourche River Basin. With the exception of Keyhole Reservoir, game fish habitat is restricted to small impoundments and to a relatively few stream segments. Native fishes are limited by low-oxygen and high-temperature stress during periods of low flow (Barnes 1996).

High streamflow fluctuation, streamflow alteration, long periods of low flow, high turbidity, and siltation limit the potential of most streams and standing waters in the drainage to support game fish, particularly cold-water species. Fleischer (1978) noted that morphological modifications of the drainage from rechannelization, mining, and reclamation will alter surface water drainage patterns and flow regimes, a major consequence of which could be a reduction of inflow into Keyhole Reservoir (WGFD 2008b). Impacts of coal mining and CBNG industries on fisheries and wildlife in the Belle Fourche River Basin are not well understood. According to the [WOGCC website](#), CBNG and natural gas development has increased in the Belle Fourche River Basin.

Little Missouri River Basin

The Little Missouri River Basin covers 735 square miles of northeastern Wyoming. There is one fourth-level HUC from this basin in the planning area. Most of the drainage is in Crook County,

although small headwater sections originate in Campbell County. Elevations range from 3,460 feet near the Montana-Wyoming border to about 4,600 feet at the headwaters (Gumtow et al. 1994).

Vegetation throughout the drainage area consists of mostly sagebrush and grassland, with ponderosa pine along the ridges and breaks of the low rolling hills. Agricultural activities such as hay production and livestock grazing are predominant in the valleys and riparian areas.

Although there are some state and federal lands in the drainage, no public access is available to the flowing water, all of which is on private land (Mueller and Rockett 1966).

Twenty-four fish species have been documented in the Little Missouri River Basin; most are native nongame species. Seven species are not native to the Little Missouri River Basin. In general, suitable habitat for game fish is minimal in this drainage. Due to the small size and low flow of the Little Missouri River and its tributaries, sport-fish potential is low. Fish habitat in streams is mainly confined to large pools, which can be isolated during extreme low-water conditions. Game fish habitat is mostly restricted to small impoundments in the Little Missouri River drainage. Factors limiting standing waters in the Little Missouri River drainage include drought periods, drawdowns for irrigation, and stock watering. Shallow depths of standing waters often limit overwintering for fish, resulting in fish kills. Other factors affecting fisheries in the Little Missouri River drainage include a lack of data on fish population abundance and species distribution, and lack of public access to waters that do or possibly would support sport fisheries.

Game fish habitat is restricted to small reservoirs and stock ponds, limited streamflows in the Little Missouri River below its confluence with the North Fork Little Missouri River, and in the North Fork Little Missouri River (Mueller and Rockett 1964). Mueller and Rockett (1966) reported that the WGFD had stocked 33 reservoirs in the Little Missouri River drainage with game fish, and numerous other small reservoirs have populations of largemouth bass, green sunfish, and black bullhead introduced illegally. The WGFD stream/lake database lists 58 standing waters, 31 of which are listed as unsuitable for sustaining a fishery. The WGFD or private landowners who obtained stocking authorization have stocked many of these unsuitable waters and most of the remaining 27 waters noted as suitable. Often, these unsuitable waters, when they become suitable during good water years, are stocked again (by the landowner), and might support a fishery for a few years. At present, the WGFD does not stock any of the standing waters or streams in the drainage.

Fisheries management is currently very limited in the Little Missouri River Basin. With approximately 80 percent of the land in the basin being private, management opportunities are minimal. In recent years (2004 and 2005) native nongame fish in the basin have become a priority. Although fish abundance, distributions, life histories, and conservation needs are not well known, recent surveys provide insight that can aid future fisheries management in the Little Missouri River Basin.

All Basins

Continuing threats to fish populations in the planning area include sedimentation, high concentrations of salts and metals, fuel and drilling fluid runoff, degradation of riparian habitat (including vegetation removal, cottonwood depletion, invasive plant species, and impacts from livestock), changing water levels, and introductions of predatory fish, increased clarity, flow stabilization, and construction of stream and river crossings. Refer to the *Water* section of this document for total discharges of CBNG produced water contributing to each basin.

Management actions for fish generally address water sources and rights; habitat restoration, improvement, and conservation; impacts from other BLM resource program authorized activities; floodplain connectivity; land tenure adjustments; and recreation. The BFO has developed an activity plan, the *Buffalo Resource Area Wetland Habitat Management Plan*, to focus management of site-specific riparian-wetland habitat improvements in the planning area. This activity plan is in various stages of implementation.

Powder and Tongue Rivers

The assessment of potential effects of water produced from CBNG development on macroinvertebrate and algal communities in the Powder and Tongue Rivers indicates the following:

Invertebrate community metrics and O/E scores, as well as algal metrics, indicated a substantial decline in biological condition between sites downstream of Willow Creek and upstream of Pumpkin Creek. At other site pairs, multiple lines of evidence indicate no substantial differences or an increase in biological condition, such as an increase between sites upstream and downstream of Beaver Creek. The spatial variability indicates localized noncumulative stressors might be affecting the biota. Biological condition generally declined in the middle reaches of the Powder River, indicating potential cumulative effects from CBNG discharges in some reaches from Flying E Creek to downstream of Wild Horse Creek. The middle reaches of the Powder River also contained the highest alkalinity concentrations, a potential indicator of toxicity from sodium bicarbonate. Inflow of water between Barber Creek and Wild Horse Creek might be associated with the corresponding decline in macroinvertebrate community condition and increase in facultative nitrogen heterotrophic diatoms. The increase in nitrogen heterotrophs indicates that the water contains relatively high concentrations of organic nitrogen. Comparison of invertebrate metric results from 2010 to those from 2005–08 corroborated previous findings that biological condition in the middle reaches of the Powder was lower than in the upper or lower reaches (Peterson et al. 2011).

Biological condition in the lower reaches of the Powder River was variable. Biological condition on the Tongue River showed an increase in one case and a decrease in another. Few substantial differences were noted from upstream to downstream of Prairie Dog Creek. No notable differences were noted in the Tongue River upstream and downstream of Hanging Woman Creek (Peterson et al. 2011).

3.4.5.4. Trends

A relatively small percentage of waters in the planning area have available estimates of fish populations. These estimates show that there have not been any extensive declines in overall fish assemblages in recent years. However, fish populations in the planning area fluctuate due to naturally occurring events such as drought, fire, and floods, but anthropogenic effects from road crossings, flow alterations, and changes to water quality, can also influence populations. Standing-water habitat is limited by drought periods, drawdowns for irrigation, and stock watering. Shallow depths of these standing waters often limit overwintering for fish, periodically resulting in partial or complete winterkills. Fish habitat in many streams is mainly confined to pools that might be isolated during extreme low water conditions.

3.4.5.5. Key Features

Riparian areas represent a key feature in fisheries health. Four types of riparian ecosystems, including wetlands, have been identified in the planning area – forest dominated riparian, willow and shrub dominated riparian, herbaceous riparian, and wet meadow. Approximately three percent of the planning area is comprised of riparian and wetland areas.

Hunters, anglers, bird watchers, and biologists have long recognized the value of riparian ecosystems to fish and wildlife. Riparian ecosystems are particularly valuable in a dry environment such as Wyoming. It has been estimated that, although only a small percent of the planning area is classified as riparian land, about 80 percent of the native animals depend on riparian zones for food, water shelter, and migration routes during some time of the year (Olson and Gerhart 1982).

Alteration of hydraulic conditions can affect the physical and chemical properties in a wetland, such as pH, soil salinity, sediment properties, oxygen content, and nutrient availability. Small changes in hydraulic conditions can result in massive responses by wetland biota in terms of species composition, species richness, and ecosystem productivity. Changes to the interrelationships among surface-water dynamics, groundwater level, and river channel processes can lead to changes in the establishment and maintenance of dependent riparian plant communities (Busch and Smith 1995). These changes are rapidly occurring in the planning area. Impacts to the riparian ecosystems in the planning area are: livestock grazing, which increases channel erosion and agricultural water withdrawals; physical disturbances created by the extraction of O&G resources; water depletion from invasive species such as tamarisk and Russian olive; and discharge of CBNG produced water directly into riparian corridors.

Special management of these areas will be necessary to ensure riparian corridors are healthy, that these ecosystems remain intact, and that they can meet the needs of present and future demands on public lands. Riparian areas key to fishery habitat management occur in all delineated Areas of Relative Ecological Importance and in the remaining area not included in this designation.

3.4.6. Fish and Wildlife Resources – Wildlife

3.4.6.1. Regional Context

The planning area is in the southern portions of the short- and mixed-grass prairie ecoregion. Short- and mixed-grass prairie is the largest grassland ecoregion in North America, covering almost 247,000 square miles. This ecoregion covers parts of southeastern Alberta and southwestern Saskatchewan, much of the area east of the Rocky Mountains, central and eastern Montana, western North and South Dakota, and northeastern Wyoming. Four major features distinguish this unit from other grasslands – the harsh winter climate, with much of the precipitation falling as snow; short growing season; periodic severe droughts; and vegetation.

Two environmental gradients determine species composition in short- and mixed-grass prairies – increasing temperatures from north to south and increasing rainfall from west to east. With increasing latitude, the short-grass prairies take on an aspect more similar to mixed-grass prairies such as in this ecoregion, where many cool-season species predominate (Sims 1988). In general, this ecoregion has an arid grassland ecoclimate.

Please refer to the *Vegetation* sections for descriptions of habitats comprised of forests and woodlands, grasslands and shrublands, and/or riparian/wetland communities. The short- and mixed-grass prairie is surprisingly rich in mammals for an ecoregion so far north. Much of the bird fauna is comprised of species typically associated with the prairie potholes.

In pre-settlement times, drought, fire, and wildlife grazing were likely the major disturbance factors, with fire playing a smaller role than in other grassland ecoregions. The potential for large-scale restoration is perhaps greater in this ecoregion than in almost any other in North America.

Major degradation threats are exotic invasive species such as cheatgrass, leafy spurge, and tamarisk. There is increased industrial activity (particularly O&G), road expansion, and widespread application of pesticides and herbicides. Historic, current, and predicted activities in the planning area directly contribute to all of the threats to this ecoregion. The planning area is ecologically important to the continuity of the ecoregion as a whole.

BLM and WGFD guidance documents are available regarding BMPs and management of wildlife habitats (WGFD 2009b; BLM 2005a). Although not as specific in management focus as the HMPs and action plans identified below, the existing plan does guide BLM overall management of wildlife habitats in the planning area. Due to the relationship between wildlife habitats managed by the BLM and wildlife species managed by the WGFD, a statewide agreement was established to facilitate cooperation between these agencies related to wildlife (WGFD and BLM 1990). In accordance with the cooperative relationship between these agencies, the following description of wildlife species in the planning area is organized by WGFD statutory wildlife categories to facilitate the discussions. The primary headings are game species (big game, trophy game, small game, waterfowl and other water birds, upland game birds, and furbearers), non-game species (raptors, summer and year-round resident and migratory birds, and non-game mammals), predatory animals, and reptiles and amphibians.

Sagebrush ecosystems also support a variety of species. Sagebrush obligates are animals that cannot survive without sagebrush and its associated perennial grasses and forbs; that is, species requiring sagebrush for some part of their life-cycles. Sagebrush obligates in the planning area listed as sensitive species by BLM Wyoming include Greater Sage-Grouse, Brewer's sparrow, sage thrasher, and sage sparrow; these species are further addressed in the *Special Status Species – Wildlife* section. Other sagebrush-obligate species in the planning area include sagebrush vole, pronghorn, and sagebrush lizard. Pronghorn are often associated with sagebrush, but also occupy grasslands in the planning area.

In addition, regional context for each species or species group are included where available/appropriate.

3.4.6.2. Indicators

Road density has been correlated with habitat effectiveness (BLM 2003c). The measurement of road density provides an approximation of the potential for impacts to wildlife in several ways. First, it allows for an estimate of the amount of wildlife habitat that might be adjacent to roads and, therefore, the amount of habitat that might be less effective because wildlife species sensitive to human disturbance avoid the habitat. Second, it provides a measure of the amount of habitat fragmentation, which is important in assessing impacts to wildlife species that require large tracts of habitat free from development. Third, it allows an estimate of other parameters important

to wildlife populations, such as the potential for road-kill and the potential for disturbance and mortality related to hunting. The locations of many existing roads in the planning area, particularly associated with recent non-federal O&G development, are not known; therefore, neither a spatial analysis using buffers on existing roads nor a road density estimate are possible.

Fragmentation of shrub-steppe habitat is a major disruption that has consequences for sagebrush-obligate species (Braun et al. 1977; Rotenberry and Wiens 1978). In fragmented habitats, suitable habitat area remains only as remnants surrounded by unusable environments (Urban and Shugart 1986; Fahrig and Paloheimo 1988). Populations of sagebrush-obligate species decline because areas of suitable habitat decrease (Temple and Cary 1988), because of lower reproduction, and because of higher mortality in remaining habitats (Robinson 1992; Porneluzi et al. 1993).

The extent of indirect impacts to wildlife species from human uses adjacent to their habitats varies by species and other factors such as topography, vegetative screening, habituation to disturbance, and frequency and intensity of disturbance. Mule deer, for example, tend to reduce their habitat use within 0.125 mile of roads (Rost and Bailey 1979). Elk tend to reduce their use of habitats within 0.5 mile of roads (Ward 1976). By applying a buffer to existing roads, it is possible to estimate the amount of habitat that has been reduced in effectiveness for a species.

Please refer to the *Vegetation* sections for descriptions of indicators of vegetation health for habitats comprised of forests and woodlands, grasslands and shrublands, and/or riparian/wetland communities. In addition, indicators for each species or species group are included where available/appropriate.

3.4.6.3. Current Condition

All of the vegetative types listed in the *Vegetation* sections provide habitat for some wildlife species. In an undisturbed condition, the major vegetative types in the planning area provide high-quality habitats for many wildlife species. Because these habitats tend to occur in a mosaic across the landscape, many wildlife species use more than one habitat. Most of the habitat consists of mixed-grass prairie, sagebrush shrubland, other shrubland, and riparian areas (including herbaceous, willow and shrub dominated, and forest dominated riparian areas). In addition to the common vegetative types, wet meadows tend to provide habitat for wildlife species associated with nearby dominant vegetation cover types, such as prairie or sagebrush shrubland, although in areas of large wet-meadow complexes, species common to riparian habitats can also occur. Furthermore, although they occur only sporadically throughout the planning area, coniferous woodlands support a different set of wildlife species than the main habitat types, primarily as a result of seed production and potential nest substrates provided by the various conifer species; varying forest conditions can provide specialized habitat for several forest-dwelling wildlife species.

The terrestrial vertebrate wildlife species in the planning area represent all major vertebrate classes – reptiles, amphibians, birds, and mammals. The following paragraphs list some of the wildlife species present in the common vegetative types in the planning area, although these species can also be present in other habitat types if the necessary habitat components are available. The *Special Status Species* sections that follow this discussion of wildlife address species of special concern (Threatened, Endangered, and BLM sensitive species).

Common wildlife species that typically occur in mixed-grass prairie habitats include prairie rattlesnake, golden eagle, prairie falcon, ferruginous hawk, Swainson's hawk, plains sharp-tailed grouse, lark bunting, horned lark, western meadowlark, lark sparrow, vesper sparrow, chestnut collared longspur, McCown's longspur, badger, coyote, swift fox, thirteen-lined ground squirrel, black-tailed jackrabbit, Ord's kangaroo rat, deer mouse, western harvest mouse, plains pocket gopher, black-tailed prairie dog, mule deer, and pronghorn.

Common wildlife species that may occur in sagebrush shrublands include eastern short-horned lizard, prairie rattlesnake, northern harrier, Swainson's hawk, Greater Sage-Grouse, Say's phoebe, western kingbird, horned lark, sage thrasher, Brewer's sparrow, vesper sparrow, sage sparrow, western meadowlark, desert cottontail, black-tailed jackrabbit, thirteen-lined ground squirrel, northern pocket gopher, Ord's kangaroo rat, deer mouse, prairie vole, pronghorn, and mule deer.

Common wildlife species that can occur in other shrublands are similar to those that inhabit sagebrush shrublands, and include garter snake, chukar, plains sharp-tailed grouse, western kingbird, horned lark, black-billed magpie, rock wren, sage thrasher, lazuli bunting, spotted towhee, Brewer's sparrow, lark sparrow, lark bunting, bobolink, masked shrew, desert cottontail, least chipmunk, Wyoming ground squirrel, thirteen-lined ground squirrel, deer mouse, northern grasshopper mouse, coyote, western spotted skunk, pronghorn, and mule deer.

Wildlife species that can occur in riparian areas (including herbaceous, willow and shrub dominated, and forest dominated riparian areas) include bull snake, tiger salamander, northern leopard frog, northern harrier, Virginia rail, sora, common snipe, short-eared owl, marsh wren, common yellowthroat, savannah sparrow, song sparrow, red-winged blackbird, yellow-headed blackbird, deer mouse, meadow vole, red fox, pronghorn, mule deer, and white-tailed deer. Wet meadows tend to provide habitats for wildlife species associated with nearby dominant vegetation cover types (such as prairie or sagebrush shrublands), although in areas of large wet-meadow complexes, species common to riparian habitats can also be present.

Common wildlife species in coniferous forest include ruby-crowned kinglet, downy woodpecker, hairy woodpecker, mountain chickadee, golden eagle, mountain bluebird, northern flicker, western tanager, pinyon jay, chipping sparrow, Nuttall's cottontail, mule deer, elk, moose, black bear, porcupine, bushy-tailed woodrat, and mountain lion.

Prairie dog colonies are of particular importance to the planning area because these unique ecosystems create habitat for many species of wildlife (King 1955; Reading et al. 1989). Agnew et al. (1986) found that bird species diversity and rodent abundance were higher on prairie dog towns than on mixed-grass prairie sites. Several studies (Agnew et al. 1986; Clark et al. 1982; Campbell and Clark 1981; Reading et al. 1989) suggest that species richness increases with colony size and regional colony density. Prairie dog colonies attract many insectivorous and carnivorous birds and mammals because of the concentration of prey species (Clark et al. 1982; Agnew et al. 1986; Agnew et al. 1988). In South Dakota, 40 percent of the wildlife taxa (134 vertebrate species) are associated with prairie dog colonies (Agnew 1983; Agnew et al. 1986; Apa 1985; McCracken et al. 1985; Uresk and Sharps 1986; Deisch et al. 1989). Of those species regularly associated with prairie dog colonies, six are on the BLM Wyoming sensitive species list – swift fox, mountain plover, ferruginous hawk, burrowing owl, loggerhead shrike, and long-billed curlew.

Three HMPs currently guide management in the planning area: the South Bighorns HMP (BLM 1986c); the Buffalo Resource Area; Wetland HMP (BLM 1986b); and the Middle Fork Powder River HMP (BLM 1980). Although they remain relevant, all of these plans need to be revised.

Current conditions for each species or species group are included where available/appropriate.

Big Game

Current Condition

Big game species expected to occur in suitable habitats throughout the planning area include pronghorn, white-tailed deer, mule deer, elk, and moose. The WGFD has identified various ranges for big game species, as follows:

- *Crucial Range* is any particular seasonal range or habitat component, but describes the component documented as the determining factor in a population's ability to maintain and reproduce itself at a certain level (see Map 29).
- *Summer or Spring-Summer-Fall* use is when a population or portion of a population of animals uses the documented habitats in this range annually from the end of previous winter to the onset of persistent winter conditions.
- *Severe Winter Relief* is a documented survival range that might or might not be considered a crucial range area as defined by crucial range. It is used, to a great extent, only in extremely severe winters. It might lack habitat characteristics that would make it attractive or capable of supporting major portions of the population during normal years, but is used by and allows at least a substantial portion of the population to survive the occasional extremely severe winter.
- *Winter* use is when a population or portion of a population of animals uses the documented suitable habitat sites in this range annually and in substantial numbers only during the winter period.
- *Winter-Yearlong* use is when a population or a portion of a population of animals makes general use of the documented suitable habitat sites in this range year round. During the winter months, there is a considerable influx of additional animals into the area from other seasonal ranges.
- *Yearlong* use is when a population of animals makes general use of suitable documented habitat sites in the range year round. Animals might leave the area under severe conditions.
- *Calving Areas* are documented birthing areas commonly used by females. It includes calving areas and fawning areas. These areas might be used as nurseries by some big game species.

Other than the specific ranges identified by the WGFD for each species, Map 29 shows baseline data on other aspects of each species' seasonal activities and movements (for example, fawning areas and priority migration corridors).

The planning area encompasses all or part of 26 big game populations or herd units (12 pronghorn, 5 mule deer, 4 white-tailed deer, 6 elk, and 1 moose).

Indicators

Established population size "objectives" guide management strategies for each big game herd unit. The WGFD establishes these objectives through a public and interagency review and input process and sets population size objectives at a biologically sustainable and socially acceptable level. The WGFD considers weather trends, performs habitat condition assessments, compiles population information (line transect surveys, classification surveys, and population modelling) and collects and analyzes hunter statistics and harvest information in order to assess population size and distribution of big game. Moderate to extreme fluctuations in this data typically warrants changes in hunting seasons or harvest to stabilize populations at desired objectives. For current population objectives, current population estimates, population trends, and management challenges for each herd unit, see the most recent WGFD Sheridan Region Job Completion Report.

Pronghorn

Regional Context

Pronghorn are unique to the western plains of North America and are the only living species in their taxonomic family (Antilocapridae). Wyoming is the center of the pronghorn's range and supports the largest population of pronghorn (Clark and Stromberg 1987). Pronghorn typically inhabit grasslands and semi-desert shrublands of the western and southwestern United States. This species is most abundant in short- and mixed-grass habitats and is less abundant in more xeric habitats. Home ranges for pronghorn can vary between 400 acres and 5,600 acres, according to several factors including season, habitat quality, population characteristics, and local livestock occurrence. Typically, daily movement does not exceed 6 miles. Some pronghorn make seasonal migrations between summer and winter habitats, but these migrations are often triggered by availability of succulent plants and not local weather conditions (Fitzgerald et al. 1994).

Current Condition

Pronghorn occur in the entire planning area, with the exception of most forested areas. The WGFD has divided pronghorn into herd units to estimate population sizes. The following pronghorn herd units reside entirely or partially in the planning area: 203, 308, 309, 316, 318, 339, 351, 352, 353, 354, 355, 740, and 748. The WGFD has estimated that the 2012 population size of all herd units in the planning area is 162,870 animals (WGFD 2013a). The overall population objective of this same group of herd units is 151,400 animals; therefore, population levels are currently above objective overall, but not in every herd unit.

Potential management concerns common to most herd units include obtaining adequate classification samples, inconsistent line transect density estimates, limited hunter access to private lands, high buck ratio, difficulty attaining desired harvest, limited or inaccessible public-land hunting opportunities, expanding subdivisions limit hunting opportunity and hunter access, and urban development (WGFD 2007a; WGFD 2013a). Increased activity related to the O&G industry, attempts to balance private and public land use, wildfire, fawn recruitment, forage production, and reclamation are all factors that have influenced herd numbers in recent years (WGFD 2013a).

Extensive ongoing and planned future O&G development is noted as a potential management concern for a number of herd units. The increase in O&G activity has resulted in restricted surface access on the large tracts of public land. This results in frustration from hunters seeking a public-land hunt, and has upset some non-resident hunters who had returned to the area annually and are not able to access areas they once frequented as landowners become concerned about the safety of hunters and CBNG employees on their property. CBNG development has also been an issue with hunter satisfaction; complaints have increased regarding the quality of the hunting experience while dealing with increasing CBNG traffic and land use.

Trends

The overall population trend for pronghorn in the planning area appears to be stable to decreasing (WGFD 2013a).

Deer

Current Conditions

Both mule deer and white-tailed deer occur in the planning area. Mule deer are distributed throughout the seasonal ranges, and generally prefer habitat types in the early stages of plant

succession and with numerous shrubs. They use the woody riparian, shrublands, juniper woodland, and aspen woodland habitat types extensively during spring, summer, and fall. These habitat types provide adequate forage areas with succulent vegetation for lactating females and adequate cover for security and fawning. They are often present in juniper and limber pine woodlands, sagebrush/rabbitbrush, bitterbrush/sagebrush steppe, and riparian habitat types. White-tailed deer use woody riparian habitats along creeks and rivers for forage and cover.

Mule Deer

Regional Context

Mule deer occur from southern Yukon and northwest territories of Canada, south through the western United States to Wisconsin and western Texas. Mule deer in Wyoming are among the eastern edges of this species' distribution. In Wyoming, mule deer occur in mountains and associated foothills, broken hill country, and prairie grasslands and shrublands (Clark and Stromberg 1987).

Current Conditions

Browse is an important component of the mule deer's diet throughout the year, making up as much as 60 percent of total intake during autumn, while forbs and grasses typically make up the rest of their diet (Fitzgerald et al. 1994). This species tends to be more migratory than white-tailed deer, traveling from higher elevations in summer to winter ranges that provide more food and cover. Fawn mortality is typically due to predation or starvation. Adult mortality often occurs from hunting, winter starvation, and collisions with automobiles. Typical predators can include coyotes, bobcats, golden eagles, mountain lions, bears, wolves and domestic dogs (Fitzgerald et al. 1994).

Mule deer ranges occur in almost all parts of the planning area. The WGFD has divided mule deer into herd units to estimate populations. Seasonal range maps are subject to change as new management data becomes available. The following herd units reside entirely or partially in the planning area: 208, 319, 320, 321, 322, 740, 751, and 755.

Extensive ongoing and planned future O&G development is noted as a potential management concern for a number of herd units. O&G development in some areas is creating problems for hunters. Public accessibility to BLM and state lands is particularly problematic, because intensive development activity has reduced hunting opportunity and quality. In recent years, these lands have attracted fewer hunters. Almost all landowners charge access fees or require an outfitter for buck hunting, and tend to cater to non-resident hunters. Land use by the CBNG industry create additional restrictions as landowners become concerned about safety issues and restrict hunting where CBNG activity is high. Increased traffic and other activities associated with the CBNG industry also interfere with an "enjoyable hunt," and this issue has become a more frequent complaint on landowner surveys for the region. When these factors cause landowners to more tightly control access to private lands, it increases pressure on the few areas of public land available in this herd unit. Many hunters contacted on public land (mainly Thunder Basin National Grassland) complained of the low quality and young age of bucks and the excess of does, which can mainly be attributed to increased hunting pressure on public lands (WGFD 2006b; WGFD 2007a).

Trends

The WGFD has estimated that the 2012 population of all herd units in the planning area is 131,199 animals (WGFD 2013a). The overall population objective of this same group of herd units is 201,100 animals. All herd units in the planning area are below objective, although 751 is only 2.5 percent below.

Lack of hunter access to private land, increased activity related to the O&G industry, attempts to balance private and public land use, wildfire, poor fawn recruitment due to weather factors, predators, forage production, increased competition from other species, and reclamation are all factors that have influenced herd numbers in recent years (WGFD 2007a; WGFD 2006b; WGFD 2013a).

White-tailed Deer

Regional Context

White-tailed deer occur throughout North America from the southern United States to Hudson Bay in Canada. Across much of its range, this species inhabits forests, swamps, brushy areas, and nearby open fields. White-tailed deer are present throughout Wyoming, typically concentrated in riparian woodlands, shrubby riparian and associated irrigated agricultural lands, and are generally absent from dry grasslands and coniferous forests (Clark and Stromberg 1987).

Current Conditions

Their diet is diverse, capitalizing on the most nutritious plant matter available at any time. In addition to native browse, grass, and forbs, this species relies on agricultural crops, fruits, and acorns and other nuts. White-tailed deer mortality is typically related to hunting, winter starvation, collisions with automobiles, and predation. Predators can include coyotes, mountain lions, wolves, and occasionally, bears, bobcats, and eagles (Fitzgerald et al. 1994).

In the planning area, white-tailed deer are restricted to river and stream drainages across the PRB and to riparian habitats associated with the northern foothills of the Big Horn Mountains. They tend to be absent from large expanses of prairie and shrubland.

The WGFD has divided white-tailed deer into herd units to estimate population sizes. Seasonal range maps are subject to change as new management data becomes available. The following herd units reside entirely or partially in the planning area: 201, 303, 706, and 707.

Trends

The WGFD has estimated the 2012 population size of two of these herd units at 56,719 animals (16,600) in herd unit 303, with a objective of 8,000, and 40,119 in herd unit 706, with a objective of 40,000); however, survey data were not adequate to allow estimates of the sizes of the other herd units. The population is thought to be substantially higher than the objectives for both herd units, with a stable or increasing trend (WGFD 2013a). The stated cause for populations substantially higher than objective is lack of public access for hunting, and urbanization in the northwest part of the planning area.

Elk

Regional Context

Elk formerly ranged over much of central and western North America from the southern Canadian Provinces and Alaska south to the southern United States, and eastward into the deciduous forests.

This species is present throughout Wyoming in a variety of habitats, including coniferous forests, mountain meadows, short- and mixed-grass prairies, and sagebrush and other shrublands.

Current Conditions

In the planning area, elk are concentrated in the Big Horn Mountains and associated foothills, the Fortification Creek area west of Gillette, the Pine Ridge area in the south, and the Rochelle Hills in the southeast. Similar to other members of the deer family, this species relies on a combination of browse, grasses, and forbs, depending on their availability throughout the seasons. Elk tend to be migratory, moving between summer and winter ranges, although within the planning area, the Fortification Creek and Rochelle Hills elk herds are essentially non-migratory. Specific studies on seasonal movement and range use have been completed for the Fortification Creek herd unit; therefore, data for this area are presented separately from the other herd units. Typically, mortality is a result of predation on calves, hunting, and winter starvation. Predators can include coyotes, mountain lions, bobcats, bears, wolves, and golden eagles.

The WGFD has divided elk into herd units to estimate population sizes. The following herd units reside entirely or partially in the planning area: 211, 320, 321, 322, 344, and 743. The WGFD has estimated the total population size of five of these herd units at 17,136; however, survey data were not adequate to allow a population estimate of the size of herd unit 743, but is likely to be larger than was thought by wildlife managers in the past (WGFD 2013a). The overall population objective of the same group of four herd units is around 12,000 animals; therefore, population levels are currently above objective overall. Factors influencing herd numbers include lack of public access for hunting, access to private lands for hunting at a level sufficient to allow effective herd management, wildland fire, and weather conditions. The Fortification herd harvest is limited by private land owners. WGFD Job Completion Reports, which are online, do not indicate habitat quality as limiting elk.

Extensive ongoing and planned future CBNG development was noted as a potential management concern for one herd unit. Impacts from CBNG development are not known at this time; however, increased road density, produced-water discharge, loss of vegetation, and increased human presence have the potential to adversely affect herd units subject to substantial CBNG development (BLM 2003c). Research in the Fortification herd unit to study the effects of development on elk are ongoing (WGFD 2013a).

Trends

The overall recent trend has been increasing herd numbers, except in herd unit 322, which is decreasing; however, the herd unit is still above objectives (WGFD 2013a). Elk numbers in Fortification Creek and on the Southern Big Horns are above desired objectives by 241 percent and 109 percent respectively. WGFD has increased hunter opportunities in the Southern Big Horns in an attempt to reduce the population.

Moose

Regional Context

In North America, moose occur from Alaska to the northeastern United States and south along the Rocky Mountains into Colorado. Typical moose habitats in the Rocky Mountains include willow, spruce, fir, aspen, or birch. These habitats are common to forest dominated riparian, shrub dominated riparian and wet meadow vegetative types.

Current Conditions

Moose ranges are extremely limited in the planning area and are restricted to areas along the western boundary in the Big Horn Mountains. These range data are based on seasonal range maps available from the WGFD at the time of this writing. Seasonal range maps are subject to change as new management data become available. Willow is an important dietary component on all seasonal ranges, especially in winter range when grasses, forbs, and aquatic vegetation are less available. Moose tend to have strong affinity for specific home ranges, but would make seasonal migrations in search of suitable forage and habitat. Major mortality factors include hunting, starvation, and predation. Common predators include mountain lion, wolverine, coyote, bear, lynx, wolves, and domestic dog (Fitzgerald et al. 1994).

There are existing disturbances to moose habitats attributed to agriculture, mineral development, or urban areas in the planning area. Specific data on mining, roads, compressors, and ancillary O&G facilities are not available in sufficient detail to allow a determination of their impacts on moose habitats.

The 313 herd unit is the only moose herd unit in the planning area. WGFD has estimated that the 2012 population of this herd unit is 452 animals (WGFD 2013a). The overall population objective of this herd unit is 500; therefore, population levels are currently at 90 percent of objective. Some problems associated with the management of this herd include lack of sufficient funding for data collection, lack of a reliable population estimate technique, non-hunting mortality (e.g., illegal harvest and moose-vehicle collisions), possible forage competition, weather conditions, and habitat quality.

Trends

The overall population trend for moose in the planning area is thought to be relatively stable or trending slightly downward (WGFD 2013a).

Trophy Game

The WGFD classifies mountain lions and black bears as trophy game.

Mountain Lion

Regional Context

Formerly distributed throughout North America, the mountain lion is now found mostly in remote areas of the western United States. Mountain lions are typically present in remote areas with dense cover and rocky, rugged terrain. They are present in most habitats where deer, their primary prey base, are present.

Indicators

Local and regional management objectives are developed and evaluated based on WGFD-collected harvest data. A source-stable-sink adaptive management approach is applied evaluating (1) density of human caused mortalities, (2) sex-age composition of mountain lion harvest focusing on relative proportion of adult female harvest, and (3) the relative age of harvested adult females. WGFD will implement adaptive management strategies to address short and long-term management needs where appropriate and additional research efforts will be conducted to address other management priorities as funds become available relative to other

Department needs. Mountain lion management objectives are based on ecological data and social conditions to ensure management strategies benefit both the species of concern and the people who are impacted by mountain lion conflicts (WGFD 2006a).

Current Conditions.

Incidental, non-target take (from trapping and snaring) and WGFD removal account for the majority of non-harvest mortalities (WGFD 2013b). Illegal and natural mortalities also occur.

Human safety and human/mountain lion interactions are topics vigilantly addressed and monitored where people and mountain lions coexist. Annual educational efforts continue, and if warranted, will be increased to inform the public about mountain lion behavior and safety procedures to follow when humans come in contact with mountain lions. There are preventive methods (i.e., landscaping, husbandry techniques, and outdoor awareness) that reduce the overall chance of human/mountain lion encounters. Education increases the ability of humans and mountain lions to cohabit.

Livestock (primarily sheep) depredation attributed to mountain lions will always be an issue of contention to be addressed regarding mountain lion management in Wyoming. Certain hunt areas are being managed as sinks because of depredation issues.

Trends

The WGFD mortality report for years 2010–2012 indicates that the population of mountain lions in northeast and north-central Wyoming is decreasing, while the population across the state appears to be stable to increasing; management objectives for northeast Wyoming include population reduction (WGFD 2013b).

Black Bear

Regional Context

Black bears are found in most of Alaska, southeastward through Canada to northern Minnesota, Wisconsin and Michigan and in the Maritimes, south through New England, New York, Pennsylvania and the Appalachian Mountains to Florida. They are also found on the west coast in northern California, east through the Rocky Mountain states to New Mexico as well as in Arkansas and Oklahoma.

Indicators

WGFD employs a range of harvest criteria to assess harvest impacts on black bears in Wyoming. These include percent adult males in the harvest, percent of females in the harvest and percent of adults in the female segment of the harvest. All data is analyzed using 3-year averages, compiled over 10-year periods for long-term trends. In addition to harvest data, WGFD monitors annual average human-caused black bear mortality per area of suitable habitat for each hunt area. This density provides an index of more localized impacts of human-caused mortality on black bear populations. With future population density estimates, this metric is also used to gauge the proportion of black bear population harvested annually.

Current Conditions

Black bears are present along the western boundary of the planning area in the Big Horn Mountains. Black bears prefer forested and shrubby areas. They are also known to inhabit

ridgetops, burned areas, riparian areas, agricultural fields, and avalanche chutes. Black bears can be present in dry sage and juniper habitats. In mountainous areas, they seek southerly slopes at lower elevations for forage and move to northerly and easterly slopes at higher elevations as summer progresses. Black bears use dense cover for hiding and thermal protection, and for bedding. They climb trees to escape danger and use forested areas and rivers as travel corridors.

Annual harvest totals for the Bighorns Bear Management Unit show a relatively steady rate of harvest since 1979, with a decline shortly after female quotas began in 1994. Harvest criteria indicate that harvest is beginning to affect the black bear in this Bear Management Unit. The percent of adult males in the harvest decreased in the late 1990s and then increased into the population reduction range. The percent of females in the total harvest has remained in the stable range since the mid 1990s and the percent of adults in the female harvest moved from stable to increasing (WGFD 2007a).

Healthy stands of timber, especially lodgepole pine and spruce-fir in different stages of succession, are essential to provide suitable habitats for black bears. These habitat types provide forage, cover, and bedding areas. Adverse impacts to important bear habitats can be more detrimental to bear populations than human-induced mortalities, particularly if the impacts are irreversible. Because of the difficulty in observing black bears, estimating their abundance is an ongoing management challenge. The overall goal of black bear management in Wyoming is to sustain black bear populations throughout all suitable habitats while maintaining recreation opportunities and managing black bear damage (WGFD 2007b).

Trends

Populations for black bear are thought to be stable or increasing in the planning area.

Small Game/Game Birds

Small game includes small game mammals and upland game birds. Most of the data on these species come from harvest statistics kept by the WGFD for management areas in the state.

Mammals

Regional Context

The small-game mammals are cottontails, snowshoe hares, and red, gray, and fox squirrels. Cottontails can typically be found from extreme south-central British Columbia and western Washington, south to eastern California, and east through Saskatchewan, Montana and south into northern New Mexico. Snowshoe hare distribution is throughout Alaska and most of Canada south to northern California, northern New Mexico, northern Minnesota, northern Michigan, northern New Jersey and southward through the Allegheny Mountains. Red squirrels occur throughout much of Alaska and Canada. In the United States, they occur through the Rocky Mountain states and to the east to Iowa, northern Illinois, northern Indiana, Northern Ohio, northern Virginia and through the Alleghenies. Both the fox and gray squirrels are at the western-most edges of their range in Wyoming as they typically occur in the eastern United States from New England, westward to the Dakotas and eastern Texas.

Indicators

The majority of Wyoming's mammalian Species of Greatest Conservation Need (SGCN) are not truly monitored (WGFD 2010b).

Current Conditions

These species are present throughout the planning area and are hunted during fall and late winter. Due to the wide distribution of small-game species throughout Wyoming, no management challenges have been identified in the planning area. The primary BLM management effort is directed toward maintaining the continuity of ecosystems in the planning area.

Trends

Small-game population trends in the planning area are unknown, although these populations appear to be relatively stable over time. Small-game populations likely fluctuate as a result of naturally occurring phenomena such as drought, fire, and floods.

Upland Game Birds

Upland game birds in the planning area include chukars, Hungarian partridge, ring-necked pheasant, wild turkey, Greater Sage-Grouse, and sharp-tailed grouse (Orabona et al. 2012). Greater Sage-Grouse, although listed as an upland game bird by WGFD, is a BLM Wyoming sensitive species and is addressed in detail in the *Special Status Species – Wildlife* section of this chapter.

Regional Context

Chukars are present in hilly and rolling terrain along mountain foothills, and to some extent in badland topography. This species ranges throughout the northwest and southwest from California and Western Canada eastward through the Plains and the Rocky Mountains. The Hungarian partridge prefers habitat of open, grassy areas in a cool, dry climate. Preferred nesting areas include grasslands, hay and grain fields, and especially alfalfa fields. Heavily wooded areas are almost always avoided. This species occupies a range along the northern United States and southern Canada, westward through the Plains and the Rocky Mountains to the northwest. Ring-necked pheasant habitat includes farmlands, pastures, and grassy woodland edges. These habitats are occupied by the ring-necked pheasant throughout the majority of the northern United States and southwestern Canada and scattered throughout portions of the southwest United States. Wild turkeys are present in wooded areas in the upper elevations and along riparian corridors. This species occurs throughout a large portion of the United States, from Florida to the Great Lakes, Texas to southwestern Canada, and from the Mid Atlantic to the Rocky Mountains and scattered populations in California and the northwest. The sharp-tailed grouse is present throughout much of central Canada and from Montana to central Nebraska. This species inhabits short- and mixed-grass prairie, sagebrush shrublands, woodland edges, and river canyons (Sibley 2003).

Indicators

Birds are the most monitored taxa in Wyoming. Key efforts include annual Breeding Bird Surveys (BBSs) and strategies outlined in the Wyoming Bird Conservation Plan. Additionally, the WGFD is involved in a variety of single species monitoring efforts related to raptors, waterfowl, and a few upland birds. Program adaptation occurs when new information or changing conditions trigger modification of individual actions to accomplish conservation goals or evaluation and adaptation of Wyoming Comprehensive Wildlife Conservation Strategy (WGFD 2005).

Current Condition

Chukars, Hungarian partridges, ring-necked pheasants, and wild turkeys are present in their preferred habitats throughout the planning area. These populations do periodically fluctuate as a result of naturally occurring phenomena such as drought, fire, and floods. The BLM does not specifically monitor or manage any of these species other than through normal hunting seasons.

In Wyoming, and throughout the planning area, sharp-tailed grouse are present where grasslands are intermixed with shrublands, especially wooded draws, shrubby riparian areas, and wet meadows. Species of shrubs that produce berries (such as chokecherry) provide important winter forage for sharp-tailed grouse. Each spring, the males perform elaborate mating dances on historical strutting and dancing grounds called leks (BLM 2003c). Leks are typically on hilltops, ridges, or other high points in low, open grassland habitats. Data provided by the WGFD, Nongame Division, indicate that plains sharp-tailed grouse leks are present primarily in the northern portion of the planning area, where sharp-tailed grouse preferred habitats are most common. There are 102 documented lek sites in the planning area. Past surveys have not covered the entire planning area because of the amount of private land present; therefore, the number of leks could be higher.

Management actions for game birds generally are directed at activities around delineated breeding and nesting habitats (e.g., sharp-tailed grouse leks). Wild-turkey populations are thriving; therefore, there are no opportunities for wild-turkey introductions in cooperation with the WGFD. There are opportunities for translocation of nuisance wild turkeys in the planning area, although no areas for placement of these turkeys have been identified. Current management restricts or prohibits surface occupancy within 250 yards of a sharp-tailed grouse leks and does not allow surface use within 0.64 mile of leks between April 1 and May 7. The BLM authorized officer may grant exceptions to both restrictions. Management challenges focus on maintaining or enhancing the presence of game birds and the habitats upon which they depend.

Trends

Populations of chukars, Hungarian partridges, ring-necked pheasants, and wild turkeys appear to be relatively stable.

Sharp-tailed grouse population trends are not known at this time; however, populations are thought to be declining due to habitat removal and fragmentation by O&G development and urbanization throughout the planning area.

Migratory Game Birds

Regional Context

The planning area is in the central flyway (east of the Continental Divide). The planning area includes part of the Northern Great Plains joint venture area. Appendix K (p. 2161) lists species of concern to the Northern Great Plains joint venture. Ducks Unlimited has developed a national conservation plan (Ducks Unlimited 2004) that addresses waterfowl management needs, including those in Wyoming.

Indicators

In cooperation with the USFWS, the Migratory Game Bird Section of the WGFD conducts the following annual surveys to derive population indices for management: September crane survey, mid-winter waterfowl survey, Canada goose breeding population survey, Rocky Mountain population of Canada geese molt survey and mourning dove call-count survey. The Migratory

Game Bird Section remains strongly involved in the Central and Pacific Flyway management efforts, including development and revision of management plan for various migratory game bird populations and annual season setting (WGFD 2010b).

Current Conditions

Ducks and geese are present in aquatic areas throughout the planning area. Some individuals or species breed, winter, or remain in the state year round, while larger numbers pass through during spring or fall migration. The various sources of water, natural lakes, streams, and man-made reservoirs are important resting areas for a variety of waterfowl species, including ducks, geese, snipe, rails, and shorebirds. Aquatic resources scattered throughout the planning area support various species of waterfowl during nesting periods, and private agricultural lands provide important foraging habitat where grains and hay are grown. Most of these species depend on wetlands or open water that is sufficiently shallow to support rooted vegetation, and they feed on the biotic communities developed in such habitats.

Waterfowl species that can be present in the planning area include Canada goose, wood duck, mallard, gadwall, harlequin duck, green-winged teal, American widgeon, northern pintail, northern shoveler, blue-winged teal, cinnamon teal, Barrow's goldeneye, bufflehead, canvasback, lesser scaup, tundra swan, and redhead. The occurrence and distribution of these species vary and are influenced by local conditions such as aquatic habitat, adjacent upland habitat, season, and land use practices. These waterfowl species are expected to be present in suitable habitats in the planning area during the appropriate species-specific nesting, migration, and wintering seasons.

Historic activities in watersheds that have contributed to loss or degradation of habitat in the planning area include recreation, agriculture, forest management, fire management, urbanization, and land development. Management of wetlands and riparian areas in this arid climate continues to be a challenge. Other challenges include access to public lands during breeding season, contaminants, invasive plant species, and water quantity and quality. The BLM will continue to seek opportunities to develop and enhance migratory bird habitats in the planning area.

Various methods of handling produced water could have caused impacts. At present, much of the CBNG produced water is discharged to surface drainages. Important wildlife habitat may be severely impacted or eliminated by surface discharge of produced water. Impoundment of streams receiving produced water tends to increase waterborne selenium concentrations through evaporative concentration and create a hazard for migratory aquatic birds. Fish also can bioaccumulate selenium directly from the water as well as from their diet. Top level consumers in aquatic systems, such as waterfowl, can readily accumulate selenium concentrations leading to low reproduction, embryonic deformities and increased mortality.

In an *Assessment of Contaminants Associated with Coal Bed Methane-Produced Water and Its Suitability for Wetland Creation or Enhancement Projects* (USFWS 2005), aquatic vegetation was collected from all sites where it was present. Boron concentrations in aquatic vegetation collected from these sites, where it was present, exceeded the 30 micrograms per gram level documented to effect growth in ducklings. Cadmium concentrations in aquatic vegetation from two sites and one site's levels were slightly above the 0.1 micrograms per gram wet weight level that should be "viewed with caution" in terms of wildlife dietary levels. Chromium concentrations in pondweed from two sites exceeded the wildlife dietary threshold of 10 micrograms per gram. Selenium concentrations in water, sediment, and biota were below threshold levels known to cause adverse effects to sensitive species of fish and aquatic birds, with the exception of CBNG produced water discharges and CBNG closed containment impoundments. Closed containment ponds containing

high selenium water may present a risk to aquatic birds using these ponds if the ponds provide a dietary route of exposure through submerged aquatic vegetation or aquatic invertebrates (USFWS 2005). In addition, toxic concentrations of salts could be accumulating in some containment reservoirs, making them unsuitable for waterfowl use.

Trends

No estimates of population sizes in the planning area are available for any of these species. Mourning doves are abundant in a variety of habitats in the planning area. Call-counts declined considerably throughout the Central Management Unit over the most recent 10-year and the 43-year periods. However, no obvious trends were noted.

Furbearing Animals

Badger, beaver, bobcat, American marten, mink, muskrat, and weasel are furbearing animals present in the planning area.

Regional Context

Distribution of the badger in North America includes the open plains and prairies, farmland, and sometimes edges of woods in the western United States, east to eastern Texas, Oklahoma, northern Missouri, northern Illinois, northern Indiana, and northern Ohio, north to southeastern British Columbia, Alberta, Manitoba, and Saskatchewan. The beaver occupies most of Canada and the United States except for most of Florida, Nevada, and southern California. The bobcats distribution is spotty from coast to coast, though scarce or absent in much of the Midwest. The marten occupies the extreme north of the United States, extending spotty distribution into California and the Rocky Mountains and New England. Most of the United States, except Arizona, southern California, southern and central Utah, southern New Mexico and western Texas is typically home to the mink. The muskrat's range encompasses most of the United States and Canada except for the Arctic regions, much of California and the southwest, Texas and Florida. The least weasel can be found in most of Canada, south into the Midwest of the United States, northeastern Montana, Nebraska, Iowa, northern Illinois, northern Indiana, Ohio, Pennsylvania, West Virginia, and the southern Appalachian Mountains.

Indicators

WGFD biologists use furbearer/trapper harvest survey results to monitor populations of these species and make hunting season recommendations.

Current Conditions

Badger, bobcat, and weasel are habitat generalists, occupying all vegetative types in the planning area with appropriate prey base. Marten primarily utilize mixed-conifer forest and aspen communities in the ponderosa and lodgepole pine forests and the aspen, juniper, and limber pine woodlands vegetative types. Beaver, muskrat, and mink typically are present in the aspen and riparian and wetland vegetative types. Due to the wide distribution of other furbearing animals throughout Wyoming, no management challenges have been identified for the planning area. The primary BLM management effort is directed toward maintaining the continuity of ecosystems in the planning area.

Trends

Furbearer population trends in the planning area are not known at this time. Population figures are available only on a statewide basis. Trapping seasons apply to most furbearers. These populations likely fluctuate as a result of naturally occurring phenomena such as drought, fire, and floods. Population fluctuations of their prey base also affect furbearer abundance.

Predatory Animals

According to Wyoming statute, predatory animals in the planning area include coyote, red fox, raccoon, porcupine, skunk, and jackrabbit. These species may be hunted or trapped without a license, and there is no closed season.

Regional Context

Historic coyote distribution occurred throughout eastern and southern Alaska, southern and western Canada, and all of the western United States, but is now believed to extend throughout the entire United States. The red fox can be found throughout most of Canada and the United States, except for the far north, northwestern British Columbia, much of the western United States and southern Florida. Raccoons range from southern Canada through most of the United States, except portions of the Rocky Mountains, central Nevada, Utah, and Arizona. Porcupine distribution encompasses most of Canada and the western United States, south to Mexico and in the east, south to Wisconsin, the northern half of Michigan, most of Pennsylvania, New York, and New England. Most of the United States and Canada is home to skunk. Jackrabbits can be found in the western United States from south-central Washington, south to California, east to Nebraska, western Missouri and Texas.

Indicators

No indicators for predatory animals are available at this time.

Current Conditions

USDA APHIS-Wildlife Services conducts predatory animal damage-control activities on public lands in accordance with the national MOU and local action plans (BLM 2000a). APHIS-Wildlife Services performs these activities in response to requests from individuals, organizations, and agencies experiencing damage caused by wildlife. Animal damage-control activities primarily include mechanical (trapping, shooting, and denning), chemical (poison), and nonlethal methods (e.g., noise devices and aversive conditioning). Through the Animal Damage Management Board, the State of Wyoming also performs animal damage-control activities, particularly actions involving rabies and other diseases.

The management challenge for animal damage-control activities is to implement a program that responds to predation problems and remains socially acceptable and safe in accordance with applicable laws and regulations. The BLM does not perform any habitat management activities for predatory animals. An overabundance of predatory animals can be devastating to prey populations. Future management of BLM-authorized activities should incorporate BMPs aimed at reducing supplemental habitat for predatory species throughout the planning area.

Trends

Predatory animal population trends in the planning area are not known at this time. CBNG infrastructure such as roads, pipeline corridors, and nearby metering facilities provides shelter and den sites for ground predators such as skunks and foxes. These populations likely fluctuate as a

result of naturally occurring phenomena such as drought, fire, and floods. Population fluctuations of their prey base also affect these animals' populations.

Nongame Animals

The following paragraphs briefly describe existing conditions for four categories of nongame wildlife (raptors, neotropical migrants, mammals, and reptiles and amphibians). Raptors and neotropical migrants are afforded protection under the Migratory Bird Treaty Act. Additional detail about nongame wildlife in the planning area can be found in the WGFD *Atlas of Birds, Mammals, Amphibians and Reptiles in Wyoming* (Cervoski et al. 2004). Also, the *Wyoming Partners in Flights Wyoming Bird Conservation Plan* identifies priority bird species and habitats, and population and habitat objectives for birds (Cervoski et al. 2001).

Raptors

Raptor species (eagles, hawks, owls, and falcons) in the planning area include the bald eagle, golden eagle, American kestrel, Cooper's hawk, ferruginous hawk, northern harrier, northern goshawk, red-tailed hawk, Swainson's hawk, great horned owl, short-eared owl, long-eared owl, western burrowing owl, peregrine falcon, and prairie falcon. Less common raptors in the planning area include osprey and merlin. Raptors are present in habitats throughout the planning area. The USFWS Wyoming Ecological Field Office *Raptor Guidelines* (USFWS 2013d) summarizes the typical nesting periods by raptor species. Raptors are sensitive to environmental disturbance and occupy an ecological position at the top of the food chain; therefore, they act as biological indicators of environmental quality. Several of these species (bald eagle, ferruginous hawk, northern goshawk, peregrine falcon, Swainson's hawk, and western burrowing owl) are further addressed in the *Special Status Species – Wildlife* section. Appendix K (p. 2161) identifies these and other raptor species of interest to agencies and groups in the planning area.

Indicators

Key efforts for monitoring include annual EOs and strategies outlines within the Wyoming Bird Conservation Plan. Additionally, the WGFD is involved in a variety of single species monitoring efforts related to raptors, waterfowl, and a few upland birds.

Current Conditions

Most species have specific nest-site requirements, which are key factors in nest-site selection and in reproductive success. These generally include nesting strata, available prey base, and nest-site disturbance. Nests can be present in a myriad of habitats, including steep cliffs and rock ledges, trees, and on the ground. Individual raptors tolerant of human activity might nest on manufactured structures such as barns, utility poles, and tanks. The nesting-reproductive season is considered the most critical period in the raptor life-cycle because it determines population productivity, short-term diversity, and long-term trends. Current management restricts or prohibits surface occupancy within a biologic buffer of a raptor nest and does not allow surface use within 0.5 mile of a nest between February 1 and July 31. The BLM authorized officer may grant exceptions to both restrictions.

Management challenges for raptors generally involve activities around nesting habitat, concentration sites (e.g., winter roosts), and foraging areas. Management of powerlines and contaminants for raptor conservation are ongoing issues in the planning area. Emerging issues for raptors in the planning area are energy development and impacts to raptor species from the

WNv. Human activities close to active raptor nests interfere with nest productivity. Romin and Muck (2002) indicate that activities within 0.5 mile of a nest are prone to cause adverse impacts to nesting raptors. If mineral activities occur during nesting, they could be sufficient to cause adult birds to remain away from the nest and their chicks for the duration of the activities. This absence can lead to overheating or chilling of eggs or chicks. Prolonged disturbance can also lead to adult abandonment of the nest. Both actions can result in egg or chick mortality. In addition, routine human activities near these nests draw increased predator activity to the area and increase nest predation.

Management direction for the BLM is identified in the BLM *Fish and Wildlife 2000 Raptor Habitat Management Plan* (BLM 1992b). Management procedures and activities for raptors are identified by the USFWS management guidelines (USFWS 2009) and Avian Protection Plan guidelines (Avian Power Line Interaction Committee 2006). The *Wyoming Partners in Flight Wyoming Bird Conservation Plan* identifies habitat requirements and threats for raptor species (Cerovski et al. 2001). Approximately 13,100 raptor nests have been documented in the planning area. Not all these nests are occupied; however, the BLM and the WGFD regularly survey and monitor raptor nest activity.

The following sections briefly describe the regional contexts, current conditions, and trends for the raptor species that may occur within the planning area that are not considered special status species.

- Golden Eagle

Regional Context

In North America, this species occurs throughout the mountain and grassland regions where medium-sized mammals are available and abundant (Glinski 1998). Golden eagles typically nest on open cliffs or in trees (in the planning area, most often cottonwoods). Important foraging habitats include grasslands, sagebrush, and farmlands (Barrett 1998a). Golden eagles are protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act, two statutes that are considered during the project planning and approval processes.

Current Conditions

In Wyoming, this species is considered a common year-round resident, feeding mostly on jackrabbits, rodents, small mammals, and carrion in winter (Orabona et al. 2012).

Trends

Golden eagle populations in Wyoming should remain relatively stable in the foreseeable future. However, if urbanization and industrial development continue in the state, the amount of available nesting and hunting habitat will decline. The net result will most likely be a minor reduction in eagle numbers (Phillips et al. 1984).

- American kestrel

Regional Context

The American kestrel is present throughout North and South America from Alaska south to the southernmost tip of South America. This species is known to breed in every state in the United States except Hawaii, and in every province of Canada.

Current Conditions

American kestrels prefer open country with sufficient perches (e.g., dead trees, rocky outcrops, and utility poles and wires) for hunting insects and small mammals (Winn 1998). Nesting sites often include tree cavities, crevices, cliffs, and nest boxes. Most commonly found along riparian corridors, kestrels forage for mice and voles, but would also take larger invertebrates (e.g., grasshoppers) where other prey is limited. In Wyoming, the kestrel is a very common summer resident of suitable habitats below 8,500 feet elevation.

Trends

Declines in American kestrel populations are widely reported, and BBS data suggests that the North American population declined substantially from 1984 to 2007. Population declines are attributed to habitat loss and degradation and non-breeding season mortalities (Smallwood et al. 2009). Additional factors that have been identified as causes for declining kestrel numbers that warrant further investigation include poisoning by pesticides in agricultural areas, increased predation by Cooper's hawks, and **WNv** (Farmer and Smith 2009).

- Cooper's hawk

Regional Context

Cooper's hawk is native to the North American continent and found from Canada to Mexico.

Current Conditions

The breeding pair builds a stick nest in a large tree. These birds capture prey from cover or while flying quickly through dense vegetation, relying almost totally on surprise. Birds preyed on can range in size from wood-warblers to ring-necked pheasants. Cooper's hawks also eat small mammals, especially rodents such as chipmunks and tree squirrels. Mammalian prey can be as small as mice and as large as hares. Other possibilities are lizards, frogs, snakes, and large insects. Cooper's hawks are increasingly seen hunting smaller songbirds in backyards with feeders.

Trends

In Wyoming (Keinath et al. 2003) and Montana (Bergeron et al. 1992), these hawks are considered to be common and do not have any special conservation status. In Montana, raptor survey results from 1977 to 2004 showed increasing, though not substantial, numbers of Cooper's hawks detected. Populations in the west overall appear to be relatively stable (Atkinson 2005).

- Northern Harrier

Regional Context

This species is present throughout much of North America, with highest densities in the prairie pothole region of the United States and Canada.

Current Conditions

Harriers nest in a variety of habitats, including native and non-native grasslands, agricultural lands, emergent wetland marshes, and mountain sagebrush (Carter 1998a). In Wyoming, this species is a common summer resident, feeding mostly on small mammals (often voles) that it discovers while gliding (Orabona et al. 2012).

Trends

Harrier numbers at migration sites have shown increases, with the majority occurring in western Montana (eight out of 45 sites surveyed in Montana from 1977 to 2004) (Atkinson 2005).

- Red-tailed Hawk

Regional Context

Red-tailed hawks use a variety of habitats and range from Alaska south to Panama and east to Nova Scotia and the Virgin Islands (Preston 1998b). This species typically nests in patches of tall trees or on secluded cliff faces, but will also use tree windbreaks where available.

Current Conditions

In Wyoming, this species is considered a year-round resident common to most habitats below 9,000 feet, including prairie grasslands, riparian areas, sagebrush communities, and pinyon/juniper woodlands (Orabona et al. 2012). They nest mainly in trees and are more tolerant of human activities than are other raptors. Typical prey species include rodents and other small mammals.

Trends

In Montana, from 1977 to 2004, red-tailed hawk population trends have shown an average annual increase of 20.14 percent. Western red-tailed hawk populations have shown upwards trends for some time, likely resulting from a positive response to habitat fragmentation and human-caused changes in the landscape (Atkinson 2005).

- Prairie Falcon

Regional Context

The prairie falcon ranges over the western half of North America from southern Alberta, Saskatchewan, and British Columbia south to central Mexico (Jones 1998b). This species nests almost exclusively on tall cliff faces. Prairie falcons hunt birds and small mammals from perches and while soaring.

Current Conditions

In Wyoming, the prairie falcon is considered a common resident, nesting in cliff habitats in open areas (Orabona et al. 2012). Where nesting substrates are present, as at the Pumpkin Buttes, several pairs can be found near one another; however, large areas of otherwise suitable habitats can be unoccupied if nesting substrates are absent.

Trends

Fifty-eight percent of the 43 occupied routes surveyed in Montana showed decreases (1977 to 2004) in numbers of prairie falcons observed, four of which were important. Three routes showed increasing rates. Montana's increasing rates of prairie falcons observed in similar to western migration route sites, however, some western populations have declined steeply in the last 30 years (Atkinson 2005). These declines are likely contributed to habitat loss (Steenhof et al. 2005).

- Great Horned Owl

Regional Context

The great horned owl is present from the northern edge of the boreal forest in Alaska and Canada to the southern tip of South America. This owl typically nests in wooded areas adjacent to open spaces such as shrublands, grasslands, and farm fields that provide excellent opportunities for hunting rodents and other small mammals (Boyle 1998a).

Current Conditions

In Wyoming, this owl is considered a common resident of most habitats below 9,000 feet, especially in riparian areas dominated by cottonwood (Orabona et al. 2012). Great horned owls are tolerant of human activities and will nest in a variety of structures, including industrial facilities. The nesting density of this owl varies from 18.5 to 40 square miles per pair, although the secretive nature of the species makes nest detection difficult (BLM 2003c).

Trends

Population trends appear to be stable, though no local data is available for the great-horned owl.

- Short-eared Owl

Regional Context

The short-eared owl is present throughout Canada and the central and northern United States.

Current Conditions

In Wyoming, this species is a common year-round resident (Orabona et al. 2012). This owl is a ground-nesting species, building its nest of grasses, weeds, and down feathers in short- and mixed-grass prairies and herbaceous wetlands (Boyle 1998b).

Trends

Density of nesting short-eared owls appears to be highly variable and is based on the abundance of voles and other small mammals (BLM 2003c). Data from BBS and Christmas Bird Counts show substantial declines in both breeding and wintering populations in Wyoming. Factors most likely responsible for declines in the populations are low reproductive success and poor overwintering survival, likely tied to loss or degradation of suitable nesting and/or foraging habitat, habitat fragmentation, and consequent decreases in prey abundance.

- Long-eared Owl

Regional Context

A bird of temperate forests, the long-eared owl roosts and nests in trees by day and hunts in open areas by night. Although widespread and relatively common in its range, it is rarely seen. Common habitat includes dense vegetation adjacent to open grassland or shrubland, and open forests. This owl typically uses stick nests built by other bird species, including black-billed magpie, American crow, and hawks. In rare cases, this owl nests in cavities. Like most owl species, the long-eared owl hunts almost exclusively at night, flying low over open ground, locating prey by ear.

Current Conditions

In Wyoming, breeding home range in riparian habitat varies from 34 to 106 ha (83 to 262 acres), and averages 51 ha (134 acres) (Craighead and Craighead 1956).

Trends

Populations of long-eared owls appear to be stable in most of North America, although they have declined in some areas due to habitat loss. Local trends are unavailable.

- Osprey

Regional Context

The osprey tolerates a wide variety of habitats, nesting in any location near a body of water that provides an adequate food supply. It is present on all continents except Antarctica, although in South America it is present only as a non-breeding migrant. The osprey's diet consists almost exclusively of fish. In North America, it breeds from Alaska and Newfoundland south to the Gulf Coast and Florida, wintering farther south from the southern United States through to Argentina.

Current Conditions

In Wyoming, this species breeds by freshwater lakes and streams. The nest is a large heap of sticks, built in forks of trees, on rocky outcrops, on utility poles, or on artificial platforms.

Trends

Mean annual increases of osprey migration site surveys in Montana equaled nearly fifty-six percent from 1997 to 2004. Osprey populations appear to be on an incline likely resulting from decreased DDT use and provision of nesting structures (Atkinson 2005).

- Merlin

Regional Context

Merlin nest in boreal forests below tree line from coast to coast and along the western mountains south to Oregon, Idaho, and Montana. It winters in southern latitudes from the southern United States to South America (Udvardy 1977).

Current Conditions

In Wyoming, this species is an uncommon resident in a diversity of habitats below 8,500 feet, including open grasslands and shrublands and coniferous forests (Orabona et al. 2012). In the planning area, merlin often lay their eggs in abandoned black-billed magpie nests. Most merlin nests in the planning area are known from Rochelle Hills in southeastern Campbell County (BLM 2003c). Merlin typically rely on locally abundant populations of small birds as prey species, but will also prey on toads, reptiles, and mammals (BLM 2003c). This species is a documented breeder throughout much of Wyoming, including the planning area (Orabona et al. 2012). This species can be present in suitable habitats in the planning area.

Trends

Generally stable migration counts have been seen throughout western migration sites, with slight increases noted at the Montana sites (Atkinson 2005).

Summer and Year-round Resident and Neotropical Migrant Birds

Regional Context

Neotropical migrants are birds that migrate long distances from wintering grounds in the New World tropics of Central and South America to breeding grounds in North America. A wide variety of summer and year-round resident and neotropical migrants use the planning area during migration or the breeding season. This category includes shorebirds, water birds, and songbirds.

Current Conditions

These species could use all habitat types in the planning area; the highest level of use by the most species occurs in the more productive and diverse habitats (e.g., forested riparian areas). Shrub-steppe habitats (sagebrush shrublands and other shrublands in part) and short-grass prairie habitats are both common in the planning area and are of critical importance to some of these species (Rothwell 1992).

Many species of high concern to management because of declining populations use shrub-steppe and short-grass prairie areas for their primary breeding habitats (Saab and Rich 1997). The *Special Status Species – Wildlife* section of this chapter addresses those BLM sensitive species. In response to concerns about neotropical migrants, the *Wyoming Bird Conservation Plan* (Cerovski et al. 2001) identifies two groups of high-priority species in Wyoming. Appendix K (p. 2161) lists the migratory bird species of management concern in Wyoming not addressed elsewhere in this chapter and known or expected to occur in the planning area (Orabona et al. 2012).

Management challenges focus around maintaining, enhancing, or restoring the presence of these species and the habitats upon which they depend. Ongoing conservation issues include managing hazards such as habitat degradation, powerlines, communications towers, and contaminants.

CBNG-related activities are affecting migratory bird populations in the planning area. Loss and degradation of habitats has occurred, as has disturbance to individual birds resulting from construction and production activities. In areas of concentrated development, breeding density of some species could have been reduced because of these and other impacts. Species specific to grassland and shrub-steppe habitats and sensitive to disturbance and habitat fragmentation have likely been the most affected. Human activities likely displace migratory birds farther than simply the physical habitat disturbance. Drilling and construction noise can be troublesome for songbirds by interfering with the males' ability to attract mates and defend territory, and the ability to recognize calls from conspecifics (BLM 2003c).

Habitat fragmentation results in more than just a quantitative loss in the total area of habitat available; the remaining habitat area is also qualitatively altered (Laudenslayer 1986). Ingelfinger and Anderson (2004) identified that the density of breeding Brewer's sparrows declined by 36 percent and breeding sage sparrows declined by 57 percent within 100 meters (approximately 30 feet) of dirt roads in a natural-gas field. Impacts occurred along roads with light traffic volume (fewer than 12 vehicles per day). The increasing density of roads constructed in developing natural-gas fields exacerbated the problem, creating substantial areas of impact where indirect habitat losses (displacement) were much greater than the direct physical habitat losses.

Reclamation and other activities in spring could be detrimental to migratory bird survival. Edge-sensitive species will be displaced farther away from vegetative edges due to increased human activity, causing otherwise suitable habitat to be abandoned. If the interior habitat is at carrying capacity, then birds displaced from the edges will have no place to relocate. One consequence of habitat fragmentation is a geometric increase in the proportion of the remaining

habitat that is near edges (Temple 1986). In severely fragmented habitats, all of the remaining habitat might be so close to edges that no interior habitat remains (Temple and Cary 1988). Over time, this will lead to a loss of interior habitat species in favor of edge habitat species. Other migratory bird species that utilize the disturbed areas for nesting could be disrupted by the human activity and equipment could destroy nests.

The use of the proposed water treatment facilities increases the potential for migratory bird mortality in the evaporation ponds that receive a backwash stream from the conditioning ponds. This evaporation pond will contain a concentrated brine solution. Birds entering this pond can ingest the brine and die from sodium toxicity. Salt toxicosis has been reported in ponds with sodium concentrations of more than 17,000 mg/L. Ingestion of water that contains high sodium levels can chronically affect aquatic birds, especially if a source of fresh water is not available nearby. Aquatic birds ingesting hypersaline water can be more susceptible to avian botulism. During cooler temperatures, sodium in the hypersaline water can crystallize on the feathers, affecting thermoregulatory and buoyancy functions, and causing the bird to die of hypothermia or drowning (Windingstad et al. 2004). Effective wildlife exclusionary devices, such as netting, are required to prevent access by migratory birds, or other options should be utilized to contain and dispose of the brine solution should sodium concentrations rise to more than 17,000 mg/L.

Migratory bird species in the PRB nest in spring and early summer and are vulnerable to the same affects as raptor species. Although the BLM typically does not apply timing restrictions specifically to protect migratory bird breeding or nesting, where Greater Sage-Grouse or raptor nesting timing limitations are applied to BLM-authorized activities, nesting migratory birds are also protected. Where these timing limitations are not applied and migratory bird species are nesting, migratory birds remain vulnerable.

Neotropical migrant management direction for the BLM is identified in the BLM *Fish and Wildlife Nongame Migratory Bird Conservation Plan* (BLM 1992b). *Wyoming Partners in Flight Wyoming Bird Conservation Plan* provides habitat requirements for neotropical migrant species and identifies their threats (Cervoski et al. 2001).

Trends

Ground-nesting birds are exhibiting decreasing population trends due to increased human-adapted predator populations. Similarly, disturbance-sensitive species are exhibiting decreasing population trends due to disruptive human activity (e.g., OHV use, recreation, livestock grazing, construction of O&G wells, roads, pipelines, powerlines, mines, and livestock facilities) within important buffer zones or during critical periods (e.g., breeding or nesting) (Cervoski et al. 2001; Vander Haegen et al. 2002; Ingelfinger and Anderson 2004).

Mammals

Fifty species of nongame mammals, including species such as gophers, mice, rats, voles, ground squirrels, shrews, bats, otters, and prairie dogs are known or suspected to be present in the planning area (WGFD 2006c).

Regional Context

For a complete habitat description and distribution of nongame mammals, refer to the *Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming* (Cervoski et al. 2004). Most nongame

mammals are widely distributed in the state. These species are present in habitats throughout the planning area.

Six mammal species (black-tailed prairie dog, fringed myotis, long-eared myotis, spotted bat, swift fox, and Townsend's big-eared bat) are considered BLM sensitive species and further addressed in the *Special Status Species – Wildlife* section. Appendix K (p. 2161) lists the mammal species of management concern in Wyoming not discussed elsewhere in this document and known or expected to be present in the planning area (Orabona et al. 2012).

Current Conditions

Although these species utilize a wide variety of habitats, caves and abandoned mines represent important habitat components upon which the bat species depend for roosts, nurseries, and hibernacula. Very little habitat components have been delineated on public lands in the planning area. Inventories thus far have revealed bat occupied caves within the Southern Bighorns and in the foothills of the Big Horn Mountains in Sheridan County. WNS is caused by a fungus, and has become a threat to bats in the eastern United States, but has not been detected in Wyoming (BLM 2010c; Abel and Grenier 2011). Cave and abandoned mine-hibernating bats are at risk of contracting a fungus, *Geomyces destructans*, which invades and erodes the skin of hibernating bats, causing the bats to arouse more frequently and deplete fat stores more rapidly, which could result in mortality. Deaths can result from *Geomyces destructans* infection through starvation, dehydration, and exposure to cold temperatures (Abel and Grenier 2011).

Management challenges currently focus on increasing the understanding of habitat requirements for these species and maintaining the presence of these species in occupied habitats. Ongoing conservation efforts for nongame mammals include managing invasive species and managing hazards such as contaminants and developments.

Trends

Population trend data and specific habitat requirement information are lacking for many of these species.

Reptiles/Amphibians

Reptiles and amphibians known to be present in the planning area include one salamander species, three toad species, five frog species, three turtle species, two lizard species, and seven snake species (WGFD 2006c).

Regional Context

For a complete habitat description and distribution of reptiles and amphibians in the planning area, refer to the *Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming* (Cervoski et al. 2004).

Current Conditions

In general, reptile habitats in the planning area include aquatic (turtles), rocky outcrops (lizards), and a variety of terrestrial vegetative types (snakes and lizards occupy a variety of habitats). Amphibians in the planning area occupy aquatic habitats, including springs, wetlands, riparian corridors, or open water for the first phase of their life-cycles. Amphibians present in the planning area include tiger salamanders, toads, and frogs. Population data for reptiles and amphibians in the planning area are not available.

Management challenges for reptiles and amphibians primarily include maintaining a variety of habitat types and components, including crucial habitat elements (e.g., rocky outcrops) nearby to provide for the requirements of these species.

Trends

In general, combined results from Wyoming Natural Diversity Database surveys in 2008 and 2009 show that boreal chorus frogs and Woodhouse's toads currently have the highest site occupancy rates in the PRB based on nocturnal call surveys (Estes-Zumpha et al. 2010). Tiger salamander mortality was documented at sixty-three percent of standing water bodies surveyed in 2009, a marked increase from the twenty-five percent of sites found to contain dead salamanders in 2008. Ranavirus infection has been found as the cause for these mortalities. It is unknown if the ranavirus outbreak is natural or if changes in water quality in the PRB could be increasing susceptibility of tiger salamanders to the virus. Other amphibians do not seem to be impacted by the virus (Estes-Zumpha et al. 2010).

3.4.6.4. Trends

Historic activities from agriculture, development, fire management, OHV use, recreation, and transportation have, in some areas, contributed to the degradation of wildlife habitats in the planning area. In other areas, historic activities have improved habitats or the ability to manage wildlife habitats.

Examples of historic activities that have contributed to the degradation of wildlife habitats include livestock concentration areas (e.g., water sources), in which vegetation has been trampled and removed and vegetation and soil has been compacted; utility and pipeline corridor installation, which has disturbed soil and provided opportunities for the spread of invasive plant species; fire suppression, which might have altered the natural fire regime with which habitats evolved; O&G well and associated infrastructure development, which has disturbed soil for well pad and road development, thereby contributing to soil erosion and habitat fragmentation; improper OHV use, which has spread invasive plant species and disturbed wildlife; recreation activities, which have disturbed wildlife; and road placements, which have contributed to habitat fragmentation in the planning area. These historic activities have occurred to varying degrees in the planning area. Consequently, wildlife habitats in the planning area exhibit a range of existing conditions, from habitats in PFC to habitats in something less than PFC, and from large, contiguous blocks of habitat to small, fragmented patches. Examples of historic activities that have improved wildlife habitats or improved the management of habitats in the planning area include prescribed fire to maintain or restore desirable vegetative types and restore a natural fire regime; livestock water developments as sediment traps and as water sources for native ungulates and other wildlife; use of OHVs to manage and monitor wildlife habitat in remote locations in the planning area; and granting public access for hunting as a tool for big game management.

Wells, roads, pipelines and other infrastructure associated with energy development constructed in prairie dog colonies directly removes habitat for prairie dog colony-obligate species. Activities that disturb these species could lead to temporary or long-term (permanent) abandonment. Continued loss of prairie dog habitat and active prairie dog towns will result in the decline of numerous sensitive species in the short-grass prairie ecosystem.

Shrubland and grassland birds are declining faster than any other group of species in North America (Knick et al. 2003). In Wyoming, existing O&G wells are located primarily in landscapes

dominated by sagebrush, causing direct habitat loss. Associated road networks, pipelines, and powerline transmission corridors also influence vegetation dynamics by fragmenting habitats or by creating soil conditions and facilitating the spread of invasive species (Braun 1998; Gelbard and Belnap 2003). Density of sagebrush-obligate birds within 100 meters (approximately 330 feet) of roads constructed for natural gas development in Wyoming was 50 percent lower than at greater distances (Ingelfinger 2001). Increased numbers of corvids and raptors associated with powerlines (Steenhof et al. 1993; Knight and Kawashima 1993; Vander Haegen et al. 2002) increases the potential predation impact on Greater Sage-Grouse and other sagebrush breeding birds (Knick et al. 2003). Fragmentation of shrub-steppe has the further potential to affect the conservation of shrub-obligate species because of the permanence of disturbance (Knick and Rotenberry 1995). Several decades are required to reestablish ecologically functioning mature sagebrush communities. Therefore, sagebrush-obligate species might not return even after habitat is reestablished.

There is considerable potential for habitat restoration due to the extent of only partially modified grazing lands. However, O&G development and the creation of road networks are very considerable factors, and tame grazing and hay crops are increasingly replacing more native grasslands. A combination of O&G pipelines and the road network contributed to further dissection of the landscape.

3.4.6.5. Key Features

Key features for special status wildlife species include: riparian corridors (see key features in the *Fish and Wildlife Resources – Fish* section) and the following:

- *Prairie Dog Colonies* – Prairie dogs have been described as a keystone species and an ecological engineer. They build prairie dog towns, which provide habitat for more than 170 species. Of species regularly associated with prairie dog colonies, six are on the BLM Wyoming sensitive species list – swift fox, mountain plover, ferruginous hawk, western burrowing owl, loggerhead shrike, and long-billed curlew. This biodiversity issue is relevant in the planning area.
- *Sagebrush Steppe Ecosystems* – Sagebrush steppe ecosystems support a variety of species. Sagebrush obligates are animals that cannot survive without sagebrush and its associated perennial grasses and forbs; that is, species that require sagebrush for some part of their life-cycle. Sagebrush obligates in the PRB, listed as sensitive species by BLM Wyoming, include Greater Sage-Grouse, Brewer's sparrow, sage thrasher, and sage sparrow.

3.4.7. Special Status Species – Plants

3.4.7.1. Regional Context

Regional context for each species is included below in each species description.

3.4.7.2. Indicators

Special status plants are present in a variety of habitats in the planning area. The landscape in the planning area exhibits diverse climates, topography, soils, and vegetative communities. Because riparian systems comprise only two percent of the land cover types in the planning area, these areas become vitally important for their species richness. Some species occur in higher altitude, alpine riparian, others occur in lower riparian systems associated with open grassland, and all

zones in between. Species have variable soil requirements from deep, organic rich soils to shallow gravelly sites. Some can only be found on the edges of snowlines, the forest understory, and in drying mud of ponds; others in dry sandy prairie; and others occur in disturbed sites. Habitat suitability models and known populations are indicators of special status plant species.

3.4.7.3. Current Condition

One Threatened plant species, Ute ladies'-tresses orchid, could be present in the planning area (see Appendix I (p. 2025) for additional information). There also are three BLM Wyoming-listed sensitive plant species in the planning area (Table 3.44, "Special Status Plant Species Potentially Present in the Planning Area" (p. 497)). Appendix K (p. 2161) lists plant species of special concern to other agencies and groups in the planning area.

Table 3.44, "Special Status Plant Species Potentially Present in the Planning Area" (p. 497) lists habitat associations for special status plants known to be or that could be present on BLM-administered land in the planning area. The Wyoming Natural Diversity Database has modeled special status plant habitat throughout the planning area. In addition, surveys have been conducted, extensively in some areas, however, few populations have been identified and therefore, there is little information about the locations and numbers of populations of special status plant species in the planning area.

Table 3.44. Special Status Plant Species Potentially Present in the Planning Area

Common Name	Habitat	Status
Ute ladies'-tresses orchid (<i>Spiranthes diluvialis</i>)	Moist stream banks, wet meadows, and abandoned stream channels. Elevation 4,750 to 5,400 feet. Flowering period: July – September.	Federally listed Threatened
Limber pine (<i>Pinus flexilis</i>)	Dominates on dry, rocky sites at many elevations (4,900 to 9,800 feet) within its range. It can occur scattered throughout forested regions on more mesic sites, especially in low density, open areas.	BLM Wyoming-listed sensitive
Porter's sagebrush (<i>Artemisia porteri</i>)	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes. Elevation 5,300 to 6,500 feet. Flowering period: June – July.	BLM Wyoming-listed sensitive
Williams' waferparsnip (<i>Cymopterus williamsii</i>)	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides. Elevation 6,000 to 8,300 feet. Flowering period: May – June.	BLM Wyoming-listed sensitive
Source: BLM 2010d		
BLM Bureau of Land Management		

Ute Ladies'-tresses Orchid (Federally Threatened)

Regional Context

The Ute ladies'-tresses orchid is known to occur in Converse, Goshen, Laramie, and Niobrara counties of eastern Wyoming, with habitat and predicted population occurrences noted in southern Campbell County (Heidel 2007; Fertig 2000b) (Map 34).

Current Condition

The Ute ladies'-tresses orchid is ranked as rare at the global level, critically imperiled at the state level, and Threatened at the federal level. Habitat for this perennial orchid includes riparian and wet meadow habitats. Across its entire range, over 50 extant populations are documented for this species, totalling an estimated 85,000 individuals (Fertig et al. 2005). In Wyoming, nine known occurrences have been documented, with an estimated population of 3,800 individuals (Heidel 2007). Threats to this species include water developments, intense domestic livestock grazing, hay mowing, competition from invasive species, habitat fragmentation, urbanization, and collection by humans (Fertig 2000b; USFWS 1992). In 2004, the USFWS initiated a 5-year status review to determine if delisting this species is warranted (USFWS 2004). The USFWS has not yet released the results of the review, and the plant continues to be listed. See the Appendix I (p. 2025) for additional information.

Trends

Based on limited census data and loss or conversion of riparian habitat throughout its range, populations of Ute ladies'-tresses orchids are thought to be declining.

Limber Pine (BLM-listed Sensitive)

Regional Context

Limber pine occurs throughout western North America, from British Columbia and Alberta in Canada south into the United States to Arizona and New Mexico and from the coasts of California and Oregon, east to the Dakotas, Nebraska and Colorado.

Current Conditions

Limber pine are located in the western portion of the planning area along the timberline of the Big Horn Mountains and also along the side slopes of the Pumpkin Buttes in the southeast region of the planning area. Limber pine are a long-lived, but slow growing member of the pine family. In Wyoming, limber pine is distributed from 5,000 feet to over 10,000 feet in elevation, ranging from high elevation timberline to the woodland/grass/sagebrush ecotone. Associated species in Wyoming include Rocky Mountain lodgepole pine, Engelmann spruce, whitebark pine, Rocky Mountain Douglas-fir, subalpine fir, Rocky Mountain juniper, Mountain Mahogany, and common juniper. This species has been declining. The major threats are white pine blister rust, dwarf mistletoe species, increases in mountain pine beetle, fire suppression, climate change, and their synergistic effects.

Trends

Limber pine has been undergoing a downward trend and it is estimated that approximately 50 percent of stands currently are dead or dying in Wyoming (BLM 2010d).

Porter's Sagebrush (BLM-listed Sensitive)

Regional Context

Porter's sagebrush is endemic to the Wind River Basin and PRB in Fremont, Johnson, and Natrona counties in Wyoming (Fertig 2000a).

Current Conditions

This species occurs primarily in sparsely vegetated *Artemisia pedatifida*, *A. longifolia*, or *A. porteri* communities on clay flats, badlands slopes, depressions, or gullies at 4,600 to 7,000 feet elevation. The major potential threats are O&G and mining development, invasive species, such as cheatgrass, and vehicle disturbance (Fertig 2002). Specialized ecological refugia are threatened and Porter's sagebrush is thereby designated as sensitive.

Trends

Long-term trend data are not available for most populations of Porter's sagebrush. Although some habitat has been altered or lost during O&G developments throughout Wyoming, the overall population of Porter's sagebrush in central Wyoming is probably stable.

William's Waferparsnip (BLM-listed Sensitive)

Regional Context

This perennial umbel is endemic to limestone habitats in the Big Horn Mountains (Fertig 2007).

Current Conditions

A moderate number (21 to 75) of occurrences are documented for William's waferparsnip. This species is uncommon (5,000 to 50,000 individuals or 500 to 5,000 occupied acres) in abundance, and distribution is limited to four counties in Wyoming, including Johnson.

Trends

Populations are thought to be stable in part because habitat is often inaccessible and cattle and sheep apparently do not graze this species. However, limestone quarrying and other ground disturbance could threaten this species.

3.4.7.4. Trends

In addition to those listed for each species, most of the trends that affect other plant species in the planning area also affect special status species. These include habitat degradation and fragmentation, grazing practices and management, invasive species, motor vehicles, and climate.

Management of special status plant species in the planning area presents a number of challenges, including declining population trends for select species, drought and other natural events, spread and control of invasive species, maintaining PFC for riparian and wetland habitats, vegetation treatment with prescribed fire or herbicides, lack of periodic disturbance events (e.g., fire, flood, and grazing), physical trampling (e.g., OHV use), loss of habitat resulting from altered hydrology, and challenges presented by special status plant populations occurring over multiple land ownerships. While threats to some species could remain low due to the remoteness of their habitats, threats to other species could increase despite distance or restricted access. For example, special status plant species that depend on groundwater levels could be affected by upstream depletions of groundwater far removed from affected populations. Moreover, early successional special status plant species protected from habitat alteration could still be adversely affected by natural succession and the lack of fire, flooding, or other disturbance factors necessary to retain early successional habitat.

3.4.7.5. Key Features

Ute ladies'-tresses orchid is listed as Threatened under the ESA (see Appendix I (p. 2025) for additional information). It is extremely rare and occurs in moist, sub-irrigated or seasonally flooded soils at elevations between 1,780 and 6,800 feet above sea level (Map 34). Habitat includes wet meadows, abandoned stream channels, valley bottoms, gravel bars, and near lakes or perennial streams that become inundated during large precipitation events. The Wyoming Natural Diversity Database model predicts undocumented populations could be present, particularly in southern Campbell County and northern Converse County.

Before 2005, only four populations of Ute ladies'-tresses orchids had been documented in Wyoming. Five additional sites were identified in 2005 and one in 2006 (Heidel 2006). The new locations were in the same drainages as the original populations, with two on the same tributary and within a few miles of an original location. Drainages with documented populations include Wind Creek and Antelope Creek in northern Converse County, Bear Creek in northern Laramie County and southern Goshen County, Horse Creek in Laramie County, and the Niobrara River in Niobrara County.

3.4.8. Special Status Species – Fish

3.4.8.1. Regional Context

The only special status fish in the planning area is the Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*). This subspecies of cutthroat is found in the Little Bighorn and Tongue River drainages on the Northeastern corner of the Big Horn Mountains. These drainages are located along the eastern edge of the Yellowstone cutthroat trout's native range.

3.4.8.2. Indicators

The BLM is responsible for managing habitat for special status species fish. Special status species considered in this analysis are those listed as Threatened or Endangered, those proposed for listing or that are candidates for listing under the provisions of the ESA, and those designated by the BLM State Director as sensitive. For a discussion of indicators related to fish species, see the *Fish and Wildlife Resources – Fish* section of this chapter.

3.4.8.3. Current Condition

Special status species fisheries habitats include perennial and intermittent streams that support Yellowstone cutthroat trout fish through at least a portion of the year. Yellowstone cutthroat trout historically occur in the Tongue River and Little Bighorn River drainages. For a discussion of water quality and water quantity in the planning area, see the *Water* section of this chapter. Table 3.45, "Special Status Fish Species in the Planning Area" (p. 501) lists fish species that could be present in the planning area that are listed as Threatened or Endangered under the ESA or as sensitive by BLM Wyoming.

Table 3.45. Special Status Fish Species in the Planning Area

Common Name	Habitat	Status
Yellowstone cutthroat trout (<i>Oncorhynchus clarkii bouvieri</i>)	Relatively clear, cold creeks, rivers, and lakes at temperatures between 4 and 15 °C (approximately 32 and 59 °F).	BLM Wyoming-listed sensitive
Source: BLM 2010d Note: Species is not present in the planning area, but is present in habitat subject to hydrologic influence from actions in the planning area. BLM Bureau of Land Management °C degrees Celsius °F degrees Fahrenheit		

At present, the only special status fish species in the planning area is Yellowstone cutthroat trout, a BLM-listed sensitive species. The USFWS was petitioned in 1998 to list Yellowstone cutthroat trout under the ESA, but determined in 2006 that listing was not warranted. Yellowstone cutthroat trout are very limited on BLM-administered land, with approximately 5 miles of stream from nine distinct stream segments on the Tongue River, Little Youngs Creek, Earley Creek, SR Creek, Ash Creek, South Fork of the Little Tongue River, Middle Fork of East Pass Creek, East Pass Creek, and Red Gulch Creek within the historic range of this trout species. The last four of those listed total approximately 1.6 miles of stream on BLM-administered land and are within the current occupied range (Bradshaw et al. 2008) of the Yellowstone cutthroat trout. Bradshaw et al. (2008) estimated 986 total stream miles in the Little Bighorn and Tongue river drainages were historically occupied. There are federal minerals under virtually all the current occupied range, with most of the surface administered by the USFS. In contrast to the Yellowstone cutthroat, most of the fish in the planning area are warm-water, prairie fishes that do not cohabitate with Yellowstone cutthroat.

Today, stocking is relatively minimal in the Little Bighorn River Basin. Several attempts have been made to establish wild Yellowstone cutthroat trout populations. Most attempts have involved stocking Yellowstone cutthroat trout in headwater streams where brook trout are less prevalent (WGFD 2000). The Little Bighorn River has been stocked with Yellowstone cutthroat trout since 1990 and Gold and Little Falls creeks have been stocked since 2000. Future stocking has been cancelled because electrofishing surveys have shown that Yellowstone cutthroat trout do not retain and establish viable populations in these creeks after stockings. There could be several plausible explanations, such as poor spawning and over-winter habitat, cold water, and perhaps most importantly, competition with non-native brook trout. It is assumed that high-gradient cold-water temperatures, interspecific competition with brook trout, and poor habitat are the major contributing factors.

While fisheries habitat condition in the planning area is a function of historic activities, the BLM actively manages fishery habitat to conserve listed species and the ecosystems on which they depend, and ensure that the actions requiring BLM authorization or approval are consistent with the conservation needs of special status species and do not contribute to the need to list special status species, either under the provisions of the ESA, BLM Manual 6840 (BLM 2008d), or the BLM Wyoming Sensitive Species Policy and List (BLM 2010d). Activities and management challenges affecting special status species fish are similar to those discussed in the *Fish and Wildlife Resources – Fish* section of this chapter. Appendix K (p. 2161) lists Wyoming NSS 1 through 3 species, including potentially rare to common species with declining or vulnerable habitats.

3.4.8.4. Trends

Most of the trends that have affected other species of fish in the planning area have also affected special status species. These include, but are not limited to, the impacts of grazing practices and management, recreation, mineral development, drought, and degraded habitat conditions. See the *Fish and Wildlife Resources – Fish* section for additional information.

3.4.8.5. Key Features

Key features for special status fish species are the same as the key features for general fish species. See the *Fish and Wildlife Resources – Fish* section for additional information.

3.4.9. Special Status Species – Wildlife (including Greater Sage-Grouse)

3.4.9.1. Regional Context

For a discussion of the regional context for populations and habitat for all wildlife including special status wildlife species, see the *Fish and Wildlife Resources – Wildlife* section of this chapter. The regional context of Greater Sage-Grouse within the Western Association of Fish and Wildlife Agencies (WAFWA) Management Zone (MZ) 1 follows.

Greater Sage-Grouse MZ1 lies east of the Rocky Mountains in southern Alberta, eastern Montana and Wyoming, and extreme western North and South Dakota. MZ1 represents the eastern extent of Greater Sage-Grouse range. The primary sagebrush species associated with Greater Sage-Grouse habitat in MZ1 is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Overall shrub cover is less than 10 percent (State of Montana 2012). Perennial herbaceous components typically contribute greater than 25 percent vegetative cover and consist mostly of rhizomatous and bunch-form grasses, with a diversity of perennial forbs (State of Montana 2012). Land ownership throughout is predominantly private (61%) with 26 percent on BLM managed lands and 13 percent state or other federal ownership.

Greater Sage-Grouse populations have declined in portions of MZ1 through wholesale loss of habitat as well as direct impacts to birds through disturbance and direct mortality. The most pervasive and extensive change to the sagebrush ecosystems in MZ1 is the conversion of nearly 60 percent of native habitats to agriculture (USFWS 2013c). The conversion was facilitated by the Homestead Act of 1862 in the United States and the Canada Dominion Act of 1872 (Knick 2011). Under the Homestead Act, nearly 1.5 million people acquired and plowed over 309,000 square miles, (800,000 km²) of land, primarily in the Great Plains (USFWS 2013c). The impacts of land conversion in the late 1800s and early 1900s were probably greatest for sagebrush habitats nearest perennial water sources.

Currently, native vegetation covers about 59 percent of MZ1. Much of the direct habitat loss from conversion to agriculture has occurred in the far northwestern and northeastern portions of MZ1 (Knick et al. 2011). Cropland currently covers nearly 19 percent of the MZ1 and 91 percent of the MZ1 is within 6.9 kilometers of cropland (Knick et al. 2011). Recent interest in bio-fuel production and high prices for small grains has resulted in an increase in the conversion of native grasslands or lands formerly enrolled in the Conservation Reserve Program (CRP) to cropland,

further emphasizing the importance of BLM-administered lands and associated private lands managed for grazing to maintain large blocks of native grassland and shrubland habitats.

Most sagebrush habitats in MZ1 are managed as grazing lands for domestic livestock. Livestock grazing can influence ecological pathways and persistence of native vegetation and wildlife (Bock et al. 1993). The effects of grazing on sagebrush habitats in this MZ are much different than effects noted in the Great Basin since the landscape throughout MZ1 is adapted to withstand grazing disturbance (Knick et al. 2011). Historically large numbers of bison (*Bison bison*) moved nomadically through the MZ1 in response to changes in vegetation associated with drought, past grazing, and fire. Bison were replaced with domestic livestock in the late 1800s. The intensity and duration of grazing increased as domestic livestock numbers and annual grazing pressure increased. The high intensity grazing probably increased the density and perhaps the distribution of sagebrush in MZ1 particularly in combination with a concurrent reduction in the amount of fire on the landscape. Grazing on public lands was unregulated until the passage of the Taylor Grazing Act in 1934. Since the passage of the Taylor Grazing Act, range conditions have improved due to improved grazing management practices and livestock operations related to decreased livestock numbers and the annual duration of grazing. In addition, the BLM has applied Standards for Rangeland Health since 1997 to enhance sustainable livestock grazing and wildlife habitat while protecting watersheds and riparian ecosystems. However, developments to facilitate grazing management can include elements detrimental to Greater Sage-Grouse. Perhaps the most pervasive change associated with grazing management in Greater Sage-Grouse habitats throughout MZ1 is the construction of fencing and water developments (Knick et al. 2011). Barbed wire fences contribute to direct mortality through fence collisions (Stevens et al. 2011) and water developments may contribute to increased occurrence of WNV in Greater Sage-Grouse (Walker and Naugle 2011). Water developments are particularly prevalent in the north central portion of MZ1. Additional habitat modifications associated with grazing management include mechanical and chemical treatments to increase grass production, often by removing sagebrush (Knick et al. 2011).

Other major land uses in MZ1 include energy development (primarily O&G development), and urbanization and infrastructure. O&G development has occurred throughout MZ1, but is concentrated in the southern portions (PRB), the north (Bowdoin Field), and the south and east (Williston Basin). O&G development includes direct loss of habitat from well pad and road construction as well as indirect disturbance effects from increased noise and vehicle traffic. O&G developments directly impact Greater Sage-Grouse through avoidance of infrastructure, or when development affects survival or reproductive success. Indirect effects include changes to habitat quality, predator communities, or disease dynamics (Naugle et al. 2010). Currently nearly 16 percent of MZ1 is within 3 km of O&G wells, a distance where ecological effect is likely to occur (Knick et al. 2011).

Urbanization and infrastructure development in MZ1 has also impacted Greater Sage-Grouse habitat. Development at population centers and subdivisions or smaller ranchettes and associated buildings, roads, fences, and utility corridors has also contributed to habitat loss and fragmentation in portions of MZ1. Current estimates suggest about 16 percent of MZ1 is within 6.9 kilometers of urban development, although MZ1 generally has lower population densities and lower rates of population increases compared to the other MZs (Knick et al. 2011). Infrastructure development effects to Greater Sage-Grouse habitats in MZ1 are primarily related to highways, roads, powerlines and communication towers, with nearly 92 percent of MZ1 within 6.9 kilometers of a road, 32 percent within 6.9 kilometers of a powerline, and 4 percent within 6.9 kilometers of a communication tower (Knick et al. 2011). Increased recreation and OHV

use on lands in MZ1 are also thought to impact Greater Sage-Grouse habitats, but have not been studied (Knick et al. 2011).

The cumulative and interactive impact of multiple disturbances and habitat loss has influenced the current distribution of Greater Sage-Grouse in MZ1. The cumulative extent of human caused changes, the human footprint, on Greater Sage-Grouse habitat in MZ1 one is highest at the northern edge of MZ1, but occurs throughout MZ1 (Leu and Hanser 2011). Population centers for Greater Sage-Grouse in MZ1 (Doherty et al. 2011) generally correspond to areas lacking a high human footprint and some of these areas have been designated as Core Population Area by state game agencies. Greater Sage-Grouse range in MZ1 is overall very similar to portions of the range where Greater Sage-Grouse have been extirpated (i.e., areas with high human footprints), mostly because of the abundance and distribution of sagebrush in MZ1 (Wisdom et al. 2011) suggesting that Greater Sage-Grouse in MZ1 are more vulnerable to declines than other portions of the Greater Sage-Grouse range. For additional information on the regional context of Greater Sage-Grouse within Wyoming and range-wide, see Wyoming Greater Sage-Grouse Step Down Report (BLM 2013n) and Summary of Science, Activities, Programs and Policies that Influence the Rangewide Conservation of Greater Sage-Grouse (*Centrocercus urophasianus*) (Manier et al. 2013), commonly referred to as the Baseline Environmental Report. These reports document the existing conditions and trends of resources affecting Greater Sage-Grouse and their habitat in Wyoming and range-wide respectively; the reports also identify management indicators.

3.4.9.2. Indicators

For a discussion of indicators related to special status wildlife species, see the *Fish and Wildlife Resources – Wildlife* section of this chapter. Please refer to the *Vegetation* sections for descriptions of indicators of vegetation health for habitats comprised of forests and woodlands, grasslands and shrublands, and/or riparian/wetland communities. In addition, indicators for each species or species group are included where available/appropriate.

3.4.9.3. Current Condition

Numerous special status wildlife species are present or have available habitat in the planning area (see Table 3.46, “Special Status Wildlife in the Planning Area” (p. 504)), including, one species that is a candidate for federal listing as a Threatened species (Greater Sage-Grouse). The planning area also includes habitat for 21 other species listed as BLM Wyoming sensitive. Appendix K (p. 2161) lists wildlife species of special concern to other agencies and groups in the planning area.

Table 3.46. Special Status Wildlife in the Planning Area

Common Name	Habitat	Status
Upland Game		
Greater Sage-Grouse	Sagebrush habitats	Candidate for federal listing as a Threatened species
Birds of Prey		
Bald eagle	Near large lakes and rivers in forested habitat where adequate prey and old, large-diameter cottonwood or conifer trees are available for nesting	BLM Wyoming-listed sensitive

Common Name	Habitat	Status
Ferruginous hawk	Arid and semi-arid grassland regions that is open, level, or rolling prairies; foothills or middle elevation plateaus largely devoid of trees, and cultivated shelterbelts or riparian corridors	BLM Wyoming-listed sensitive
Northern goshawk	Mature, high-elevation forests of Engelmann spruce, subalpine fir, and lodgepole pine interspersed with mature aspen stands; needs a home range of more than 2,500 acres	BLM Wyoming-listed sensitive
Peregrine falcon	Open habitats from open woodlands and forests to shrub-steppe, grasslands, marshes, and riparian habitats; nests on cliffs	BLM Wyoming-listed sensitive
Swainson's hawk	Open grasslands, prairies, farmlands, and deserts that have some trees for nesting	BLM Wyoming-listed sensitive
Western burrowing owl	Arid and semiarid environments, with well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground; prefers open prairie, grassland, desert, and shrub-steppe habitats, and might also inhabit agricultural areas; depends on burrowing mammals, such as prairie dogs and ground squirrels	BLM Wyoming-listed sensitive
Migratory birds (excluding Birds of Prey)		
Baird's sparrow	Native mixed-grass and fescue prairie	BLM Wyoming-listed sensitive
Brewer's sparrow	Northern Rocky Mountains, including sagebrush and alpine meadows	BLM Wyoming-listed sensitive
Loggerhead shrike	Grasslands interspersed with scattered trees and shrubs that provide nesting and perching sites	BLM Wyoming-listed sensitive
Long-billed curlew	Plains, grasslands, and prairies; nests on the ground in habitat that usually includes grass fewer than 30 centimeters (approximately 12 inches) high; bare ground, shade, abundant invertebrate prey, and a minimum of suitable habitat	BLM Wyoming-listed sensitive
Mountain plover	Low, open habitats such as arid short-grass, and mixed-grass prairies dominated by blue grama and buffalograss with scattered clumps of cacti and forbs, and saltbush habitats of the shrub-steppe of central and western Wyoming	BLM Wyoming-listed sensitive
Sage sparrow	Sagebrush flats, alkaline flats with saltbush, and semi-desert shrublands in the lowlands	BLM Wyoming-listed sensitive
Sage thrasher	Open, shrub-steppe country dominated by sagebrush or bitterbrush, with native grasses intermixed; generally avoids cheatgrass-dominated landscapes	BLM Wyoming-listed sensitive
Trumpeter Swan	Foraging grounds during migration include wetlands, lakes, and reservoirs	BLM Wyoming-listed sensitive
White-faced ibis	Shallow lake waters, muddy ground of wet meadows, marshes, ponds, lakes, rivers, flooded fields, and estuaries	BLM Wyoming-listed sensitive

Common Name	Habitat	Status
Yellow-billed cuckoo	Riparian obligate; prefers extensive areas of dense thickets and mature deciduous forests near water; requires low, dense, shrubby vegetation for nest sites	BLM Wyoming-listed sensitive
Mammals		
Black-footed ferret	Short-grass and mid-grass prairies in close association with prairie dog colonies	Federally listed Endangered
Black-tailed prairie dog	Dry, flat, open, shortgrass, and mixed-grass grasslands with low, relatively sparse vegetation, including areas overgrazed by cattle	BLM Wyoming-listed sensitive
Fringed myotis	Hot desert scrubland, grassland, xeric woodland, sage grass steppe, mesic old-growth forest, and multi-aged subalpine coniferous and mixed deciduous forest; xeric woodlands (oak and pinyon juniper)	BLM Wyoming-listed sensitive
Long-eared myotis	Coniferous forests in mountain areas; roosts in small colonies in caves, buildings, and under tree bark	BLM Wyoming-listed sensitive
Northern long-eared bat	Ponderosa pine, mixed coniferous/deciduous forests, often dense forests. Roosts in crevices, caves and cavities of trees, under loose bark, and occasionally in buildings.	Proposed for federal listing as an Endangered species
Spotted bat	Prominent rock features in extreme, low desert habitats to high-elevation forests	BLM Wyoming-listed sensitive
Swift fox	Grasslands, plains, and foothills in short-grass prairies and deserts	BLM Wyoming-listed sensitive
Townsend's big-eared bat	Mines, caves, and structures in woodlands and forests to elevations above 9,500 feet	BLM Wyoming-listed sensitive
Reptiles and Amphibians		
Columbia spotted frog	Subalpine forests, grasslands, and sagebrush habitats at elevations from 1,700 feet to 6,400 feet	BLM Wyoming-listed sensitive
Northern leopard frog	Permanent ponds, swamps, marshes, and slow-moving streams throughout forest, open, and urban areas; waterbodies with abundant aquatic vegetation.	BLM Wyoming-listed sensitive
Source: BLM 2010d		
BLM Bureau of Land Management		

Trophy Game

There are no special status trophy game species in the planning area.

Small game Mammals

There are no special status small game species in the planning area.

Migratory Game Birds

There are no special status migratory game bird species in the planning area.

Furbearers

Chapter 3 Affected Environment
Special Status Species – Wildlife (including Greater Sage-Grouse)

May 2015

There are no special status furbearer species in the planning area.

Predatory Animals

There are no special status predatory wildlife species in the planning area.

Upland Game Birds

Greater Sage-Grouse

Regional Context

The Greater Sage-Grouse is a sagebrush obligate species (Schroeder et al. 1999). It is present on the plains and foothills of the arid west and can be found in short-grass and mixed-grass prairies, sagebrush shrublands, other shrublands, wet meadows, and agricultural areas, always associated with substantial stands of sagebrush. In Wyoming, this species is present as a breeding resident in suitable habitats below 8,300 feet (Orabona et al. 2012). Unlike in many other western states, the current range of the Greater Sage-Grouse in the planning area has not substantially contracted from its historical extent (WGFD 2002). Although the range of this species is relatively unchanged, the population numbers have trended downward. This decrease has been associated with the disturbance, destruction, and fragmentation of suitable Greater Sage-Grouse habitats (Martin 1970; Braun et al. 1977; Swenson et al. 1987; WGFD 2008d; Oedekoven 2001), increased predation resulting from these habitat alterations, and more recently disease in particular WNV (Wesenberg et al. 2012).

The PRB is near the eastern edge of Greater Sage-Grouse range. Vegetation communities in the planning area are naturally patchy because they represent a transition between the intermountain basin sagebrush communities to the west and the prairie communities to the east. Sagebrush coverage within the PRB is estimated to be 35 percent with an average patch size less than 300 acres (Leu and Rowland 2005). The PRB patch size has decreased by more than 63 percent in the past forty years, from 820 acre patches and an overall coverage of 41 percent in 1964 (Leu and Rowland 2005).

In 2000, the Wyoming Sage-grouse Working Group was formed to develop a statewide strategy for Greater Sage-Grouse conservation. This group prepared the Wyoming Greater Sage-Grouse Conservation Plan (WSGWG 2003) to provide for coordinated management and direction across the state. In 2004, local Greater Sage-Grouse working groups were formed to develop and implement local conservation plans. The entire planning area is part of the Northeast Wyoming local working group, in which the BLM participates.

Indicators

Birds are the most monitored taxa in Wyoming. Key efforts include annual BBSs and strategies outlined in the Wyoming Bird Conservation Plan. Additionally, the WGFD is involved in a variety of single species monitoring efforts related to raptors, waterfowl, and a few upland birds. Greater Sage-Grouse leks are extensively monitored across the state, annually, coordinated by the WGFD. The lek monitoring effort helps to estimate population, and identify trends. Program adaptation occurs when new information or changing conditions trigger modification of individual actions to accomplish conservation goals or evaluation and adaptation of Wyoming Comprehensive Wildlife Conservation Strategy (WGFD 2009a).

Current Conditions

In 2010, the USFWS determined that the Greater Sage-Grouse is warranted for federal listing across its range, but listing is precluded by other higher priority listing actions. In addition to being listed as a Wyoming BLM sensitive species, Greater Sage-Grouse are listed as a WGFD SGCN, because populations are declining and they are experiencing ongoing habitat loss. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a Bird of Conservation Concern (BCC) for Region 17.

Males of this species perform an extravagant mating display in areas called leks. Male Greater Sage-Grouse, particularly juveniles, are known to attend several different leks in a single breeding season (Schroeder et al. 1999). The components of lek habitat are discussed below. There are 371 documented lek sites (328 classified as occupied or undetermined) in the WGFD Sheridan Region, which approximates the planning area. Lek complexes are present in many locations and are defined as one or more leks within 0.5 to 2.0 miles of each other. Map 37 shows the distribution of known lek sites in the planning area. Greater Sage-Grouse in the Buffalo planning area represent a population that may provide a genetic link between much larger populations within Montana. Grouse movements in the eastern portions of the Buffalo planning area have not been well documented. There are leks on both sides of the Wyoming-Montana state line and movement between the states has been documented (Walker et al. 2007a).

Seasonal range use and movements of Greater Sage-Grouse vary considerably between populations, with movements in some populations exceeding 45 miles (Connelly et al 1988). Depending on the migratory nature of the population, these ranges can overlap or be geographically distinct (Connelly et al. 2000). Within the overall range of a population, a series of habitats are used during the year. The spatial arrangement of leks, their relative availability, and the condition of vegetation in leks all affect the potential of these habitats to support Greater Sage-Grouse. The following six seasonal habitats have been defined for Greater Sage-Grouse in Wyoming (WGFD 2002), each of which has components important for Greater Sage-Grouse reproduction and survival:

- **Winter Habitat:** Greater Sage-Grouse feed almost exclusively on sagebrush during winter. Winter habitats generally contain a canopy cover of 15 percent or greater of taller sagebrush and are in areas where snow depths do not restrict access to sagebrush, such as south-facing slopes and windswept areas (Connelly et al. 2000; WGFD 2002).
- **Breeding Habitat (Leks) – Early Spring:** Greater Sage-Grouse use leks from late March through April and the leks generally are in open areas such as broad ridges, grassy areas, and disturbed sites (WGFD 2002). Greater Sage-Grouse select sites with less sagebrush and other shrub cover than the surrounding landscape, although these sites are often surrounded by sagebrush that females attending the lek and non-displaying males use as cover and for foraging (Schroeder et al. 1999). Habitats that surround the lek site also are important because they provide the forage hens need to produce eggs and are often used for nesting (Braun et al. 1977); however, migratory populations are much less centered around lek sites than nonmigratory populations (Connelly et al. 2000).
- **Nesting Habitat – Late Spring:** Nests are generally placed under sagebrush, but other large shrubs can be used (WGFD 2002). Greater Sage-Grouse select nest sites with higher than average canopy cover of sagebrush and herbaceous plant density, which leads to increased nest success (Connelly et al. 2000).
- **Early Brood-Rearing Habitat – June to Mid July:** This habitat is used during the first month of the brood's life (WGFD 2002). The brood is moved from the nest site immediately after it

hatches and can move up to 5 miles in the first 10 days. This habitat generally has a higher herbaceous cover because brood survival is closely related to the availability of forbs and insects, which are the most important part of chick diets (Schroeder et al. 1999).

- Late Brood-Rearing Habitat – Mid July through Mid September: During this period, many upland forbs have dried up and Greater Sage-Grouse typically move to wetter locations, such as higher elevations or riparian areas (WGFD 2002). Broods tend to move to sites with higher than average forb cover and will focus on relatively small areas if the necessary forage is available (Connelly et al. 2000).
- Fall Habitat – Mid September to First Major Snow: Movement to, and use of, fall habitat is variable, depending on the weather and condition of forage. In Wyoming, this habitat is typically used from mid September until the first major snow (WGFD 2002). During this period, Greater Sage-Grouse shift from feeding mostly on forbs to relying heavily on sagebrush as frost causes forbs to become dormant (Connelly et al. 2000).

Based on the distribution of sagebrush, Greater Sage-Grouse are present in much of the planning area throughout the year. Populations in the planning area are both nonmigratory, exhibiting minimal migratory behavior, moving locally to different food resources or to escape deep snow, and migratory, moving several miles to different food resources or to escape deep snow.

Evidence suggests that habitat loss, fragmentation, and destruction across much of the species' range has contributed to extensive population declines over the past century (USFWS 2010). The Conservation Objectives Team report lists sagebrush elimination, fire, conifers, weeds/annual grass, energy, mining, infrastructure (roads and powerlines), improper grazing, and recreation as threats to the Greater Sage-Grouse population in the PRB (USFWS 2013c). As a result of past and ongoing human activities in the planning area, substantial areas of Greater Sage-Grouse habitats have been altered from their natural conditions. For example, 46 percent (3,386,530 acres) of the planning area is BLM-administered fluid mineral estate of which 75 percent (2,544,512 acres) has been leased (Map 12); the majority of which has been developed and is held by production. Much of the non-federal minerals have also been developed as the pattern is to develop the non-federal minerals prior to the federal minerals. Human disturbances include, but are not limited to, agriculture, mining, roads, urban areas, O&G well pads, compressor sites, and other ancillary facilities. Changes in land use and land development are the primary causes of habitat loss, while habitat degradation is a complicated interaction among many factors, including drought, improper livestock grazing, changes in natural fire regimes, and invasive plant species (Fischer et al. 1996; Pyle and Crawford 1996; Beck and Mitchell 2000; Nelle et al. 2000). Emerging issues include the impacts of pesticides, disease, noise, and raptor perch sites on powerlines among Greater Sage-Grouse populations. The adverse effects of fragmentation on Greater Sage-Grouse are diverse and include reduced courtship-site persistence, courtship-site attendance, winter habitat use, recruitment, yearling annual survival, and female nest-site choice (USFWS 2010).

Energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87 percent to 5 percent (Walker et al. 2007a). Current research suggests that impacts to leks from energy development are discernible out to a minimum of 4 miles, and that some leks within this radius have been extirpated as a direct result of energy development (Apa et al. 2008). Even with a timing limitation on construction activities, Greater Sage-Grouse avoid nesting in O&G fields because of the activities associated with operations and production.

Another concern for Greater Sage-Grouse populations is that reservoirs created for disposal of CBNG produced water provide habitat for mosquitoes that carry WNV (Thiele 2005). WNV represents an important new stressor, which in 2003 reduced late summer survival of Greater

Sage-Grouse an average of 25 percent within four populations, including the PRB population (Naugle et al. 2004) and in an outbreak year can more than cut a population in half (Taylor et al. 2012). In northeastern Wyoming and southeastern Montana, WNV-related mortality during summer resulted in an average decline in annual female survival of five percent from 2003 to 2006 (Walker et al. 2007a). Greater Sage-Grouse losses in the planning area during 2004 and 2005 were not as severe. Summer 2003 was warm and dry, more conducive to WNV replication and transmission than the cooler summers of 2004 and 2005 (Cornish 2005). Current science suggests a synergy between WNV and energy development that amplifies the adverse impact to Greater Sage-Grouse (USFWS 2010). Persistent low-level WNV mortality, combined with severe disease outbreaks, results in local and regional population declines (Naugle et al. 2004; Naugle et al. 2005). WNV outbreak years exacerbate the impacts of other stressors, such as O&G development. The interactive effects of energy development and outbreak years are severe. Eliminating mosquito breeding habitat from anthropogenic water sources is crucial for reducing impacts (Zou et al. 2006). Reducing the threat of WNV by reducing the number of new man-made water sources is a sensible option (Walker and Naugle 2011). Although the BLM could try to fight WNV with mosquito control, the cost associated with treating tens of thousands of acres may be prohibitive, and benefits of spraying must be weighed against detrimental effects (Marra et al. 2004). Additional information on the threat of WNV to Greater Sage-Grouse can be found in Appendix D (p. 1863).

Greater Sage-Grouse avoidance of O&G infrastructure results in even greater indirect habitat loss. Doherty et al. (2008) demonstrated that Greater Sage-Grouse in the PRB avoided otherwise suitable wintering habitats once they have been developed for energy production, even after timing and lek buffer stipulations had been applied. Research indicates that oil or gas development exceeding approximately one well pad and its associated infrastructure per square mile results in calculable impacts to breeding populations, as measured by the number of male Greater Sage-Grouse attending leks (Holloran 2005; Walker et al. 2007a). The WGFD recommends avoiding a well density greater than three or greater than 60 acres of disturbance per square mile (WGFD 2009a).

Current management of Greater Sage-Grouse focuses primarily on the protection of Greater Sage-Grouse breeding and nesting habitats. Current management restricts surface disturbance and occupancy within 0.25 mile of occupied Greater Sage-Grouse leks. Current management also restricts surface-disturbing and disruptive activities in suitable Greater Sage-Grouse nesting habitats within two miles of an occupied lek from March 15 to June 15, unless site-specific circumstances warrant greater protections.

Based on research conducted by Holloran et al. (2005) and Moynahan et al. (2004), a two-mile timing limitation, given the long-term population decline and the fact that fewer than 50 percent of Greater Sage-Grouse are expected to nest in the protected area, is insufficient to reverse the population decline. The end result is that the Wyoming PRB population supports a small remaining Greater Sage-Grouse population that has experienced an 82 percent decline within the expansive energy fields (Walker et al. 2007a). Moynahan et al. (2004), like the Western Association of Fish and Wildlife Agencies (Connelly et al. 2000), recommend increasing the protective distance around Greater Sage-Grouse leks. Walker et al. (2007a) indicates the size of a no-development buffer sufficient to protect leks would depend on the amount of suitable habitat around the lek and the impact to population deemed acceptable. Research suggests additional more effective mitigation strategies include, at a minimum: burying powerlines (Connelly et al. 2000); minimizing road and well pad construction, vehicle traffic, and industrial noise (Lyon and

Anderson 2003; Holloran et al. 2005); and managing produced water to prevent the spread of mosquitoes with the potential to vector WNV in Greater Sage-Grouse habitat (Walker et al. 2007a).

In response, Governor Freudenthal issued an EO on August 1, 2008, mandating special management for all state lands in Greater Sage-Grouse “Core Population Areas.” Core Population Areas are important breeding areas for Greater Sage-Grouse in Wyoming. In addition to identifying Core Population Areas, the Sage-Grouse Implementation team recommended placing stipulations on development activities to ensure that existing habitat function is maintained within the Core Population Areas. Accordingly, the EO prescribes special consideration for Greater Sage-Grouse, including authorization of new activities only when the project proponent can identify that the activity will not cause declines in Greater Sage-Grouse populations in the Core Population Areas. These protections would apply to approximately 80 percent of the total estimated Greater Sage-Grouse breeding population in the state. In February 2010, the Wyoming State Legislature adopted a joint resolution endorsing Wyoming’s Core Population Area Strategy as outlined in the Governor of Wyoming’s EO 2008-2. BLM Wyoming has adopted Wyoming’s approach for projects under its authority, which was updated in three subsequent EOs in 2010, 2011, and 2013, EO 2010-4, EO 2011-5, and EO 2013-3, respectively.

By 2008, the PRB had already experienced a level of impact that severely reduced options for delineating Core Population Areas that would be large enough and in high enough quality habitats to sustain populations (Taylor et al. 2012). Wyoming’s core population area policy will be most effective where implemented in advance of extensive energy development, and in southwest portions of the state where high elevation populations are less susceptible to WNV impacts. In northeast Wyoming, WNV outbreak years are the wild card in Core Population Area management. One of the programs the BLM has initiated to improve the situation, is that the BLM’s High Plains District founded the PRB Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats for the Greater Sage-Grouse.

While the PRB Greater Sage-Grouse population is a population at risk of extirpation, the Wyoming Basin population is at low risk, as the state designated Core Population Areas adequately capture redundancy and representation for this large population (USFWS 2013a). The USFWS views Wyoming’s Core Population Area Strategy as a sound policy and an adequate mechanism to preclude the need to list Greater Sage-Grouse (USFWS 2011). The Core Population Area Strategy is being analyzed within Alternative D of this document.

Trends

WGFD relied on lek data as the basis for analyzing trends in the population of Greater Sage-Grouse. The number of active leks and lek complexes has varied over the past 10 years, as has the estimated population. The Greater Sage-Grouse population in northeast Wyoming is exhibiting a steady long-term downward trend (WGFD 2009a). Absent a WNV outbreak year, the lower 95 percent confidence limit on the population count is 3,147 males, suggesting that immediate extirpation of the northeast Wyoming population is unlikely if all environmental conditions for Greater Sage-Grouse other than energy development, remain favorable. CBNG activity has waned in recent years with the decline in natural gas prices. To date development is approximately half that predicted in the PRB Final EIS (BLM 2003c). Additional information on the existing conditions and trends of resources affecting Greater Sage-Grouse within Wyoming and range wide are identified in the Wyoming Greater Sage-Grouse Step Down Report (BLM 2013n) and Summary of Science, Activities, Programs, and Policies that Influence the Rangeland

Conservation of Greater Sage-Grouse (*Centrocercus urophasianus*) (Manier et al. 2013) commonly referred to as the Baseline Environmental Report. The Baseline Environmental Report is anticipated to be publicly available in May 2013.

Non-Game Species

Birds of Prey

Indicators

Birds are the most monitored taxa in Wyoming. Key efforts include annual BBSs and strategies outlined in the Wyoming Bird Conservation Plan. Additionally, the WGFD is involved in a variety of single species monitoring efforts related to raptors, waterfowl, and a few upland birds. Program adaptation occurs when new information or changing conditions trigger modification of individual actions to accomplish conservation goals or evaluation and adaptation of Wyoming Comprehensive Wildlife Conservation Strategy (WGFD 2009a).

Current Conditions

Six special status raptor species are present in the planning area (Table 3.46, “Special Status Wildlife in the Planning Area” (p. 504)); all are BLM-listed sensitive species. The USFWS Wyoming Ecological Field Office *Raptor Guidelines* (USFWS 2013d) summarizes the typical nesting periods for these and other raptor species.

Current management establishes a buffer zone around raptor nest sites that considers topography and special status prey habitats surrounding the nest site. Except for bald eagles, buffer zones around nests also include a 0.5-mile seasonal restriction (timing limitation stipulation) for activities from February 1 through July 31. The bald eagle timing limitation is discussed below.

Management challenges for special status raptor species include habitat degradation, fragmentation, and loss; lack of cottonwood and aspen regeneration; collision and electrocution from powerlines; collision with wind turbines; and incompatible land use practices (e.g., land conversion, clear cutting, snag removal, industrial activities, intensive recreational activities, and removal of burrowing mammals). Other challenges include impacts from contaminants and human disturbance during sensitive periods (Cerovski et al. 2001; Barrett 1998b; Jones 1998a; Preston 1998a; WGFD 2009a).

Management actions focus on maintaining the presence of special status raptor species and the habitats upon which they depend in the planning area. Seasonal and spatial protective stipulations are currently applied around identified nest sites and roost areas (bald eagle) to afford raptors a level of protection from human disturbance and industrial activities.

Bald Eagle

Regional Context

Bald eagles are present throughout North America from Alaska to Newfoundland, and from the southern tip of Florida to southern California. In Wyoming, this species builds large nests in the crowns of large mature trees such as cottonwoods or pines. The availability of food is likely the single most important determining factor for distribution and abundance of bald eagles. Fish and waterfowl are the primary sources of food where eagles are present along rivers and lakes. Big game and livestock carrion, waterfowl and large rodents such as prairie dogs also can

be important dietary components where these resources are available (Ehrlich et al. 1988). The bald eagle is an uncommon breeding resident in Wyoming, using mixed coniferous and mature cottonwood-riparian areas near large lakes or rivers as nesting habitat (Orabona et al. 2012).

Current Conditions

The bald eagle was listed as Endangered on February 14, 1978, in all of the conterminous United States except Minnesota, Wisconsin, Michigan, Oregon, and Washington, where it was classified as Threatened (USFWS 1978). On July 12, 1995, the USFWS reclassified the bald eagle from Endangered to Threatened throughout its range in the lower 48 states (USFWS 1995). On August 8, 2007, the bald eagle was removed from the Endangered species list. The bald eagle remains under the protection of the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act, and now carries status as a BLM Wyoming sensitive species.

In Wyoming, the availability of carrion, including big game and livestock, is an important winter food source for wintering bald eagles. Eagles winter throughout the planning area. Feeding areas, diurnal perches, and night roosts are fundamental elements of bald eagle winter habitat. Although eagles fly as far as 15 miles (24 kilometers) to and from these elements, they are present primarily where all three elements are available comparatively close (Swisher 1974).

This species is a documented breeder and winter resident of the planning area (Orabona et al. 2012). Map 41 shows documented bald eagle nests in the planning area. The bald eagle population in the planning area increases during winter when seasonal migrants and year-round residents share roost sites and foraging areas.

Human activity and development (residential and recreational) near rivers and lakes continues to escalate and is degrading bald eagle habitat (WGFD 2010a). Pioneering pairs of bald eagles often have difficulty establishing nesting territories that are disjunct from other nesting pairs. Bald eagles are still accumulating organochlorines and relatively high levels of heavy metals, and could also be at risk from organophosphate or carbamate pesticides (WGFD 2010b). These contaminants could affect production and survival.

Different from the management of all other raptor species, current management of bald eagle habitats consist of a disturbance-free buffer zone of 0.5 mile (NSO) established year round for all bald eagle nest sites. A seasonal disturbance-free buffer zone of 1 mile is established for all bald eagle nest sites (February 15 to August 15). A seasonal disturbance-free buffer zone of 0.5 mile is established for all bald eagle winter roost sites (November 1 to April 1). These buffer zones and timing can be adjusted based on site-specific information through coordination with, and written approval from, the USFWS.

Trends

Data from the North American BBS Trend Analysis (Sauer et al. 2012) indicate a positive trend for populations of this species in Wyoming during the period 1966 to 2011. The trend for the United States during the same period is positive.

Ferruginous Hawk

Regional Context

The ferruginous hawk is an uncommon occupant of grasslands, sagebrush, and desert scrub habitats in the Great Plains and Great Basin regions. On the Great Plains, breeding pairs are

normally associated with native grasslands (Gilmer and Stewart 1983). The BLM Wyoming considers it a sensitive species. In Wyoming, this species is a common breeding resident, occupying basin-prairie shrublands, short-grass prairie, rocky outcrops, and cottonwood-riparian habitats (Orabona et al. 2012). This hawk will nest in trees and similar structures when available, but also will readily nest on the ground (Preston 1998a). Nest sites include cliff faces, rocky outcrops, grassy knolls, promontories, tall sagebrush, or in junipers where numerous small mammals provide abundant prey base (Orabona et al. 2012). This hawk preys almost exclusively on small to medium-sized mammals, including jackrabbits, cottontails, prairie dogs, and ground squirrels (Preston 1998a). The ferruginous hawk is known to nest in suitable habitats throughout Wyoming and has been documented in the planning area. Wyoming has one of the largest breeding populations of ferruginous hawks when compared to any other state or province and is also the approximate center of the species breeding range. Estimates have been made indicating that there may be more than 800 pairs of ferruginous hawks within Wyoming.

Current Conditions

The USFWS BCC (USFWS 2008b) report identifies the ferruginous hawk as a “species, subspecies, and population of migratory bird that without conservation actions is likely to become a candidate for listing under the ESA.” The Wyoming Partners in Flight Wyoming Bird Conservation Plan identifies the ferruginous hawk as a “Conservation Priority Level 1 (Conservation Action).” WGFD lists the ferruginous hawk as an NSS3, indicating a restricted or declining population with extirpation possible, but not necessarily imminent. This designation generally recognizes suitable habitat as vulnerable to ongoing disturbance and loss.

Threats attributed to decline in ferruginous hawk populations range-wide may be attributed to habitat loss and degradation. Other major threats include control of prey populations via means of shooting and chemical poisoning of varmints and small mammals. Large declines in occupied prairie dog habitat have also occurred throughout every state in Region 2. Another key player is energy and mining development activities which are believed to threaten ferruginous hawks via means of disturbance, habitat alternation or loss, and reduction or loss of prey populations. The development of CBNG reserves throughout Wyoming and Colorado is relatively recent. These new developments will potentially affect a large portion of the range of ferruginous hawks in these areas. These threats include but are not limited to: increased habitat fragmentation, increased human disturbance during the reproductive period, potential changes in the abundance and diversity of primary prey species, increased exotic vegetation establishment in newly disturbed areas, increased risk of electrocution of ferruginous hawks due to additional overhead power, and increased risk of collisions with vehicles and high tension wires. This threat should be considered serious and will likely persist for many decades. Also the conversion of native shrub-steppe habitats to non-native annual grasslands through altered fire regimes is a serious threat to ferruginous hawks in the Intermountain West, and areas of the Region 2 such as Wyoming that contain large expanses of sagebrush (Collins and Reynolds 2005).

Trends

Data from the North American BBS Trend Analysis (Sauer et al. 2012) indicate a minor positive trend for populations of this species in Wyoming during the period 1966 to 2011. The overall trend for the United States during the same period is positive. Range-wide population data available for this species is limited, and it is declining in portions of its range. Population trends in certain parts of the ferruginous hawk’s range are attributed to concomitant fluctuations in the available prey base, suggesting the plasticity of the species to adapt to variation within prey

populations. Variation in ferruginous hawk annual breeding numbers range-wide and in Region 2 is primarily influenced by changes in prey abundance, while annual variation in winter abundance is primarily related to winter severity and prey abundance. As a result, during more arduous winters ferruginous hawk numbers may be drastically reduced in Wyoming and South Dakota (Collins and Reynolds 2005).

Northern Goshawk

Regional Context

The northern goshawk is a common resident in Wyoming and BLM Wyoming considers it a sensitive species. This species is known to occur from Alaska through the Rocky Mountains to New Mexico and in the mountains and forests of Washington, Oregon, and interior California (Udvardy 1977). Goshawks typically prey on squirrels, ducks, and other birds. They often forage throughout the forest, including in aspen stands, meadows, and forest openings. The northern goshawk is a documented breeding resident of Wyoming (Orabona et al. 2012). Northern goshawks nest in a variety of habitats, including conifer and aspen forests, and occasionally cottonwood trees (Barrett 1998b). Several northern goshawk nest sites have been documented in the planning area.

Current Conditions

Incompatible forest management techniques could remove suitable nest stands and degrade habitat by reducing stand density and canopy cover. Fire suppression, catastrophic fires, loss of vegetative cover, and outbreaks of insects and tree diseases can result in the deterioration or loss of nesting habitat. Human disturbances (such as forest management) can cause nest abandonment.

Trends

The population status and trends of northern goshawks in Wyoming are largely unknown; however, data from the BBS Trend Analysis (Sauer et al. 2012) indicate a minor positive trend for populations of this species in Wyoming between 1966 and 2011. For the same period across all BBS routes in the United States, the population trend was minor and negative.

Peregrine Falcon

Regional Context

A mid- to large-sized falcon, this species occurs across North America and uses a variety of habitats. The peregrine falcon is typically associated with open country near rivers, marshes, and coasts. Cliffs are preferred nesting substrate; however, they might also use tall fabricated structures. Peregrine falcons typically prey on birds such as waterfowl, shorebirds, grouse, and pigeons. In Wyoming, this species is a rare resident, with most breeding records from the western portion of the state (Orabona et al. 2012).

Current Conditions

Widespread use of pesticides, especially DDT, caused extensive eggshell thinning and reproductive failure. By the late 1970s, there were no viable breeding populations in Wyoming. In 1972, federal legislation limited the use of many pesticides, including DDT, and in 1980 the WGFD formed a partnership with The Peregrine Fund, Inc., and began a 15-year cooperative reintroduction effort. Since 1984, Wyoming's nesting population of peregrine falcons has

increased by about 35 percent every year, and more than 60 pairs nested in the state in 2002. The development and use of new chemicals, along with growing pollution, could increase environmental contamination and again threaten production and nesting populations (WGFD 2010b).

Increasing numbers and distribution of peregrine falcons in Wyoming mean a dramatic increase in survey efforts to continue adequate documentation of the population increase, but funding is increasingly inadequate to monitor peregrine falcon populations. The peregrine falcon was removed from the federal list of Endangered species in 1999 (USFWS 1999). BLM Wyoming now considers it a sensitive species. This species nests in the Big Horn Mountain portion of the planning area, but has not been observed on BLM-administered surface.

Trends

Data from the BBS Trend Analysis (Sauer et al. 2012) indicate positive trends in population change for this species in USFWS Region 6, which includes Wyoming, and the United States between 1966 and 2011.

Western Burrowing Owl

Regional Context

The western burrowing owl, a BLM Wyoming sensitive species, occurs from south-central British Columbia eastward to southern Saskatchewan and south through most of the western United States. Burrowing owls primarily nest in rodent burrows, particularly prairie dog burrows, in grasslands, shrublands, deserts, and grassy urban settings (Jones 1998a). In Wyoming, this species uses grasslands, sagebrush and other shrublands, and agricultural areas. Burrowing owls typically feed on insects, rodents, lizards, and small birds. This species is a confirmed breeder throughout much of the state (Orabona et al. 2012). Populations of this species can vary considerably in the planning area, influenced by fluctuations in availability of prey. This species is present as a summer resident, nesting in suitable habitats in the planning area.

Current Conditions

The dramatic reduction of prairie habitat in the United States has been linked to reduction of burrowing owl populations (Klute et al. 2003). Use of roads and pipeline corridors associated with CBNG development increases owl vulnerability to vehicle collision. Overhead powerlines provide perch sites for larger raptors, which prey upon burrowing owls. CBNG infrastructure such as roads, pipeline corridors, and nearby metering facilities also provide shelter and den sites for ground predators such as skunks and foxes. The western burrowing owl is relatively tolerant of human activity, often to its detriment. Threats across the North American range of the burrowing owl are habitat loss and fragmentation, primarily due to intensive agricultural and urban development, and habitat degradation due to declines in populations of colonial burrowing mammals (Klute et al. 2003). It is listed as a sensitive species by the BLM throughout the west.

Different from the management of all other owl species, current management of western burrowing owl nests consists of a 0.25-mile timing restriction buffer zone for burrowing owl nest locations during their nesting season (April 15 to August 31).

Trends

The current population of the western burrowing owl in the United States is not well known, but trend data suggest material declines (McDonald et al. 2004). Data from the North American BBS Trend Analysis (Sauer et al. 2012) indicate a minor positive trend for populations of this species in Wyoming during the period 1966 to 2011. The overall trend for the United States during the same period, however, is negative. The last official population estimate placed them at fewer than 10,000 breeding pairs. Most of the states in the owl's range have recognized that western burrowing owl populations are declining.

Migratory Birds (Excluding Birds of Prey)

Ten special status migratory birds are known or suspected to be present within the planning area (Table 3.46, "Special Status Wildlife in the Planning Area" (p. 504)). Regional context is provided for each special status migratory bird species.

Indicators

In cooperation with the USFWS, the Migratory Game Bird Section of the WGFD remains strongly involved in the Central and Pacific Flyway management efforts, including development and revision of management plan for various migratory game bird populations and annual season setting (Roberts and Bohne 2010).

Current Conditions

Threats to migratory birds include habitat fragmentation and degradation, land conversion, incompatible land uses (e.g., industrial activities, human disturbance, contaminants, and agricultural practices), water quantity and quality, lack of cottonwood regeneration, snag removal in preferred habitats, collision with wind turbines and powerlines, and interspecific competition for nest sites.

Management actions focus on maintaining or increasing the viability and biological integrity of special status species' foraging and nesting habitats in the planning area.

Trends

Species widely distributed in Wyoming are believed to have relatively stable population trends in the planning area; however, there are no population trend data for species that exhibit a more restricted distribution. Results and analyses of 1966 to 2011 data for the North American BBS provide more information on trends (Sauer et al. 2005). Collectively, these species occupy all vegetative types in the planning area and are all seasonal migrants.

Baird's Sparrow

Regional Context

Baird's sparrow, a BLM Wyoming-listed sensitive species, ranges from Alberta, Saskatchewan, Manitoba, and Montana to South Dakota (Udvardy 1977).

Current Conditions

In Wyoming, this species is an uncommon summer resident that uses short-grass prairie habitats (Orabona et al. 2012). The typical diet for this species consists of seeds and insects. This species can be present in suitable habitats in the planning area; however, no nests have been documented due to a lack of surveying effort.

Trends

Data from the BBS Trend Analysis (Sauer et al. 2012) indicate negative trends in population change for this species in USFWS Region 6, which includes Wyoming, and the United States between 1966 and 2011.

Brewer's Sparrow

Regional Context

Brewer's sparrow, a BLM Wyoming-listed sensitive species, ranges from British Columbia east to Saskatchewan, south to New Mexico, Arizona, and southern California (Udvardy 1977).

Current Conditions

In Wyoming, this species is a common summer resident occupying sagebrush shrubland and other shrubland habitats throughout the state (Orabona et al. 2012). Brewer's sparrow typically feed on insects and seeds. This species is present in suitable habitats in the planning area.

Trends

Data from the BBS Trend Analysis (Sauer et al. 2012) indicate a minor negative trend for populations of this species in Wyoming between 1966 and 2011. For the same period across all BBS routes in the United States, the population trend was negative.

Loggerhead Shrike

Regional Context

Loggerhead shrike, a BLM Wyoming-listed sensitive species, occurs from North America, south of the coniferous forest region into Mexico (Udvardy 1977). The loggerhead shrike is typically associated with open vegetative types, including agricultural areas, sagebrush shrublands, desert scrub, pinyon-juniper woodlands, and montane meadows (BLM 2003c).

Current Conditions

In Wyoming, this species is a common summer resident, using pine-juniper, woodlands, short- and mixed-grass prairies, and shrublands. Loggerhead shrikes typically feed on grasshoppers, crickets, other insects, mice, and small birds. This species is known to breed throughout Wyoming (Orabona et al. 2012) and is present in the planning area.

Trends

Data from the BBS Trend Analysis (Sauer et al. 2012) indicate a negative trend for populations of this species in Wyoming between 1966 and 2011. For the same period across all BBS routes in the United States, the population trend was negative.

Long-billed Curlew

Regional Context

Long-billed curlew, a BLM Wyoming-listed sensitive species, occurs from southern British Columbia to Manitoba, southeast to Wisconsin, Illinois, and Kansas, and south to northern California and northern Texas (Nelson 1998). The long-billed curlew nests on short-grass

prairies and feeds on insects and aquatic invertebrates in salt marshes, mud flats, and beaches (Udvardy 1977).

Current Conditions

In Wyoming, suitable habitat can include sagebrush shrublands, wet meadows, irrigated meadows, and agricultural areas (Orabona et al. 2012). This species is a common summer breeding resident throughout much of central and western Wyoming. In the planning area, breeding curlews have been reported from Johnson County (Orabona et al. 2012).

Trends

Data from the BBS Trend Analysis (Sauer et al. 2012) indicate a minor positive trend in population change for this species in Wyoming between 1966 and 2011. During the same period across all BBS survey routes in the United States, the trend was minor and positive.

Mountain Plover

Regional Context

Mountain plovers once occupied suitable breeding habitats in many of the Great Plains states from Canada to Texas, but their breeding range is now restricted to extreme southern Alberta, Canada, portions of Montana and Wyoming, eastern Colorado, northern and eastern New Mexico, northeastern Utah, and the western panhandle of Oklahoma and Texas. There are a few records of breeding activity in extreme western Kansas and Nebraska and in northeastern Arizona. Wintering mountain plovers are typically concentrated in the Central Valley of California, Texas, and Mexico. Arizona and New Mexico also support lower densities of wintering mountain plovers (BLM 2007l).

Current Conditions

This species uses high, dry, short-grass prairie with vegetation typically shorter than 4 inches. Within this habitat, the mountain plover most often uses areas of blue grama and buffalograss, as well as areas of mixed-grass associations dominated by needle and thread and blue grama (Dinsmore 2003). Nests consist of a small scrape on flat ground in open areas. Most nests are placed in April on slopes of less than 5 degrees in areas where vegetation is shorter than 3 inches. More than half identified nests were within 12 inches of old cow manure piles and almost 20 percent were against old manure piles in similar habitats in Colorado. Nests in similar habitats in Montana (Dinsmore 2003) and other areas (Ehrlich et al. 1988) were almost always associated with the heavily grazed short-grass vegetation of prairie dog colonies.

Mountain plovers arrive on their breeding grounds in late March and begin laying eggs in late April. Clutches are hatched by late June, and chicks fledge by late July. The fall migration begins in late August, and most birds are gone from the breeding grounds by late September. In Wyoming, this species is a common breeding resident (Orabona et al. 2012) and is expected to be present in suitable habitats in the planning area. Data compiled by the BFO indicate that mountain plover nesting occurs sporadically throughout the planning area, including in northeastern Converse County near Gillette, and in Sheridan County. Records of mountain plover observations in the Wyoming Natural Diversity Database include sightings near Buffalo and Gillette and in the Thunder Basin National Grassland. Kenaith et al. (2001) characterized mountain plover habitat in the planning area as sparse and fragmented.

In 2003, the USFWS withdrew its proposal to list the mountain plover as Threatened, but reinstated it again in 2010. On May 11, 2011, the USFWS, once again, withdrew their proposed listing of the mountain plover as a Threatened species. Currently, the mountain plover is listed in Wyoming as a BLM sensitive species. Mountain plover is a WGFD SGCN, because population status and trends are unknown but are suspected to be stable, habitat is vulnerable without ongoing substantial loss, and the species is sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a species with highest conservation priority, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17, which includes the project area. BCCs are those species that represent USFWS's highest conservation priorities, outside of those that are already listed under ESA. The goal of identifying BCCs is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions. Mountain plovers are considered an uncommon nester in the planning area.

Current management of mountain plovers includes:

- A mountain plover nesting survey is required in suitable habitat before commencing surface-disturbing activities.
- No surface-disturbing activities are allowed in suitable habitat from March 15 to July 31 unless there has been a mountain plover nesting survey during the current breeding season.
- There is a seasonal disturbance-free buffer of 0.25 mile around occupied mountain plover nesting locations between March 15 and July 31.
- Documented nesting areas are surveyed for 5 years following project completion.
- Maximum allowed travel speed on roads within 0.5 mile of identified mountain plover nesting areas do not exceed 25 miles per hour from March 15 to July 31.
- No dogs are permitted at worksites to reduce the potential for harassment of mountain plovers.

Trends

Data from the BBS Trend Analysis (Sauer et al. 2012) indicate a negative trend for populations of mountain plovers in Wyoming and along all survey routes in the United States between 1966 and 2011 (Map 42).

Sage Sparrow

Regional Context

The sage sparrow, a BLM Wyoming-listed sensitive species, occurs from Washington south to Baja California and throughout the Great Basin (Udvardy 1977).

Current Conditions

The sage sparrow is a common summer resident in the Wyoming grasslands and shrublands, typically feeding on insects and seeds (Orabona et al. 2012). This species is present in the planning area.

Trends

Data from the BBS Trend Analysis (Sauer et al. 2012) indicate positive changes for populations of this species in Wyoming between 1966 and 2011. For the same period across all BBS routes in the United States, the population trend was minor and negative.

Sage Thrasher

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Special Status Species – Wildlife (including Greater
Sage-Grouse)

May 2015

Regional Context

The sage thrasher, a BLM Wyoming-listed sensitive species, occurs from south-central British Columbia to southern Nevada, Utah, through Texas and Oklahoma, and in the San Joaquin Valley of California (Udvardy 1977).

Current Conditions

In Wyoming, this species is a common summer resident, breeding in sagebrush shrublands throughout the state (Orabona et al. 2012). Sage thrashers typically feed on insects and some fruit. This species is present in suitable habitats in the planning area.

Trends

Data from the BBS Trend Analysis (Sauer et al. 2012) indicate a minor positive trend for populations of this species in Wyoming between 1966 and 2011. For the same period across all BBS routes in the United States, the population trend was minor and negative.

Trumpeter Swan

Regional Context

The trumpeter swan breeds in southern Alaska, northern British Columbia, western Alberta, Oregon, Idaho, Montana, and Wyoming.

Current Conditions

BLM Wyoming considers the trumpeter swan a sensitive species because breeding populations are restricted in numbers and distribution, there is ongoing material loss of nesting habitat, and it is sensitive to human disturbance. Trumpeter swans typically feed on aquatic vegetation, aquatic invertebrates, and insects. As a result of habitat destruction and over hunting, this species was close to extinction, but careful management and reintroduction practices have helped return the population to several thousand individuals (Udvardy 1977). This species is an occasional migrant that nests on muskrat houses or small islands in open water; however, there are no breeding populations in the planning area. Suitable habitats for this species include lakes and ponds with developed aquatic vegetation for feeding and nesting materials (BLM 2003c). This species has been observed throughout the state, including the planning area (Orabona et al. 2012).

Trends

The BBS Trend Analysis (Sauer et al. 2012) did not include population trend data for this species. The USFWS coordinates surveys for breeding swans in the United State, including Wyoming. Overall trends from the surveys for 1993 – 2011 are minor negative for Wyoming, and positive in the overall population that breeds in the United States (Olson 2012).

White-faced Ibis

Regional Context

The white-faced ibis, a BLM Wyoming-listed sensitive species, nests from central Mexico to Louisiana and Texas and through the Great Basin, with isolated colonies in Alberta, New Mexico, California, Montana, North Dakota, Iowa, and Kansas (Ryder 1998).

Current Conditions

In Wyoming, this species is an uncommon summer resident present throughout much of the state, including the planning area (Orabona et al. 2012), although is not expected to nest in the planning area. Preferred nesting habitat includes tall emergent vegetation such as bulrushes and cattails growing as islands surrounded by water deeper than 18 inches. Feeding habitats can include wet hay meadows and flooded agricultural croplands, and marshes and shallow water ponds, lakes, and reservoirs (Ryder 1998). This species feeds primarily on aquatic invertebrates and insects.

Trends

The BBS Trend Analysis (Sauer et al. 2012) did not include data for this species in Wyoming. The trend for the United States was substantial and positive.

Yellow-billed Cuckoo

Regional Context

The western yellow-billed cuckoo, a BLM Wyoming-listed sensitive species, once ranged throughout the United States, southern Canada, and Mexico. The range of the western subspecies has been dramatically reduced and is mostly limited to California and Arizona (Carter 1998b).

Current Conditions

In Wyoming, this species is an uncommon summer resident, occupying cottonwood riparian habitats below 7,000 feet and urban areas. Typical prey includes insects, especially hairy caterpillars. It has been recorded in most areas of the state except for the montane regions (Orabona et al. 2012). Records obtained from Wyoming Birds Record Committee indicate this species, though rare, has been observed within the planning area (Wyoming Birds Record Committee 2011).

Trends

The BBS Trend Analysis (Sauer et al. 2012) did not include data for this species in Wyoming. Across all BBS routes in the United States from 1966 – 2011, the population trend was substantial and negative.

Mammals

Six special status nongame mammals are known or suspected to be present in the planning area and are designated as BLM sensitive. The black-footed ferret, a federally listed Endangered species, is not known or suspected to be present in the planning area. A discussion of this species is included because habitat is available and has been identified by the WGFD as potentially suitable for reintroduction efforts. Following is a brief description of existing conditions for nongame mammals identified in Table 3.46, “Special Status Wildlife in the Planning Area” (p. 504).

Black-footed Ferret

Regional Context

Historically, the distribution of black-footed ferrets closely matched that of prairie dogs, their primary prey, occurring throughout Texas, Oklahoma, New Mexico, Arizona, Utah, Kansas, North and South Dakota, Montana, Wyoming, Nebraska, and Colorado.

Current Conditions

Ferrets can occur in colonies of white-tailed or black-tailed prairie dogs. The USFWS has concluded that, at a minimum, potential habitat for the black-footed ferret must include a single white-tailed prairie dog colony of more than 1,000 acres, or a complex of smaller colonies within a 4.3 mile (7 kilometer) radius totaling 1,000 acres (USFWS 1988). The minimum colony size for black-tailed prairie dog is 1,000 acres (USFWS 2007). The last known wild population of black-footed ferrets was discovered in Meeteetse, Wyoming. Individuals from this population were captured and raised in protective captive breeding facilities in an effort to prevent extinction (Clark and Stromberg 1987). On March 6, 2013, the USFWS issued a letter acknowledging 'block clearance' for the State of Wyoming. That letter provided acknowledgement that the likelihood of identifying wild ferrets in Wyoming, outside of those resulting from reintroductions, was distinctly minimal (USFWS 2013d).

The WGFD has identified areas in the planning area that could be suitable for black-footed ferret reintroductions. If this were to occur, it is likely that the USFS would be the lead agency responsible for the population that would likely be managed similar to the Shirley Basin/Medicine Bow experimental population. New reintroduction projects would likely be subject to special rules similar to those included in the Shirley Basin/Medicine Bow Cooperative Management Plan.

Trends

Black-footed ferret is a federally listed Endangered species (USFWS 1970). The black-footed ferret is closely associated with prairie dogs, and depend almost entirely on the prairie dog for its survival. The decline in populations of the ferret has been attributed to the reduction in the extensive prairie dog colonies that historically existed in the western United States; it is unlikely that wild ferret populations in Wyoming have persisted (USFWS 2013d).

Black-tailed Prairie Dog

Regional Context

Found throughout the Great Plains in short-grass and mixed-grass prairie areas (Fitzgerald et al. 1994), the black-tailed prairie dog has declined in population and range in recent years because of habitat destruction or disturbance and pest control. In Wyoming, this species is primarily found in isolated populations in the eastern half of the state (Clark and Stromberg 1987).

Current Conditions

The black-tailed prairie dog is a highly social, diurnally active, burrowing mammal. Aggregations of individual burrows, known as colonies, form the basic unit of prairie dog populations. Many other wildlife species, such as the black-footed ferret, swift fox, mountain plover, ferruginous hawk, and burrowing owl, depend on the black-tailed prairie dog for some portion of their life-cycle (USFWS 2000).

The black-tailed prairie dog was added to the list of Candidate species for federal listing on February 4, 2000 (Sovada et al. 2009). On August 12, 2004, the USFWS removed the black-tailed prairie dog from Candidate status. On December 2, 2008, the USFWS posted a 90-day finding and status review for the black-tailed prairie dog. BLM Wyoming considers prairie dogs a sensitive species. This species is considered a common resident, inhabiting short-grass and mid-grass habitats in eastern Wyoming (Orabona et al. 2012). Active and inactive prairie dog colonies are present in the planning area (Map 35).

Habitat loss and fragmentation, disease, and eradication programs remain serious threats to this species. Sylvatic plague has the potential to result in substantial adverse impacts to prairie dog populations. There are currently no effective management approaches to mitigate the spread of plague. Specific management actions currently in place in the planning area for the black-tailed prairie dog include conservation measures that protect against unauthorized control of black-tailed prairie dogs on BLM-administered lands, unauthorized use of poisons for black-tailed prairie dog control on BLM-administered lands, and managing grazing allotments containing black-tailed prairie dog colonies for a mosaic of range conditions. The black-tailed prairie dog is listed as a pest under the Wyoming Weed and Pest Act, and the WGFD does not currently regulate or monitor recreational shooting. Prairie dogs have been targets of intensive eradication programs; therefore conservation efforts are often poorly understood and not supported.

Trends

Population trends and status are not well documented. Current trend data have not been readily available to the general public and resource managers. There are extreme differences of opinion concerning acceptable statewide population objectives and appropriate management responses if objectives are not maintained.

Swift Fox

Regional Context

Current swift fox distribution is estimated to occur in southern Alberta, Saskatchewan, and Manitoba south through eastern Montana and Wyoming, northeastern Colorado, the Dakotas, Nebraska, western Kansas and Oklahoma, eastern New Mexico, and northern Texas; southern Oregon and southwestern Idaho south through Nevada and western Utah to southern California and Arizona (Sovada et al. 2009).

Current Conditions

In Wyoming, this species is considered a common resident and uses grasslands in the eastern plains, agricultural areas, irrigated native meadows, and the banks of roads and railroads (Orabona et al. 2012). The swift fox is found in short- and mixed-grass prairie habitats. It appears to prefer flat to gently rolling terrain. Although not an obligate, the swift fox often is present in association with prairie dog towns. The swift fox preys on small rodents, rabbits, and birds. In addition to these, the swift fox supplements its diet with insects during summer and fall. Dens are generally along slopes or ridges that offer good views of the surrounding area (Fitzgerald et al. 1994). Pups emerge from the den in June. Where swift fox are abundant, they occur at a density of one pair per 1,200 to 2,000 acres. Individuals can roam over 2,000 to 2,500 acres during a night of hunting (Clark and Stromberg 1987). This species is present in suitable habitats in the planning area, although baseline data are limited.

In January 2001, the USFWS did not support listing this species as Threatened under the ESA (USFWS 2001) based on new biological information. Swift foxes are listed as a BLM Wyoming sensitive species. Human-related activities in the early 1800s through the mid 1900s contributed to a restricted distribution and abundance throughout the range of the swift fox. Some of these activities include the loss of native prairie habitat, predator-control campaigns, unregulated trapping and hunting, and rodent-control programs. Swift foxes are very vulnerable to trapping, poisoning, and death on highways.

Current management includes the following related to BLM-authorized activities:

- A swift fox survey is required in suitable swift fox habitat between April 15 and June 15.
 - If a swift fox den is identified, then a seasonal disturbance-free buffer of 0.25 mile is maintained between March 1 and August 31.
 - If no swift fox dens are identified, then surface-disturbing activities are allowed in suitable habitat until the following breeding season (March 1).

Trends

Population trends and distribution are poorly known in Wyoming.

Bats

There are four special status bat species present in the planning area (Table 3.46, “Special Status Wildlife in the Planning Area” (p. 504)). Although these species utilize a wide variety of habitats, caves and abandoned mines are important habitat components on which these species depend for roosts, nurseries, and hibernacula. Refer to the *Cave and Karst Resources* section of this chapter for additional information. WNS is caused by a fungus, and has become a threat to bats in the eastern United States, but has not been detected in Wyoming (BLM 2010c; Abel and Grenier 2011). Cave and abandoned mine-hibernating bats are at risk of contracting a fungus, *Geomyces destructans*, which invades and erodes the skin of hibernating bats, causing the bats to arouse more frequently and deplete fat stores more rapidly, which could result in mortality. Deaths can result from *Geomyces destructans* infection through starvation, dehydration, and exposure to cold temperatures (Abel and Grenier 2011).

Current Conditions

Management challenges for special status bats include habitat degradation, land conversion, incompatible land uses (e.g., industrial activities, human disturbance, use of contaminants, certain mine reclamation practices, cave closures, and insect control practices), lack of cottonwood and willow regeneration, bat collisions with wind turbines, and snag removal in preferred habitats. Management actions are intended to maintain and enhance the presence of bats and the habitats on which they depend.

Fringed Myotis

Regional Context

The fringed myotis, a BLM Wyoming-listed sensitive species, is known to occur from British Columbia through western North America to southern Mexico.

Current Conditions

In Wyoming, this species is present along the eastern edge of the state from the Black Hills to Laramie in Weston, Platte, Albany, and Laramie counties (BLM 2003c). This species is associated with a variety of vegetative communities, including montane meadows, sagebrush shrublands, desert scrub, mixed-grass prairies, and woodlands, although it appears to prefer coniferous forests (Fitzgerald et al. 1994). Caves, abandoned mines, and buildings are used as day and night roosts for colonies of up to several hundred individuals. Although no breeding has been reported, this species has been observed in the planning area (Orabona et al. 2012) and is suspected to be present in suitable habitats in the planning area.

Of all the populations in Wyoming, the Black Hill population of fringed myotis is considered to be of special concern due to its restricted distribution. Roosting habitat has been lost in Wyoming and continues to be threatened by abandoned mine reclamation, removal of old buildings, and renewed mining. The fringed myotis is extremely sensitive to disturbance at roost sites, particularly maternity colonies. Recreational activities (such as spelunking and rock climbing) can affect roosting bats in caves, abandoned mines, and rock crevices. Forest management and the removal of snags can result in loss of roosting habitat. Broad-scale insect control projects can affect the prey base of bats and other insectivores.

Trends

Population status, trends, and distribution of the fringed myotis in Wyoming are not known, making effective management difficult.

Long-eared Myotis

Regional Context

The long-eared myotis, a BLM Wyoming-listed sensitive species, occurs throughout the western portion of North America, south to Baja California. Wyoming is close to the eastern periphery of its range.

Current Conditions

Clark and Stromberg (1987) reported this species is distributed throughout Wyoming, with records in Park, Big Horn, Teton, Platte, Fremont, Sublette, Natrona, Sweetwater, Carbon, and Laramie counties. Scattered throughout most of the state at elevations between 5,000 and 9,800 feet, the long-eared myotis is considered uncommon. In sagebrush steppe habitat, they are likely limited to small stands of conifers. Preferred habitats include coniferous forests, including ponderosa pine and spruce-fir, forests, sagebrush shrublands, and grasslands (Orabona et al. 2012). This species roosts in caves, buildings, and mine tunnels (Clark and Stromberg 1987) and could be present in suitable habitats in the planning area.

Roosting habitat has been lost in Wyoming and continues to be threatened by abandoned mine reclamation, removal of old buildings, and renewed mining. Recreational activities (such as spelunking and rock climbing) can affect roosting bats in caves, abandoned mines, and rock crevices. Forest management and the removal of snags can result in loss of roosting habitat. Broad-scale insect control projects can affect the prey base of bats and other insectivores.

Trends

Population status, trends, and distribution of the long-eared myotis in Wyoming are not known, which precludes effective management.

Northern Long-eared Bat

The northern long-eared bat was included in the Biological Assessment for this RMP. More information on life history, regional context, current conditions, trends, habitat, and threats can be located there.

Regional Context

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Special Status Species – Wildlife (including Greater
Sage-Grouse)*

May 2015

The northern long-eared bat (also known as northern long-eared myotis or northern myotis) was proposed for listing as Endangered under the ESA by the USFWS in October 2013 (USFWS 2013a). The bat ranges across much of the eastern and north central United States, and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia (USFWS 2013a). Wyoming is the western periphery of its range, with northeastern Campbell County being the extreme western edge.

Current Conditions

The species is known to occur in northeastern Wyoming and has been documented in Campbell, Crook, and Weston counties; however, population information is limited and the species is considered uncommon or rare outside of the Black Hills in Wyoming (USFWS 2013a). Only one positive identification of the species had been recorded in the planning area. An individual was captured by mist net and several acoustic calls were recorded in 2006 in northern Campbell county on USFS lands.

Preferred habitats include forested habitats used for roosting and foraging. The species typically roosts in live or dead trees, and occasionally in crevices or caves if available. Caves, abandoned mines, or man-made structures are utilized for hibernacula (USFWS 2013a). This species could be present in suitable habitats in Campbell County.

It has been determined that the northern long-eared bat is in danger of extinction, predominantly due to the threat of WNS. However, other threats (the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; other natural or manmade factors affecting its continued existence) when combined with WNS heighten the level of risk to the species (USFWS 2013a).

Trends

Population status and trends of the northern long-eared bat in Wyoming are not well known. The WGFD plans to continue inventorying forested habitats and caves (WGFD 2010).

Spotted Bat

Regional Context

The spotted bat, a BLM Wyoming-listed sensitive species, suspected to occur in western North America from Mexico to the southern border of British Columbia, is considered rare in Wyoming. Wyoming is on the northeast periphery of its range (BLM 2003c).

Current Conditions

Suitable habitat in Wyoming includes juniper and sagebrush shrublands, and short- and mixed-grass prairies (Orabona et al. 2012). Roosting sites in rock crevices and cliff complexes are also known to be important (BLM 2003c). This species is often described using cliffs over perennial water (Clark and Stromberg 1987). In Wyoming, occurrence records are restricted to the Big Horn Mountains and the southwestern portion of the state (Orabona et al. 2012). This species has been observed within the planning area (Cervoski et al. 2004). Activities such as rock climbing and quarry operations can affect roosting bats in rock crevices and cliffs. Broad-scale insect control projects can affect the prey base of bats and other insectivores.

Trends

Population status, trends, and distribution of the spotted bat in Wyoming are not entirely known, making effective management difficult. It is an extremely difficult species to inventory and monitor.

Townsend's Big-eared Bat

Regional Context

Townsend's big-eared bat, a BLM Wyoming-listed sensitive species, is most common throughout the western half of North America and occurs south into central Mexico, although it is considered rare in Wyoming. Although Wyoming forms part of the Core Population Area of the species' main range, it is distributed sparsely throughout the state (Clark and Stromberg 1987).

Current Conditions

This species has been recorded in Converse, Goshen, Platte, Crook, Fremont, Big Horn, Hot Springs, Sweetwater, Washakie, Park, and Johnson counties. Suitable habitats in Wyoming include deciduous forests, dry coniferous forests, sagebrush and other shrublands, short-grass and mixed-grass prairies, and juniper woodlands. This species uses caves, abandoned mines, buildings, and rock outcrops for day and night roosts and hibernation sites (Orabona et al. 2012). Although no breeding has been reported, this species has been observed in the planning area (Orabona et al. 2012).

Roosting habitat has been lost in Wyoming and continues to be threatened by abandoned mine reclamation and renewed mining. Townsend's big-eared bat is extremely sensitive to disturbance at maternity roosts and hibernacula. Recreational activities (such as spelunking) can affect roosting bats in caves and abandoned mines. Broad-scale insect control projects can affect the prey base of bats and other insectivores.

Trends

Population status, trends, and distribution of the Townsend's big-eared bat in Wyoming are not known, making effective management difficult.

Reptiles and Amphibians

Columbia Spotted Frog

Regional Context

The Columbia spotted frog, a BLM Wyoming-listed sensitive species, occurs throughout much of British Columbia and in Washington, Oregon, Idaho, Montana, Nevada, Utah, and Wyoming (Stebbins 1985). Wyoming is on the eastern edge of the frog's range, where it is known from Park, Teton, Lincoln, Fremont, Sheridan, and Sublette counties. The primary population is in the northwest part of the state, where it is contiguous with populations in Idaho and Montana (BLM 2003c).

Current Conditions

There is a glacial disjunct population in the Big Horn Mountains about 100 miles east of the primary, contiguous population. It is confined to the headwaters of the South Tongue River drainage and its tributaries in Sheridan County (Garber 1994). There are no other known populations in the planning area. In Wyoming, suitable habitats are present in foothills and

montane zones, usually near permanent water such as ponds, sloughs, small streams, and beaver ponds. This species might avoid areas with warm stagnant water and dense cattails. It breeds in old oxbow ponds with no fish and with emergent sedges in wet meadows at the edge of lodgepole pine forests (Garber 1994). Adult spotted frogs typically feed on insects, invertebrates, and small vertebrates, including tadpoles and other frogs.

Trends

The Big Horn Mountain population is likely limited in its range and vulnerable to extirpation. Introduced species, such as the bullfrog, are thought to be a factor in the decline of this species. Other factors could include alterations in habitat quality. The source and extent of these alterations is not well understood.

Northern Leopard Frog

Regional Context

The Northern leopard frog, a BLM Wyoming-listed sensitive species, is found throughout much of the southern half of Canada, south through the upper mid west and central plains states, westward into Idaho, Nevada, northern Arizona, and New Mexico (Stebbins 1985). The northern leopard frog has experienced contractions in its range resulting from local extirpations of breeding populations, particularly in western North America (Wagner 1997).

Current Conditions

In Wyoming, this species is present in cattail marshes and beaver ponds from the plains to montane conditions as high as 9,000 feet (Orabona et al. 2012). Adult leopard frogs typically feed on insects, invertebrates, and small vertebrates, including tadpoles, snakes, and fish. This species is present in suitable habitats throughout the planning area.

While no single factor has been identified as the overwhelming cause for the reduction in leopard frog populations, there are several contributing factors, including disease (red-leg and chytrid), introduced species (bullfrogs, fish, and crayfish), chemicals (e.g., atrazine and rotenone), and habitat loss/alteration/fragmentation. Habitat changes and other factors could be adversely affecting this species, but lack of data precludes identification of specific problems and development of management recommendations. Population status, distribution, and habitat data are lacking for this species.

Trends

While northern leopard frogs were once very common, their populations are currently undergoing a range-wide dramatic decline.

3.4.9.4. Trends

Trend information where available was discussed by species within the *Current Conditions* section.

3.4.9.5. Key Features

Key features for special status wildlife species include: riparian corridors (see key features in the *Fish and Wildlife Resources – Fish* section) and the following:

*Chapter 3 Affected Environment
Special Status Species – Wildlife (including
Greater Sage-Grouse)*

- *Prairie Dog Colonies* – Prairie dogs have been described as a keystone species and an ecological engineer. They build prairie dog towns, which provide habitat for more than 170 species. Of species regularly associated with prairie dog colonies, six are on the BLM Wyoming sensitive species list – swift fox, mountain plover, ferruginous hawk, western burrowing owl, loggerhead shrike, and long-billed curlew. This biodiversity issue is relevant in the planning area.
- *Sagebrush Steppe Ecosystems* – Sagebrush steppe ecosystems support a variety of species. Sagebrush obligates are animals that cannot survive without sagebrush and its associated perennial grasses and forbs; that is, species that require sagebrush for some part of their life-cycle. Sagebrush obligates in the PRB, listed as sensitive species by BLM Wyoming, include Greater Sage-Grouse, Brewer's sparrow, sage thrasher, and sage sparrow.

3.5. Heritage and Visual Resources

3.5.1. Cultural Resources

Cultural resources are tangible, physical evidence or expression of past human activity in the form of material items produced by human workmanship or use, and elements of the natural environment that were altered by people's activities. Examples of cultural resources include artifact scatters, animal traps, rock art, battle sites, trails and structures. Cultural resources can possess important scientific information about the past and may be valuable to the cultural and social heritage of our citizens, locally, regionally and nationally. Archeologists, anthropologists, ethnographers, historians and other researchers study the remains of the past in an effort to identify the forces that have shaped human history, and to define how cultures originate, develop and interact with the environment. Cultural resources in the form of emigrant trails, rock art, campsites, mines, ghost towns, homesteads, or sacred sites can provide people with visible links to their past and reminders of their ancestral heritage. In turn, this can help to foster a sense of belonging and pride in our cultural and historical backgrounds.

3.5.1.1. Regional Context

The archeology of the Northwestern Plains is divided into two major timeframes. Prehistoric refers to a timeframe beginning with the arrival of humans into North American around 12,000 years ago and ends with the arrival of Euro-American into the region in the early 1800s. The term historic generally refers to the time period after the arrival of Euro-Americans and to events that typically have associated written records. Physical remains and traces of events associated with each time period can be considered archeological sites, many of which are present in the planning area. The BLM is obligated by law, regulation and policy to preserve and protect significant archeological sites.

Prehistoric Context

The Buffalo planning area is mostly within the Northwest Plains physiographic region, and partially in the Rocky Mountains. This distinction is important in a discussion of cultural prehistory, because some defined prehistoric cultural complexes theoretically occur in the mountains and not on the plains, and vice-versa. Several notable researchers have established these localized cultural complexes and the regional cultural chronology over the last several decades (Mulloy 1958; Frison 1991). Although not always corresponding in names, divisions, or

dates of complexes, these chronologies are all generally based on and recognized by projectile point typology and other stone tools as culturally diagnostic markers (Frison et al. 1996).

The Frison (1991) summary of the Northwest Plains and proposed prehistoric chronology is generally accepted as the primary narrative for the region. Furthermore, the chronological framework was partially established by work conducted on and data retrieved from significant sites within Buffalo planning area. Therefore, for the purposes of this discussion, this overview uses the Frison (1991) chronology, which ranges from the Paleoindian period to the Protohistoric period, for a span of nearly 12,000 years.

The Paleoindian period is considered the first human occupation of the New World; however, the timing and location of the first migrations is a topic of debate. Generally believed to have occurred sometime after the retreat of the Continental Glacier, the currently accepted chronology of the Paleoindian period is considered to start roughly 12,000 years before present with the Clovis culture and ending with the Late Paleoindian Lanceolate period around 7,800 years before present. However, earlier dates are not only possible but ultimately probable, considering the contemporaneous Clovis cultural materials found all across North and South America.

Paleoindian cultures are believed to have been opportunistic hunters and gatherers who relied on big game hunting and supplemented their diets with plant resources. The climate immediately after the glacial retreat is believed to have been much wetter than at present. The projectile point technology is characterized by large lanceolate spear points, thought to have been used as thrusting spears or atlatl darts, especially at the beginning of the period. By the middle of the Paleoindian period, stemmed points began to appear; by the end of the period, many different point styles are evident. The main complexes derived from these projectile points on the Northwest Plains are Clovis, Goshen, Folsom, Hell Gap-Agate Basin, Alberta-Cody and Late Paleoindian Lanceolate, with minor traditions such as the Foothill-Mountain Paleoindian.

The Early Archaic period is recognized by side notched projectile points dating from approximately 8,000 years before present to 5,500 years before present (Frison 1991) and a distinct change in subsistence strategies. A more intensive use of plant products is suggested in the Early Archaic by the increased number of stone-lined roasting pits and grinding-stone artifacts recovered from sites of this age. This change in subsistence strategy could have been due to a reduced animal population (as well as human population) from a drier climate across the Plains known as the Altithermal climatic episode, which occurred at roughly the same time (Frison 1991). It is not clear at this time if Early Archaic age sites are few in number due to low human populations or because of increased erosion during the drier climatic episode. Either way, the Early Archaic period is underrepresented on the Northwest Plains.

The Middle Archaic period of the northwest plains is usually synonymous with the McKean complex, which dates from 5,500 years before present to 3,500 years before present. Characterized by a style of projectile points, the period also sees a proliferation in the grinding stones and stylized forms of food preparation pits that made their appearance in earlier periods (Frison 1991). In addition, the earliest stone circle sites are attributed to the Middle Archaic period, which suggests a possible change in habitation structures for prehistoric cultures. This change could represent the origin of tipis with the rocks used to hold down hide covers, or for other log-structure dwellings with stones used as a foundation (Frison 1991).

The Late Archaic period of northwest plains prehistory dates from 3,500 to 1,500 years before present. The period is recognized by corner-notched dart points described as the Pelican Lake, Yonkee, and Besant cultural horizons (Frison 1991). The Pelican Lake variant is widespread in

the northern Plains and Rocky Mountains, whereas the Yonkee is less widespread and is mostly found within the PRB of Montana and Wyoming. The Besant variant appears later on the Plains at approximately 2,000 years before present (Frison 1991). The Late Archaic period also is known for large communal bison kills in arroyo traps or bison pounds.

The Late Prehistoric period of the northwest Plains prehistory dates from approximately 1,500 to 200 years before present. The period is recognized by the emergence of arrow points from the introduction of the bow and arrow (Frison 1991). Additionally, the period sees a proliferation of stone circles and diagnostic pottery of various traditions (Frison et al. 1996). Large communal bison hunts also increased during the Late Prehistoric Period.

The Protohistoric period of the Northwest Plains basically starts with the contact of Native Americans with Europeans, which occurred up to 250 years ago or more. The period can generally be dated from 250 years before present to the historic period, which started roughly 130 years ago. The Protohistoric archeological record is characterized by horses, glass beads, metal artifacts, or other European trade items (Frison et al. 1996).

The introduction of the horse brought the most significant cultural changes to Plains Indian groups (Frison 1991). Acquisition of horses increased mobility and contact with other groups, changed hunting techniques, and likely altered political structures (Aaberg et al. 2006). Regarding local area tribes, Shoshonean groups are believed to have been the first to acquire horses (in the first quarter of the 18th Century), with the Crow acquiring them shortly thereafter (Frison 1991).

Historic Context

By the early 1800s, fur trappers were exploring the Big Horn Mountains and PRB. In 1807 George Drouillard, a former member of the Lewis and Clark Expedition, explored and trapped portions of the upper Yellowstone, Bighorn, and Tongue River drainages, drafting a sketch map of the pertinent geographic features (Skarsten 1964). Another exploration party under the command of Jean Baptiste Champlain and Ezekiel Williams trapped the drainages on the eastern flanks of the Big Horn Mountains. The next major commercial expedition through the northwest plains was carried by the American Fur Company and Pacific Fur Company in 1811 (Allen 1997; Chittenden 1954; Goetzmann 1966; Swagerty 2001). An overland party under the command of Wilson Price Hunt was dispatched to the Columbia River. The group ascended the Missouri River from St. Louis and turned inland at the confluence of the Grand River. Proceeding west, Hunt's party reached the Little Missouri River and followed its course southwest into the PRB (Chittenden 1954; Goetzmann 1966). The expedition was subsequently guided by the Crow Indians and another trapper, Edward Rose, through Powder River Pass into the Wind River country in September 1811 (Chittenden 1954; Goetzmann 1966).

Rocky Mountain Fur Company trapping parties under the commands of William Ashley, Jim Bridger, John Weber, Robert Campbell, and Jedediah Smith traversed the area of present-day Wyoming between 1822 and 1825 (Allen 1997; Chittenden 1954; Dale 1917; Goetzmann 1966; Morgan 1953; Swagerty 2001). In summer 1823 Smith followed the Belle Fourche River into the Powder River valley and crossed west over the mountains via Granite Pass into the Bighorn Valley (Allen 1997; Chittenden 1954; Dale 1917; Goetzmann 1966; Morgan 1953). English fur trader Benjamin Bonneville, whose trapping forays were primarily west of the Rocky Mountains dispatched Antonio Montero to establish a trading post on the Powder River. The post, referred to as the "Portuguese Houses," was constructed in 1828 and eventually abandoned in 1836 to 1837 (Watson 1982). The demise of the fur trade by 1840 was precipitated by decreased demands for

pelts and the suspension of financing for fur trade ventures in 1837 (Watson 1982). In spite of this, the descriptions and delineation of the Rocky Mountain region by these fur traders provided the catalyst for subsequent Euroamerican settlement.

Several expeditions with varying goals travelled through the PRB in the 1840s and 1850s. Jesuit missionary Pierre-Jean DeSmet went through the basin along the east face of the Big Horns in 1849. Sir George Gore travelled throughout the Buffalo planning area in 1855 and 1856. Gore was a wealthy Scottish aristocrat who spent two years on a hunting expedition in the western US. In 1859 and 1860, the Reynolds Expedition was the first systematic military effort to map and describe the topography in the planning area. William F. Reynolds was a captain in the Corps of Topographical Engineers, a branch of the United States Army. The expedition travelled along the east face of the Big Horns, part of their route later becoming the Bozeman Trail. The Reynolds party included geologist Ferdinand V. Hayden who would later explore and document the Pumpkin Buttes.

In 1863 John Bozeman scouted a route through the PRB that would provide a direct overland route for freight traffic and immigrants to the gold fields in western Montana. The later establishment of the Bozeman Trail and the efforts of the United States Army to protect travelers along the route led to “Red Cloud’s War” between the United States Army and a combined force of Sioux, Cheyenne, and Arapaho. Although the U.S. Army established several forts along the Bozeman Trail, it never fully succeeded in protecting travelers along the trail. The Fetterman Battle, near Fort Phil Kearney, resulted in the worst defeat of the U.S. Army at the hands of the Plains Indians as Fetterman and his entire command of 80 soldiers were killed. Failing to achieve success in region, the Army eventually abandoned its efforts with the signing of the second Treaty of Fort Laramie in 1868, which closed the Bozeman Trail and ceded the majority of the Buffalo planning area to the Sioux.

What is referred to as the “Great Sioux War” began in the early 1870s as settlers and miners began to break the provisions of the 1868 Treaty of Fort Laramie and venture into land set aside for the tribes. The discovery of gold in the Black Hills resulted in hundreds of miners entering what was then Sioux territory. After a series of conflicts between the tribes and white settlers and miners in reservation lands, the U.S. Army was once again at war with the Sioux, the Cheyenne, and the Arapahoe. The climax of the war was the Battle of Little Bighorn, in which General George Custer and his entire command of 300 men were killed. The most significant events associated with the war within the planning area occurred after the Battle of Little Bighorn as the U.S. Army increased its efforts to remove the tribes from the area. Cantonment Reno was constructed as a military supply fort on the Bozeman Trail. The Dull Knife Battle in the Southern Big Horn Mountains resulted in the Northern Cheyenne Tribe losing the majority of their possessions and horses resulting in their eventual surrender. General George Crook later undertook a failed winter campaign to locate the Sioux in the PRB. By 1877 the Great Sioux War was over. The Sioux, Cheyenne, and Arapaho tribes surrendered to the U.S. Army, and were forcibly removed from the PRB, leaving it open for stock grazing and homesteading.

By the early 1880s, the open-range practice of turning cattle loose on the range in the fall and gathering them in the spring, with no supervision from cowboys, was in full swing (Larson 1978). Small land and livestock owners started to band together as early as 1871. The booming cattle industry was dominated by cattle kings, represented by the Wyoming Stock Growers Association. During the early 1880s, the cattle industry in Wyoming peaked. An estimated 175,000 cattle grazed the open range in Johnson County in 1884, and in 1886, more than 6,000 sheep also ranged in Johnson County (Bollinger and the Jim Gatchell Memorial Museum 2009).

In 1890, Wyoming became the 44th state in the Nation. The tensions between the small and large livestock growers would culminate in the early 1890s with the Johnson County War, which “ranks as the most notorious event in the history of Wyoming” (Larson 1978). The big operators began to take matters into their own hands beginning with the lynching of James Averill and Ella “Cattle Kate” Watson near Independence Rock on July 20, 1889 (Larson 1978). Eventually, approximately 50 invaders hired by large cattle operators, invaded Johnson County and killed both Nick Ray and Nate Champion at the KC Ranch house on April 9, 1892 (Bollinger and the Jim Gatchell Memorial Museum 2009). The invaders stayed the night at the TA Ranch but were surrounded the next day by a posse that had formed in Buffalo after being informed of the Ray and Champion deaths (Bollinger and the Jim Gatchell Memorial Museum 2009). The invaders barricaded themselves at the ranch and held off the Buffalo posse until April 13, at which time soldiers from Fort McKinney arrived and arrested the invaders (Bollinger and the Jim Gatchell Memorial Museum 2009). None of the invaders was convicted of a crime. The Johnson County War was a major political issue in the 1892 elections that ended with Democratic victories in the gubernatorial and the congressional races.

Economic depression was widespread in the United States throughout the 1890s, and the cattle industry shrank considerably (Larson 1978). However, the fledgling oil industry produced the first oil well in the Shannon Field of the Salt Creek oil basin in 1889 (Larson 1978). The first oil field established in the PRB, in 1887, was in the Moorcroft area (Metz 1992). The Salt Creek oil field boomed during World War I as demand for oil peaked in 1917 (Metz 1992). The Teapot Dome scandal, along with the depressed oil market and the lack of transportation, led the Wyoming oil industry into a “lull until after the Depression” (Metz 1992). Between 1900 and 1938, approximately 6,700 wells were drilled for O&G in Wyoming” (Metz 1992).

Throughout the 1890s and until 1901, the Hole-in-the-Wall Gang, a loose knit group of outlaws sometimes led by Butch Cassidy, were based out of the Red Wall or Hole-in-the-Wall southwest of Kaycee. Other famous outlaws reported as being in the PRB include Frank James, who used the pseudonym McKinney while he rode with Big Nose George Parrott’s gang in 1878 (Patterson 1982). Nate Champion, who was killed during the Johnson County War, was considered by some to be an outlaw who rustled cattle. Patterson (1982) claims, “many members of Butch Cassidy’s Wild Bunch of the 1890s got their start riding with Champion’s rustlers, including the Logan brothers, Flat Nose George Currie, and Tom O’Day.”

The expansion of the Homestead Act in 1909 brought a new wave of homesteaders to the PRB (SWCA 2006) and, in 1916, the Stock Raising Act allowed an individual to claim 640 acres for grazing, although the federal government retained the mineral rights. Many dry-land farmers “flocked to the state in the years 1909-1913” (Larson 1978). World War I brought an increased demand for agricultural goods and encouraged the growth of farms and ranches, which were becoming more mechanized, but also going into debt (Cassidy 2006). After World War I, agricultural production in the PRB remained high, never dropping to prewar levels, which led to excess products on the market and drove prices down (Cassidy 2006). In addition, a severe drought hit the area in 1919. All of these factors combined to lead to the large scale abandonment of homesteads and/or banks repossessing land (Cassidy 2006).

Agriculture, oil, and coal mining were economically very important to Wyoming, and all three industries suffered setbacks in 1920 (Larson 1978). National coal strikes in 1919 and 1922 affected the state, and petroleum production declined after 1924 (Larson 1978). In the PRB, Cassidy reports that the average farm and ranch size doubled between 1920 and 1929, due in part to larger operations expanding and buying out smaller farms and ranches as mortgages

foreclosed or they were “weakened by the tight money supply and declining prices on their products” (Cassity 2006).

By 1940, farms were no longer family businesses. Instead, large corporate farms that specialized in one crop, or cattle or sheep, were the most successful and numerous, while small landholders and farmers were not economically viable (Cassity 2006). The principal industries of Wyoming, and the PRB, including agriculture, livestock, transportation, oil, and coal prospered during World War II, effectively ending the Great Depression (Larson 1978).

Regulatory Context

NHPA requires federal agencies to consider impacts to historic properties prior to making land use decisions. Historic properties are localities that are listed on or are eligible for listing on the National Register of Historic Places (NRHP). Historic properties can include (but are not limited to) archeological sites, historic sites, or properties significant to tribes for spiritual or religious significance. NHPA compliance and NEPA compliance related to this RMP were coordinated to conserve BLM resources, reduce redundancy and make it easier for the public and tribes to understand when and how to contribute to the decision making process. The BLM consulted the Wyoming State Historic Preservation Office (SHPO), several tribes, county and state governmental representatives, industry representatives, private landowners, the public, and other interested parties through meetings with agencies, public meetings, and the public comment period. The goals, objectives and alternatives associated with this document were created in consultation with the cooperating agencies. Comments received during scoping and after issuance of the draft EIS were considered by the BLM and incorporated into the analysis of this document.

On a project specific basis federal agencies are required to consider impacts to such historic properties, although they are not required to protect them. Through consultation with SHPOs, tribes and other entities, adverse impacts to historic properties must be resolved. Mitigation is an option for the resolution of adverse effects, but it is also BLM policy to initially attempt to avoid impacts to historic properties. Federal agencies are required to protect and preserve certain types of sites that are significant to tribes.

Federal agencies are required to protect and preserve certain types of sites that are significant to tribes. The American Indian Religious Freedom Act (AIRFA) is a civil rights act requiring federal agencies to consider impacts to sites that are important to tribes for religious purposes. The Native American Graves Protection and Repatriation Act (NAGPRA) protects Native American graves on federal surface and requires federal agencies to repatriate Native American human remains and funerary objects taken from federal surface to tribes.

Following BLM policy (reference 8130), cultural resource protection plans can be drafted for significant archeological sites or regions containing numerous examples of significant sites. According to BLM Manual 8130.4 “Cultural Resource Project Plans (CRPP) are detailed design plans for implementing decisions made in regional or local land use plans.” An earlier version of the BLM cultural resource manual referred to these plans as “cultural resource management plans (CRMP).” BFO drafted three CRMPs as a result of the 1980 RMP, however these plans are now out dated and obsolete.

3.5.1.2. Indicators

The resource indicator for cultural resources is the degree of loss of characteristics that qualify a historic property for listing on the NRHP or something that diminishes the value of an area important to Native American or other traditional communities. Natural or accelerated erosion, project construction, unauthorized collection, and vandalism can remove, alter, or damage characteristics that make the resource significant. Any impact to a cultural resource is difficult to measure without baseline data, which is typically recorded on a site form. The majority of cultural resource sites in the planning area have not been recorded. Inventories are typically conducted, sites are recorded and historic properties are avoided in response to project applications which reduces or minimizes the loss of characteristics that qualify a historic property for listing on the NRHP. On a much smaller scale, sites are recorded in a proactive manner in order to gather baseline data which is used in the event of natural impacts or unauthorized collection. Any loss of the characteristics that make a historic property significant could be addressed through techniques including (but not limited to) site stabilization, repair or additional recordation.

3.5.1.3. Current Condition

Archeological investigations in the planning area started in the 1950s with the Smithsonian Institution's Missouri River Basin (MRB) surveys. Since the 1970s, however, most investigations were associated with NHPA compliance as a result of coal, oil, gas, and other minerals exploration and development. The numbers of cultural resources inventories and associated surveyed acres have increased and decreased over the decades with the boom and bust cycle of the O&G industry. Since the late 1990s, several thousand sites have been discovered during over one million acres of inventory associated with CBNG development in the PRB.

The planning area is in the Northwest Plains and Rocky Mountain physiographic regions. For analysis purposes, the area has been divided into four cultural subregions based on present-day ecological conditions (Chapman et al. 2004). These subregions are delineated based on such factors as geology, physiography, hydrology, climate, soils, wildlife, vegetation, current land use, and known cultural resource site locations. A discussion of subregions is necessary to understand how cultures adapted, subsisted, and settled in this region. As Wood (2003) states in reference to the sub-regions of the Great Plains, "These subareas, for the most part, are reflected in the cultural systems of the people who lived within them." Map 46 shows the analyzed cultural subregions for the planning area in Campbell, Johnson, and Sheridan counties. Note that this analysis excludes the higher-elevation ecoregions of the Big Horn Mountains since this subregion is managed by the USFS. Table 3.47, "Summary of Prehistoric Sites by Cultural Period and Subregion in the Planning Area" (p. 536) lists prehistoric sites chronologically by cultural period for each subregion in the planning area.

Table 3.47. Summary of Prehistoric Sites by Cultural Period and Subregion in the Planning Area

Cultural Subregion	Unknown Prehistoric	Paleoindian	Early Archaic	Middle Archaic	Late Archaic	General Archaic	Late Pre-historic	Proto-historic	Total
Grassland	2,626	44	44	136	245	52	393	21	3,561
Powder River Basin	2,240	12	15	67	122	20	197	21	2,694
Tongue River	243	3	2	7	10	1	16	5	287

Cultural Subregion	Unknown Prehistoric	Paleoindian	Early Archaic	Middle Archaic	Late Archaic	General Archaic	Late Pre-historic	Proto-historic	Total
Southern Big Horn Mountains	366	6	2	15	30	14	42	4	479
Buffalo Field Office Planning Area ¹	5,475	65	63	225	407	87	648	51	7,021
Source: BLM 2012f									
¹ Does not include Bighorn National Forest									

Table 3.48, “Subregions and Overall Cultural Resource Statistics of the Buffalo Planning Area” (p. 538) identifies the subregions and the overall cultural resource statistics of the planning area.

Table 3.48. Subregions and Overall Cultural Resource Statistics of the Buffalo Planning Area

Subregion	Total Acres	BLM Acres ¹	BLM %	Inventory Acres ²	Number of Sites	Number of Sites with Prehistoric Components ³	Number of Sites with Historic Components ³	Number of Sites Eligible for NRHP ⁴	Number Sites Not Eligible for NRHP	Number of Un-evaluated Sites	Invento-ried Acres Per Site
Tongue River	791,212	17,357	2	48,341	662	262	425	175	258	229	73
Powder River Basin	3,166,031	504,325	16	802,500	5,816	4,056	2,410	591	4,458	767	138
Southern Big Horn Mountains	484,480	145,629	30	28,803	579	477	125	142	253	184	50
Grasslands	2,195,669	107,143	5	861,970	4,595	3,359	1,607	519	3,354	722	188
Totals	6,637,392	774,454	12	1,741,614	11,652	8,154	4,567	1,427	8,323	1,902	149

Source: BLM 2012f

Note: Some totals might not equal the sums of the values.

¹Derived from land status maps supplied from the Wyoming Geographic Information Science Center.

²Includes overlapping survey areas; assumes 100-foot-wide survey corridor for linear inventory.

³Number of components will not match number of sites because a site can have both historic and prehistoric components.

⁴Includes eligible sites, listed sites, National Landmarks, and National Monuments.

BLM Bureau of Land Management

NRHP National Register of Historic Places

The Southern Big Horn Subregion has a much higher density of sites than the rest of the planning area. There are also more numerous significant prehistoric sites such as rock art and rock shelters in the Southern Big Horn Subregion. The Tongue River Subregion also has a higher density of sites than other subregions, but the majority of those sites are historic. The data show that the Grassland and Powder River Subregions have been inventoried more extensively than other subregions, a result of CBNG and coal development in these areas. These subregions contain several significant sites (Carter-Kerr-McGee Site, Ruby Site, Cordero Mine Site, etc.), but at a lower density than the Southern Big Horn and Tongue River Subregions.

Historic Trails

There are numerous historic trails in the planning area, most notably the Bozeman Trail which is listed on the NRHP. Much of the trail has disappeared or has been destroyed by recent roads and, where evident, appears as sporadic “U” shaped wagon ruts or two-track roads. There are very few intact significant portions of the Bozeman Trail on BLM surface in the planning area, the most notable example being near the crossing of Crazy Woman Creek. Other historic trails in the planning area eligible for listing on the NRHP include the Deadwood Trail, Sawyers Expedition Route, Crook Scout Route, Black and Yellow Trail, and the Texas Trail.

The exact locations of most historic trails are typically not known until a specific project is analyzed by the BFO and an archeological inventory is undertaken. The general location of most historic trails are documented on historic maps, typically General Land Office maps from the late 1800s. Historic trails were often placed in the most logical locations for roads and were often continuously used through history and into recent times. In these cases historic trails can be obscured by two-track ruts or modern road upgrades. Some segments of historic trails are represented by sinuous intact trail ruts paralleling existing county roads or state highways. In some cases inventory reveals that physical remains of the trail are not evident due to erosion or deposition. In rare cases intact historic trail ruts are isolated in areas that are not near modern roads or other improvements. Although historic trails as a whole can be listed or eligible for listing on the National Register, in most cases the entire trail has not been inventoried. Inventoried segments are classified as either “contributing” or “non-contributing” to the site’s integrity. Contributing segments are considered to be intact and are worthy of preservation while non-contributing segments are portions of the trail that have typically been destroyed and do not warrant preservation. Segments of the historic trails that have not been ground-truthed are considered to be “unevaluated.” The BFO treats unevaluated historic trail segments as if they are contributing segments until they get a proper evaluation.

BFO must also consider impacts to the setting of historic trails. As defined in National Register Bulletin 15, “Setting is the physical environment of a historic property. Whereas location refers to the specific place where a property was built or an event occurred, setting refers to the character of the place in which the property played its historical role. It involves how, not just where, the property is situated and its relationship to surrounding features and open space.” In many areas in the planning area contributing trail segments do not have intact settings due to modern developments such as O&G infrastructure, roads, powerlines or other such facilities. In these cases, the setting is considered to be compromised. Areas within the setting of historic trails that do not contain modern or recent modifications or structures are generally considered to have intact settings.

Buried Cultural Resources

Alluvial and colluvial deposits have the potential to contain intact buried cultural resources, but consistently locating such resources is difficult. A geoarcheological assessment associated with the DOE's PUMP III (Eckerle et al. 2005) study examined general depositional areas throughout the planning area that have the potential to contain such resources. Relying on soil geology and archeological data, the study found that alluvial and colluvial deposits are more likely to contain buried cultural resources than others. The study also noted that due to some unique circumstances in the planning area buried cultural resources are difficult to locate in cutbanks or in soil profiles exposed by construction equipment. The PUMP III report makes a statistical assumption that, in lieu of an obvious soil horizon and estimating a typical artifact density of approximately 100 per square meter, the probability of encountering a buried site in a cutbank (or construction trench) is an astonishingly low 0.3 percent (Eckerle et al. 2005). This notion is reinforced by the fact that many significant buried archeological sites discovered in the 1970s and 1980s attracted academic investigations (Carter-Kerr-McGee Site, Sisters Hill Site, Ruby Site, etc.), but after nearly two million acres of archeological inventory no recent sites eliciting such interest have been discovered. Although the geology of planning area exhibits the preservation traits to hold numerous significant buried sites, such sites are very difficult to discover.

Traditional Cultural Properties and Sacred Sites

National Register Bulletin 38 defines Traditional Cultural Properties (TCPs) as a “kind of cultural significance a property may possess, and that may make it eligible for inclusion in the Register, is *traditional cultural significance*. “Traditional” in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices” (NPS 1990). TCP status can be given to sites that are significant to any culture, although the focus in the Wyoming has typically been on Native American concerns. There is one known TCP in the planning area, the Pumpkin Buttes. Sacred sites are not easily defined, but are typically discrete geographic areas that have religious or cultural significance to Native Americans tribes. Sacred sites are not necessarily archeological in nature and can be expressed by things like geographic locations or plant communities.

As mandated by the NHPA, the BLM primarily consults Native American tribes about impacts to sacred sites or TCPs, although tribal concerns can go beyond impacts to specific archeological sites. Tribal representatives indicate that archeologists are not adequately trained to identify areas important to a tribe, and suggest the use of trained tribal members to do so. Tribes also indicate sacred sites are not necessarily archeological in nature and may be more properly associated with things such as geographic features or plant communities. To date the BFO has not utilized Native American inventory before making land use decisions.

In 2006 the BLM, in consultation with the Wyoming SHPO and 15 tribes, determined that Pumpkin Buttes is a TCP. The site consists of four prominent buttes on the divide between the Belle Fourche basin and PRB. Although the buttes themselves are considered to be significant, several tribes also identified specific sacred sites and indicated that there could be numerous undocumented sacred sites, such as burials and offering sites, on the buttes. The buttes are also the origin place for a significant ceremony related to a specific tribe. Many tribes indicated a desire to utilize the buttes for ceremonial and plant-gathering activities. Tribes have informed the BLM that the setting or viewshed that can be observed from sacred sites such as the Pumpkin buttes are important aspects of those sites. For example, Pumpkin Buttes are the highest point in

the PRB and geographic features such as the Big Horn Mountains, Black Hills and the Laramie Range are visible in the distance. Tribes informed the BLM that visible modern developments between Pumpkin Buttes and such features may diminish the experience for those performing ceremonial uses.

In 2009, the BLM and the Wyoming SHPO signed a programmatic agreement related to the proposed energy projects within two miles of the Pumpkin Buttes TCP. The agreement allowed the BLM to streamline the SHPO consultation process for projects within two miles of the base of the buttes if the applicant could design their project to create a weak contrast to the setting of the TCP. The agreement did not create any type of specific protections for the buttes themselves; it is essentially a way to expedite projects that conform to a specific set of design features that are intended to preserve the setting of the TCP.

Native American burials have been located and in some cases inadvertently removed from public lands in the planning area. NAGPRA mandates that all Native American human remains and associated funerary objects on public lands be protected, and if they are removed, they are to be repatriated. The BFO is actively working to repatriate Native American human remains and associated funerary objects removed from BLM-administered lands. Occasionally, tribes request that such remains or funerary objects are re-interred on BLM-administered surface.

Consultation with tribes related to TCPs and sacred sites in the planning area is primarily performed in relation to NHPA and NEPA compliance. Consultations and information gathering related to this planning effort indicate that the Pumpkin Buttes TCP is a very significant resource to all tribes. Most tribes also indicated that all rock art sites, burials, and sites containing stone features are significant to their cultures. Tribal representatives were hesitant to pinpoint specific locations of significant areas since the places may be well known through oral traditions, but since tribes have not had a strong presence in the planning area since the late 1800s specific locations may be currently unclear to them. They identified that field visits were a good way to confirm the locations of culturally significant areas. However, they also expressed strong confidentiality concerns with public disclosure of such locations and were hesitant to have them described in this document. Most tribes expressed a strong desire to take part in project level planning effort to locate areas that are significant to their cultures, but there are significant challenges to meeting this goal.

Project specific tribal consultation has typically been reactionary in nature and there have been few opportunities for proactive planning to identify such sites. The high proportion of federal undertakings that occur on private surface in the planning area often complicates the situation. Tribes have no input on the overall management of areas that are significant to their cultures that are on private surface unless there is a federal nexus. Additionally, the BFO has established good working relationships with tribes, but there is no clearly defined process outlining the triggers for consultations or for a process to be followed once consultations are initiated. Programmatic consultation agreements between a tribe or tribes and the BLM can outline such a process. An agreement can clarify rules, give the BLM and tribes a sense of participation, and outline how each party is obligated and involved.

Rural Historic Landscapes

National Register Bulletin 30 defines a rural historic landscape as “a geographical area that historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land

use, vegetation, buildings and structures, roads and waterways, and natural features” (NPS 1989). To date there are no identified rural historic landscapes in the planning areas. BLM did consider defining the ranching community around the Pumpkin Buttes as a rural historic landscape during the process of determining that the buttes are a TCP (SWCA 2006). The buttes are a distinct geographic area, but the ranching community does not possess a significant adaptation to the area as reflected in any specific types of buildings, roads, vegetation types, etc. The presence of the Pumpkin Buttes in the area did not appear to make the local ranching community any more or less distinctive than other ranching communities in northeastern Wyoming and the BLM did not feel it warranted a special designation.

Management Challenges

There are several unique management challenges associated with cultural resources in the planning area. Consistent assessments of site conditions throughout the planning area are difficult given the recent focus on energy development projects. Areas that are developed for fluid minerals or coal are often intensively inventoried, while other areas with significant resources (such as the South Big Horns) are not. Impacts to the setting of historic properties presents a difficult management challenge in the face of energy development. Increased energy development is also leading to other unique challenges as hundreds of thousands of acres are inventoried and documented.

Large-scale block inventories can be good tools for cultural resource managers, but in the heavy APD permitting atmosphere at the BFO through the 2000s, their use for Section 106 compliance did not necessarily result in the desired outcome. Cultural resources inventory for the purpose of complying with Section 106 of the NHPA identifies archeological sites, but does not necessarily lead to advancement of archeological knowledge. Variable recordation techniques, limitations of regulation, private surface owner concerns, and other issues hinder pure scientific investigations. There is a general assumption that block inventories as a result of NHPA compliance for energy projects are beneficial for the archeological information they provide. One assumption is that identifying sites on a general scale provides good contextual information for a region. Another logical assumption is that specific site information gained from site recordation related to NHPA compliance can be used to formulate various regional hypotheses. There is also an assumption that sites that would not normally be studied are excavated as a result of heightened development, again supplying important archeological data. Although these assumptions are logical, they are not entirely accurate. The assumption that large-scale block inventories provide good contextual information is not necessarily true. One reason for this is that NHPA compliance inventories are not peer reviewed. Generally, the BLM and the SHPO are the only reviewers of Class III reports; specific site interpretations from archeological consultants are not often critiqued. In addition, most inventories in the Buffalo planning area occur on split estate, with the surface belonging to a private land owner. In many cases, the landowner requests cultural resource information from their property be considered confidential. This negates the possibility of using that information for any future scientific purpose.

Another reason for doubting the validity of contextual information provided by contracted archeological reports is that the inventory results vary greatly between consultants. The BLM is responsible for controlling the quality of contracted reports, but given an immense workload, field verification of contractors’ results is not performed for entire blocks. Field checks for block inventories are primarily performed where the ground will be disturbed, leaving the rest of the block inventory unverified. Analysis of the Wyoming Cultural Resource Office database reveals several instances where different consulting archeologists report drastically different site densities

for adjoining project areas in the same topography. There is an inaccurate assumption that data gathered from individual site forms identified during compliance inventories can be used to formulate regional hypotheses. As mentioned before, the lack of peer review in these instances is a major factor. Also, the kinds of data the BLM and the SHPO require contractors to provide are very basic. The goal of a cultural resources survey designed to comply with NHPA Section 106 is to identify historic properties. Typically, the data required to make this determination do not need to be exhaustive. Basic archeological investigation techniques such as formal excavation, radiocarbon dating, faunal analysis, and paleoethnobotanical analysis are rarely necessary for the BLM to determine site eligibility. In addition, most of the sites recorded during these inventories are surface manifestations. It is risky to assume that the presence or absence of certain types of artifacts found at surface scatters provides useful archeological information. Given the propensity for surface sites to experience both erosion and unauthorized collection, site interpretation can easily be skewed. It is inaccurate to assume that heightened development provides for more data recovery or excavation. BLM policy is to avoid historic properties. For CBNG projects, anything beyond simple shovel testing to make determinations of eligibility is exceedingly rare. Because CBNG facilities can easily avoid historic properties in the PRB, mitigation in the form of site excavation simply does not happen.

There is also a major hazard to cultural resources associated with performing large block inventories. It is possible that the BLM's intent to protect sites through identification and avoidance inadvertently leads to unauthorized collection. Identifying, recording, and mapping a site puts it at a heightened risk of unauthorized collection or vandalism. Leaving pin flags in the field, marking artifacts or site boundaries, and PVC datums highlight the location of archeological sites. Artifacts and features are documented in Class III reports; however, it is common for artifacts to be missing when field checks are performed by BLM archeologists. In a few cases, all of the artifacts appear to have been stolen.

Timely documentation of site conditions is one of the greatest management challenges for the BFO. There are numerous significant sites, such as cave sites in the Middle Fork area, the BLM has not visited since the 1970s. Some sites, such as Cantonment Reno and the Sweem-Taylor rockshelter, have associated interpretive facilities, but are not regularly patrolled to check for signs of vandalism or natural erosion. Other sensitive sites, such as burial sites or the Pumpkin Buttes TCP, do not receive adequate BLM visitation to immediately address imminent threats.

Hundreds of archeological sites are discovered and recorded each year as a result of inventory associated with energy development. Most of these sites are assessed for their eligibility for listing on the NRHP. Site condition is assessed as part of the eligibility determination. Site condition can change over time due to such actions as erosion, grazing, unauthorized collection, and vandalism. Because the condition of a site can readily change, monitoring is necessary. Due to the recent increased emphasis on energy development, the BFO has focused on permitting and has performed minimal monitoring.

There are nationally significant historic sites in the planning area, such as Cantonment Reno, that experience human and natural impacts. The site, on BLM surface, is a rare example of a military fort from the late 19th Century, and contains well-defined feature foundations and thousands of buried artifacts. Although there is no legal public access, there are documented cases of unauthorized excavation and collection at Cantonment Reno. The site is on a floodplain and could soon be exposed to erosion from an encroaching oxbow bend in the Powder River. Other nationally significant historic sites on or partially on BLM surface that could be experiencing

similar impacts are the Dull Knife Battlefield, Crazy Woman Battle site, and portions of the Bozeman Trail.

Archeological sites in rockshelters are typically significant because they are often stratified and tend to preserve artifacts and features more than open-air sites. There are numerous rockshelters in the Middle Fork and other similar canyons in the South Big Horn Mountains that require special consideration. Many of the known rockshelters in the planning area have not been properly recorded or patrolled in the last 30 years. Looters often target rockshelters as likely places to recover artifacts, and it is very likely that significant rockshelters on BLM surface have been vandalized.

One of the significant rockshelter sites in the planning area that has been adversely affected is the Sweem-Taylor rockshelter. Excavation by an amateur society in the 1950s removed almost all of the cultural deposits inside the shelter. Amateurs performed the work using dated excavation methods, and no peer reviewed scientific description or analysis of the finds was published. After the excavation, looters removed the remaining cultural layers inside the shelter. Although a barrier fence between an access road and the site and an interpretive sign were installed in the 1980s, most of the damage had been done. Due to the complete removal of the cultural layers, the site cannot be analyzed using modern technology and professional methods, and now contains very little important scientific information.

Rock art is a fragile resource that can be affected or altered by many natural or human-caused factors. The majority of rock art in the planning area has modern graffiti near or on top of the art. Rock art on boulders inside the Sweem-Taylor rockshelter were destroyed or removed during unauthorized excavation. Smoke from modern campfires inside the shelter also led to the destruction of some rock art. Rock art erodes due to natural weathering, especially if it is placed on soft sandstone. Site 48JO108 was recorded in 1978 as a fairly well defined pictograph on a sandstone cliff face. During a site visit in 2009, it was noted that almost half the pictograph was no longer distinguishable due to natural weathering.

Preservation of the setting of historic trails presents a unique management challenge. Setting is one of the aspects that can contribute to the integrity of a historic property. For example, if an individual on a portion the Bozeman Trail can observe the same type of landscape adjacent the trail as a traveler on the trail in the early 1860s did, the site retains its historic setting. The addition of O&G facilities to the setting of a historic trail obviously does not give an observer the impression that the historic setting is intact. With setting being a subjective term, it is a difficult concept to effectively manage. It is essential that the person assessing the setting has a thorough knowledge of both the history of the landscape and the historic property being evaluated. An observer who is not familiar with the Wyoming landscape may feel that a trail segment adjacent to a crested wheat field without visible O&G facilities or modern buildings retains its historic setting. Someone familiar with the history of the area could identify the crested wheat as a non-native species, which is only established by mechanical seeding, and determine that the historic setting has been compromised.

Preserving the setting of historic properties that are surrounded by private surface presents a major management challenge. The setting near the Pumpkin Buttes TCP is entirely on private surface. When the BLM determined that the Pumpkin Buttes was a TCP, it also determined that although there are existing modern developments such as roads, powerlines, fluid mineral wells, etc., the setting of the site was intact. BLM later signed an agreement with the Wyoming SHPO stating that it would apply certain conditions on energy development projects in order to preserve the

setting. BLM can require COAs that reduce visual impacts, but those conditions are only limited to BLM authorizations. Private land owners and proponents building projects that do not have any associated federal authorizations are not obligated to consider impacts to the setting of the Pumpkin Buttes TCP. These actions can have major impacts to the setting of the TCP and may diminish it to the point that the setting no longer contributes to the integrity of the site.

Archeological sites are fragile nonrenewable resources. Sites in the planning area have been adversely affected or destroyed through various actions. The BLM has taken measures to reduce impacts to some sites, but hundreds of significant sites do not have specific protection measures. Although monitoring is necessary to document and prevent site damage, the BFO does not have the proper planning document or resources to do so.

3.5.1.4. Trends

If the demand for production of federally owned minerals increases or remains the same, there will be an increased need to identify cultural resources. Intensive inventory is required before approval of any surface-disturbing activity associated with minerals development. In the PRB EIS, the BLM suggested that operators have their permittees perform large block inventories to better plan large projects with multiple wells and associated infrastructure, and most operators have complied with this request. The contracted reports are used to determine if archeological sites eligible for listing on the NRHP will be affected by the proposed action. Sites that not eligible for listing on the NRHP are not avoided and could be destroyed during construction. It is BLM policy (as outlined in BLM Manual 8140) that historic properties are avoided by at least 100 feet. If historic properties cannot be avoided, they must be mitigated.

The demands of recent heightened federal minerals production has created, and will continue to create, impacts to cultural resources. BLM archeologists often perform pre-approval field checks of contracted Class III inventories, but are primarily focused on the project footprint and are unable to adequately verify the accuracy of large block inventories. Therefore, it is not clear if the contracted inventories are adequately locating all cultural resources. The emphasis on report review and permitting does not allow BLM archeological personnel the time to adequately perform post-approval duties. Although post-approval site monitoring is rare in the planning area, many sites in developed areas appear to have been subject to unauthorized collection or vandalism. Protective measures are often required as COAs for federal undertakings, but it is not clear if those measures are adequately implemented.

3.5.1.5. Key Features

There are numerous archeological sites throughout the planning area that are key features. Site types range from prehistoric sites that are significant for their scientific value, historic structures or the locations of significant historic events, and sacred sites significant to Native American tribes. There are undoubtedly undiscovered significant sites throughout the planning area, but the following known sites necessitate special management considerations.

Prehistoric sites

1. Buried sites:
 - Sisters Hill Site
 - Carter-Kerr-McGee Site
 - Ruby Site

- Piney Creek Site
 - Big Goose Site
 - Cordero Mine Site
 - Mavrakis-Bentzen-Roberts Site
 - Powder River Site, Mooney Site
2. Rockshelters:
 - Schiffer Cave Site
 - Grey-Taylor Site
 - Sweem-Taylor Site

Historic Sites

1. Forts and Ranches:
 - Cantonment Reno
 - Fort Reno
 - LX Bar Ranch
 - K Ranch
2. Trails:
 - Bozeman Trail
 - Deadwood Trail
 - Sawyers Expedition Route
 - Crook Scout Route
 - Black and Yellow Trail
 - Texas Trail
3. Battle Sites:
 - Dull Knife Battle
 - Crazy Woman Battle
 - Tongue River Fight Site

Sacred Sites

1. TCPs:
 - Pumpkin Buttes
2. Rock Art
3. Stone Circle and Cairn Sites

Areas With a High Potential for Buried Cultural Resources

Areas with a high potential for buried cultural resources are key features that should be considered during the planning process. Buried archeological sites are very difficult to locate during a standard Class III inventory and during earth moving construction activities. Given the potential for significant buried sites and the difficulty in locating those sites, such areas necessitate special management considerations.

South Big Horn Mountains

The 1985 RMP necessitated the creation of the **CRMP** for the Outlaw Cave Archeological District. Limited inventory indicated a high density of significant sites (rockshelters, rock art, and stratified buried sites) near Outlaw Cave and in the drainage of the Middle Fork Powder River. The density of significant sites reported in this early inventory is undoubtedly not limited to that specific area. Recent data indicate the entire Southern Big Horn Mountain Subregion contains the

same high density of significant sites. Given the density of significant sites and the limited amount of research in the subregion, the general area necessitates special management considerations.

3.5.2. Paleontological Resources

Paleontological Resources are any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth. Scientifically significant paleontological resources (including vertebrate, invertebrate, plants, and trace fossils) are known to occur in many of the geologic formations within the Wyoming PRB. These paleontological resources are documented in the scientific literature and in museum records, and are known by paleontologists and land managers familiar with the area. It has been determined that paleontological resources on federal land shall be managed and protected using scientific principles and expertise. Appropriate plans for the inventory, monitoring, and the scientific and educational use of these resources shall be developed, in accordance with applicable agency laws, regulations, and policies. These plans shall emphasize interagency coordination and collaborative efforts where possible with non-federal partners, the scientific community, and the general public.

All paleontological resources offer scientific information, but not all fossils offer noteworthy scientific information. Fossils generally are considered to be scientifically noteworthy if they are unique, unusual, rare, diagnostically or stratigraphically important, or add to the existing body of knowledge in a specific area of science. Most paleontological resources occur in sedimentary rock formations. Although experienced paleontologists generally can predict which formations may contain fossils and what types of fossils may be found based on the age of the formation and its depositional environment, predicting the exact location where fossils may be found is not possible.

3.5.2.1. Regional Context

Geologic formations are the basic units of stratigraphy. A formation consists of a certain number of rock strata that have a comparable lithology, facies or other similar properties. Paleontological resources are closely tied to the geologic formations in which they are present; different-aged rocks contain different types of fossils. Almost all of the geologic formations in the planning area have the potential to produce significant paleontological resources. There are known fossil localities scattered throughout the planning area that have produced a variety of important fossils from the six Class 5 formations, as well as others, so there is a potential for additional significant discoveries to be made. Formations known to produce important vertebrate remains in the planning area include the Chugwater, Sundance, Morrison, Cloverly, Lance, Fort Union, Wasatch and White River formations. Many of the fossil-bearing formations within Wyoming are in the planning area, but they are not extensively distributed or substantially exposed at the surface.

Management of fossils found on BLM-administered lands is restricted to public surface. Collecting fossils is allowed with some restrictions, depending on the significance of the fossils. Hobby collecting of common invertebrate or plant fossils by the public is allowed in reasonable quantities when only hand tools are used and negligible disturbance is made. Commercial collecting of fossils is not permitted. Collection of all vertebrate and any administratively designated plant or invertebrate fossils may be done only under permits issued by the BLM to qualified researchers. All fossils collected under a permit remain public property and must be curated in an approved repository.

The BLM utilizes the Potential Fossil Yield Classification (PFYC) system to classify the potential to discover or impact significant paleontological resources. PFYC is based on the likelihood of geologic formations to contain significant paleontological resources using a scale of 1 (very low potential) to 5 (very high potential). The PFYC is intended to help determine proper management and mitigation approaches for surface-disturbing activities, disposal or acquisition actions, recreation possibilities or limitations, and other BLM-approved activities, with more intense mitigation efforts aimed at higher-potential formations. The system also can highlight areas likely to be a focus of paleontological research efforts or illegal collecting.

3.5.2.2. Indicators

The primary resource indicator for paleontological resources is the degree of loss of characteristics that make fossils or fossil localities important for scientific and educational use or public enjoyment. Damage or destruction of the fossils themselves, impacts to the natural setting of the fossils, poorly executed molding or casting, or disassociation of related fossils all can contribute to a loss of scientific information or public use of the resource. Natural or accelerated erosion, decay of the fossils, project construction, improper collection, and vandalism can remove, alter, or damage the characteristics that make the paleontological resource scientifically important or enjoyable for the public.

3.5.2.3. Current Condition

Exposure of bedrock is necessary to find fossils, and these exposures are limited in the planning area due to the generally rolling, soil-covered, and well-vegetated landscape. Although most of the formations in the planning area contain fossils, relatively few fossil localities are recorded. Documentation of fossils depends on the number of researchers and others looking for fossils. Out of 53 current BLM paleontological research permits, 12 include some type of focus on the planning area. Only two researchers are specifically focused on paleontological resources in the planning area. Even though there appears to be low academic interest at the current time, there is still a high likelihood that undocumented significant fossils are present in the planning area.

Scattered occurrences of vertebrate fossils, leaf impressions and invertebrate marine fossils are known in the planning area. The most easily identified fossil in the planning area is petrified wood from the Wasatch Formation, sometimes found as large log segments or rarely as upright stumps. The Dry Creek Petrified Tree EEA (40 acres) near Buffalo contains fossilized trees and stumps preserved in upright positions and fallen logs. The BLM has developed the location with interpretive signs and walkways to provide an educational area. An NSO stipulation has been applied to the site to restrict any surface disturbances.

Mitigation efforts aimed at identifying and protecting paleontological resources are being applied to energy development activities, major pipelines, and road and other construction actions. These efforts are focused on areas anticipated to commonly contain significant fossils. While it is likely that there is some hobby collecting of fossils the planning area, there is no data relating levels of use. Similarly, there is no documentation of illegal fossil collecting in the planning area.

The potential for impacts to scientifically significant paleontological resources are predicted to be greatest in areas where PFYC Class 4 or 5 (High or Very High) formations are present. In addition, in most cases those rock units with a PFYC of 3 (Moderate or Unknown) will require some management decision and action. Class 3 formations are fossiliferous units where fossil content varies in significance, abundance, and predictable occurrence; or of unknown fossil

potential. Surface-disturbing activities will require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action, and whether that action could affect the paleontological resources.

The Wasatch Formation is the most geographically widespread unit exposed on the surface over most of the planning area. It is underlain by the Fort Union Formation. The fossiliferous Morrison and Lance formations crop out along the margins of the PRB and occur at depth in the vicinity of the coal mines. The highly fossiliferous White River Formation occurs only on Pumpkin Buttes in southwestern Campbell County.

In recent years, the Wasatch Formation has been downgraded to a Class 3a formation (geologic units with widely scattered scientifically significant fossils) in the PRB, but remains a Class 5 formation (highest rating) statewide. The Fort Union Formation has been proposed to be upgraded from a Class 3 (geologic units where fossil content varies in significance, abundance, and predictable occurrence; or of unknown fossil potential) to a Class 4 formation (geologic units containing a high occurrence of scientifically significant fossils) statewide.

Currently there are six geologic formations in the field office that have a PFYC rating of 5 (Table 3.49, “Formations Containing Very High Fossil Yield Classifications” (p. 549)). These formations total 230,182 acres or approximately three percent of the entire planning area. A total of 28,177 acres with a PFYC rating of 5 occur on BLM surface (3.6%). However, as the PFYCs for rock units in Wyoming are under revision, these numbers will change in the near future.

Table 3.49. Formations Containing Very High Fossil Yield Classifications

Formation	Age	Potential Fossil Yield Classification
White River Formation	Oligocene Epoch, Tertiary Period – approximately 38 to 30 million years ago	5
Moncrief and Kingsbury Conglomerate Members of the Wasatch Formation	Eocene Epoch, Tertiary Period – approximately 55 to 38 million years ago	5
Lance Formation	Cretaceous Period – approximately 70 to 65 million years ago	5
Cloverly Formation	Cretaceous Period – approximately 138 to 100 million years ago	5
Morrison Formation	Jurassic Period – approximately 142 to 138 million years ago	5
Sundance Formation	Jurassic Period – approximately 170 to 142 million years ago	5
Source: Love et al. 1993		

White River Formation

The Middle Tertiary White River Formation consists of bentonitic mudstone, sandstone, and altered or unaltered volcanic debris. Thousands of vertebrate fossils have been collected from this rock unit, including mammals, reptiles, amphibians, fish, and birds, as well as trace fossils. This formation is found throughout the Northern Great Plains and forms the landscape preserved at Badlands National Park in South Dakota. The only occurrence of this geologic formation in the planning area is the sandstone caps forming the tops of Pumpkin Buttes. Vertebrate fossils, including mammal bones from this formation have been located in the planning area.

Moncrief and Kingsbury Conglomerate Members of the Wasatch Formation

The Lower Tertiary Wasatch Formation in eastern Wyoming consists of sandstone and variegated claystone with numerous coalbeds in the lower portions (Love and Christiansen 1985). In the western PRB the Wasatch Formation includes the Moncrief Member (a conglomerate of Precambrian clasts, interbedded with sandstone and claystone) and the Kingsbury Conglomerate (a conglomerate of Paleozoic clasts, interbedded with sandstone and variegated claystone) (Love and Christiansen 1985). In southwestern Wyoming the Wasatch Formation contains numerous mammal, amphibian, bird, and reptile fossils, including trace fossils. Wasatch Formation deposits underlie the majority of the planning area, and occasionally contain fossil bones. Reptile and mammal fossils are sporadically found throughout the basin, and some very rich fossil localities are known from this unit near the towns of Sussex and Lynch. Some nearly complete large fossil mammals have been found in the upper parts of the formation. Researchers have also collected small vertebrate fossils, including mammal bones, primarily from anthills in the Wasatch Formation.

Lance Formation

The Upper Cretaceous Lance Formation is dominated by nonmarine coastal floodplain sandstones, mudstones, and marls, with marginal marine sandstones and shales in its lower parts. It reaches more than 750 meters in thickness and is found in many places throughout Wyoming. The formation can contain a diverse fauna from the end of the Mesozoic Era including tyrannosaurs and other theropods, ankylosaurs, hadrosaurs and other ornithopods, ceratopsians, and pachycephalosaurs, and pterosaurs, as well as a variety of mammals, reptiles, amphibians birds, and fish. Important track sites are also known. A relatively small portion of the formation is exposed along the margins of the planning area. There are no known fossil discoveries from the geologic unit in the planning area, although there have been numerous significant finds between Lusk and Newcastle.

Cloverly Formation

The Lower Cretaceous Cloverly Formation was deposited under floodplain and lacustrine conditions, having an average thickness of approximately 90 meters. The formation primarily has variegated claystones with channel-filling sandstones and conglomeratic sandstones. Above the zone of conglomerates and conglomeratic sandstones at the base of the Lower Cretaceous, the shales and sandstones are buff and gray with purple, maroon, and red shales in the middle. The Cloverly Formation has produced a diverse dinosaur fauna in Montana and the Bighorn Basin of Wyoming including iguanodonts and other ornithopods, sauropods, theropods, and ankylosaurs as well as lizards, turtles, fish, and early mammals. Dinosaur eggs have also been found in this unit. Small portions of the formation are exposed in the foothills of the Big Horn Mountains in the planning area, although no significant finds have been documented.

Morrison Formation

The Upper Jurassic Morrison Formation was deposited under floodplain and lacustrine conditions and can be up to 65-meters thick. It consists of green and greenish-gray shale and claystone with lenticular silty sandstones and occasional conglomerates, thin carbonaceous beds, freshwater marls, and limestone lenses characteristic of floodplain and lake deposits. The Morrison Formation is well known for producing a scientifically noteworthy and highly diverse fauna and flora. In

Wyoming this fauna includes allosaurids and other theropods, diplodocids and camarasaurids, stegosaurs, ornithopods, ankylosaurs, and pterosaurs, as well as variety of mollusks, reptiles, amphibians, fish, early mammals, and trace fossils. This formation is found throughout the Rocky Mountain area and is noted for fossil deposits at Dinosaur National Monument in Utah, Como Bluff in Wyoming, Dinosaur Ridge in Colorado, and other world-class sites. Small portions of the formation are exposed in the foothills of the Big Horn Mountains in the planning area and important discoveries have been (and continue to be) made there since the late 1800s.

Sundance Formation

The Middle-Upper Jurassic Sundance Formation consists of marine sandstones, limestones, and shales deposited in an inland sea or adjacent near-shore and beach deposits from the latter part of the Jurassic Period. The formation varies in thickness from 75 to 130 meters. It consists of greenish-gray glauconitic mudstones and shales with some interbedded sandstones and limestones containing many invertebrate fossils, including clams and oysters, crinoids (sea lilies), echinoids (sea urchins), and belemnites (squid-like animals). Marine reptiles including ichthyosaur, and plesiosaur specimens are also found this formation. A rich trace fossil record is recorded in this unit ranging from a diversity of invertebrate traces to pterosaur and theropod dinosaur footprints. Small portions of the formation are exposed in the foothills of the Big Horn Mountains in the planning area, although no significant finds have been documented.

3.5.2.4. Trends

Given the limited number of localities, monitoring data and the minimal amount of paleontological research in the planning area it is difficult to identify trends. It can be assumed that any surface-disturbing activities in areas with a PFYC of 5 have the potential to destroy significant fossils. Although, the majority of foreseeable development considered in this plan is not in these areas.

However, as most of the geologic formations in the planning area have the potential to produce significant paleontological resources and there are known fossil localities scattered throughout the planning area, there is a potential for additional significant discoveries to be made. Future research and mitigation efforts could discover significant paleontological resources, which could require special management to protect or develop them.

However, the absence of localities in the PRB does not always mean that scientifically significant fossils are not present, as much of the area within and surrounding the PRB has not been adequately explored for paleontological resources. As a result, development activities in the planning area have the potential to adversely affect scientifically significant fossils, if they are present in or adjacent to disturbance areas.

The greatest potential impact on surface and subsurface paleontological resources would result from disturbance of surface sediments and shallow bedrock during construction and/or operations, depending on the type of project. Potential subsurface disturbance of paleontological resources (e.g., during drilling operations) would not be visible or verifiable. However, as only portions of the planning area have been evaluated for the occurrence of paleontological resources, and discrete locations for development activities cannot be determined at this time, no accurate estimate can be made as to the number of paleontological sites that may be affected by cumulative development activities. Development activities which involve federally owned surface and/or minerals are subject to federal guidelines and regulations protecting paleontological resources.

Protection measures, permit COAs, and/or mitigation measures would be determined on a project specific basis at the time of permitting to minimize potential impacts on paleontological resources as a result of these activities.

3.5.2.5. Key Features

Geologic formations with a very high (Class 5) potential to produce significant paleontological resources currently include the White River Formation, the Moncrief and Kingsbury Conglomerate Members of the Wasatch Formation, and the Lance, Cloverly, Morrison, and Sundance Formations. These geologic formations amount to approximately 230,182 acres or approximately three percent of the entire planning area; on BLM surface, they total approximately 28,177 acres or approximately 3.6 percent. Due to the fact that these formations have a very high potential to contain significant fossils, they are key features.

In addition, unique examples of large intact logs and upright stumps of petrified wood fossils preserved in the Wasatch Formation are the most widespread important fossils in the planning area. The Dry Creek Petrified Tree EEA is an outstanding example of this resource and is a key feature.

3.5.3. Visual Resources

Scenic values are identified in FLPMA as one of the array of resources that the BLM must manage and protect. To meet its responsibility to maintain the scenic values of public lands, the BLM has developed a Visual Resource Management (VRM) system based on the concept that every landscape has the basic environmental design elements of form, line, color, and texture. Projects that repeat the natural environmental design elements are generally considered to be in harmony with their surroundings and result in less impact to visual resources; those that do not repeat natural environmental design elements create contrast and result in greater impacts to visual resources. Determining how an area should be managed first requires an assessment of the area's scenic values.

The VRM system provides an orderly method for observing the scenic qualities of public lands, classifying existing visual resources and determining appropriate management actions. It also provides a way to analyze potential impacts to visual resources and apply visual design techniques to ensure that surface-disturbing activities harmonize with their surroundings. The BLM VRM system consists of two stages – (1) Visual Resource Inventory (VRI) and the designation of VRM Classes during the resource management planning process; and (2) implementation of RMP decisions and analysis through the Visual Contrast Rating (VCR).

The inventory stage, performed in the planning area in July 2009 (BLM 2009b), provides a baseline assessment of the condition of visual resources and assigns them to inventory classes. The VRI is composed of three factors:

- **Scenic Quality Rating Units.** Rating units divide the landscape within the planning area into discrete units of similar natural character based on the physical design elements of form, line, color, and texture.
- **Sensitivity Level Rating Units.** Sensitivity levels (high, moderate, low) measure public concern for scenic value. Determinations include identification of visually sensitive publics (i.e., TCPs), landscape features of concern and any other corresponding scenic values identified or documented by the public.

- **Delineation of Distance Zones.** Distance zones (foreground/middleground, background, seldom seen) assist in defining areas that are visible from nearby access areas from landscapes that appear farther away. The VRI process includes identifying places where the public is most likely to view public lands.

Thus, the VRI rates the visual appeal of a defined land, measures public concern for scenic quality of the tract, and determines whether the tract of land is visible from travel routes or observation points. Units within the planning area are then placed into one of four VRI classes based on the interrelationships between the three inventoried factors. The process is described in detail in BLM Handbook H-8410-1 (BLM 1986a). VRI Class I includes the most highly valued visual landscapes while VRI Class IV are the least. The VRI serves as the baseline from which change is to be measured through NEPA analyses during the implementation phase of the land use plan.

The results of the VRI are considered throughout the RMP process in conjunction with other management actions for a given alternative. In each alternative, BLM-administered lands are assigned to management classes (VRM Class I-IV) with established objectives. For example, management of an area with high scenic value might be focused on preserving the natural character of the landscape, and management of an area with little scenic value might allow for major modifications to the landscape within a given alternative.

3.5.3.1. Regional Context

Units of BLM-administered surface within the planning area are classified as one of the four VRM classes based on management objectives in concert with the unit's identified scenic values. The degree of visual modifications allowed is specific for each VRM class (BLM 1984). The goal of VRM, however, is to minimize the visual impacts of all surface-disturbing activities regardless of the VRM Class in which they occur. The *Glossary* summarizes the objectives for VRM classes. Formerly, VRM included an additional class (Class V) that identified areas where the landscape character has been so severely impaired that landscape restoration or rehabilitation was necessary (i.e., large surface coal mines). Lands that are managed by the USFS, such as the Bighorn National Forest and Thunder Basin National Grassland, are subject to the landscape or scenery management considerations required under USFS policy and specified in the relevant Forest Plan.

3.5.3.2. Indicators

Visual resources within the planning area are influenced by a wide variety of topographic, geologic, hydrological, vegetative, and other characteristics of the region. The type of vegetation varies and is largely dependent on elevation and the amount of precipitation received in any given area. Landforms range from relatively flat land, to low mountains, low rolling or flat-topped hills, and isolated hills, to higher elevations near the Big Horn mountains containing mountain shrub vegetation and alpine forest. Cultural modification exists in various levels of concentration across the landscape, but is generally concentrated near cities and towns for residential development and infrastructure, while O&G operations are concentrated within the Powder River Breaks. Vegetation patterns, landforms and development, in conjunction with several other environmental factors, affect color, form, line, and contrast. The indicator for visual resources is the repetition of these four natural environmental design elements.

3.5.3.3. Current Condition

Visual resources in the planning area vary widely, from mountains and foothills in the western portion to low rolling prairie in the east. The large areas of undisturbed sagebrush-grasslands and mountain foothills in the planning area are unique compared to the more densely populated Great Plains regions to the east and south. While the visual resources inventory incorporates the entire visual landscape into the analysis, the BLM only assigns VRI and VRM classes to BLM-administered surface.

Almost 60 percent of the planning area is in the PRB ecoregion (EPA 2004). This region includes gently rolling to steep dissected plains and wide belts of steeply sloping badlands that border the Powder and Tongue river valleys. In places, flat-topped, steep-sided buttes rise sharply above the surrounding plains, such as Pumpkin Buttes in the southeast part of the planning area. The vegetation is primarily sagebrush and grassland, with patches of pine-juniper woodland.

The foothill shrublands and low mountains ecoregion of the Wyoming Basin is the second largest region represented on BLM-administered surface in the planning area (approximately 14%). It is in the southwest part of the planning area in the foothills of the Big Horn Mountains. The vegetation is shrub steppe, desert shrubland, and pine-juniper woodland. The Chugwater Formation, with its striking crimson color and steep vertical escarpments, is prominent in the southern foothills of the Big Horn Mountains. In addition, Powder River tributaries cut deep vertical canyons in the foothills of the Big Horn Mountains, and then break out into broad riparian zones that provide visual diversity across the grasslands of southern Johnson and Campbell counties.

Visual resources are also often associated with recreational opportunities and/or special designations. Many recreational activities, such as backpacking, geologic and nature study, photography, and hiking, are greatly influenced by the natural settings and scenic views that VRM is intended to protect. Areas managed to protect primitive recreational opportunities, such as WSAs or suitable segments of Wild and Scenic Rivers (WSRs), would have strong visual resource components.

Visual Resources Inventory within the Planning Area

The BFO produced a detailed analysis of visual resources in the planning area in the BFO VRI which is herein incorporated by reference (BLM 2009b). The entire planning area was divided into a total of 48 Scenic Quality Rating Units based on physiographic elements such as geology, vegetation, hydrology, texture, color, variety, and topography. With few exceptions, the Scenic Quality Rating Unit boundaries were also used for analysis of the sensitivity of the landscape in terms of public concern for scenic values. Finally, the analysis considered the distance of a given unit based on relative visibility from travel routes or observation points. Mineral exploration, mining activities, ranching, and recreational use have been ongoing in the BFO for several decades. Consequently, the Field Office has an extensive road and travel-route network. The result is that very few areas are not within three to five miles of travel routes, and no lands are more than five miles from an established road or trail. Even in the roughest and most topographically diverse parts of the BFO, roads and trails penetrate virtually all areas. In addition, areas that are not easily accessed are still visible. Therefore, for the purpose of determining final VRI Classes, only the Foreground-Middleground distance zone is applied to inventoried lands within the planning area. Map 48 displays the VRI Classes assigned to the planning area.

Current Visual Resource Management within the Planning Area

While the VRI documents the baseline conditions of visual resources on public lands and provides a quantifiable framework for assessing VCR during implementation, discussion of the current VRM classes (Alternative A) provide the basis for the no action/present management alternative environmental consequences documented in Section 4.5.3, “Visual Resources” (p. 1377).

The predominant VRM classes in the planning area are Classes III and IV, which comprise approximately 80 percent of the total area (Map 48). Some scenic areas are managed as VRM Class II, including lands adjacent to the Bighorn National Forest and within the foothills of the Big Horn Mountains, the Tongue River east of Interstate 90, State Highway 336 in the vicinity of Wyarno, U.S. Highway 14 and Interstate 90 in the vicinity of the Powder River, and Interstate 90 between Rozet and Wyodak. The majority of the Fortification Creek area is designated VRM Class III. Only approximately one percent of the area is rated as Class V, primarily in the vicinity of coal mines and densely populated areas. The VRM system no longer recognizes Class V management areas. As reclamation in previously designated Class V areas has yet to take place, the areas are generally managed as VRM Class IV. The 1985 RMP and subsequent amendments or updates did not formally designate areas as Class I, as shown in Table 3.50, “Visual Resource Management Classes” (p. 555). However, WSAs and the portion of the Middle Fork Powder River corridor that is suitable and eligible for WSR designation are currently managed as VRM Class I (BLM 2000b).

The three WSAs have been withdrawn from mineral entry and are closed to leasing. Under current management, any facilities or structures proposed in or near WSAs must be designed so as not to impair wilderness suitability. Outside of WSAs, no activity or occupancy is allowed within 200 feet of the edge of state and federal highways. Facilities or structures such as powerlines, oil wells, and storage tanks are required to be screened, painted, and designed to blend with the surrounding landscape except where safety dictates otherwise.

Table 3.50. Visual Resource Management Classes

VRM Class	BLM Surface Acres
Class I ¹	30,103
Class II	127,594
Class III	63,583
Class IV	559,674
Class V	702

Source: BLM 2012f

¹ The three WSAs and Middle Fork Powder River WSR were not originally designated as VRM Class I, but are managed as such. The acreage for the Fortification Creek WSA (12,419) was subtracted from VRM Class III and the acreage for the remaining WSAs and Middle Fork Powder River WSR (17,984) was subtracted from VRM Class II.

BLM Bureau of Land Management

WSA Wilderness study Area

WSR Wild and Scenic River

VRM Visual Resource Management

Visual Intrusions

Impacts to visual resources from human disturbance were relatively minor before mineral development under current management. O&G development, particularly CBNG, has resulted in the most widespread impacts to visual resources in the PRB. Long-term disturbance to visual

resources has occurred with the construction of well pads, access roads, overhead powerlines, water-handling facilities, central metering facilities, and compressor stations. Increased night lighting at facilities has introduced intrusive and potentially undesirable elements into the visual landscape. The scores assigned for the cultural modification factor in the scenic quality evaluation of the VRI assist in documenting a baseline for analyzing impacts from visual intrusions. Visibility has been affected by fugitive dust emissions and exhaust from vehicles and production facilities. Natural disturbances have been principally fire and drought. Coal mining has had the most intensive impact on visual resources in the portions of the planning area affected by coal mining. During the life of a coal mine, substantial changes to line, form, color and texture occur on a local level.

In VRM Class II areas along major transportation routes, facilities constructed on state and private surface that were not part of a federal action have resulted in substantial impacts to visual resources in the area and eroded the usefulness of mitigation measures implemented on federal surface. As of April, 2012, there were approximately 1,025 active O&G wells in VRM Class II areas, mainly along Interstate 90, U.S. Highway 14/16, and near the Tongue River. Of these, 645 (63%) were non-federal actions. Surface-disturbing activities associated with these facilities are easy to notice because of the amount of contrast with the representative landscapes. Additionally, across the planning area the extraction of other minerals such as bentonite, uranium, sand, and gravel often includes a substantial change in the line, color, and form of the existing landscape, which increases with the scale of the operation.

3.5.3.4. Trends

The widespread development of mineral resources in the planning area has created direct, adverse visual impacts. Mitigation of this activity has largely prevented mineral development activities from exceeding the established VRM class objectives. However, the trend toward continued expansion of natural resource development could create areas of potential conflict between resource uses and the established VRM class objectives.

The number of completed wells in the planning area has averaged more than 1,000 per year since 2004. However, the number of plugged wells has been substantially less, approximately 230 per year over the past 15 years. Exceptions for development within 200 feet of highway corridors have been granted by the Federal Highway Administration, creating notable contrasts to the existing landscape along the I-90 corridor. O&G facilities constructed on private surface that were not part of a federal action have resulted in impacts to the viewshed, despite mitigation measures implemented on federal surface. These non-BLM actions have resulted in major impacts to visual resources in Class II areas along Interstate 90 and U.S. Highway 14 near the Powder River. Extraction activities for other minerals (such as bentonite, sand, and gravel) have contributed to visual resource degradation at a site-specific level. However, many recent applications for mining of these minerals have been for areas either adjacent to, or very near, existing mining operations, and therefore tends to minimize overall degradation by concentrating it in areas already degraded.

Renewable energy projects such as solar panels or wind farms have not yet been constructed in the planning area, although at least one project has been proposed on fee surface adjacent to BLM-administered lands. Renewable energy project proposals are expected to increase as traditional energy sources are depleted and the economic and political incentives for alternative energy sources increases.

Recreational use, most specifically OHV use, has adversely affected visual resources by damaging vegetation and increasing erosion, especially in riparian areas or on hillclimbs. Enforcement of OHV regulations in the planning area was minimal before 2008, resulting in resource damage, including visual resource impairment. The presence of law enforcement personnel since 2008 has reduced or mitigated the number of OHV incidents in the planning area.

Visual intrusions normally associated with smaller projects would result in fewer impacts to visual resources. Contrasts in the basic elements are generally moderate and most of these projects remain subordinate to the representative landscape. These projects include a wide variety of range improvements, fuel-reduction projects, and two-track roads throughout the planning area.

3.5.3.5. Key Features

The following visually sensitive areas have been identified to help guide land use management decisions.

Unique Visual Landscapes

The Big Horn Mountains and foothills form the western boundary of the planning area and dominate the view from many observation points to the east. River canyons cutting through a variety of geologic formations interrupt the foothills, creating dramatic shapes along the eastern slope of the Big Horn Mountains.

The Middle Fork Powder River is in the southwest portion of the planning area. It includes steep incised canyons, ranging in elevation from 5,000 to more than 8,000 feet. It is a popular recreation area, frequented by fishermen, hikers, and history buffs. Outlaw Cave is in Middle Fork Canyon.

The Red Wall, east of the Middle Fork Powder River, is a unique geologic formation running north to south along the foothills of the Big Horn Mountains. It is characterized by its steep cliffs and red stone of the Chugwater Formation. The Middle Fork Powder River and its tributaries run in the valley between the Red Wall and the Big Horn Mountains, creating a picturesque riparian corridor. The Hole-in-the-Wall historic site is on the southern end of the Red Wall on BLM surface.

Two WSAs, Gardner Mountain and North Fork, are in the Big Horn Mountain foothills, also in the southwest part of the planning area. They are approximately 5 miles apart in a very remote portion of the mountains. The Red Fork Powder River runs through the Gardner Mountain WSA and the North Fork Powder River bisects the North Fork WSA. The scenic rugged canyons and rock outcrops have prevented much development in the region apart from isolated range facilities, small mines and historic forestry actions.

There is a third visually unique WSA in the north-central portion of the planning area. Fortification Creek WSA is east of the Powder River and is dominated by steep draws, erosive soils, and a mosaic of vegetative types. It includes juniper-ponderosa pine woodland patches that provide cover for a resident elk herd.

Primary Visual Corridors

The planning area is divided by two interstate highways – Interstate 90, which runs primarily east-west through the PRB and then north to the Montana State line, and Interstate 25, which runs north-south along the Big Horn Mountains to its intersection with Interstate 90. Interstate 90 is a

major transportation highway across the northern tier of the United States and is one of the main vacation routes between the Black Hills of South Dakota and Yellowstone National Park.

The U.S. Highway 14/16 corridor runs east-west across the northern portion of the PRB. It is an alternative route through the Big Horn Mountains, following riparian valleys for approximately half its distance across the planning area.

U.S. Highway 59 runs north-south along the eastern side of the planning area. It is a main industrial transportation route between Gillette and Douglas to the south. The northern portion of the route, between Gillette and the Montana State line, is largely undeveloped.

Several rivers offer opportunities for recreation, especially fishing, including Clear Creek, Crazy Woman Creek, the Tongue River, and all forks of the Powder River. The Tongue River in Sheridan County is also a popular destination for boaters and float trips throughout summer months. The Middle Fork Powder River is a blue ribbon trout stream and one of the most popular destinations for anglers in the planning area.

Historic properties are also particularly susceptible to visual impacts. Areas of notable concern for visual impacts to the cultural setting include the Pumpkin Buttes TCP, the Bozeman Trail and historic forts and battlefield sites. Visual intrusions in these locations can greatly affect visitor experience and the integrity of areas where viewshed is integral to historical significance.

3.6. Land Resources

3.6.1. Forest Products

3.6.1.1. Regional Context

The planning area lies on the east side of the Big Horn Mountains and extends into the PRB. The ecoregions for the forest lands are the Granite Subalpine Zone, the Dry Mid-Elevation Sedimentary Mountains, and the Pryor Bighorn Foothills. There are seven major forest management units and smaller units that are scattered tracts from the north end of the planning area west of Sheridan, Wyoming, on the Red Grade Road and larger contiguous tracts that extend from Mosier Gulch to the Hole-in-the-Wall campground in the South Big Horns. The geographical area includes the Billy Creek forest management area at the North end of Hazelton Road on the east facing slopes of the Big Horns, the Powder River Management Area, Hazelton Road Management Area, the Horn, Bear Trap Management Area, Garden Mountain Management Area, and the Graves Corral Management Area on the southern end.

There are scattered woodlands throughout the tri-county area with concentrations of woodlands in Campbell and Johnson Counties. They are concentrated in the Pine Scoria Hills, the Casper Arch, the Mesic Dissected Plains, and the PRB Ecoregions. The woodlands in Campbell County, extend from Dead Horse Creek to Bitter Creek on the Montana border, on the east side from Homestead Draw to Horse Creek, and in the southeast from Corral Creek to 7 Prong Creek. The woodlands extend on the east side of the south Big Horns to the Middle Fork Powder River in Johnson County.

The forest products industry within the planning area has also undergone a substantial reduction in infrastructure because of the recession in the area. This includes the closure of the primary saw

mill in Sheridan, Wyoming and the intermittent closing of two smaller mills in Buffalo. Due to this fact, sales for saw logs have been minimal and post and pole sales have increased in demand and value; however, these post and pole products are being delivered to South Dakota, which is a greater than 450 mile round trip. The nearest saw mill is located in Livingston, Montana, which also presents an extremely high fuel cost, with a distance of 650 miles. Personal use has averaged 220 cords per year between 2009-2013 (BLM TimberSale Information System). Multiple other products including Christmas tree sales have been utilized to thin sapling stands and implement meadow restoration processes.

According to the BLM Economic Analysis for 2012, Public Domain Forestry returns between \$10–\$15 to the community for every dollar expended by the forestry program.

3.6.1.2. Indicators

The fundamental indicators are those that recognize a connection between the forest and the people. The only way to achieve sustainability of the forest and therefore the forest products is to have understanding and support of the people.

Forest product sales (commercial and personal use) are an important part of maintaining and restoring forest health by removing dead and dying trees, and effectively managing the density of the forests.

- To ensure the productivity of the forest and woodlands for forest products they need to be available for timber production and management.
- The forest and woodlands need to be managed for ecosystem health.
- The production and removal of the forest products should compare to sustainable harvest levels.
- The resources that play a role in the forest and woodland health, such as soil and water and wildlife habitat, should be conserved and maintained.
- Representation of multiple tree species and genetic variation within the species, and multiple age classes, to support diversity and a multitude of products, concentrating on commercially desirable tree species.
- Support and maintenance of the socioeconomics, including demand, of the community and society.
- The political framework and support for the forest industry.

3.6.1.3. Current Condition

The BFO administers 77,229 acres of forests and woodlands. Forests and woodlands are distinguished by type (species composition) and the physical environment in which they grow. Approximately 95 percent of the volume removed was utilized for forest products, with posts and poles being the largest components of removal from the growing stock, followed by sawlogs and fuelwood. The remaining 5 percent was left in the woods.

Worldwide, fuelwood has taken the lead in forest uses with over 1.8 percent of the wood being utilized in this capacity. The forest products removed in this area have followed suit, as the mills that once utilized and dispensed the forest products have declined.

Forest lands commercially available for production and harvest average approximately, 5 to 10 mbf per acre. These volumes increase or decrease with the economy, opportunities, and natural occurrences.

Active timber sales within the area will continue, primarily in lodgepole and Douglas fir. The areas harvested in the past have successful natural regeneration in the openings and provide species and age class diversity. These future stands will require thinning and other silvicultural manipulations to reduce the density and promote healthy stands. The sale and removal of forest products have been focused on salvage harvest for the sawlogs and Timber Stand Improvement, especially for the posts and poles, to create healthy and resistant forest.

3.6.1.4. Trends

Timber processing capacity has steadily declined over the past two decades within the planning area, as well as in the west. In the interior west, the restricted availability of timber is the result of several restrictions such as appeals and litigation, Threatened and Endangered species protection, changing environmental laws, and the changing expectations of the public.

The integration of the timber industry into the global markets has introduced substantial competition worldwide and has driven down the prices of forest products. The recent recession is the worst in 25 years for the forest products industry.

The development of new forest products such as wood pellets, biofuels, and biomass has not gained substantial traction within the region; most of the new development of these alternative products has been concentrated in the southeast and the northwest portions of the U.S.

As a result of fire suppression and the reduction in harvesting activities, forests with commercial potential are in need of active management to increase their economic suitability, economic viability, and health conditions. However, the increased utilization of fuelwood aids in manipulating the increased amount of fuels in the forest and reducing the density of forest and woodland stands to support the diversity of age and species distribution.

The public demand for fuelwood, posts and piles and other special forest products, such as Christmas trees has remained strong and is anticipated to increase as the population of the planning area increases. The continuing recovery from the recession and the concern about forest health issues have provided opportunities for increased commercial activity to improve forest health.

3.6.1.5. Key Features

The key feature of the forest products program is the flexibility that the forest presents in providing the desirable products to the communities and the ability to manipulate the forest/woodlands in producing these products while providing for all the other resources including watersheds, wildlife, and recreation. The products are allocated in response to the economics of the communities.

A unique characteristic of forest and woodlands is that they are renewable resources. Therefore, products utilized by society and, in particular, this community are able to be replaced. Successful regeneration of the forest is and has been a valuable asset in replacing vegetation and replenishing the watersheds of the Big Horn Mountains.

The other type of product provided by the forest and woodlands, is a product that cannot be measured. This is the value offered for educational opportunities, conservation benefits, and recreational activities.

3.6.2. Lands and Realty

Lands and realty management supports all resources and resource management programs. The primary focus activities of the program are land use authorizations for ROW and corridor management associated with O&G development. Secondary activities include land tenure adjustments such as sales, exchanges, donations, acquisitions (including easements); leases and sales under the Recreation & Public Purposes Act; withdrawals; classifications and other segregations, various land use authorizations; and trespass identification and abatement.

3.6.2.1. Regional Context

FLPMA is the primary statute governing public land management and is the primary authority for activities within the lands program. Specific BLM Wyoming objectives include the following:

- Avoid trespass and improve access and manageability of public lands
- Support multiple-use management goals among the various resource programs
- Respond to public requests for land use authorizations, sales and exchanges, and to acquire access to serve administrative and public needs
- Consideration of Recreation and Public Purposes (R&PP) applications that do not exhibit conflicting uses
- Support management of other resource programs and other federal agencies regarding withdrawals

3.6.2.2. Indicators

Indicators for management for success in the Lands and Realty program would include the number of actions and acreage size of land use authorizations such as leases, permits, easements, land tenure adjustments, withdrawals, classifications, and segregations. For example, the number and acreage of access easements acquired and the total acreage that becomes legal public access from the acquired easements.

3.6.2.3. Current Condition

The BLM currently manages approximately 10 percent of the surface in the planning area. The general land ownership pattern in the planning area consists of some large blocks of BLM-administered public lands interspersed with many isolated, small-acreage parcels, which are difficult or impossible to access or manage.

The BFO identifies approximately 108,243 acres as more difficult or less economic to manage than most of the BLM-administered public lands in the planning area. These lands have priority consideration for disposal through exchange, public sale, or transfer of jurisdiction to another agency.

Leases, Permits, and Easements

Land use authorizations under FLPMA section 302 (b) authorizes the BLM to use, occupy, and develop public lands through leases, permits, and easements of those public lands. CFR Title 43 Part 2920 provides the appropriate regulations and guidance for these authorizations. Easement acquisitions are an integral part of management.

Since 1985, the BFO has acquired 24 easements on non-federal lands for improved access and public land management. The BFO acquired easements in the Poison Creek, Dry Creek Petrified Tree, and Outlaw Cave areas. These lands involve a total of approximately 96 acres.

Land Tenure Adjustments

The land ownership pattern in the planning area is diverse, with a large portion of scattered parcels that are isolated by large private landholdings. This scattered isolated ownership pattern makes these lands difficult and economically inefficient to manage as part of the public land system. The small size of many scattered parcels and their isolation from other parcels of public land make them of marginal utility to the public. Lack of legal public access diminishes their public utility. The existing plan prioritizes exchanges and acquisitions on lands adjacent to large blocks of public lands. Some area of exceptions occur north of Gillette (Cow Creek Breaks area), the eastern flank, and south to southwest Johnson county areas, where larger parcels are present.

Land ownership (or land tenure) adjustment refers to those actions that result in the retention of public land, disposal of public land, or the acquisition by the BLM of non-federal lands or interest in land. Land tenure adjustment is used to increase access and manageability of public lands, particularly those with high-value resources. Special legislation often governs land program activities in a particular management area, or directs acquisition or disposal of specific lands. Private legislation can also direct land tenure adjustments.

Management recognizes the potential retention of lands where there are archeological, historic, wildlife, or other values. Conversely, small parcels included in a large federal grazing allotment are generally efficient to manage and should be retained. Lands identified for disposal are typically small, isolated tracts that are difficult and economically inefficient to manage. Lands designated in the BLM land use plan as potentially available for disposal are more likely to be conveyed out of federal ownership through an exchange rather than a sale. This preference toward exchange over sale is established in BLM's policy.

Retaining isolated land parcels in public ownership remains a management liability because they are difficult to access and uneconomical to manage with the potential for trespass, resulting in unnecessary management costs to abate and mitigate. In most cases, these lands provide little or no utility to the public because of limited or lack of legal access, and the average size of individual parcels is too small to afford a viable recreation or other outdoor experience.

Historically, many isolated public land parcels were difficult to access and manage appropriately. Although the BFO acquired approximately 24 easements for access and range management, the overall condition remains – small isolated parcels with limited or no access are difficult to manage due to increased potential for conflicts with adjacent landowners, inadvertent and willful trespass, and other uses difficult to monitor and control.

Land Sales (FLPMA Section 203)

Conducting land sales requires either offering a direct sale to relevant landowners, which could include the state in which the lands are located, the local government entity in the state, adjoining landowners, individuals, or any other person. FLPMA states that, “the United States receives fair market value of the use of public lands and their resources unless otherwise provided for by statute” (FLPMA section 102(9)). Competitive sale of lands is required unless the Secretary of

the Interior determines a necessity to dispose of lands through modified competitive bidding or without competitive bidding.

To be considered for disposal, lands must, at a minimum, meet the following criteria as outlined in Section 203 of the FLPMA: (1) They are difficult and uneconomical to manage, and are not suitable for management by another federal department or agency; (2) The tract was acquired for specific purposes and is no longer required for that purpose or any other federal purpose; (3) Disposal would serve important public objectives, including but not limited to, community expansion or economic development, that could not be achieved prudently or feasibly on land other than public lands and that outweigh other public objectives or values.

The BLM gives priority consideration for identified disposal lands and lands meeting disposal criteria for exchange or public sale identified in the land use plan (Appendix L (p. 2211)). The BFO identifies priority lands in areas adjacent to major blocks of public land, areas with high recreational potential, and areas where easements will improve access.

One 40-acre sale under Revised Statute 2455, which sets forth provisions related to public land sales under the Isolated Tracts Act, occurs in the BFO. There have been 15 FLPMA land sales that occurred since 1985 on approximately 1,304 acres.

Mineral (FLPMA Section 209)

FLPMA specifies that all minerals underlying public lands disposed of by sale shall be reserved to the United States, unless all mineral interests in the lands, except where there are no known mineral values, or where the reservation of the mineral rights is interfering with or precluding a more beneficial use of the land. FLPMA section 209 also specifies the conditions under which the mineral rights will be conveyed, a mineral report must be prepared to assess fair market value of the minerals, payment of the administrative costs of the sale, payment of fair market value for the mineral rights, and possibly having to perform an exploratory program and preparing a mineral report. The Surface Mining Control and Reclamation Act defines criteria for minerals in environmentally sensitive areas like steep slopes, timber lands, and prime farmland, including minerals underlying alluvial valley floors. The BLM will provide opportunities for such exchanges while meeting fair market value requirements.

Land Acquisitions (FLPMA Section 205)

The BFO gives priority to lands adjacent to major blocks of BLM-administered public lands. Acquisition is used to acquire key natural resources or acquire legal ownership of lands that enhance the management of existing lands and resources, such as in areas with high recreational or natural resource values. Acquisition of land by purchase is used sparingly given the limited funds available through appropriations. The preferred method for acquisition will be through exchange.

Exchanges (FLPMA Sections 205 and 206)

Exchange is the process of trading lands or interest in lands. BLM-administered public lands may be exchanged for lands or interests in non-federal lands owned by corporations, individuals, or government entities and located in the same state. Exchanges are the primary means by which land acquisition and disposal are carried out. Except for those exchanges that are congressionally mandated or judicially required, exchanges are voluntary and discretionary transactions with willing landowners. Exchanges must be of approximately equal monetary value and located

within the same state, be in the public's best interest and conform to applicable BLM land use plans and National BLM policy in BLM Manual 2200–1 Land Exchange Handbook, and meet the requirements of BLM Manual H-2104 Preacquisition Environmental Site Assessment.

Land exchanges are used to improve public lands and interests in land with high public resource management capabilities. Protecting resources and/or implementing management actions on acquired public lands or disposing of public lands that are difficult or expensive to manage, consolidating land and mineral ownership patterns to achieve more efficient management of resources and BLM programs, and disposing of land parcels identified for disposal through the planning process. Recent exchanges resulted in the acquisition of 9,906 acres of private land in the Cow Creek Breaks area and 1,600 acres adjacent to the Tongue River.

Federal law prohibits exchange of public lands in one state for private land in another unless authorized by an Act of Congress. Exchanges are to be of equal value, based on a fair market appraisal, and do not have to be of equal acreage. In other words, exchanges are made on a value-for-value basis rather than an acre-for-acre basis. Furthermore, land exchanges are a discretionary BLM action. The BLM is not obligated to process every proposal it receives, even if the proposal has some merit. The BLM evaluates exchange proposals in light of existing workloads, funding, and other program priorities when deciding to pursue a land exchange proposal.

Since 1985, the BFO has processed 17 land exchange cases under FLPMA section 206 involving approximately 55,000 acres of non-federal and federal lands. BLM acquired 15,321 acres. There are two exchanges pending. Land exchanges take considerable resource time and generally multiple years to complete. However, little focus on land exchanges in the planning area perpetuates the ongoing fractionated land ownership pattern and limited access to public lands. This creates higher costs for resource planning and administration, and provides little legal authority to obtain access from disinterested land owners.

Recreation and Public Purposes Act Leases and Conveyances

This act of June 14, 1926, as amended in 1988 (43 U.S.C. 869 et seq.), commonly known as the Recreation and Public Purposes Act, authorizes the Secretary of the Interior to lease or convey public lands for recreational and public purposes. The act also authorizes direct conveyance of public lands for solid waste disposal or any other purpose that could result in or include the disposal, placement, or release of any hazardous substance to state and local governments and to qualified non profit organizations. The BLM periodically reviews areas leased or conveyed under the act to ensure continued compliance with the associated terms and conditions. A lease can be terminated or a title to patented land can revert to the United States if the authorized entity is not complying with those terms.

To date, the BFO has issued R&PP patents for the Buffalo Housing Authority on one acre, the Buffalo Rifle Range on five acres, the Sheridan Recreation Complex on 560 acres, and the City of Buffalo Green Belt consisting of 260 acres. The BLM is considering one conveyance from the town of Kaycee for an R&PP sale for a shooting range.

Trespassing and Illegal Dumping

Trespass actions are uses of public land that occur or are ongoing without specific authorization, or that exceed the established thresholds of an authorization or of casual use. Casual use is defined by the regulations at 43 CFR 2920.0-5(k) as follows:

“Casual use means any short term noncommercial activity which does not cause appreciable damage or disturbance to the public lands, their resources or improvements, and which is not prohibited by closure of the lands to such activities.”

Trespass actions can cause damage to public lands and natural resources. The cost to resolve trespass and to clean up and reclaim the public land affected by trespass is often passed on to the general public. Trespass resolution involves cessation of the unauthorized use, and could require removal of the unauthorized facilities or appropriate authorization of that use. Three considerations are included in trespass abatement, as follows:

- Payment of the administrative costs to resolve the trespass
- Payment of fair market value for the period of unauthorized use
- Rehabilitation and restoration of the affected public lands

To date, there are approximately 49 identified cases of unauthorized use, occupancy, and development. Several unauthorized uses were informally identified in 2011 and the number is expected to increase substantially in the wake of the intense O&G development activities in the area.

Donations and Condemnations

The BLM occasionally receives gifts or donations of lands or interests in land where an entity elects not to receive the market value for the interests being conveyed. Donations are infrequent and cannot be planned for. They are sometimes used in conjunction with other acquisition tools to complete larger transactions. The BLM has not used condemnation in the Buffalo planning area. From the 1960s to 1972, the BFO received nine land donations totaling approximately 80 acres.


Withdrawals and Classifications

A withdrawal is a formal action that sets aside, withholds, or reserves federal lands for public purposes. Table 3.51, “Existing Withdrawals and Classifications in the Planning Area” (p. 565) displays the existing withdrawals and classifications in the planning area. Withdrawals accomplish one or more of the following:

- Transfer total or partial jurisdiction of federal land between federal agencies
- Segregate (close) federal land from operation of some or all of the public land laws and or mineral laws
- Dedicate federal land to a specific purpose

Table 3.51. Existing Withdrawals and Classifications in the Planning Area

Name	Acreage
Resource Protection	
Stock driveways	18,391
Winter Game Ranges	4,583
Classifications	
R&PP Classifications	0
Other Federal Agency Withdrawals	

Name	Acreage
Bureau of Land Management miscellaneous	968
U.S. Forest Service national recreation sites	3,823
U.S. Forest Service national forests	20,167
U.S. Department of Defense	3,733
Veteran's Administration	61
U.S. Bureau of Recreation Power Site Classification	6,831
Source: BLM 2010 	
Note: Due to overlapping resources, numbers are not additive.	
R&PP Recreation and Public Purpose	

Withdrawals are established for a wide range of public purposes, including military reservations, administrative sites, national parks and national forests, reclamation projects, recreation sites, stock driveways, and power and water site reserves. There are three major types of withdrawals, as follows: (1) Administrative withdrawals – those made by the President, the Secretary of the Interior, or some other authorized officer of the executive branch of the federal government; (2) Congressional withdrawals – withdrawals legislated by Congress; and (3) Federal Power Act (16 U.S.C. 791 et seq.) or Federal Energy Regulatory Commission withdrawals – power project withdrawals established under the authority of the Federal Power Act.

The BLM is responsible for reviewing all proposed administrative withdrawals and restorations; for making recommendations concerning those actions to the Assistant Secretary of the Interior; and for assisting other bureaus and agencies with their withdrawal and revocation programs.

The withdrawal review program is primarily aimed at existing administrative withdrawals and making recommendations concerning the extension, modification, or revocation of the withdrawals. Requirements of national laws and concerns about scarce resources or species in key areas with mineral potential, could justify withdrawal of the land from operation of the mining laws. Land uses can change when withdrawals are revoked. In part this is the result of opening the land to operation under the mining laws. Part of the review process for land withdrawals must include anticipation of any such land use changes.

Management decisions for withdrawals for surface and minerals are considered on a case-by-case basis. Withdrawals are used to segregate or reserve lands for a specific purpose or use. A withdrawal can also transfer jurisdiction of a tract of land under BLM jurisdiction to another federal agency. Withdrawals in the planning area also serve to protect public lands from operation of the public land laws, including the mining laws, but not including mineral leasing laws.

There are several withdrawals in the planning area serving various interests including several stock driveway withdrawals encompassing almost 18,391 acres. There are three crucial winter game ranges for big game in the planning area that the WGFD manages as a wildlife protective area through a cooperative agreement with the BLM. The Amsden Creek (approximately 3,905 acres) and Kerns (approximately 4,949 acres) winter game ranges, located west to northwest of Dayton, Wyoming, managed as a wildlife refuge area withdrawal and the Ed O. Taylor winter game range, formerly Middle Fork recreational withdrawal, (approximately 10,224 acres) is west of Kaycee, Wyoming. The withdrawal protects the Middle Fork area from mineral entry because this area has unique visual qualities, wildlife habitat, fisheries, and general outdoor recreational qualities.

Because the acquisition program is envisioned to be an ongoing effort, acquisitions through these tools would continue to improve management opportunities, to enhance recreation opportunities,

and to further resource preservation. Only very high priority exchanges and acquisitions will be possible. Furthermore, the existing plan contains a maintenance action that establishes criteria for evaluating acquisitions and sales. These criteria are reevaluated and modified in this plan revision.

3.6.2.4. Trends

Currently, there is a substantial need to consolidate land ownership patterns and access routes through sales, exchanges, and acquisitions. The BFO anticipates the land and realty program to be slightly more active during the period of the next plan than during the last 20 years in order to achieve an improved land ownership pattern across the planning area.

Land tenure adjustments (which include sale, acquisitions, and exchanges) in the planning area are rare due to the priority for O&G ROW activities over the last several years. However, addressing land tenure adjustments is necessary to improve access and management. Achieving an improved land ownership pattern will reduce management costs, reduce owner conflicts associated with multiple uses on public lands, reduce trespass, and improve a greater overall range of multiple-use opportunities.

Current land disposal consists of two pending land exchanges in the planning area. Current management challenges are primarily related to the focus on O&G authorizations and compliance monitoring. Improved public land tenure boundaries and access opportunities across private lands would facilitate a more efficient management framework. An active land tenure program would provide opportunities to consolidate land ownership patterns, and strengthen the BFO's ability to access these lands and efficiently manage resources for the protection, conservation, and multiple uses of public lands.

Trespass is an ongoing and increasing problem in the Buffalo planning area. Some types of known illegal activities include, but are not limited to, indiscriminate dumping of trash, debris, and household wastes; farming and irrigation of public land; corrals; fences; buildings and construction of roads and other utility-related features.

3.6.2.5. Key Features

The primary key feature is the land tenure pattern (ownership). Key areas in the planning area include:

- The southern region of the planning area, commonly known as the South Big Horns, encompasses resource values including cultural and historical properties, cave and karst sites, wildlife and livestock habitat, and recreation opportunities.
- The eastern region of the planning area is the most likely area for wind-energy development. The BFO manages many small, isolated, and difficult to access parcels in this area. Authorizations for uses on these parcels will likely result from continued O&G development and wind-energy development.
- The Powder River and Powder River Breaks, and the northern region of the planning area, encompass a variety of natural formations, include considerable wildlife and livestock habitats, contain considerable O&G resources (both federally and privately owned), and offer multiple recreation opportunities.
- Pumpkin Buttes is a natural feature in the center of the planning area that can be seen for miles around. This unique, culturally sensitive site is used for communications sites.

3.6.3. Renewable Energy

Information in this section includes a brief summary of the types of renewable energy (wind, solar, biomass, and geothermal), the demand for renewable energy, and federal direction for renewable energy (i.e., the National Energy Policy Act of 2005).

3.6.3.1. Regional Context

Renewable energy comes from replenishing sources like wind, sun, water, and heat generated from the earth. Wyoming is considered one of the most viable places in the country for energy development. The planning area has experienced intense O&G development activity. These activities are likely to continue into the foreseeable future. There is potential for energy development under new technologies, particularly using renewable energy sources. This will likely affect management actions in the planning area. According to the National Renewable Energy Laboratory (NREL), there is fair to good potential for wind-energy development, and fair potential for solar development. Conversely, there is very little potential for biomass or geothermal development in this area.

The Energy Policy Act of 2005, sections 221 through 237, addresses geothermal development; section 367 addresses ROW fees based on fair market value data. Other potential renewable energy sources not yet identified also would be supported in the planning area considering the use and its relation to other resource objectives and goals.

Section 211 of the Energy Policy Act of 2005 addresses wind-energy activities; implementation of EO 13212 (May 18, 2001) requires the BLM “to expedite projects that will increase the production, transmission, or conservation of energy.” IM 2009-043 is currently being updated and will provide guidance on implementing a ROD for the programmatic EIS on wind-energy development and guidance on processing ROW applications for wind-energy projects on BLM-administered lands and will be finalized by the time the final resource plan revision is in place.

3.6.3.2. Indicators

Indicators of the success of the renewable energy program would be the number of renewable energy ROW authorizations and the acreages involved.

3.6.3.3. Current Condition

Current management and development challenges are unknown because there have been no formal inquiries associated with renewable energy development in the planning area. Given that the area is considered to have moderate potential for wind- and solar-energy development, the BFO is open to these types of uses across the planning area into the foreseeable future. The planning area has not seen any solar renewable energy development, except for some individual solar panels that supplement electricity to individual O&G or water wells. This activity is minor compared to the potential within the planning area.

3.6.3.4. Trends

Considering nationwide and statewide trends to pursue clean energy resources, it is reasonable to expect that the BFO will see increased interest in renewable energy development in the future. Recent wind-energy development on private surface in the planning area suggests there will be interest in wind-energy development on public lands in the future. There is moderate potential for wind-energy development in the southern and southeastern regions of the Buffalo planning area.

3.6.3.5. Key Features

The most notable areas identified for wind-energy development are the southern region of the planning area and the southern Big Horn Mountains.

3.6.4. Rights-of-Way and Corridors

A ROW grant is an authorization to use portions of public land for specific facilities, utilities, or transportation for a specified period. The ROW program consists of the evaluation, authorization, and management of ROWs for a variety of uses on public land. Most authorizations extend over a 30 year period. ROWs are removed and reclaimed upon termination of the grant.

3.6.4.1. Regional Context

Revised Statute 2477 is a contentious issue with those attempting to utilize this statute to cross private lands for recreational purposes. The statute was passed to facilitate early western settlement. Its entire text is stated in one sentence: “the right-of-way for the construction of highways across public lands not otherwise reserved for public uses is hereby granted.” The FLPMA repealed Revised Statute 2477 and regulates ROW grants within the BLM.

3.6.4.2. Indicators

The number of ROWs issued, the types of ROWs, and the acreage involved will be the indicators for the success of the ROW program.

3.6.4.3. Current Condition

Most ROWs on BLM-administered lands in the planning area are associated with O&G development, electrical transmission, irrigation ditches, and communications. At present, the primary ROWs issued are for site facilities, reservoirs, O&G, water, electricity, and roads. The number of communication site ROWs continues to grow. Increasing populations and continued mineral development require utility ROWs to support those infrastructures. Also, changing telecommunications technology is increasing the need for more communication sites and fiber-optic routes. Access roads and utilities associated with development of private lands have become increasingly important. Authorizations must consider all other resource values and their locations.

See Table 3.52, “Existing ROWs in the Buffalo Field Office Planning Area” (p. 570) for a list of existing ROWs in the planning area.

Table 3.52. Existing ROWs in the Buffalo Field Office Planning Area

Existing Authorization	Number of Sites	Acres ¹
Roads ²	569	15,786
Pipelines/sites (mostly oil and gas related)	441	4,522
Powerlines/sites	435	2,740
Telephone/fiber-optic cables	55	173
Water facility ditches and reservoirs	120	1,077
Communication sites: concentration area south Middle Butte of Pumpkin Buttes	24	17
U.S. Forest Service easements/grants	14	3,289
Other	15	130
Total	1,673	27,734
Source: BLM 2010e		
¹ Right-of-way miles were not calculated because there are substantial numbers of existing supplemental uses in the grant information. LR2000 totals do not reflect these supplemental uses and therefore would not be accurate. As a result, the acres were calculated to provide an accurate calculation of actual surface disturbances. Numbers are current as of 2011.		
² Includes railroads and stations, federal highways, and material sites.		
ROW Right-of-Way		

The BFO authorizes most ROW disturbances within corridors by placing linear roads, pipelines, and electric lines alongside one another to the extent practical. Generally, the existing identified major corridor routes are localized to major traffic routes. The BFO will continue to coordinate disturbances among operators or development entities to keep disturbance corridors to a minimum. Achieving this will reduce fragmentation of wildlife habitat and surface disturbance.

Since fiscal year 1985, the BFO has processed more than 1,800 ROWs across almost 28,000 acres of public land. The 2001 RMP amendment identified 850 ROWs issued since 1985, a span of 16 years. The remaining 950 grants were processed after 2001. At present, there are approximately 1,673 authorized ROWs in the planning area.

3.6.4.4. Trends

The BFO historically managed ROWs related to livestock grazing and some O&G development. In recent years, CBNG development has dominated ROW activities, and this is likely to continue during the planning period.

The BFO will continue to coordinate disturbances among operators or development entities to keep disturbance corridors to a minimum. Achieving this will reduce fragmentation of wildlife habitat.

Current BLM policy is that using public lands for CCS purposes, which is the long-term isolation and storage of carbon (usually in the form of liquefied CO₂) underground, will be authorized as a Land Use Application and Permit (WO IM-2012-035). Interest suggests that the BFO may receive applications to inject CO₂ into pore spaces in the rocks below the surface. See Chapter 3 *Geological Resources* for more information regarding CCS, and the likely trend for these projects in the planning area. Land use authorizations would require rent on the entire subsurface space used and could encompass thousands of acres.

3.6.4.5. Key Features

Key features are the ROW Exclusion and Avoidance Areas within the planning area which have been specifically identified for the protection of other resources. Individual resource sections in Chapters 2 and 4 identify and address the protected areas.

3.6.5. Travel and Transportation Management

Travel management planning is the proactive management of public access in compliance with travel-related regulations and according to the best land use management principles. Travel management planning involves the following (Graves et al. 2006):

- A comprehensive approach that considers various aspects of road and trail system planning and management; natural resource management; road and trail design and maintenance; and recreation and non-recreation uses of roads and trails
- Route inventory and evaluation, innovative partnerships, user education, mapping, monitoring, signage, field presence, and law enforcement
- All resource aspects (recreational, traditional, casual, agricultural, industrial, educational, and cultural) and accompanying modes and conditions of travel on the public lands, including motorized, mechanized, and nonmotorized/mechanized uses

3.6.5.1. Regional Context

Travel and transportation decisions include allowable types of travel (over land, water, and snow, and by air), and modes and conditions of travel on public lands. Pivotal to the BLM strategy for managing public lands is maintaining and improving the BLM transportation system, which includes roads, bridges, trails, and related facilities in a manner that enhances accessibility, connectivity, and safety, while addressing public needs, preserving ecological functions, and fostering economic development (BLM 2001b). Map 60 illustrates the preliminary transportation network for the BFO. Maps 61 to 64 identify the transportation features in the Sheridan, Gillette, Wright, and Kaycee areas, respectively.

A well-functioning transportation system is essential for resource extraction, energy production, and recreational activities on BLM-administered lands. In addition to allowing the BLM to achieve its agency goals – sustaining the health, diversity, and economic vitality of our public lands – transportation enables ongoing contributions to the regional and national economies.

In BLM-administered areas where there are unique circumstances, high levels of controversy, or complex resource considerations, a Travel Management Area (TMA) may be delineated to address particular concerns and prescribe specific management actions for a defined geographic area. TMAs are areas where a rational approach has been taken to classify the area as Open, Closed, or Limited. An individual Special Recreation Management Area (SRMA) is often also a TMA.

3.6.5.2. Indicators

The indicator for the program is the increase or decrease in transportation routes or access opportunities to and on BLM-administered lands. TMAs are usually identified where travel and transportation management (either motorized or nonmotorized) require particular focus or increased intensity of management. While OHV-area designations are land use plan allocations, TMAs are planning-tool delineations (BLM 2007k). TMAs may be established during the

planning process or during the development of a Recreation Area Management Plan. All designated travel routes in TMAs should have a clearly identified and documented need and purpose, and clearly defined activity types, modes of travel, and seasons or timeframes for allowable access or other limitations.

3.6.5.3. Current Condition

County roads providing critical access to larger parcels of BLM-administered lands include Hazelton Road, Barnum Road, Mayoworth/Slip Road, Trabing Road, Tipperary Road, Sussex Road, Upper and Lower Powder River Road, Irigary Road, Schoonover Road, Napier Road, Bishop Road, and Elk Creek Road. Most county roads are also designated as stock driveways. The transportation infrastructure, traffic volume, and accident rates in the planning area are relatively low due to small populations in the counties.

At present, the BFO maintains 16.5 miles of roadways in the planning area. However, the much larger network of unimproved, two-track and industrial roads are not included in this figure. According to the 2003 PRB Final EIS, approximately 7,135 miles of new improved and 10,619 miles of two-track roads are being developed in conjunction with CBNG facilities, both on public and private lands. Some of these roads have not been constructed or maintained to BLM standards. In an effort to minimize road footprints and accommodate use, the BLM has previously issued decisions to allow roads that do not meet BLM standards. Over time, these roads have become a safety and resource concern. The potential for maintaining these roads to provide public access to public lands is uncertain at this time.

Travel Management and Off-Highway Vehicles

OHV use continues to increase in popularity and includes four-wheel-drive, sport utility, and all-terrain vehicles (ATVs). Typical recreational OHV activities in the planning area include exploring, ATV and motorcycle trail riding, and OHV use related to hunting. In addition, OHV use can provide access over long distances for hunters and subsequent nonmotorized recreational purposes such as fishing, hiking, mountain biking, horseback riding, and primitive camping opportunities. People with disabilities may be allowed to travel on OHVs in otherwise closed areas on a case-by-case basis with a permit from the WGFD and authorization from the BLM authorized officer. Table 3.53, “2010 Motorized and Nonmotorized Activities and Number of Participants in the Buffalo Planning Area, Wyoming” (p. 573) lists the numbers of participants in motorized and nonmotorized recreational activities.

Table 3.53. 2010 Motorized and Nonmotorized Activities and Number of Participants in the Buffalo Planning Area, Wyoming

Motorized Activities	Number of Participants
Driving for pleasure	2,682
Hunting – Big Game (assumes use of four-wheel-drive vehicles and ATVs)	10,150
OHV – ATV	3,105
OHV – cars, trucks, and sport utility vehicles	1,778
Nonmotorized Activities Requiring Vehicle Access	Number of Participants
Bicycling (Mountain & Road)	666
Fishing	3,104
Hiking, walking, and running	5,646
Horseback riding	1,048
Hunting – Small game, Upland Bird, Waterfowl, Other	1,765
Picnicking	2,984
Camping	2,720
Source: BLM 2011h	
ATV All terrain vehicle	
OHV Off-highway vehicle	

The road network in the planning area is comprised of a series of county roads, BLM-maintained roads, existing two-track roads, and snowmobile trails. The maintenance and use of these travel routes has become an integral part of public land management because these roads are used for both recreational and non-recreational purposes. Motorized off-road travel to perform necessary tasks and casual use, which includes activities such as retrieving big game kills, livestock management, and energy-related exploration, is currently allowed. Non-recreational OHV use in the planning area is predominately related to rangeland management and energy development and is usually managed under an authorization or permit. The BLM uses OHVs under administrative use for inspections, vegetative treatments, surveying, mapping, inventories, monitoring, fire suppression, and project construction and maintenance.

Travel Management Designations

The BLM must designate all public lands as Open, Closed, or Limited for OHV use. Area and trail designations are completed during the planning process and are limited to the following three management categories:

- *Open*: Areas used for intensive OHV use where there are no compelling resource needs, user conflicts, or public safety issues to warrant limiting cross-country travel. Areas where all types of vehicle use are permitted at all times anywhere in the area.
- *Limited*: Areas or trails where the BLM restricts OHV use to meet specific resource management objectives. These limitations can include limiting the time or numbers and types of vehicles; limiting the time or season of use; permitted, licensed use only; limiting to existing roads and trails; and limiting use to designated roads and trails. The BLM may place other limitations, as necessary, to protect other resources, particularly in areas that OHV enthusiasts use intensively or where they participate in competitive events.
- *Closed*: Areas where the BLM enforces a closure to all OHV use when it is necessary to protect resources, ensure visitor safety, or reduce conflicts, including units in the National Wilderness Preservation System. Access by means other than OHV (i.e., foot, horseback, and bicycle) is generally allowed.

Table 3.54, “OHV-Use Designations in the Planning Area” (p. 574) identifies the acreages of OHV-use designations in the planning area as identified in the existing plan.

Table 3.54. OHV-Use Designations in the Planning Area

Designation	Acreage
<i>Open areas:</i> Vehicle travel is permitted both on and off roads if the vehicle is operated responsibly in a manner unlikely to cause substantial undue damage to the environment.	20,386
<i>Closed areas:</i> Travel by vehicles, including snowmobiles, is prohibited.	3,650
<i>Limited areas A:</i> Use is limited to existing roads and vehicle routes in existence as of 1985.	566,184
<i>Limited areas B:</i> Use is limited to designated roads and vehicle routes in these areas. (Until signs are posted, vehicle travel is limited to existing roads and vehicle routes.)	170,982
<i>Limited areas C:</i> Vehicle travel is closed to all OHVs, including snowmobiles, from December 1 to April 15.	37,646
Total	798,848
Sources: BLM 2001a; BLM 2012f	
OHV Off-highway Vehicle	

Area designations are completed during the Land Use Planning process (this document) whereas trail designations are implementation level decisions complete through a variety of site specific decision making processes, including Travel Management Plans.

OHV Use and Environmental Concern

It is reasonable to expect impacts from OHV use to accumulate over time as visitation increases and new roads and trails develop. Dispersal of OHV use is directly related to the size and percentage of federal parcels in a given area and the ease of public access. Unregulated use can heavily impact popular areas (e.g., Weston Hills and Middle Fork Powder River area) with high concentrations of OHV use. Adverse impacts include habitat fragmentation, increased soil erosion, stream sedimentation, physical damage to vegetation, and damage to vegetative communities due to the spread of invasive plant species. Environments that are more susceptible to OHV-related damage include crucial winter ranges, wildlife breeding areas, riparian habitats, and areas with steep slopes, wetlands, and riparian areas or sensitive soils.

Current OHV management allows off-road and trail travel to perform necessary tasks and for casual use, which includes activities such as retrieving big game kills, livestock management, and energy-related exploration. Impacts related to necessary tasks and casual use are increased soil erosion, habitat fragmentation, route proliferation, visual degradation, and degradation of recreational settings.

The BLM objective is to improve a selective public lands transportation system that will contribute to a safe and adequate network of roads and trails to improve public access while protecting sensitive resources and reducing environmental impacts. Meeting current OHV management challenges will require the BLM to continue to gather data for needs analyses, coordinate with adjacent agencies and partners to improve consistency in transportation planning procedures and the designation and data needs, and to continue to provide updated and current transportation information and an improved road and trail system.

3.6.5.4. Trends

Prominent among the travel management issues the BLM faces is the complex challenge of managing motorized activities on public lands. The combined effect of population increases in the west, growth in the use of OHVs in the planning area over the last 10 years, and technological advances has generated increased social conflicts and resource impacts on public lands related to motorized recreation, and impacts to other recreation activities and resource uses.

Indiscriminate use of OHVs continues to increase, creating unauthorized pioneered trails. These trails can scar landscapes, dissect vital wildlife habitats, increase the degradation of cultural and paleontological resources, and cause increased erosion to fragile soils. The environmental impacts of OHV use are becoming apparent in the planning area, most notably in the Weston Hills Recreation Area and on BLM-administered lands in the southern Big Horn Mountains. The Powder River Breaks south of Interstate 90 also experience heavy vehicle traffic because the area is designated as Open for OHV use. OHV users often adopt routes created by necessary tasks and casual use and perceive them as existing routes. This trend creates an increase in roads and trails. In areas where vehicle use is limited to existing roads and trails, issues arise on user created routes because subsequent users can legally operate on non-designated routes.

3.6.5.5. Key Features

Open Areas

Both the 1985 RMP and 2001 Update designated 20,386 acres as Open, where vehicle travel is allowed both on and off roads if the vehicle is operated responsibly in a manner unlikely to cause substantial undue damage to the environment. These areas include all stock driveways and rests, and approximately 3,460 acres south of Interstate 90 at its junction with the Powder River.

Limited Areas

Approximately 97 percent (774,184 acres) of the planning area is designated as “limited to existing” or “limited to designated” roads and trails (Map 65). Although there are approximately 800,000 acres of BLM-administered land in the planning area, public access via motorized routes is only available to approximately 400,000 acres. The limited use designations were originally intended to allow OHV use without increasing the number of acres disturbed. Additionally, the designation of routes will assist in reducing physical impacts and conflicts between various uses. Recreational users within “limited” areas cannot travel off roads and trails except during the performance of “necessary tasks,” such as for game retrieval. Since the 1985 RMP and the 2001 Amendment, OHV use in the planning area has increased dramatically. OHV users are creating new trails every year, especially during the hunting season.

Closed Areas

Areas closed to all OHV use include 40 acres in the Dry Creek Petrified Tree EEA, 572 acres in Cantonment Reno, and 3,038 acres in Middle Fork Canyon. These areas have special resource concerns and were closed to OHVs as a protective measure. This management action has proven an effective way to protect cultural and natural resources from unnecessary degradation.

3.6.6. Recreation

As one of the DOI's four primary missions, recreation is an important BLM program. The primary mission of the outdoor recreation program is to provide a broad spectrum of resource-dependent recreational opportunities to meet the needs and demands of visitors to public lands. The Recreation and Visitor Services (R&VS) program also seeks to maintain high-quality recreation facilities that meet public needs and enhance the image of the agency, as well as to improve understanding of public land resources and foster support of the BLM by effectively communicating the agency's multiple-use management programs to the recreation visitor. *BLM's Priorities for Recreation and Visitor Services* (BLM 2007b) identifies seven objectives for the R&VS program. These include:

- Manage public lands for recreation experience and quality of life outcomes.
- Encourage sustainable travel and tourism development with gateway communities and provide community-based conservation support for visitor services.
- Provide fair value and return for recreation through fees and commercial services.
- Establish a comprehensive approach to travel management and planning.
- Ensure public health and safety, and improve the condition and accessibility of recreation sites and facilities.
- Enhance and expand visitor services, including interpretation, information and education.
- Encourage and sustain collaborative partnerships, volunteers and citizen-centered public service.

3.6.6.1. Regional Context

Recreation planning produces opportunities for visitors to experience desired physical and social outcomes. Recreational values are considered in management through the understanding that settings provide opportunities for experiences created by visitors and that a diversity of settings provides the basis for quality recreation experiences. The responsibility for managing for various types of settings lies with the land management agency. Settings are comprised of a variety of attributes such as biophysical (human-induced and natural environment), social (visitor type and density), and managerial (regulations and facilities). Each of these attributes differs, thus facilitating some experiences and hindering others. By providing a diversity of settings with varying attributes over space, and making visitors aware of those opportunities, public land managers ensure that visitors are capable of producing quality experiences (McCool et al. 2007). Decisions for the recreation program should be responsive to past changes and adaptive to future changes in technology, sources of information, demographics, and population dynamics.

Visitors come to the planning area from all over the United States and from international locations. The location of the planning area in relation to other natural areas (Yellowstone National Park and the Bighorn National Forest to the west, Montana to the north, the Black Hills to the east, and the Front Range to the south), the accessibility of the planning area via major interstate corridors, and the abundant natural and cultural resources of northeastern Wyoming drive visitation. Historically, the summer months of June through August receive the heaviest use related to non-consumptive recreation. Hunting season (September through November) also brings high visitation to the planning area, with the highest use occurring on large tracts of BLM-administered lands with public access. However, research predicts that as the retirement population in the United States increases, many public lands will experience more consistent year-round use as retired visitors exercise the ability to travel and recreate year-round (McCool et al. 2007). According to the Wyoming Office of Tourism, key activities that motivate people to

choose Wyoming include scenery and natural experiences. More than half of the visitors in the 2012 Visitor Profile Report participated in hiking or backpacking and more than a third reported engaging in wildlife watching (Wyoming Office of Tourism 2012).

Recreation on public lands provides regional economic benefits. Recreation service providers (e.g., hotels, outfitters, equipment manufacturers and dealers, and restaurants) depend in part on public lands for their livelihoods. The Bureau of Labor Statistics predicts a 19 percent increase in recreation-related jobs between 2010 and 2020 (Bureau of Labor Statistics 2012c). Many recreation-related jobs depend on public lands, including BLM-administered lands. Protecting recreation resources could benefit the future of the recreation and tourism industry. One study (Sonoran Institute 2006) showed that annual expenditures from hunting and fishing in Wyoming exceeded \$335 million and that hunters spent 74 percent of their hunting days (960,000 days) on public lands. A 2009 Wyoming Travel Impact Report estimates that travel and tourism to Wyoming generated more than \$3.1 billion in direct spending and resulted in \$128 million in state and local tax revenues and supported approximately 30,500 jobs (with earnings of \$761 million) for Wyoming residents (Dean Runyan Associates 2013).

Recreational opportunities are offered to the public on BLM-administered lands in the planning area where there is legal access. The BLM provides opportunities for outdoor recreation and nature-based tourism using the concept of multiple-use management. Research and regional scoping meetings have identified that the public values natural landscapes, the freedom to choose a particular activity in which to participate, the opportunity to test skills, time spent with family and friends, and the opportunity for discovery. In addition, Johnson and Sheridan counties were identified as non-metropolitan counties with “significant concentrations of recreational activity” and recreation-driven economic growth (Johnson and Beale 2002).

3.6.6.2. Indicators

The indicator for the recreation program is the ability to provide a spectrum of recreation opportunities (i.e., primitive, developed, extractive and non-extractive) on BLM-administered lands. Visitor satisfaction can often identify when and where additional opportunities are necessary.

3.6.6.3. Current Condition

The approximately 800,000 acres of BLM surface in the planning area receive in excess of an estimated 30,000 recreation visits per year since 2010 (BLM 2013l). The towns of Sheridan, Buffalo, Gillette, Arvada and Kaycee are adjacent to public lands used by local residents as community recreation areas. Visitation to Mosier Gulch, Welch Ranch, Dry Creek Petrified Tree, Weston Hills and Burnt Hollow predominately consists of local residents. Middle Fork and Hole-in-the-Wall draw visitation from a much broader region; it is not uncommon to find visitors from Colorado, Nebraska and Montana at Outlaw Cave. Both the southern Big Horns and the PRB attract many out-of-state hunters to BLM recreation sites and tracts with public access. Hunting associated with commercial guides also occurs on public lands without public access.

The BFO recreation program is responsible for maintaining developed recreation sites ranging from minor access route improvements to trailheads, primitive campgrounds, and day-use areas. The BLM posts public and private land boundaries, interprets resources, and provides regulatory and informational kiosks in high-use areas. Detailed information is available to the public via informational pamphlets, land ownership maps, and online websites. BLM personnel encourage

the principles of programs such as Leave No Trace and TREAD Lightly! through public outreach. Law enforcement is also an integral part of the recreation program.

Several developed recreation sites in the planning area are closed to livestock grazing (Mosier Gulch, Dry Creek Petrified Tree EEA). Additionally, the discharge or use of firearms, weapons, and fireworks within developed recreation sites is prohibited per 43 CFR 8365.2-5(a). Prohibiting the discharge of projectiles and weapons at developed recreation sites not only prevents damage to facilities (signs, picnic tables, etc.), but it also reduces the possibility of accidental injury to other visiting recreationists.

Monitoring and enforcement of dispersed recreation is severely limited, especially in areas with a small percentage of public lands and limited access. The BLM depends on cooperation from public land users and other federal and state agencies for successful management of these areas. Cooperation from public land users is received through voluntary compliance with regulations and contributions of noncompliance information. The WGFD and local law enforcement agencies help provide an official presence that would otherwise not be available. Management prescriptions emphasize monitoring, education, and enforcement to reduce user conflicts and provide resource protection.

Most of the complaints the BLM has received involves illegal posting or otherwise restricting public access to federal lands, trespass onto private lands, vandalism to vegetation and soils, illegal dumping and failure to maintain roads. In addition, the BLM has received complaints about unpermitted outfitters and guides, and the careless discharge of weapons near infrastructure associated with various developments. All complaints are investigated or handled on a case-by-case basis.

Special Recreation Permits

The BFO issues an assortment of special recreation permits (SRPs) for commercial, competitive, or organized recreational uses of public lands. The BFO currently manages 46 SRPs; the majority are for commercial outfitting and guide services. Fees collected from SRPs average between \$10,000 and \$12,000 per year and are used to improve facilities or support programs within the planning area.

Undeveloped/Dispersed Recreation

Dispersed recreation occurs throughout the planning area over a wide range of ecosystem types. Occurring in combination with other resource activities, dispersed recreation includes but is not limited to hunting, camping, hiking, sightseeing, OHV use, vehicle touring, backpacking, horseback riding, photography, wildlife viewing, geo-caching, and fishing, boating, and other water-related activities.

Hunting, camping, fishing, and vehicle touring are among the most common recreational activities on BLM-administered public lands in the Buffalo planning area. All BLM-administered lands allow for hunting and many areas are open to target shooting unless posted otherwise. Restrictions on gun use include a prohibition on shooting within developed recreation sites and areas and upon, along or across roadways. Vehicle touring is generally in conjunction with hunting, fishing, rock hounding, equestrian use, camping, or hiking. During hunting season, there is an increase in use of motorized vehicles throughout the planning area.

By definition, dispersed recreation is comprised of small events distributed over large areas. Impacts such as minor disturbances to soil and vegetation are negligible and the environment tends to recover quickly. However, long-term cumulative impacts could occur in association with dispersed recreational activities. They are normally, but not exclusively, linked to heavily used areas and could include soil compaction and erosion, dispersal of invasive plant species, the creation of unauthorized two-track roads and trails, and the purposeful vandalism of natural and cultural resources. Over time, recreational activities could adversely impact sensitive soils, wildlife habitat, riparian areas, and important cultural and historical sites.

Recreation Management Areas

A recreation management area (RMA) is a land unit where R&VS objectives are recognized as a primary resource management consideration and specific management is required to protect the recreation opportunities. The RMA designation is based on: recreation demand and issues, recreation setting characteristics, resolving use/user conflicts, compatibility with other resource uses, and resource protection needs. A RMA is designated as either a SRMA or an extensive recreation management area (ERMA). SRMAs recognize unique and distinctive recreation values and are managed to enhance a targeted set of activities, experiences, benefits, and recreation setting characteristics, which become the priority management focus. ERMAs recognize existing recreation use, demand, or R&VS program investments and are managed to sustain principal recreation activities and associated qualities and conditions of the ERMA, commensurate management with other resources and resource uses.

Both SRMAs and ERMAs must have measurable objectives. SRMAs are recognized as the predominant land use plans focus for R&VS, where specific recreation opportunities and recreation setting characteristics are managed and protected on a long-term basis. Therefore, in SRMAs, the identification of recreation as the “predominant use” could constrain other uses and resources. ERMAs, in contrast, are managed commensurate with the management of other resources and resource uses. Thus, the essential difference between SRMAs and ERMAs is not necessarily the level of visitor use or necessary investment on the part of the BLM, but whether the area is to be managed with recreation as the predominant use (i.e., SRMA) or recreation is to be managed as a commensurate use with other resources or resource uses (i.e., ERMA).

Special Recreation Management Areas

SRMAs are an administrative unit where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance and/or distinctiveness, especially as compared to other areas used for recreation. These areas are identified during the resource management planning process and are traditionally areas that experience higher recreation use, require extra recreation investment, or need more intensive recreation management. The 1985 Buffalo RMP and the 2001 RMP Update did not designate any SRMAs. However, the 1985 RMP did designate the following two parcels as recreation areas:

- Weston Hills Recreation Area – Parts of this area are managed as undeveloped and developed recreation areas. Weston Hills is open to motorized vehicle use, and common activities include mountain biking, camping, hiking, horseback riding, big game hunting, and OHV use (ATVs and four-wheel-drive vehicles).
- Mosier Gulch Recreation Area – This area is managed as a developed recreation area. Mosier Gulch is open to motorized vehicle use, and common activities include fishing, hiking, mountain biking, picnicking, and wildlife viewing.

The 2001 RMP Update also prioritized recreation and prescribed management objectives in the Middle Fork, Dry Creek Petrified Tree, Weston Hills, and Mosier Gulch management areas and for the Gardner Mountain Trail. Management of recreation values or interpretive materials was also specifically addressed for Fortification Creek, Cantonment Reno and Crazy Woman Battle Site.

Two recreation sites, Burnt Hollow and Welch Ranch, were acquired after the RMP was last updated or amended. Recreation management was prioritized for both of these sites in site-specific management plans.

Based on visitor use, recreation setting, and desired future conditions identified in land use plans, there are seven areas in the planning area equivalent to SRMAs (Table 3.55, “Special Recreation Management Area Equivalents in the Planning Area” (p. 580)).

Table 3.55. Special Recreation Management Area Equivalents in the Planning Area

Recreation Management Area
Burnt Hollow
Dry Creek Petrified Tree
Middle Fork Powder River
Mosier Gulch
Welch Ranch
Weston Hills

Extensive Recreation Management Areas

ERMAs are an administrative unit that requires specific management consideration in order to address recreation use, demand, or R&VS program investments. ERMAs are managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Management in all ERMAs is focused on custodial implementation actions that address visitor health and safety, user conflicts, resource protection issues, and maintaining access or appropriate activity participation. The BLM often designates multiple ERMAs in a planning area based on homogenous land type or recreational opportunity factors across a large area. Lands with public access are available for dispersed recreational use by the general public. Actions proposed under other resource management programs will generally affect the recreation resource more substantially in areas with legal public access.

Public Lands Not Designated as Recreation Management Areas

Public lands that are not designated as SRMAs or ERMAs are managed to meet basic R&VS and resource stewardship needs. Recreation is not emphasized, however recreation activities may occur (except on any lands closed to public use). Currently, there are no lands identified as closed to public entry or use in the planning area. The R&VS for lands outside of RMAs are managed to allow recreation uses that are not in conflict with the primary uses of these lands. In general, these lands in the planning area will include BLM-administered parcels without legal public access. Recreation can and often does occur on lands without public access; these parcels are primarily used for recreation by adjacent private landowners or commercial outfitters and guides operating under a SRP.

3.6.6.4. Trends

Management practices change over time as social priorities shift and new scientific knowledge enhances the ability to responsibly manage differing land uses. Visitor use estimates for the planning area indicate a recent substantial increase in the number of visits to public lands in the planning area, from an estimated 20,500 visits per year in 2005 to nearly 38,700 visits per year in 2012 (BLM 2011h; BLM 2013l). Over the past 20 years, there has been a major shift in the way land management agencies view outdoor recreation. Public lands have always provided recreation opportunities. However, outdoor recreation is now recognized as an important land use providing social and economic benefits on national, regional, and local levels.

Recreation demands are expected to increase in conjunction with population. Increased public demand for the services provided by commercial, competitive, and organized activities on public lands is also anticipated. Recent studies indicate that Americans are participating in increasing numbers in recreational pursuits that natural areas and public lands provide. Both the total number of Americans and the total number of days annually in which we participate in nature-based recreation have grown substantially in the past 20 years (Cordell 2012). In particular, non-consumptive wildlife-based recreation (such as nature viewing and photography), have grown strongly, as have the number of days Americans spend primitive camping and backpacking. Participation in motorized recreational opportunities such as four-wheeling and off-road driving have also increased (Cordell 2012).

3.6.6.5. Key Features

The following paragraphs describe several features of particular importance to recreation on BLM-administered lands in the planning area. The BLM will use these key areas to shape management allocations and recreation management decisions during the planning process.

BLM-Administered Lands Adjacent to Walk-In Hunting or Fishing Areas

WGFD manages the Private Lands Public Wildlife Access program to improve public access for hunting and fishing opportunities. Walk-in agreements are negotiated between WGFD and private landowners for a specific period of time, usually several years, and thus the status of an access areas can change during the life of this plan. BLM-administered lands adjacent to Walk-In Areas provide additional access and hunting and fishing opportunities for recreationists. While the WGFD and the adjacent private landowner have authority over any lands enrolled in the program, the BLM can support the objectives of the Private Lands Public Wildlife Access program through collaborative management.

Burnt Hollow

Burnt Hollow Management Area (BHMA) consists of approximately 18,000 acres of public land accessible via State Highway 59 North approximately 20 miles northeast of Gillette, Wyoming. The management area includes Cow Creek Breaks. Highway 59 borders approximately 2.4 miles of the area, providing public access. There are two developed parking areas along this route. There is an undeveloped parking area on state land at the northeast end of the area. This parking area is accessed via Cow Creek Road, which runs for 1.9 miles along the Burnt Hollow boundary.

The area offers varied topography, including rolling sagebrush-grasslands, steep precipitous drainages, scoria buttes, and clayey outcrops with juniper and ponderosa pine uplands. Several intermittent drainages contain plains cottonwood and junipers. Springs and small wetlands are scattered throughout the BHMA. Livestock grazing, wildlife habitat, and limited mineral development are the historic land uses.

The few existing two-track roads in the BHMA were created for mineral exploration and livestock management and are only open for motorized use under administrative and permitted actions. The BHMA features opportunities for nonmotorized dispersed recreation, including camping, mountain bicycling, environmental education, hiking, horseback riding, small- and big-game hunting, picnicking, and wildlife viewing. Overnight camping and campfires are prohibited in the developed parking areas. The management area is closed to target shooting.

Cabin Canyon

The Cabin Canyon area is located off of Bishop Road approximately 22 miles southeast of Gillette, and is a 1,369 acre parcel with public lands surrounded by approximately 2,460 acres of adjacent state lands. The area has experienced increased motorized use, both on and off designated routes. Current uses are predominately mineral extraction and grazing, but motorized recreational use is slowly increasing. Recent complaints from the public regarding the proliferation of user created routes, litter, recreational shooting, established campsites, and other activities have increased education and enforcement efforts in this area.

Dry Creek Petrified Tree Environmental Education Area

The Dry Creek Petrified Tree management area is a 2,567 acre environmental education site primarily used by tourists and students. The area highlights 60 million year old remnants of petrified Metasequoia trees within red sage hills and sagebrush country. The area is approximately 8 miles east of Buffalo, Wyoming, and access is via Johnson County's Tipperary Road. The area includes a developed parking area with an outdoor toilet accessible to people with physical disabilities. The Dry Creek Petrified Tree EEA has an 0.75 mile interpretive trail; signs identifying the area and its unique values are posted on the site. The area is open to nonmotorized recreation opportunities, including cycling, hiking, and small- and big-game hunting. Open fires and discharge or use of fireworks, firearms or weapons are not allowed in the developed parking area or the interpretive site (43 CFR 8365.2). Vehicle access into the area is allowed for administrative purposes and livestock operations along existing primitive resource roads; these roads are open to nonmotorized use by the public. Vehicle use beyond the parking area is prohibited.

Hole-in-the-Wall

The Hole-In-The-Wall is part of a colorful and scenic red sandstone escarpment known as the Red Wall. The area is a historic site on BLM-administered land approximately 16 miles southwest of Kaycee, Wyoming. The area is accessible via trailheads along Natrona County 105/Bufalo Creek Road; however, vehicle access to Hole-In-The-Wall proper is limited due to land ownership patterns. The location is best known for legends of outlaw activity in the late 1800s, most notably involving Butch Cassidy and the Wild Bunch Gang. The area includes a public viewing and parking area and trailhead, with interpretive signs. More than 2.5 miles of trails are open to nonmotorized use. The surrounding area is open to motorized dispersed recreation where designated, including driving for pleasure along Johnson County roads.

Kaycee Stockrest

The BLM administers approximately 2,685 acres just northwest of the city of Kaycee. Public access is available via Highway 191 or a public easement issued to Johnson County. Approximately 200 acres is a designated stockrest. This unit has historically been used for recreational target shooting and OHV riding by local residents. The BLM received a proposal for consideration of the development of a shooting range at the site in 2009. An additional 2,485 acre parcel provides some hunting opportunities during the fall.

Middle Fork Recreation Area and Outlaw Cave

The Middle Fork Recreation Area is a spectacularly scenic part of the Old West encompassing approximately 10,083 acres. The Middle Fork area is topographically diverse, ranging in elevation from 5,000 to 8,000 feet, with numerous steep incised canyons, a red sandstone escarpment known as the Red Wall, and open grassland parks interspersed with ponderosa pine, Douglas fir, and limber pine forests. The wildlife found here are just as varied – elk, mule deer, pronghorn, mountain lions, eagles, and other small mammals and rodents. The Middle Fork Powder River is a blue ribbon trout stream containing brown and rainbow trout. The area includes the Ed O. Taylor Wildlife Habitat Area managed by the WGFD.

The Middle Fork area is approximately 20 miles southwest of Kaycee, Wyoming, and is accessible via State Highway 190 and Barnum Road. Multiple named roads provide approximately 50 miles of access routes to the area, including Barnum Mountain Road, Outlaw Cave Road, South Slope Road, Bachus Pasture Road, Buffalo Creek Road, Hazelton Road, and Bar C Road. There are another 18 miles of primitive access roads in the SRMA; however, vehicle and OHV use is allowed only on designated trails. The area is open to motorized and nonmotorized recreation opportunities such as camping, freshwater fishing, cycling, hiking, big-game hunting, and OHV (ATV and four-wheel-drive vehicles) use on designated routes.

Outlaw Cave is in the Middle Fork Recreation Area and has 0.5 mile of access road to a developed campground. There is approximately 1 mile of hiking trails to access the Middle Fork Powder River via the Middle Fork Canyon trail. An outhouse is provided; however there is no potable water at the campground. The site includes picnic tables and fire rings. A fire swept through the area in 2006, taking many of the mature trees. The area also contains archeological sites dating back to the prehistoric period, including stone circles, quarry sites, rock art, and curious petroglyphs.

Mosier Gulch

The Mosier Gulch Recreation Area is an approximately 1,026-acre parcel accessed via State Highway 16 West approximately 3 miles west of Buffalo, Wyoming. Approximately 0.5 mile of improved resource road provides access into the area's two developed parking areas. An outdoor toilet is available and is accessible to people with physical disabilities. A hand-pumping water well and four picnic sites with tables and grills provide opportunities for picnicking. There are two undeveloped parking areas. An interpretive sign that identifies the area and its facilities is posted on the site. Overnight camping, open fires, and the discharge of fire arms are prohibited in the parking or picnic areas. The area is closed to motorized use beyond the improved access road. The area is open to nonmotorized recreation opportunities including picnicking, freshwater fishing, hiking, and small- and big-game hunting.

North Bighorns Parcels

The BLM manages approximately 2,926 acres 13 parcels ranging from 40 acres to 650 acres adjacent to the Bighorn National Forest in Sheridan County, and one 40 acre parcel along Keystone Road. Public access to these parcels includes Highway 14, Smith Creek Road, Red Grade Road, Keystone Road, Little Goose Creek Road, and walk-in access from the national forest. Recreational use, including staging and riding of OHVs on parcels adjacent to public roads is known to occur.

Trails

In addition to designated OHV trails (see the *Travel and Transportation Management* section above), there are several trails for nonmotorized use in the planning area. Developed hiking trails in the planning area include Gardner Mountain Foot and Horse Trail, Hole-in-the-Wall Trail, Outlaw Cave Fishing Access Trails, the interpretive trail at the Dry Creek Petrified Tree EEA, and Poison Creek Trail.

Welch Ranch

The Welch Ranch Management Area is a 1,748-acre parcel approximately 10 miles north of Sheridan, Wyoming. Welch Ranch is in the PRB, a part of the Northern Great Plains, which includes most of northeastern Wyoming and a portion of southeastern Montana. The Big Horn Mountains are within sight of Welch Ranch to the west. The Welch Ranch area is accessible from Sheridan via Wyoming State Highway 338 (Decker Road). There are two developed parking areas at the junction of Highway 338 and the Tongue River, with directional signs identifying the area. The few existing two-track roads in the Welch Ranch area were originally created for mineral development and livestock management and are currently only open for motorized use under administrative and permitted actions.

Welch Ranch occupies a portion of the Tongue River valley floor and the adjacent dissected uplands between Ash Creek and Hidden Water Creek. Approximately 1.5 miles of the Tongue River run through the eastern portion of the Welch Ranch area. There is a coal seam fire on a ridge in the southwestern corner of Welch Ranch. Evidence of historic wildland fire is apparent from several fire events in the past few decades.

The area offers nonmotorized dispersed recreation, including camping, mountain bicycling, fishing, hiking, horseback riding, small- and big-game hunting, upland bird hunting, picnicking, wildlife viewing, bird watching, and float trips. Motorized use and target shooting are prohibited in the management area. Overnight camping, open fires, and discharge or use of fireworks, firearms, or weapons are prohibited in the developed parking area (43 CFR 8365.2).

Weston Hills

The Weston Hills area consists of approximately 9,500 acres of BLM surface lands adjoining the Thunder Basin National Grassland. The USFS jointly manages Weston Hills. The area is 25 miles northeast of Gillette, Wyoming, and accessible via State Highway 59 North.

Elevations in the Weston Hills Recreation Area range from 3,800 feet to more than 4,500 feet. The lower elevations are grasslands with some juniper, while the upper elevations are ponderosa

pine-covered hills and steep drainages interspersed with meadows and scoria outcrops. From vantage points in Weston Hills Recreation Area, one can see the Big Horn Mountains to the west and Devil's Tower to the east.

There are 5.9 miles of improved resource roads into the SRMA with two parking areas, both on USFS surface. One parking area is unimproved; the other is improved with an outdoor toilet accessible by people with physical disabilities. There also is a warm-water fishing pond at the site. The area is open to motorized and nonmotorized recreation opportunities, including mountain biking, hiking, horseback riding, small- and big-game hunting, fishing, and OHV use. Target shooting is prohibited on the Thunder Basin National Grassland and a temporary shooting closure was implemented on BLM-administered lands at Weston Hills in 2008. There are approximately 10 miles of primitive roads and OHV trails with use restricted to marked routes only. There are another 6.4 miles of trails open to nonmotorized use.

3.6.7. Lands with Wilderness Characteristics

Managing the wilderness resource is part of the BLM's multiple use mission. Lands with wilderness characteristics are parcels that meet a size requirement of 5,000 acres (or exception criteria) and contain naturalness and either outstanding opportunities for solitude or primitive and unconfined recreation. In addition, they may also possess supplemental values (e.g., ecological, geological, or other features of scientific, educational, scenic, or historical value). They are identified through a process described in BLM Manual 6310 – Conducting Wilderness Characteristics Inventory on BLM Lands and considered in the land use planning process under BLM Manual 6320 – Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process (BLM 2012b).

Under FLPMA section 201, the BLM keeps an updated inventory of the lands with wilderness characteristics resource and considers new information related to wilderness characteristics when preparing land use plans. Lands with wilderness characteristics may be managed to protect and preserve some or all of those characteristics through a land use planning process. Citizens' Wilderness Proposals (CWPs), new acquisitions, and contiguous areas of BLM surface with at least 5,000 roadless acres are considered for their potential wilderness character.

The Buffalo planning area contains three WSAs that have been previously inventoried and determined to possess wilderness characteristics (see the *Wilderness Study Areas* section of this chapter). The *Lands with Wilderness Characteristics* resource analysis is limited to areas outside of designated WSAs.

3.6.7.1. Regional Context

Initial inventories for lands potentially containing wilderness characteristics in the planning area were completed in 1978. Lands that clearly and obviously did not contain wilderness characteristics were then released from further consideration, and lands potentially containing wilderness characteristics underwent an intensive inventory. In 1979, intensive inventories were completed for three units in the BFO: Fortification Creek, Gardner Mountain, and North Fork. In the BFO, portions of these three areas were determined to meet the size and naturalness criterion and were submitted to Congress as WSAs. All other parcels were determined to lack wilderness characteristics according to the 1979 report.

3.6.7.2. Indicators

A wilderness inventory evaluates wilderness characteristics as defined in Section 2(c) of the Wilderness Act of 1964, and incorporated in FLPMA. Guidelines for producing an inventory of wilderness characteristics are specified in BLM Manual 6310 – Conducting Wilderness Characteristics Inventory on BLM Lands. In order for an area to be classified as **lands with wilderness characteristics**, it must possess sufficient size (or meet size exception criteria), naturalness, and outstanding opportunities for either solitude or primitive and unconfined recreation. In addition, it may also possess supplemental values. While the BLM is precluded from establishing any new WSAs or modifying existing WSAs during the planning process (BLM 2012c), the agency is required to consider wilderness characteristics in the planning process. When such lands are present, the BLM examines options for managing these lands and determines the most appropriate land use allocations for them. Thus, **lands with wilderness characteristics** are managed under administrative prescriptions analyzed in a land use plan, and, **in contrast to WSAs**, are not Congressionally mandated.

3.6.7.3. Current Condition

In February 2004, the BLM received a document entitled *Wilderness at Risk-The Citizens' Wilderness Proposal for Wyoming BLM Lands* (Updated Version) submitted by a consortium of organizations led by the Wyoming Wilderness Association (Howell 2004), an updated version of a previous document known as the *Citizens' Wilderness Proposal* (Wyoming Wilderness Coalition 1994). The proposal requests additional acres surrounding each of the three existing WSAs be protected as wilderness.

The Wyoming Wilderness Coalition proposes:

- **Approximately** 7,133 acres be added to the existing Fortification Creek WSA
- **Approximately** 10,181 acres be added to the existing Gardner Mountain WSA
- **Approximately** 3,388 acres be added to the existing North Fork WSA

For each of the above proposals, the document summarizes the highlights, location and access, wilderness qualities, resource analysis, and proposes boundaries and management recommendations. In summary, the CWP recommends additional acres in the Fortification Creek area for its “unique topography and truly western scenery;” additional acres in the Gardner Mountain area because of its “impressive historical legacy and terrific wildlife habitat;” and additional acres in the North Fork Powder River area for its “unsurpassed delicate beauty, impressive environment, and outstanding fishery” (Howell 2004).

Lands with Wilderness Characteristics Inventory Summaries

All contiguous blocks of BLM-administered lands greater than 5,000 acres or potentially meeting exception criteria were assessed through interdisciplinary review. Those parcels containing extensive O&G development, public roads, or having documentation of multiple constructed and maintained roads were eliminated from further consideration. Remaining parcels were inventoried for wilderness characteristics. A summary of the findings is presented below; detailed information is contained within the permanent documentation file for each wilderness characteristics inventory (BLM 2013f).

Gardner Mountain Citizens' Wilderness Proposal and Adjacent BLM-Administered Lands (WY-060-201)

The Gardner Mountain CWP (10,181 acres) and additional contiguous BLM-administered lands (~13,000 acres) were inventoried in 2011 and 2012 (BLM 2013f). The unit consists of BLM-administered lands south of the Slip Road and north of Barnum and Brock roads. In total, the 23,380 acres inventoried in the Gardner Mountain region did not meet the naturalness criteria. It was therefore determined that the Gardner Mountain inventory unit does not contain wilderness characteristics, and will not be carried forward in the alternative process.

North Fork Citizens' Wilderness Proposal (WY-060-202)

The North Fork CWP and additional contiguous BLM-administered lands were inventoried in 2011 and 2012 (BLM 2013f). The CWP totals approximately 3,470 acres as well as the WSA. Contiguous BLM-administered lands outside of the CWP, including the Horn encompass approximately 3,100 acres. In total, the 6,548 acres inventoried in the North Fork region did not meet the naturalness criteria. It was therefore determined that the North Fork inventory unit does not contain wilderness characteristics, and will not be carried forward in the alternative process.

Face of the Bighorns (WY-060-203)

The BLM documented consideration of a portion of the Face of the Bighorns in 1979 and decided against completion of an intensive inventory of the area at that time. The BLM determined that the area did not have potential for wilderness, but the rationale for the initial determinations were inconsistent with current guidance. The Face of the Bighorns was inventoried in 2011 and determined to meet the size and naturalness criteria and possess outstanding opportunities for both solitude and primitive and unconfined recreation.

Fortification Creek Citizens' Wilderness Proposal (WY-060-204)

The Fortification Creek CWP was inventoried in the summer and fall of 2010 (BLM 2011c; BLM 2013f). The CWP was separated into two sub-units for inventory purposes based on maintained roads and the configuration of the CWP in relation to the WSA. The Southeastern sub-unit totals approximately 1,705 acres and did not meet the size requirements or exceptions. Due to O&G activities and existing roads, the area did not appear to be natural. The Western sub-unit totals approximately 5,420 acres and meets the size requirements for consideration. The Fortification Creek Western sub-unit did not meet the naturalness criteria; when mechanically constructed and maintained roads are considered the unit does not contain 5,000 roadless acres. It was therefore determined that the Fortification Creek CWP does not contain wilderness characteristics, and will not be carried forward in the alternative process.

New Acquisitions

The BLM has made several acquisitions since the 1985 RMP. The Welch Ranch (1,747 acres) does not meet the size or exception criteria and was not analyzed further. The BLM has acquired two parcels (Collins Land Exchange at Weston Hills and 60 Bar Exchange at BHMA) in northern Campbell County that resulted in BLM parcels meeting the size requirement and were considered for potential wilderness characteristics. However, the levels of historic O&G development coupled with the presence of nearby state highways and county roads, extensive route networks and the current levels of motorized use at these two parcels led our interdisciplinary team to determine that further analysis was not necessary. The new acquisitions did not contain wilderness characteristics and therefore will not be carried forward in the alternative process.

3.6.7.4. Trends

Lands with wilderness characteristics are considered to be a diminishing resource nationwide. The planning area has experienced an increase in visitation since 2006 (BLM 2011h). The region has also experienced an increase in development and other multiple uses with an emphasis on mineral extraction, agricultural use, and both motorized and nonmotorized recreation opportunities.

3.6.7.5. Key Features

The one lands with wilderness characteristics unit (WY-060-203) determined to possess wilderness characteristics is located along the ridgeline of the southern Big Horn Mountains in Johnson County, Wyoming (BLM 2013f). The area was proposed as the Face of the Bighorns Area of Critical Environmental Concern (ACEC) by citizen's groups, but did not meet the relevance and importance criteria for ACEC designation (BLM 2003c). The area does meet the lands with wilderness characteristics criteria for size, naturalness and outstanding opportunities for both solitude and primitive and unconfined recreation. The vegetation and topography include forests, meadows, rock-outcroppings, and steep mountain slopes. Elevations within the unit range from approximately 5,250 feet to 7,580 feet. Slopes exceed 30 percent in much of the area, reducing the potential for issuing ROWs, constructing roads or permitting the associated economic recovery of timber. Portions of this unit are designated as important to various wildlife, particularly elk. The area does not contain any existing O&G leases, is outside of the assessment area for CBNG (very low potential), and has no conventional O&G potential.

Manageability of portions of the lands with wilderness characteristics unit may be difficult, particularly in the extreme northern portion of the unit along Billy Creek Road. The northern portion of the unit is adjacent to numerous summer homes and cabins, creating a wildland-urban interface that may require mechanical thinning to prevent wildfire. The Billy Creek Road is a cherry-stemmed route in the northwestern portion of the unit. The BLM manages a nonmotorized trail, the Poison Creek Trail, to provide hiking opportunities and access for anglers off of the Billy Creek Road. The unit is about 3.5 miles across at its widest point and approximately 0.25 mile wide at its narrowest sections in the southern portion. The unit consists of 12,237 acres of BLM surface with wilderness characteristics (Map 73).

3.6.8. Livestock Grazing Management

The livestock and agricultural industry has a long and rich heritage in Wyoming. The precipitation levels, soils types and limitations, and topography make northeast Wyoming better suited to livestock grazing on the grasslands and shrublands than to cultivated agriculture (farming). Grazing on public lands represents a vital economic value to agricultural producers and to local communities. In addition, livestock grazing represents irreplaceable environmental and social values. Livestock have grazed on these allotments for more than 100 years. These values and traditions contribute important and irreplaceable wildlife habitat, open spaces, ranchland buffers between federal lands and developments, scenic vistas, visual beauty, and the traditional image and heritage of the historic rural landscapes of Wyoming and the U.S. West.

Livestock grazing can impact soil, plants, biological crusts, streams, and springs. Soils can be affected by hoof action that breaks up soil clumps and "plants" seeds in the soil. Grazing also can compact soils if livestock are confined. Impacts to plants is primarily through removal of vegetative mass (leaves); this can invigorate plants to produce more and remove any old growth

that if allowed to build up can stunt and inhibit plant growth. A healthy stand of vegetation holds and protects soils from wind and water erosion. This reduces soil sediments from entering streams and affecting water quality. Vegetation also helps hold banks of streams and spring areas to keep soil in place and reduce water erosion. Plants also help filter sediments, and such filtration improves water quality in streams and springs. Grazing management is designed to increase plant productivity and reduce soil erosion by controlling grazing through fencing and water projects and by balancing forage demands with the land's productivity.

3.6.8.1. Regional Context

The BLM is responsible for administering livestock grazing on public land across the planning area. Livestock grazing includes the grazing of domestic animals (e.g., cattle, sheep, horses, yaks, and bison). All public land in the planning area is designated for grazing unless otherwise prohibited and is governed under Taylor Grazing Act Section 15, which regulates issuing grazing leases on public lands outside the original grazing district boundaries established by the Taylor Grazing Act of 1934. Base property is defined in 43 CFR 4100.0–5 as (1) Land that has the capability to produce crops of forage that can be used to support authorized livestock for a specified period of the year, or (2) water that is suitable for consumption by livestock and is available and accessible to the authorized livestock when the public lands are used for livestock grazing. In accordance with 43 CFR 4110.2–1, the authorized officer shall find land or water owned or controlled by an applicant to be base property if: (1) it is capable of serving as a base of operation for livestock use of public lands within a grazing district, or (2) it is contiguous land, or when no applicant owns or controls contiguous land, noncontiguous land that is capable of being used in conjunction with a livestock operation which would utilize public lands outside a grazing district. In most cases, the base property for a Section 15 lease adjoins, surrounds, or is intermingled with the leased public lands authorized for grazing under this document. Water does not serve as base property in Wyoming. Public lands comprise approximately 10 percent of the surface acres; the remaining 90 percent is a combination of private and state lands. The majority of lands with live water (streams and springs) were homesteaded and are private lands. Therefore, except for drilled water wells and associated stock water pipelines and constructed reservoirs, most of the water available for livestock and wildlife comes from private lands.

From 1949 through 1954, the BLM conducted a classification of public lands within the BFO as part of a regional effort generally referred to as the “Missouri River Basin Survey”. A large portion of the BFO was resurveyed in 1968. Through the MRB effort the PRB (Area 3) was inventoried for vegetation, capability, erosion and carrying capacity. The MRB survey determined ecological range condition for each range site on the basis of a comparison between the existing site vegetation versus what the site was originally (potentially) capable of producing. The process to estimate the available forage for livestock grazing was conducted by trained individuals and involved intensive vegetation sampling (clipping, weighing, and ocular estimation). The stocking rates for the majority of the grazing leases within the BFO are based on this inventory.

Most professional Rangeland Management Specialists that have worked in the BFO have felt that the authorized grazing use (animal unit month [AUM]) generated from the MRB was conservative. In the years since the MRB survey, the BLM has conducted supplemental Ecological Site Inventories and updated the authorized use on a few grazing allotments. In each of these cases, it was determined that the carrying capacity was higher than those resulting from the MRB. Forage produced from the public lands within the BFO area contribute approximately 110,000 AUMs or about 4 percent of the feed requirements for the livestock for all land

ownerships. The Buffalo RMP approved October 4, 1985, and the 2001 update, state that “any permanent increases in the amount of forage produced are considered for wildlife and watershed protection before additional livestock use is authorized.”

3.6.8.2. Indicators

The indicators for the livestock grazing program are an increase or decrease in available forage and/or an increase or decrease in AUMs on BLM-administered lands.

Also, the BLM recognizes that AUM production on its rangelands can be sustained only with proper management of livestock grazing activities. To evaluate land health and keep AUM production sustainable, the BLM utilizes the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming* (BLM 1997).

In 1998 the BFO began assessing and evaluating whether public lands in their allotments were achieving these standards in accordance with the change in 1995 to the 43 CFR 4100 grazing regulations. Management decisions and actions are made in accordance with the *Standards for Healthy Rangelands*. The BLM in Wyoming uses these standards to allow sustainable livestock grazing to continue while protecting watersheds, riparian and upland ecosystems, and wildlife habitat.

Standards address the health, productivity, and sustainability of BLM-administered public rangelands and represent the minimum acceptable health for public rangelands. The standards apply to all resource uses on public lands. Their application will be determined as resource-specific guidelines are developed. Standards are synonymous with goals and are observed on a landscape scale. They describe healthy rangelands rather than important rangeland by-products. The achievement of a standard is determined by observing, measuring, and monitoring appropriate indicators. An indicator is a component of a system for which the characteristics (e.g., presence, absence, quantity, and distribution) can be observed, measured, or monitored based on sound scientific principles.

3.6.8.3. Current Condition

In the planning area, public lands comprise approximately 10 percent of the surface acres; the remaining 90 percent is a combination of private and state lands. Due to this scattered land pattern, livestock operations and management are run as seamless units regardless of surface ownership. To separate public lands to be managed as special units would not be feasible for the grazing lessee or the BLM. The BLM manages livestock grazing on 782,102 acres in the planning area. This acreage incorporates 427 grazing leases (Table 3.56, “Summary of Livestock Type and Authorizations in the Buffalo Planning Area” (p. 591)) authorizing approximately 106,078 AUMs of livestock forage in 477 grazing allotments. Four hundred livestock operators use public lands in the planning area in Johnson, Campbell, and Sheridan Counties; most of these lands are in Johnson County. The BFO also administers grazing use for public lands within the boundaries of adjacent BLM Field Office planning areas through cooperative management agreements. Over the last 20 years (1989–2008), the lowest AUM allocation was in 2006 with a total of 89,297 AUMs authorized, the highest was in 1997 with 108,607 AUMs, and the AUM annual authorization average is 98,278.

Table 3.56. Summary of Livestock Type and Authorizations in the Buffalo Planning Area

Livestock Type	Number of Leases
Cattle only	362
Sheep only	18
Cattle and sheep	24
Horses only	5
Bison only	2
Yak only	1
Cattle and horses	11
Cattle, sheep, and horses	4
Total	427
Source: BLM 2009a	

Livestock grazing on allotments is authorized during various times during the year depending on management objectives. Grazing periods vary with elevation and geographical change, resource needs, and user preference. The higher-elevation allotments are generally grazed during summer and fall. The lower-elevation areas can be grazed during any season. Most of the allotments in the planning area are operating with prescribed use levels that provide for plant recovery to enhance land health. When rangelands are not meeting resource objectives, the BLM implements changes in grazing management.

In 1985, all allotments were placed in categories established by BLM range management policies, as follows: “I” (Improve), “M” (Maintenance), and “C” (Custodial). The BLM categorizes allotments according to the greatest potential for resource improvement and the greatest economic return for applied management. Factors in the categorization process include public land acreage, estimated range health and trend, resource conflict or concerns, existing grazing systems, range suitability, production potential, wildlife habitat values, land patterns and acreages, and range improvement needs. Allotments with larger tracts of public land and the highest potential were placed in the I and M categories; allotments with smaller tracts of public land were placed in the C category. The BLM gave priority to the I category allotments, followed by the M category allotments and then the C category allotments. Map 72 shows how the planning area has been categorized.

At present, 18 allotments in the planning area are operated under allotment management plans (AMPs) or management agreements (Table 3.57, “Activity Plans – Allotment Management Plans and Management Agreements” (p. 591)). AMP and grazing agreements usually incorporate a deferred rotation grazing system to allow periodic rest during the critical growing season for vegetation from initial spring green-up through seedset (March 1 to July 10).

Table 3.57. Activity Plans – Allotment Management Plans and Management Agreements

Allotment Number	Allotment Name	Type of Plan	Public Acres
22213	Tongue River	AMP	1,767
22214	Schooner Ranch	AMP	12,482
32014	North Windmill	AMP	2,074
02275	Remington Creek	AMP	2,676
02310	Little Willow	AMP	6,080
02344	Dry Vee	Agreement	4,442
02371	Slope/Mountain/Stubbs Draw/Poker Creek	AMP	16,540

Allotment Number	Allotment Name	Type of Plan	Public Acres
02380	Wormwood Ranch/Beaver Creek	AMP	12,917
02390	Olmstead	AMP	832
02426	Crooked Creek	AMP	20,367
02430	Powder River	AMP	4,526
02438	T.W.	AMP	1,840
02476	Gardner Mountain (South)	AMP	1,622
12033	Red Fork	AMP	10,000
12139	Falxa	AMP	14,759
12162	Fence Creek	AMP	4,820
22106	Wagonhammer	AMP	3,881
Total			123,247
Source: BLM 2009a			
AMP Allotment management plan			

The BFO assesses/evaluates approximately 10 percent of the grazing allotments in the planning area annually. Where existing grazing management practices or levels of grazing use on public lands are significant factors in failing to achieve the standards and conform with guidelines, appropriate actions are being taken that will result in significant progress toward fulfillment of the standards and significant progress toward conformance with the guidelines. The BLM monitors to ensure proper grazing on allotments and uses the monitoring results to help determine if the present management is adequate for achieving land health standards or if a change in management is needed. Changes in management that have been applied include the construction or implementations of range improvements to aid in livestock management. Range improvement projects can include construction of fences, water delivery systems, and water holding facilities; prescribed burning; and ensuring reliable water sources. It can also include cultural changes such as a change in livestock type, deferment of a portion or all of an allotment, change or limitation of the season of use, or leasing additional lands. The goal is to continue sustainable livestock use on public lands while maintaining healthy watersheds and providing habitat for wildlife.

At the end of fiscal year 2008, the BFO had completed land health evaluations on 125 allotments comprising 588,581 acres of public land. The BLM determined that one or more rangeland health standards were not being met in three allotments (a total of 9,601 acres). Only a portion of those acres within the allotments did not meet rangeland health standards.

The BLM implements range improvement projects to help achieve management goals. Range improvement projects implemented before the 1960s were financed by the grazing lessees. Later, the BLM contributed funds to projects and in some cases fully financed them. In recent years the BLM has sought and participated in cost-shared projects with other agencies and private organizations to achieve mutual goals on public and private lands.

The BFO uses set criteria to prioritize new projects for funding. Highest priority is given to reconstruction of existing projects and new projects needed to achieve the standards for healthy rangelands and conform with guidelines for livestock grazing management. Criteria used to rank other projects include implementation of activity plans; cooperatively funded projects; allotment category (I, stock driveway, M, and C); number of allotments benefited; project cost; number of AUMs of forage authorized on an allotment; and wildlife habitat enhancement. Current BLM policy is to assign all maintenance responsibilities to the benefiting user, usually the grazing lessee.

Before 1997, an average of 6 to 10 range improvement projects were completed annually. Since 1998, an average of four to six range improvement projects have been completed annually. These projects consist primarily of fences, stock-water pipelines, spring developments, water wells, and vegetative treatments (Table 3.58, “Range Improvement Projects Implemented in the Buffalo Planning Area, Wyoming Since 1998” (p. 593)).

Table 3.58. Range Improvement Projects Implemented in the Buffalo Planning Area, Wyoming Since 1998

Type of Project	Number Projects Projected	Projects Completed Since 1998
Fences (miles)	3.3	21
Reservoirs (number)	1	0
Springs (number)	2	7
Wells (number)	3	2
Pipelines (number)	5	10
Source: BLM 2008a		

3.6.8.4. Trends

Livestock grazing will continue in the planning area in response to public demand. Many livestock operators in the planning area depend on the forage public lands provide. A predicted increase in development of mineral resources in the planning area will increase the presence of energy development-related infrastructure and machinery (e.g., roads, pipelines, well pads, processing facilities, and a variety of vehicular traffic). Construction of new facilities and related infrastructure necessary to extract mineral resources will require removal of existing vegetation. Further indirect loss of available forage could occur as increased infrastructure and traffic constrain livestock movements. As reclamation practices are applied to the public lands, the BLM could adjust livestock numbers and locations to ensure the success of those applications.

Evaluation of land health will continue, with a focus at the allotment level. The emphasis will change somewhat from focusing only on high-priority allotments to focusing on all public lands, especially those with potential Greater Sage-Grouse habitat and habitat for other species at risk. The BLM would still adjust grazing use at the allotment level. Table 3.59, “Animal Unit Months Billed in the Planning Area” (p. 593) lists AUMs billed in the Buffalo planning area.

Table 3.59. Animal Unit Months Billed in the Planning Area

Year	Campbell County	Johnson County	Sheridan County	Field Office Total
1989	34,096	52,862	5,103	92,061
1990	34,505	55,024	5,359	90,068
1991	33,234	59,281	4,796	97,311
1992	32,860	61,078	5,145	99,083
1993	34,170	60,733	5,292	100,195
1994	35,075	66,601	5,601	107,277
1995	35,698	58,825	5,423	99,946
1996	36,368	59,865	5,107	101,340
1997	37,118	66,041	5,448	108,607
1998	35,454	68,230	4,908	108,592
1999	34,558	61,912	5,727	102,197
2000	36,288	64,756	5,290	106,334
2001	32,229	59,472	4,985	96,686
2002	34,365	55,740	4,722	94,827

Year	Campbell County	Johnson County	Sheridan County	Field Office Total
2003	33,216	58,487	5,274	96,977
2004	33,446	56,802	5,071	95,319
2005	34,751	49,864	5,677	90,292
2006	34,511	48,638	6,148	89,297
2007	35,382	49,811	6,444	91,637
2008	38,597	53,066	5,848	97,511
Average	34,796.05	58,354.4	5,127.4	98,277.85
Source: BLM 2008g				

Recent agricultural land sales suggest that there is general stability in agricultural land uses and the ownership of agricultural properties. Future demand for agricultural land in Johnson, Sheridan, and Campbell Counties and the State of Wyoming can be expected from persons seeking a rural lifestyle in either part- or full-time agricultural activities. Some existing agricultural operations might choose to expand by acquiring additional lands. Agricultural property sizes will vary, depending on the buyers' financial resources, lifestyles, and preferences and their intended uses of the property.

Developers often are attracted to better agricultural land because its topography makes it more economical to develop. This also can result in the reduction of agricultural land and the decline of the quality of life in northeast Wyoming.

3.6.8.5. Key Features

Key features for livestock grazing include I and M category allotments and crucial habitat areas for wildlife and special status species, and recreational sites.

3.7. Special Designations

The planning area contains proposed ACECs, proposed Scenic and Back Country Byways, a waterway that is suitable and eligible for WSR designation and three WSAs, discussed below. The planning area does not contain designated or proposed National Scenic and Historic Trails, National Recreation Trails or National Water Trails and these designations will not be discussed further.

3.7.1. Areas of Critical Environmental Concern

3.7.1.1. Regional Context

FLPMA section 103(a) defines an ACEC as an area within public lands where special management attention is required to protect and prevent irreparable damage to important historical, cultural, and scenic values, fish and wildlife, and natural systems or processes, and to protect human life and safety from natural hazards. ACEC implementation regulations are 43 CFR 1610.7-2(b).

The land use planning process may officially designate an area found to meet ACEC criteria and would specify the special management direction needed to protect the relevant and important resource values. While the BFO does not currently have any designated ACECs, there are several areas that meet the relevant and important criteria.

3.7.1.2. Indicators

Before an area is nominated for ACEC designation, it must meet both the relevance and importance criteria (43 CFR 1610.7-2 and BLM Manual 1613) to become eligible for further consideration. An area would meet the relevance criteria if it contains one or more of the following: a significant historic, cultural, or scenic value; a fish or wildlife resource; a natural process or system; or natural hazards. An area would meet the importance criteria if it is characterized by one or more of the following: qualities or circumstances that make it fragile, sensitive, irreplaceable, rare, unique, etc.; more than locally significant qualities; warrants protection to satisfy national priority concerns or to carry out FLPMA mandates; qualities that warrant concern for safety and public welfare; or poses a significant threat to human life and safety or to property.

3.7.1.3. Current Condition

The public nominated seven areas for ACEC designation in 2002 (Koepsel 2002). The Notice of Intent for BLM's national Greater Sage-Grouse Planning Strategy (WO IM-2012-044) invited the public to nominate or recommend areas on public lands for Greater Sage-Grouse and their habitat to be considered as ACECs. Several nominations were received. Through the scoping process, numerous nominations were presented. It is also BLM policy to evaluate newly acquired lands, such as Burnt Hollow and the Welch Ranch to determine if they meet the ACEC criteria.

Potential Areas for Consideration as ACECs

Seven public nominated ACECs and the Cow Creek Breaks (Burnt Hollow) acquisition were initially analyzed in the PRB Final EIS (BLM 2003c). Six of the nominations were determined to meet the ACEC criteria. BLM also concluded that current management was sufficient to protect the relevant and important criteria but deferred any designation decisions until such time an amendment specific to their designation or revision of the Buffalo RMP is conducted (BLM 2003c). The areas evaluated in the PRB Final EIS include Cantonment Reno, Burnt Hollow, Dry Creek Petrified Tree, Face of the Bighorns, Fortification Creek Elk Area, Hell's Half Acre, Hole-In-The-Wall, and Pumpkin Buttes. Of these, the Face of the Bighorns and Hell's Half Acre were determined not to meet the criteria and were eliminated from further consideration. In addition to the areas identified in the 2003 PRB Final EIS, the Welch Ranch parcel, acquired in 2003, also merits consideration for designation as an ACEC. Finally, an ACEC to conserve the fragile sagebrush ecosystem is also being evaluated. Table 3.60, "Evaluation of ACEC Relevance and Importance Criteria" (p. 596) lists the citizen's ACEC proposals meeting BLM criteria, new acquisitions, and areas internally identified for further review, and the BLM determinations regarding relevance and importance.

Table 3.60. Evaluation of ACEC Relevance and Importance Criteria

Proposed ACECs	Relevance Criteria	Importance Criteria
Cantonment Reno	Significant historic values (Pioneer history and associated with Bozeman Trail).	Regional and national significance (one of few forts from the time period on public land); vulnerable to adverse change (unauthorized excavation).
Burnt Hollow	Scenic values; geologic features and natural hazards (steep erosive soils prone to flooding).	Public and management concerns for safety (flood potential).
Dry Creek Petrified Tree	Rare geologic features (excellent paleontological specimens on a site with public access).	Regional significance; fragile and irreplaceable qualities (paleontological specimens) which are vulnerable to adverse change.
Fortification Creek Elk Area	Scenic values and wildlife resources (yearlong, calving and crucial winter range of plains-based elk herd).	Rare qualities (plains-based elk herd) which are vulnerable to adverse change (high mineral potential); warrants protection to meet national priority concerns.
Hole-In-The-Wall	Significant historic (western lore associated with Butch Cassidy) and scenic values (panoramic views of the Red Wall/South Big Horns).	Distinctive historical and interpretive qualities; public concerns for management.
Pumpkin Buttes	Significant cultural and historic values (religious and cultural importance to Native Americans; used by early pioneers as a landmark destination); scenic values and unique geologic features (erosional remnants forming high buttes east of the Powder River).	Regional and national significance (Native American religious and cultural values) which are vulnerable to adverse change (wind and uranium potential; communication site).
Sagebrush Ecosystem	Significant wildlife values (Greater Sage-Grouse and other rare or special status sagebrush obligates) and natural systems (sagebrush ecosystem).	Sagebrush ecosystems are fragile and sensitive systems that provide essential habitat for several special status and rare species. Greater Sage-Grouse conservation is a national priority, and the proposed ACEC has been recognized as appropriate to maintaining sustainable Greater Sage-Grouse populations.
Welch Ranch	Important scenic value, important fish and wildlife resource, and presence of a natural hazard (active coal seam fire).	More than locally important qualities that give it special worth; coal seam fire creates management concerns about safety and public welfare.
ACEC Area of Critical Environmental Concern		

3.7.1.4. Trends

The PRB Final EIS (BLM 2003c) analyzed all of the potential ACECs with the exception of the Sagebrush Ecosystem and Welch Ranch. The PRB Final EIS concluded that present management was sufficient to protect the relevant and important ACEC values. The PRB Final EIS was an O&G project and therefore did not analyze all potential land use activities affecting ACEC values. Land uses such as renewable energy development, ROWs, and other mineral development could adversely affect ACEC values.

3.7.1.5. Key Features

Burnt Hollow (Cow Creek Breaks)

The BHMA is a recently acquired parcel totaling nearly 18,000 acres of BLM-administered lands

in northern Campbell County. The varied topography and diversity of vegetative communities is unique and provide habitat for numerous wildlife species including trophy class mule deer. A few of the ephemeral drainages support ecologically important cottonwood riparian communities. The area is comprised of gently rolling sagebrush-grasslands, ponderosa pine and juniper woodlands, scoria buttes, and clayey escarpments. Portions are roadless due to steep terrain and unstable soils. The lands are presently used for livestock grazing and wildlife habitat; mineral development is limited to a few abandoned drill holes. Cultural resources are also present in the area. Twenty-three cultural properties have been recorded in the vicinity. One occupation site has been determined eligible for listing on the NRHP; another is of unknown eligibility. Other prehistoric and historic era sites are known to exist in the area, but have not yet been recorded. The area is approximately 20 miles north of Gillette on Wyoming Highway 59. Most importantly, the area is one of the largest blocks of contiguous public land in Campbell County, and one of the only parcels in the county that possesses the size and naturalness to accommodate primitive and unconfined nonmotorized recreational opportunities.

The area meets the relevance criteria for scenic value and presence of a natural hazard due to steep erosive soils and flooding potential. Burnt Hollow meets the importance criteria because of public and management concerns about safety and public welfare (flooding potential) (BLM 2003c, Appendix R).

Cantonment Reno

Cantonment Reno is a 523 acre parcel on BLM surface on the site of a historic military supply fort established in 1876 on the Bozeman Trail. The fort had the capacity to house more than 350 soldiers and contained quarters, kitchens, mess houses, a hospital, storage buildings, and specialized facilities for cavalry. It was used as a supply depot for military campaigns, primarily against the Northern Cheyenne during the winter of 1876 to 1877. The U.S. Army abandoned the cantonment in 1878. The site retains well-defined features (foundations), contains numerous buried artifacts, and is noteworthy for the large amount of intact archeological information it contains. Hundreds of documents relating to the fort are on file at the National Archives, presenting numerous opportunities to answer research questions through site excavation.

Although there is no public access, there has been unauthorized excavation and collection at the site. The location is on a floodplain of the Powder River and might soon be exposed to erosion from an encroaching oxbow bend. The fluid minerals under the site have been leased, but there is a NSO stipulation for the entire proposed ACEC. There is extensive CBNG development a few miles to the east.

Cantonment Reno is the only military fort from the period of the Great Sioux War on BLM surface in the United States. The site meets relevance criteria because it is a rare and sensitive archeological resource. The site also meets importance criteria because it is directly associated with nationally significant historic events (the Great Sioux War), has qualities that give it significant special worth and distinctiveness, and has qualities that make it fragile and vulnerable to adverse change (BLM 2003c, Appendix R).

Dry Creek Petrified Tree

The Dry Creek Petrified Tree area is a 2,567-acre parcel that includes exposed specimens of petrified trees within a 40-acre environmental education site approximately 8 miles east of Buffalo. The site has public access, an interpretive trail, an outhouse, and a picnic shelter with tables. Tourists, local schools, and hunters use the area. The area is a PFYC Class 5 Area and contains excellent paleontological specimens.

The area meets relevance criteria for unique geologic feature and importance criteria for regional significance (used as an educational and tourist attraction) and fragile and irreplaceable qualities (paleontological specimens) which are vulnerable to adverse change (unauthorized removal of specimens) (BLM 2003c, Appendix R).

Fortification Creek Elk Area

The Fortification Creek area meets relevance criteria for scenic value and as a wildlife resource. It also meets the importance criteria for rare qualities (plains-based elk herd) which are vulnerable to adverse change (high mineral potential). The BLM deferred a decision on the citizen nomination within the PRB Final EIS (BLM 2003c) concluding that management was sufficient to protect the relevant and importance criteria. The Decision Record for the 2011 Fortification Creek RMPA/EA (BLM 2011c) made a final determination on the citizen nomination, again concluding that management was sufficient to protect the relevant and importance criteria. The Decision Record also identified that the citizen proposed boundary did not adequately represent the resources for which the ACEC was nominated. To better represent the relevant and important resource values, the boundary evaluated in the RMP revision is the BLM-administered lands within the crucial seasonal ranges (calving areas and crucial winter range).

The Fortification Creek area is comprised of rough prairie break topography bisected by several drainages. Typical vegetation is sagebrush-grassland intermixed with juniper. Elk were historically present in the area but were extirpated in the late 1800s. Today, a herd of approximately 200 elk resides year-round in the area as a result of reintroductions in the 1950s. The elk herd and its habitat have been affected by and encroached upon by CBNG development (BLM 2011c; BLM 2007g). The Fortification Creek area also contains a WSA, scenic values, steep slopes, highly erodible soils, and fragile watersheds (BLM 2003c, Appendix R).

Hole-In-The-Wall

Hole-in-the-Wall is approximately 20 miles southwest of Kaycee, Wyoming. It is a colorful and scenic red sandstone escarpment rich in legend of outlaw activity in the late 1800s, most notably Butch Cassidy and the Wild Bunch Gang. The "hole" is a gap in the Red Wall that, legend has it, outlaws secretly used to move horses and cattle from the area. The BLM has not identified or documented any historic sites on BLM surface in the area. Many of the historic features are on private lands and several key artifacts have been removed and placed in regional museums. However, the area remains a popular destination for travelers from outside the region and for commercial tours due to the recognizable name, notoriety, and relevance in western lore. The area is primitive in nature, with few visitor services. The BLM recently implemented several actions (creating a public viewing and parking area and trail head and installing interpretive signs) to protect the site and allow for public access.

Hole-in-the-Wall meets the relevance criteria for significant historical or cultural values and scenic value. The site meets the importance criteria for having distinctive historical and interpretive qualities; public concerns for management (BLM 2003c, Appendix R).

Pumpkin Buttes

Pumpkin Buttes is approximately 45 miles southwest of Gillette, rising approximately 800 feet above the surrounding landscape. The buttes consist of five flat-topped mesas referred to as North Butte, North Middle Butte, South Middle Butte, South Butte, and Indian Butte. The BLM administers most of the mineral estate under the buttes. All of South Middle Butte and half of North Middle Butte are BLM surface. There is no public access to the BLM surface on either butte, although the BLM purchased an administrative easement to South Middle Butte. South

Middle Butte is currently used as a communications site and includes six transmission towers. There are numerous mining claims for uranium or other minerals on and near the buttes, with one proposed uranium mining operation on BLM surface on North Middle Butte. There is extensive CBNG development around the buttes, and an existing oil field within 3 miles. A 200 turbine wind-energy development has been proposed on fee surface within 2 miles of the east side of the buttes.

Recent consultations with Native American tribes revealed that the buttes were utilized for many types of traditional, religious and ceremonial purposes. Indications of traditional and religious uses (e.g., stone circles, eagle traps, and cairns) remain on most of the buttes. In 2007, the BLM determined in consultation with 15 tribes that the Pumpkin Buttes has an ongoing connection to traditional beliefs and practices of several Native American tribes and designated the buttes as a TCP. During the consultation process, the tribes expressed a continued interest in using the buttes for ceremonial or educational purposes.

Pumpkin Buttes is also a prominent landmark associated with several historic events. All of the explorers of the PRB in the early and mid 19th Century mention the buttes in their journals. Jim Bridger is credited with naming Pumpkin Buttes in the 1850s. The buttes also are mentioned as a landmark in several emigrant diaries from travelers on the Bozeman Trail in the 1860s. The buttes had a role in Red Cloud's War and the Great Sioux War, as a lookout for the U.S. Army and Native American tribes.

The site meets the relevance criteria because it contains several rare and sensitive archeological resources, and is a significant religious and cultural resource important to several Native American tribes. The site meets the importance criteria because it has qualities that give it significant special worth and distinctiveness. The area also has qualities that make it fragile, sensitive, irreplaceable, and vulnerable to adverse change. The area also meets the importance criteria because it warrants protection to carry out FLPMA mandates (BLM 2003c, Appendix R).

Sagebrush Ecosystem

The Notice of Intent for BLM's national Greater Sage-Grouse Planning Strategy (WO IM-2012-044) invited the public to nominate or recommend areas on public lands for Greater Sage-Grouse and their habitat to be considered as ACECs. Numerous nominations were received. Greater Sage-Grouse are a management indicator species for sagebrush ecosystem health, meaning that they are dependent upon sagebrush ecosystems at a landscape scale for their survival and managing Greater Sage-Grouse habitat would conserve other rare and special status sagebrush dependent species. Greater Sage-Grouse populations have the greatest chance of persisting when landscapes are dominated by sagebrush and natural or human disturbances are minimal (Aldridge et al. 2008; Knick and Hanser 2011; Wisdom et al. 2011). The BFO is evaluating the public lands within 4.0 miles of Greater Sage-Grouse leks and winter concentration areas, an area of 467,897 acres or 60 percent of the BLM surface within the planning area. Management within 4 miles of critical habitat features is consistent with the National Technical Team recommendations (Taylor et al. 2012) for Greater Sage-Grouse conservation.

A sagebrush ecosystem ACEC meets relevance characteristics for conserving wildlife resource values and natural systems. Sagebrush ecosystems provide essential habitat that support several BLM special status species including the Greater Sage-Grouse, an ESA Candidate species. Additional BLM sensitive species dependent upon sagebrush ecosystems, and present within the planning area, include: Brewer's sparrow, sage sparrow, and sage thrasher. Sagebrush ecosystems are terrestrial plant communities that support multiple resources (soil, water, native vegetation,

biodiversity, rare and sensitive species, etc.) and land uses (recreation, livestock grazing, etc.) for which the BLM is responsible for sustainable management.

A sagebrush ecosystem ACEC meets importance characteristics for protecting a natural system and for meeting national priorities. Sagebrush ecosystems are fragile and sensitive systems that provide essential habitat for several special status or rare species. Sagebrush ecosystems and the rare and sensitive species that they support are vulnerable to adverse change. Sagebrush ecosystems have been fragmented in the planning area by energy development particularly CBNG. Greater Sage-Grouse conservation is a national priority, and the proposed ACEC has been recognized as appropriate to maintaining sustainable Greater Sage-Grouse populations. The PRB provides important genetic linkage between population strong holds in Montana (MZ I) and the Wyoming basins (MZ II).

Welch Ranch

The Welch Ranch Management Area is a 1,748-acre parcel approximately 10 miles north of Sheridan, Wyoming, along State Highway 338. The BLM acquired Welch Ranch in 2004 as part of a land exchange (BLM 2005f). The BLM administers all of the coal estate under the surface acreage of Welch Ranch and a portion of the O&G mineral estate. As a new acquisition, the BLM must evaluate the area as a potential ACEC. At least two homesteads (the Tryor homestead and the Evans homestead) were present on the property, which also historically included a post office. There also is evidence of prehistoric use, including lithic scatters and quarries. Current and historic uses include grazing; current management provides grazing from November through April. Approximately 1.5 miles of the Tongue River runs through the Welch Ranch. The riparian corridor is important migratory bird habitat and boasts excellent habitat for mule deer and other big game. The Tongue River is a red ribbon fishery, meaning it has regional importance. A free-flowing prairie river with easy public access from a major population center in Wyoming is extremely rare. Without special designation and management, public recreation visitation will degrade the importance and relevance criteria. Increased public awareness of riparian health will assist to improve the habitat through cooperative efforts and increase the species diversity and numbers of birds to the point that the area will be acknowledged as an Important Bird Area.

There is an active coal seam fire on a ridge in the southwestern corner of Welch Ranch. Historic records indicate that the coal seam fire began before 1940 (BLM 2003b), and while the origin is unclear, the fire is now considered to be part of the natural process. The OSM and specialists within the BLM have voiced concerns regarding human health and safety in relation to the coal seam fire and has suggested that special management might be necessary to prevent unsafe exposure to this hazard. Proposed abatement would have resulted in undue and unnecessary environmental degradation and was not expected to completely extinguish the fire.

The area meets the relevance criteria for scenic value, a fish and wildlife resource, and presence of a natural hazard (coal seam fire). The coal seam fire on the north side of the river is an important resource because it represents a threat to health and safety, influences plant and animal distribution and form, and represents historical mining operations. There are no known injuries from public interaction with the fire vents. Welch Ranch meets the importance criteria because it has more than locally important qualities that give it special worth and there are management concerns about safety and public welfare. Prairie riparian habitats represent less than one percent of the planning area. The Welch Ranch constitutes one of very few BLM-administered riparian areas and one of the few areas in Sheridan County with public access for fishing and boating. The combination of the rarity of the riparian habitat type, the accessibility of the location in near a population center, and high recreational use underscore the importance of Welch Ranch.

3.7.2. Scenic or Back Country Byways

3.7.2.1. Regional Context

The BLM began a National Back Country Byway Program in 1989 to focus on enhancing recreational opportunities. A National Scenic Byway System was subsequently created under Section 1047 of the Intermodal Surface Transportation Efficiency Act of 1991. This act recognized the BLM National Back Country Byway Program as a component of the National Scenic Byway System (section 1032, eligible projects). The objectives of the byway program include the following:

- Enhance opportunities for the American public to see and enjoy the unique scenic and historical opportunities on public lands.
- Foster partnerships at local, state, and national levels.
- Contribute to local economies.
- Enhance the visitor's recreation experience and communicate the multiuse management message through effective interpretative programs.
- Manage visitor use along the byway to minimize impacts to the environment and to protect visitors.
- Contribute to the National Scenic Byway System in a way that is uniquely suited to BLM-administered national public lands.

Transportation corridors with high scenic, historic, archeological, or other public-interest values are eligible for inclusion in the National Scenic Byway System. Byways are nominated through a collaborative process and are usually designated through RMPs. Proposed byways must have attractions important on a state and national basis. Many have recreational, historical, wildlife, educational, scientific, or cultural features. The entire route must have legal access. All state, federal, and local agencies with jurisdiction over road segments of the byway must agree to the designation.

While there are no BLM-administered National Byways within the planning area, there is one BLM-administered Back Country Byway, and another byway being evaluated just outside the planning area boundaries. The South Big Horns/Red Wall National Back Country Byway, administered by the Casper Field Office, traverses the South Big Horn Mountains in northwest Natrona County. The Worland Field Office is currently evaluating the Hazelton Road within Washakie County as a potential Back Country Byway in their RMP revision. Within the planning area there are three Scenic Byways administered by the Bighorn National Forest: Bighorn Scenic Byway (US 14), Cloud Peak Scenic Byway (US 16), and Medicine Wheel Passage Scenic Byway (US 14A).

3.7.2.2. Indicators

Management indicators would be the ability to meet the objectives for which the individual byways were designated.

3.7.2.3. Current Condition

At present, there are no BLM-administered National Byways in the planning area; six routes will be evaluated.

- **Hazelton Road** – This route traverses the spine of the Big Horn Mountains in western Johnson County from US 16 south to the Washakie County line (33 miles). If designated within the Buffalo and Worland Field Offices, the Hazelton byway would connect the Cloud Peak Scenic Byway to the South Big Horns/Red Wall National Back Country Byway. The route has a mixed land tenure including private (64%), BLM (18%), Bighorn National Forest (16%), and lands managed by the State of Wyoming (2%).
- **Slip Road** – A 15 mile route providing access to the southern Big Horn Mountains from Mayoworth northwest of Kaycee. The route is a stock driveway, and with the exception of 0.5 mile of state land the entire route is on BLM surface. The western terminus is the proposed Hazelton Back Country Byway.
- **Trabing and Sussex Roads** – These two routes follow 44 miles of the Bozeman Trail through southern Johnson County connecting Interstate 25 in the north to WY 192 in the south. There are several interpretive displays related to the Bozeman Trail along the route. The route has a mixed ownership including private (83%), BLM (11%), and lands managed by the State of Wyoming (6%).
- **Powder River Road** – This route parallels the Powder River for 73 miles from Interstate 90 to the Montana State line. The route has a mixed land tenure including private (88%), BLM (11%), and lands managed by the State of Wyoming (1%).
- **Rome Hill** – This is a short (3 miles) route in southwestern Johnson County running west from the proposed Hazelton Back Country Byway to the Washakie County line. The route has a mixed land tenure including private (82%), BLM (15%), and lands managed by the State of Wyoming (3%). Rome Hill Road is not being evaluated as a potential Back Country Byway in the Worland RMP revision.
- **Tipperary and Thompson Creek Roads** – This 37 mile route passes through mixed prairie and break landforms in eastern Johnson and Sheridan Counties connecting Interstate 90 with US 14/16. The route provides access to the Dry Creek Petrified Tree EEA and parallels a portion of lower Crazy Woman Creek. The route has a mixed land tenure including private (94%), BLM (3%), and lands managed by the State of Wyoming (3%).

All routes are natural surfaced well maintained routes passable to passenger vehicles.

3.7.2.4. Trends

National Byways were a popular program at the time of their creation. Funding has substantially decreased in recent years, popularity of the program has waned with the decreased funding. Byways appeal to the increasing segment of the public engaging in vehicle touring that prefers less traveled scenic back country routes to highway travel.

3.7.2.5. Key Features

The six routes exhibit the potential for designation as National Back Country or Scenic Byways. Public support and cooperation with the appropriate counties would be essential to designate any routes.

3.7.3. Wild and Scenic Rivers

3.7.3.1. Regional Context

In 1968, Congress passed the Wild and Scenic Rivers Act, thereby establishing the National WSR System for the purpose of preserving rivers with outstandingly remarkable values in a free-flowing condition for the benefit of present and future generations. The BLM was subsequently directed to evaluate waterways and provide recommendations of which public waterways under its administration meet the criteria for designation as WSRs (BLM 2012d). The WSR System is a system of congressionally designated rivers and their immediate environments that have outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural, and other similar values and are preserved in a free-flowing condition. The system consists of three types of rivers, as follows:

- Recreation – Rivers or sections of rivers that are readily accessible by road or railroad and that might have some development along their shorelines and might have undergone some impoundments or diversion in the past
- Scenic – Rivers or sections of rivers free of impoundments, with shorelines or watersheds still largely undeveloped but accessible in places by roads
- Wild – Rivers or sections of rivers free of impoundments and generally inaccessible except by trails, with watersheds or shorelines essentially primitive and waters unpolluted

The BLM is responsible for evaluating all rivers on BLM-administered land to determine if they are appropriate for addition to the System and, as appropriate, making recommendations for legislative actions to accomplish such additions. River or stream segments must be found eligible and suitable to be considered for designation as WSRs, and only Congress can designate segments.

3.7.3.2. Indicators

WSRs must meet certain eligibility and suitability criteria. According to BLM Manual 6400 – Wild and Scenic Rivers, to be eligible for designation as a WSR, a waterway must be free-flowing and it must possess one or more of the following outstandingly remarkable values: scenery, recreation, geology, fish, wildlife, historical, cultural, or other similar values. To be further considered for designation, a waterway must meet suitability requirements related to manageability, land tenure status, reasonably foreseeable potential uses of the river corridor, and considerations of cost of management.

3.7.3.3. Current Condition

The BFO completed an assessment of all waterways within the planning area in 1993 and 1994 (BLM 2001a) and documented the findings in Appendix G of the 2001 RMP Update. A WSR Final Review Report was completed for the planning area in 2003 (BLM 2003d). The WSR eligibility review report (BLM 2003d) is available on the BFO website (<http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo/docs.html>). Four waterways were determined to be eligible for WSR designation: Beartrap Creek, Middle Fork Powder River, North Fork Powder River, and Powder River (Cantonment Reno). However, only the Middle Fork Powder River was determined to be eligible and suitable for WSR designation (BLM 2003d) (Table 3.61, “Middle Fork Powder River Wild and Scenic River Values” (p. 604)).

Table 3.61. Middle Fork Powder River Wild and Scenic River Values

Suitable for Wild and Scenic River status (miles)	Tentative Classification	Outstandingly Remarkable Values	Current management	Mineral potential, leasable	Mineral potential, locatable	Mineral potential, salable
11.25 miles in Buffalo Field Office **Note: an additional ~1.2 miles of suitable and eligible waterway extends into the Worland Field Office	Wild	Scenic, Recreational, Historic Cultural, Fish and Wildlife (Class I fishery)	BLM manages the free-flowing condition, water quality, tentative classification, and any outstandingly remarkable values of suitable rivers in a manner that protects and/or enhances these conditions and values until congress designates the river or releases it for other uses per BLM Manual 6400	Low	Low; the portion within the Ed O. Taylor has been withdrawn from mineral entry	Very low
Source: BLM 2012f BLM Bureau of Land Management						

3.7.3.4. Trends

A site-specific interim management plan is in place to maintain the wild and scenic characteristics of the Middle Fork Powder River. Proposals to dam the Middle Fork Powder River have been submitted in the past, but have not been pursued and are not currently reasonably foreseeable.

3.7.3.5. Key Features

The BLM has determined that a portion of the Middle Fork Powder River (11.25 miles; 2,664 acres) meets the WSR suitability factors and should be managed to maintain or enhance their outstandingly remarkable values (BLM 2001a). The interim management prescriptions for suitable waterways in the Buffalo RMP planning area apply only to the waterway corridor of 11.25 miles of the Middle Fork Powder River and includes the waterway area, its immediate environment, and an average of no more than one quarter mile (1,320 feet) from the ordinary high water mark on both sides of the waterway. This boundary is preliminary and, by Section 3(b) of the WSRA, may vary on either side of the waterway and be narrower or wider as long as the total corridor width averages no more than 320 acres (half of a mile or 2,640 feet wide) per river mile, and can be delineated by legally identifiable lines (e.g., survey or property lines) or some form of on-the-ground physical feature (e.g., canyon rims, roads, etc.) which provide the basis for protecting the waterway's outstandingly remarkable values. Since the suitable waterway within the Buffalo RMP planning area (i.e., Middle Fork Powder River) is located within a deep canyon

that is capable of both supporting and protecting the identified outstandingly remarkable values, corridor boundaries for the Middle Fork Powder River are delineated by the canyon rims, except in cases where “rim-to-rim” exceeds an average of a half mile. Final boundary delineation would be made if and when Congress decides to designate the waterway segments under review.

The public lands along all 11.25 miles are tentatively classified as wild. Interim management practices for the BLM-administered parcels along the Middle Fork Powder River meeting the wild classification will focus on maintaining or enhancing the outstandingly remarkable scenic, recreational, cultural, historic, fishery, and wildlife values and maintaining the relatively primitive, pristine, rugged, and unaltered character of the area.

3.7.4. Wilderness Study Areas

3.7.4.1. Regional Context

In 1964, Congress passed the Wilderness Act, thereby establishing the National Wilderness Preservation System for the purpose of preserving lands in a natural condition for the benefit of present and future generations. Through FLPMA (Section 603), Congress directed the BLM to inventory, study, and recommend which public lands under its administration should be designated as Wilderness.

WSAs are areas determined to meet Wilderness eligibility requirements but for which Congress has not acted on the managing agency’s recommendation. WSAs often have special qualities, such as ecological, geological, educational, historic, scientific, and scenic values. They are managed in accordance with BLM Manual 6330 – Management of Wilderness Study Areas to prevent impairment of wilderness characteristics until Congress acts to designate such areas as Wilderness or release the areas from further study.

3.7.4.2. Indicators

WSAs must be managed in such a manner as to preserve unimpaired their wilderness characteristics as discussed in Section 2(c) of the Wilderness Act of 1964, and incorporated in FLPMA (Section 603), which states: “A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.”

The BLM performed inventories of roadless areas in the planning area in 1979 and made recommendations to Congress of areas potentially suitable for designation as Wilderness. These recommendations are based on factors such as the manageability of the area, how well it meets the characteristics of wilderness, conflicts or potential for conflicts with other users and uses, and other relevant factors.

3.7.4.3. Current Condition

While there are no congressionally designated Wilderness areas in the planning area, the BFO does manage three WSAs. The three BLM-administered WSAs in the planning area include Gardner Mountain, North Fork Powder River, and Fortification Creek (Map 75).

The BLM completed the Wyoming Statewide Wilderness Study Report in 1991 (BLM 1991b). In this study, the BLM inventoried and documented the features of all WSAs in Wyoming. In addition, each WSA was recommended or not recommended for designation as Wilderness. Regardless of the BLM recommendation, all WSAs included in the 1991 report continue to be managed as WSAs and must be addressed as WSAs in RMP revisions.

The BLM recommendations were incorporated in the 1985 Buffalo RMP. As of October 1, 2012, Congress had not acted on these recommendations. Congress requires the BLM to manage WSAs to preserve the wilderness characteristics under the non-impairment standard until Congress designates the lands under wilderness review as Wilderness, or releases the lands to uses other than Wilderness.

3.7.4.4. Trends

Congress has not taken action on the WSAs within the planning area since 1979. Given the historic, regional and political context of wilderness, Congress is not expected to take action regarding the WSAs during the life of this plan. BLM management continues to manage the WSAs within the Buffalo planning area to the non-impairment standard.

3.7.4.5. Key Features

Gardner Mountain WSA (WY-060-201)

The Gardner Mountain WSA, which encompasses approximately 6,423 acres with no state or private inholdings, is in Johnson County 40 miles southwest of Buffalo. The area is characterized by the rugged terrain of the southern Big Horn Mountains and dominated by ponderosa pine, Douglas fir, limber pine, scattered mountain mahogany, and meadows. Deep, steep-walled canyons of Beartrap Creek and the North Fork of the Red Fork Powder River are the dominant perennial water sources. The area provides winter habitat for elk and mule deer and other wildlife resources including mountain lions, black bears, turkeys, blue grouse, golden eagles, and red-tailed hawks, among others. Solitude, excellent fishing opportunities, wildlife-based recreation, historic landscapes, and naturalness are some of the wilderness opportunities in this WSA.

North Fork Powder River WSA (WY-060-202)

The North Fork Powder River WSA, which encompasses approximately 10,089 acres with no state or private in holdings, is in Johnson County 30 miles southwest of Buffalo. The area is dominated by two deep, rugged and scenic canyons – Pass Creek and North Fork Powder River. Vegetation in the steep terrain is dominated by ponderosa pine, Douglas fir, and limber pine, while mixed with open, native-grass covered areas. The area provides winter range for elk, is a pronghorn migration route, and provides habitat for black bear and a variety of other species and raptors. Solitude, excellent fishing opportunities, primitive and unconfined recreation, and naturalness are some of the wilderness opportunities in this WSA.

Fortification Creek WSA (WY-060-204)

The Fortification Creek WSA, which encompasses approximately 12,419 acres of public lands and one state-owned in holding of 640 acres, is 36 miles northeast of Buffalo in northeastern Johnson County and northwestern Campbell County. The area is representative of the Sagebrush Steppe ecosystem/Great Plains Shortgrass Prairie province. The landscape is steeply sloping, highly dissected, and gullied terrain. The main drainages are Bull Creek, Little Bull Creek, and Deer Creek. Vegetation consists of juniper, sagebrush, and grasses. Most of the WSA is considered crucial for elk, which use the area for winter and calving range because of the available forage and cover. Solitude, primitive and unconfined recreation, naturalness and unique landscapes are some of the wilderness opportunities in this WSA.

3.8. Socioeconomic Resources

3.8.1. Social Conditions

Social conditions concern the human communities in the planning area, including towns, cities, and rural areas; the customs, culture, and history of the area as it relates to human settlement; and current social values. Although BLM management actions in the planning area can affect counties outside the planning area through social interactions among those who live, work or have social connections with nearby counties, BLM expects effects of its management actions to primarily impact counties in the planning area. Counties outside the planning area were not included in this analysis.

This section describes population and demographics, customs, culture, and social trends.

3.8.1.1. Indicators

Social conditions are best described by a combination of quantifiable indicators and qualitative descriptions that, in combination, characterize the various social aspects of the planning area. Quantifiable social indicators used below include resident population, population change, and other demographic indicators. Qualitative descriptions include those of communities and infrastructure in the planning area, local governments and occupational and interest groups. Poverty indicators are presented in the *Environmental Justice* section.

3.8.1.2. Current Condition

Population and Demographics

Table 3.62, “Population Change by County, 2010” (p. 608) summarizes population information for the planning area counties in 2010; Table 3.63, “Populations of Towns in the Planning Area in 2010” (p. 608) lists populations for towns in the planning area in 2010. The most populous county in the planning area is Campbell County, with more than 46,000 residents in 2010. Sheridan County had approximately 29,000 residents, and Johnson County had approximately 8,500. The most populous cities in the planning area, in order of decreasing size, are Gillette (Campbell County), Sheridan (Sheridan County), and Buffalo (Johnson County).

Table 3.62. Population Change by County, 2010

Area	Population in 2010
Campbell County	46,133
Johnson County	8,569
Sheridan County	29,116
Wyoming	563,626
United States	308,745,538
Sources: U.S. Census Bureau 2012	

Table 3.63. Populations of Towns in the Planning Area in 2010

Town	Population in 2010
Arvada	43
Big Horn	490
Buffalo	4585
Clearmont	142
Dayton	757
Gillette	29,087
Kaycee	263
Parkman	151
Ranchester	855
Sheridan	17,444
Story	828
Wright	1,807
Sources: U.S. Census Bureau 2010b	

Gillette, Sheridan and Buffalo are located along the I-90 highway, which connects Buffalo to Gillette along a roughly west-east direction, and Sheridan to Buffalo along a northwest-southeast direction. A few other towns are less than ten miles off I-90 (e.g., Story, Big Horn and Ranchester in Sheridan County). US Highways 14/16 also connect Sheridan to Gillette on a slightly more northern route and a few other communities are located along this highway (e.g., Arvada, and Clearmont in Sheridan County). The two largest communities in the south of the planning area are Kaycee (along Wyoming State Highway 196, running south from Buffalo, in Johnson County), and Wright (along Wyoming Highway 59, running south from Gillette, in Campbell County). These two communities are connected by 74 miles of Wyoming routes 192 and 387, running roughly in the west-east direction.

Table 3.64, “Age Distribution by County, 2010” (p. 608) lists information about the population distribution by various age groups in 2010. Johnson and Sheridan counties had a slightly older age distribution than Campbell County, Wyoming, or the United States, as reflected in a higher median age; a lower proportion of residents in the younger age categories; and a greater proportion in the older age categories.

Table 3.64. Age Distribution by County, 2010

Area	Median Age	Percent of People by Age Category				
		Under 18	18 to 24	25 to 44	45 to 64	65 and Over
Campbell County	31.9	28	10	30	27	6
Johnson County	44.8	22	6	22	31	19
Sheridan County	41.9	22	8	23	31	16

Area	Median Age	Percent of People by Age Category				
		Under 18	18 to 24	25 to 44	45 to 64	65 and Over
Wyoming	36.8	24	10	26	28	12
United States	37.2	24	10	27	26	13

Source: U.S. Census Bureau 2012

Table 3.65, “Educational Attainment in 2010” (p. 609) summarizes educational attainment in each county in 2010. Compared to the United States, people in counties in the planning area are more likely to have a high school diploma, but less likely to have a 4-year college degree. Johnson County has the highest percentage of high school graduates and the highest percentage of 4-year college graduates. Among the three counties, Campbell County has the lowest percentage of 4-year college graduates.

Table 3.65. Educational Attainment in 2010

Area	Percent of People Age 25 and Over	
	High School Diploma	4-year College Degree
Campbell County	91.0	17.6
Johnson County	94.6	25.3
Sheridan County	92.7	23.1
Wyoming	91.3	23.6
United States	85.0	27.9

Source: U.S. Census Bureau 2010a

3.8.1.3. Trends

Customs, Culture, and Social Trends

This section describes the social development, culture, and history of the planning area to provide insight into how changes in the planning area might affect the livelihood and quality of residential life.

The first people to live in the planning area were Native American Tribes, including the Crow, Lakota/Dakota, Arapaho, Kiowa, Comanche, Blackfeet, Cheyenne, and Shoshone. The first European-American or white people in the area arrived in the early 1800s and included fur trappers, traders, and explorers (Johnson County 2005). Fur trapping became more prevalent in the 1820s and 1830s, but no large or permanent settlements had been built by the mid-1800s. Clashes between the United States military and the Native Americans increased in frequency and intensity in the 1860s and 1870s, due in part to the increased number of European-American migrants and settlers traversing the area (Johnson County 2005). A series of treaties in the late 1860s provided that the Lakota (Sioux) would be allowed to live on all of the land that is now Campbell County, along with the Powder River country and the Black Hills (Johnson County 2005; Campbell County 2007b). However, less than 10 years later the U.S. government decided to restrict the Lakota and other northern Plains tribes to smaller reservations so that the land could be opened for non-native settlers. After the U.S. military defeated and evicted the northern Plains Indians, white settlement began in the vicinity of the planning area in the late 1870s and early 1880s.

Johnson County was created in 1879, and included all of the land that is now Johnson County and Sheridan County and parts of present-day Big Horn and Washakie counties. Sheridan County was split off in 1887. Campbell County was created in 1911 from Weston and Crook counties. Homesteaders and ranchers comprised most of the first settlers. In 1892, Johnson County was the location of the “Johnson County War,” when a group of armed men were sent by powerful

cattlemen to confront small ranchers who were competing with them for the use of public grazing lands (Davis No Date). Farming remains an important aspect of the livelihoods of the local population. Table 3.66, “Farming in 2012” (p. 610) shows that there are over 1,500 farms in the three counties. These farms work with cattle, sheep, winter wheat, and alfalfa hay, among other products. Sheridan and Campbell counties rank among the top nine farming counties in the state in value of production (among 23).

Table 3.66. Farming in 2012

Area	Number of Farms ¹	Value of Livestock and Crop Production (\$ million)	Rank Among Wyoming Counties
Campbell County	633	113.6	9
Johnson County	319	76.3	18
Sheridan County	599	125.1	8
Source: National Agricultural Statistics Service 2013			
¹ Number of farms is for 2007.			

Oil exploration and production activities began in the planning area in the late 1880s, primarily in parts of Campbell County and in the Salt Creek Basin of Johnson County. Increased exploration activities by various companies in the Salt Creek Basin eventually led to the development of oil camps in neighboring Natrona County (Johnson County 2005). As settlement increased through the early 20th Century, mining, railroading, and agriculture formed the basis of the economy.

In 1923, Carter Oil Company developed some commercial quantities of natural gas in the Billy Creek field southwest of Buffalo, and from 1948 to 1956 several additional fields in Johnson County came into production (Johnson County 2005). However, oil production in Campbell County started relatively late, and in 1954 there was only one producing well in the entire county. Therefore, in Campbell County, agriculture continued as the largest employer until oil drillers discovered the vast PRB resources in the 1960s (Campbell County 2007b). Campbell County experienced a boom in oil development and production during the late 1960s and early 1970s; coal development followed almost on the heels of the oil boom. The late 1980s and early 1990s saw the beginning of CBNG development, which continues today (Johnson County 2005; Campbell County 2007b). Other minerals, including uranium and bentonite, have been important contributors to the economic development of the planning area. One of Wyoming’s three major production areas of swelling bentonite is along the flanks of the Big Horn Mountains (Johnson County 2005).

The use of natural resources on private, state, and federal lands provides the basis for continued social and economic stability in all three counties in the planning area. Agriculture, mining, mineral development and production, and tourism are directly related to the ability to use federal and state lands. Therefore, management decisions for federal lands and natural resources will have a ripple effect throughout the social and economic climate of the planning area (Campbell County 2007b). Quality of life is often associated with outdoor activities, recreation and western values, and outdoor recreation areas such as the Big Horn Mountains (Sheridan County Chamber of Commerce 2012; Campbell County No Date).

Occupation and interest groups present in the area include community development organizations, health and educational organizations, youth and senior citizen organizations, recreation organizations and business associations (National Center for Charitable Statistics 2012). Among the main industries represented in the Sheridan County, Buffalo and Campbell County Chambers

of Commerce are the O&G, coal, other mining, construction and retail industries (Sheridan County Chamber of Commerce 2013; Buffalo Chamber of Commerce 2013; Campbell County Chamber of Commerce 2011).

All three counties in the planning area have comprehensive land use plans that address existing and planned or hoped-for future conditions of transportation infrastructure and other elements. The Campbell County plan does not identify any issues associated with transportation infrastructure, although it does make clear that the county government will work to preserve ROWs for private property owners (Campbell County 2007b). The Johnson County plan notes that all county roads are functioning at acceptable levels of service, but also notes that one road (French Creek Road) extending northwest from Buffalo carries substantial traffic due to numerous subdivisions along that route. The plan predicts that due to new subdivisions planned along this corridor, maintenance and improvements of this road are expected to be issues of concern (Johnson County 2005). The Sheridan County plan identifies several new roadways proposed for the future, primarily around the towns of Big Horn and Sheridan, and an extensive network of bicycle trails and paths (Sheridan County 2008).

For other types of community infrastructure, including law enforcement, schools, and medical care, the Johnson County plan identifies a need for additional county government office space and a new law enforcement center (Johnson County 2005). The Sheridan County plan notes that rural areas in the county typically lack physical infrastructure such as sewer and water lines, and states that future development will occur only in areas that have the physical infrastructure to support it (Sheridan County 2008). It does not identify specific areas of deficient services in urban areas. The Campbell County plan does not address these types of community infrastructure.

Population

Table 3.67, “Population Change by County, 1970–2010” (p. 611) shows population growth in the counties of the planning area by decade, between 1970 and 2010. The data show how population growth in the planning area declined strongly from the 1970s to the 1980s, with negative growth in Johnson and Sheridan counties. Population growth picked up again in the next two decades, although at a slower pace.

Table 3.67. Population Change by County, 1970–2010

Area	Annual Percent Change				Percent Change 1970–2010	Annual Percent Change 1970–2010
	1970–1980	1980–1990	1990–2000	2000–2010		
Campbell County	6.5%	1.9%	1.4%	3.2%	256.0%	3.2%
Johnson County	1.8%	-0.9%	1.4%	1.9%	53.4%	1.1%
Sheridan County	3.4%	-0.6%	1.2%	0.9%	63.1%	1.2%
Wyoming	3.5%	-0.3%	0.9%	1.3%	69.6%	1.3%
United States	1.1%	0.9%	1.2%	0.9%	51.9%	1.1%

Source: Wyoming Department of Administration and Information 2013; U.S. Census Bureau 2012

Table 3.68, “Population Change of Towns in the Planning Area, 2000–2010” (p. 612) shows population growth in towns in the planning area between 2000 and 2010. The table shows towns grew at considerably different paces during that decade.

Table 3.68. Population Change of Towns in the Planning Area, 2000–2010

Town	Percent Change 2000–2010	Annual Percent Change 2000–2010
Arvada	30.3%	2.7%
Big Horn	147.5%	9.5%
Buffalo	17.6%	1.6%
Clearmont	23.5%	2.1%
Dayton	11.7%	1.1%
Gillette	48.1%	4.0%
Kaycee	5.6%	0.5%
Parkman	10.2%	1.0%
Ranchester	22.0%	2.0%
Sheridan	10.4%	1.0%
Story	-6.7%	-0.7%
Wright	34.1%	3.0%
Sources: U.S. Census Bureau 2000; U.S. Census Bureau 2010b		

The Wyoming Economic Analysis Division (2010a; 2010b) provides forecasts of population for planning area counties and some towns. Table 3.69, “Population Forecasts through 2030” (p. 612) summarizes available information from this source. The data suggest that Campbell County will grow fastest, with a growth rate double that of the state. Johnson County will also grow above the rate of the state as a whole, with Buffalo and Kaycee growing about as fast as the rest of the county. Sheridan County will continue to grow at a rate below that of the state as a whole.

Table 3.69. Population Forecasts through 2030

Area	Population (Actual or Forecasted)				Percent Change 2010-2030	
	2000	2010	2020	2030	Overall	Average Annual
Campbell County	33,698	46,133	56,890	66,060	43	1.8
Gillette	19,646	29,087	35,869	41,651	43	1.8
Wright	1,347	1,807	2,228	2,588	43	1.8
Johnson County	7,075	8,569	9,450	10,450	22	1.0
Buffalo	3,900	4,585	5,056	5,591	22	1.0
Kaycee	249	263	290	321	22	1.0
Sheridan County	26,560	29,116	31,380	33,520	15	0.7
Clearmont	115	142	153	163	15	0.7
Dayton	678	757	816	872	15	0.7
Ranchester	701	855	921	984	15	0.7
Sheridan	15,804	17,444	18,800	20,083	15	0.7
Wyoming	493,782	563,626	622,360	668,830	19	0.9
Sources: Wyoming Economic Analysis Division 2010a; Wyoming Economic Analysis Division 2010b						

The Johnson, Campbell, and Sheridan comprehensive plans discuss forecasted conditions and planned coordination to varying degrees. The most important element for BLM purpose in this analysis is that all three counties emphasize the importance of coordination with the BLM and other federal land management agencies. For example, the Sheridan County plan states that the county will cooperate with and provide guidance to federal and state agencies that manage land and resources regarding regional issues of concern, including social and economic issues (e.g., substantial natural resource development) and others (e.g., water quality from CBNG development) (Sheridan County 2009). The Johnson County plan identifies three key concerns

related to BLM-administered land and resources, all related to the continued availability of public lands for livestock grazing and the policies that affect the management of federal grazing allotments (Johnson County 2005). The Campbell County plan calls on federal and state land managers to recognize the customs, culture, economic viability, social structure, and quality of life of the citizens of Campbell County in their planning actions (Campbell County 2007b).

Note that federal law (43 CFR 1610.3) requires the BLM to prepare plans that are consistent with officially adopted local land use plans, identify inconsistencies with proposed BLM plans and local plans to the Governor, and take practical steps to resolve conflicts between federal and local plans. These requirements apply only if local governments notify the BLM that a local land use plan has been adopted (Johnson County 2005).

3.8.2. Economic Conditions

Economic analysis is concerned with the production, distribution, and consumption of goods and services. This section summarizes economic information, including trends and current conditions, for the planning area. It also identifies and describes major economic sectors in the planning area that can be affected by BLM management actions.

Economic conditions in individual communities in the planning area are integrally linked to those of other communities, both inside and outside the planning area. For example, businesses in some cities outside the planning area, such as Billings and Casper, provide services and labor to CBNG developers in the planning area. Similarly, some of the people who recreate in the Big Horn Mountains and other areas come from outside the planning area. Therefore, economic conditions outside the planning area indirectly affect the economy in the planning area, and BLM management actions in the planning area can affect economic conditions outside the planning area. However, because economic effects of BLM management actions would primarily impact the planning area, the AMS for economic conditions focuses on three counties in the planning area.

3.8.2.1. Indicators

As in the case of social conditions, economic conditions are also best described by a combination of quantifiable indicators and qualitative descriptions. Quantifiable economic indicators used below include income and labor earnings, employment and unemployment, housing availability and prices and tax collections. Earnings and employment are presented by industrial sector, when possible. Additional quantitative indicators, as well as qualitative aspects, are used to further describe important industrial sectors on BLM-administered lands and/or for the planning area (e.g., O&G, travel and tourism, livestock farming). Interrelationships among producing sectors are captured in the Chapter 4 impacts analysis by the use of the IMPLAN model. For an additional description of this model, see Appendix U (p. 2589). A qualitative description of non-market values associated with BLM-administered lands is also included.

3.8.2.2. Current Conditions and Trends

Mining, Including Oil and Gas

Mining and mineral production constitutes most of the economic activity in the planning area. Table 3.70, “Estimated Mineral Production and Value by County in the Buffalo Planning Area in 2010” (p. 614) summarizes the quantity and value of mining production in counties in the planning

area, and for the state as a whole, in 2010. Economically, the largest contributors to mining activity are oil and coal in Campbell County, and gas in all three counties. Most coal produced in Wyoming in 2010 was from Campbell County, and almost one-third of the sand and gravel produced in the state was from the three planning area counties. The *Mineral Resources* section of this chapter provides additional information about mineral resources in the planning area.

Because the BLM administers subsurface mineral resources in excess of the surface lands it administers, its decisions impact mining in the planning area (see the *Mineral Resources* section for more detail). From an economic perspective, mining is a key contributor to the economic wellbeing of the planning area; therefore, BLM management decisions in this area could impact economic conditions.

Table 3.70. Estimated Mineral Production and Value by County in the Buffalo Planning Area in 2010

Mineral	Campbell County	Johnson County	Sheridan County	Wyoming
Production or Sales (units)				
Oil (barrels sold)	6,395,812	539,283	6,103	37,410,583
Gas (thousand cubic feet sold)	137,140,505	349,220,009	52,323,923	2,429,249,686
Coal (tons)	401,618,421	0	0	438,751,440
Uranium (pounds produced)	0	0	0	1,711,712
Sand and gravel (tons)	2,630,827	728,238	245,755	11,993,124
Bentonite (tons)	0	412,654	0	4,453,282
Decorative stone (tons)	0	67	0	5,959
Taxable Valuation (\$ millions)				
Oil	397	33	0	2,332
Gas	432	1,023	172	7,601
Coal	3,528		0	4,020
Uranium	0	0	0	33
Sand and gravel	4	1	0	23
Bentonite	0	3	0	64
Decorative stone	0	0	0	0

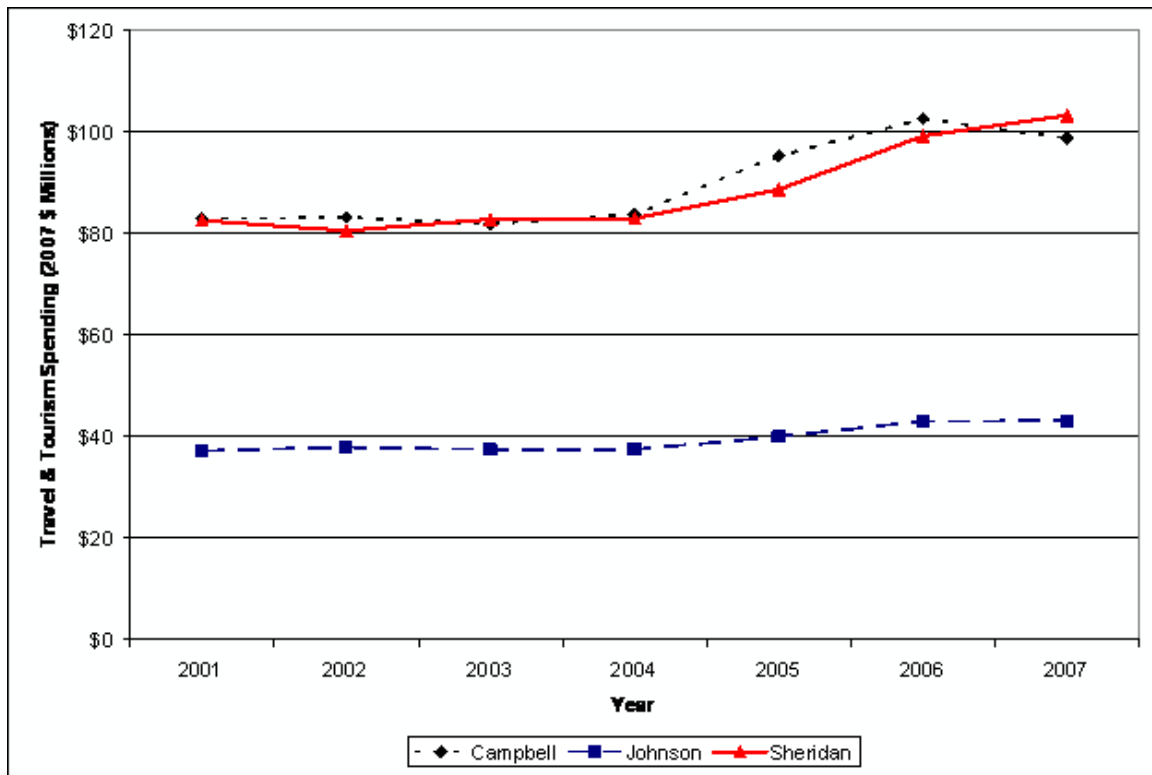
Source: Wyoming Department of Revenue 2011. Data are for year 2010.

Travel, Tourism, and Recreation

Federal lands in the planning area provide a broad spectrum of outdoor opportunities for planning area residents and visitors. Recreation on public lands also provides economic benefits. Recreation service providers (e.g., hotels, outfitters, equipment manufacturers and dealers, and restaurants) depend on public lands, in part, for their livelihood. The approximately 800,000 acres of BLM surface in the planning area receive approximately 31,400 visits per year (BLM 2008a). Most recreational users of BLM surface are Wyoming residents. The towns of Sheridan, Buffalo, Gillette, Wright, and Kaycee all have public lands bordering them that are used as “backyard” recreation areas by local residents. However, visitors from outside Wyoming come to the planning area from all over the United States and from international locations. Visitors to the planning area come because of the central location (with Yellowstone National Park and the Bighorn National Forest to the west, Montana to the north, the Black Hills to the east, and Colorado to the south) and the historic and cultural resources. Hunting, fishing, target shooting, and vehicle touring are among the most common recreational activities on BLM-administered lands in the planning area. Therefore, BLM-administered lands contribute to economic values in the planning area, albeit

mainly for local residents and those traveling through to use recreational areas administered by the USFS, the National Park Service, or other agencies.

Figure 3.25, “Travel and Tourism Spending in the Planning Area” (p. 615) shows travel and tourism spending in the planning area. In real terms, travel and tourism spending was steady from 2000 to 2004 and increased slightly from 2004 to 2006, with some decline after 2006, more pronounced in Sheridan County. The figure does not distinguish travel for business from travel for pleasure; however, a recent study by the Wyoming Office of Travel and Tourism indicates that statewide in recent years, most trips (e.g., 98% in 2006) are due to tourism for pleasure (Wyoming Travel and Tourism 2007).



Source: Dean Runyan Associates 2006; adjusted for inflation using Wyoming Economic Analysis Division 2012a

Figure 3.25. Travel and Tourism Spending in the Planning Area

Livestock Grazing

The BLM is responsible for administering livestock grazing on public land surface across the planning area. Livestock grazing includes the grazing of domestic animals (e.g., cattle, sheep, horses, yaks, and bison). The BFO manages livestock grazing on 782,102 acres. This acreage incorporates 427 grazing leases, authorizing approximately 106,078 AUMs of livestock forage in 477 grazing allotments. Four hundred livestock operators use public lands in the planning area in Campbell, Johnson, and Sheridan counties; most of the public lands are in Johnson County. The BFO also administers grazing use for public lands within the boundaries of adjacent BLM Field Offices through cooperative management agreements.

Livestock grazing on allotments is authorized during various times throughout the year depending on management objectives. In addition to the allotments, the BFO manages two major stock

driveway systems – Kaycee (28.5 miles) and Hazelton Road (51.2 miles). These two stock driveways include segments of other trails, which for administrative purposes are considered part of the main stock driveway. The stock driveways are mostly fenced lanes.

BLM-administered grazing allotment fees are lower on average than state or private lands. The federal grazing fee has been kept at \$1.35 per AUM from 2007 to 2012 (Vincent 2012). For comparison, grazing fees on state land were \$4.78 per AUM in 2006, \$5.17 per AUM in 2007, and \$5.21 in 2008 (Pannell 2008). The average grazing rate on privately owned non-irrigated land in Wyoming was \$16.00 per AUM in 2009, \$16.64 in 2010, and \$15.70 in 2008 (National Agricultural Statistics 2011).

However, the lower lease fees correspond to potentially greater use restrictions and responsibilities for the lessee. For example, federal grazing leases typically restrict the number and species of animals that may be grazed, while on private leases, there is normally no penalty for grazing more than the agreed-upon numbers of animals (USFS and BLM 1992). However, if running more animals on a private lease results in overgrazing, the landowner might not be willing to renew the lease, because if the lessee fails to maintain the condition of the property the agreement can be terminated (USFS and BLM 1992). Federal leases also tend to be less flexible than private leases regarding adjusting turnout and roundup dates (USFS and BLM 1992). In addition, there are differences in relation to construction and maintenance of rangeland improvements such as fences and water developments, although a perfect comparison is not possible because there are different specifications that vary for specific private leases. On federal leases, construction of improvements can be done in a variety of ways, and expenses other than materials could be the responsibility of the lessee; the lessee also is generally responsible for maintaining the improvements. On private leases, the landowner typically bears a substantial part of the cost of major range improvements and typically pays for revegetation (USFS and BLM 1992).

In addition, lessees on privately held land may have more influence in negotiating agreements related to access and land development. For instance, in some cases lessees have the ability to help negotiate any agreements regarding a Plan of Development for oil or gas exploration or production, and depending on the agreement may receive surface damage payments from an O&G operator. Lessees of private land may also have more ability to negotiate over public access to the land they lease.

Taylor et al. (2004) analyzed the importance of BLM-administered land for livestock grazing in nearby Fremont County using a simulated enterprise-level ranch budget. Taylor et al. (2004) stated that most ranches typically depend only partially on federal land grazing for forage, but this forage source is a critical part of their livestock operations because of the seasonal dependency, even when the proportion of acres of AUMs contributed by federal land grazing is relatively small for the operation. Much of a ranch's private land is used as hay ground to produce hay for winter feeding. Using hay acreage to feed cattle during the summer means a ranch has to purchase hay for the winter. The rigidity of seasonal forage availability means that the optimal use of other forages and resources are affected when federal AUMs are not available (Taylor et al. 2004). These authors and many others in studies they reviewed from 1975 through 2002 found that potential reductions in income and net ranch returns are greater than the direct economic loss from reductions in federal grazing.

Table 3.71, "Farm Income in 2011" (p. 617) summarizes farm income in the planning area counties. In all three counties, livestock and livestock products contribute the most of the gross farm income (at least 74%). Government payments contribute a very small amount. Although

gross income in the three counties together amounted to \$152 million in 2011, net income after expenses was negative in all three counties (and marginally positive in Campbell County if the variation in the value of inventories is considered). This fact highlights the marginal profitability of farm and ranch operations in the planning area counties, and suggests that even apparently small changes in BLM forage, other resources available to farms and ranches, or prices for inputs or products could adversely impact their viability.

Table 3.71. Farm Income in 2011

Farm Income (2011 \$ thousands)	Campbell County	Johnson County	Sheridan County
Gross income (\$)	51,877	38,540	61,996
Percent of income from livestock	79	74	76
Percent of income from crops	10	9	15
Percent of income from other sources ¹	8	17	9
Percent of income from government payments	4	1	1
Net income (\$)	-4005	-7,897	-22,858
Net income including inventory change (\$)	213	-5,411	-19,171
Source: Bureau of Economic Analysis 2012a			
¹ Includes the value of home consumption and other farm-related income components, such as machine hire and custom work income and income from forest products. This category also includes royalty payments from oil and gas producers to farmers when oil and gas development occurs on farm lands (Kennedy 2008).			
\$ U.S. Dollars			

Personal Income

This section describes personal income in the planning area. Table 3.72, “Personal Income and Earnings by Place of Work, 2011” (p. 618) summarizes the sources of personal income by place of work and county in the planning area. The table highlights county-level differences in the importance of various economic sectors, and the contribution of non-wage income, specifically dividends, interest, and rent, to personal income. In Campbell County, mining contributes almost two-fifths of total earnings by place of work, which is almost three times the contribution of any other sector. The next largest sectors are government (14%) and construction (9%). Campbell County also has a relatively low contribution from non-wage income and half of that of Johnson and Sheridan counties. Johnson and Sheridan counties have a relatively large share of income from mining; it is the third largest sector in both counties, with government employment contributing the largest share in each county followed by construction.

In all three counties, farm income contributes a very small share of earnings; in 2011, net farm income was negative in all three counties owing to expenses that exceeded gross income (Table 3.71, “Farm Income in 2011” (p. 617)). Agricultural services, such as custom tillage, may contribute as well, but the amount is no more than 2 percent in each of the three planning area counties.

The Bureau of Economic Analysis (BEA) data used to create Table 3.72, “Personal Income and Earnings by Place of Work, 2011” (p. 618) do not readily distinguish recreation earnings because these earnings can occur in a variety of sectors, including retail trade, accommodation and food services, and hunting, fishing, and trapping (included in the same row as logging and agricultural services). Subsequent tables and text provide available information on expenditures and sales tax receipts from activities related to travel and tourism, which serve as the closest approximation for recreation.

Table 3.72. Personal Income and Earnings by Place of Work, 2011

Item/Sector	Campbell County (Wyoming)	Johnson County (Wyoming)	Sheridan County (Wyoming)	Wyoming	United States
Population	46,618	8,642	29,239	568,158	311,591,917
Total personal income (\$ millions)	2,218	352	1,485	27,214	12,949,905
Dividends, interest, and rent as a percent of total personal income	17	34	34	24	16
Earnings by place of work (\$ millions) ¹	2,114	185	804	19,112	9,454,199
Percent of total earnings by place of work by sector					
Farming	0	1	0	1	1
Fishing, logging, and related activities, including agricultural services ²	0	2	1	0	0
Mining	38	8	4	16	1
Utilities	2	1	1	2	1
Construction	9	16	10	9	5
Manufacturing	2	1	2	4	10
Wholesale trade	7	2	2	3	5
Retail trade	4	6	8	6	6
Transportation and warehousing	5	5	8	5	3
Information	0	1	1	1	3
Finance and insurance	1	2	2	3	8
Real estate and rental and leasing	1	2	3	2	2
Professional and technical services	3	4	6	4	10
Management of companies and enterprises	2	0	0	1	2
Administrative and waste services	2	1	2	2	4
Educational services	0	n/a ³	0	0	2
Health care and social assistance	3	n/a ³	11	7	11
Arts, entertainment, and recreation	0	2	1	1	1
Accommodation and food services	2	5	4	4	3
Other services, except public administration	4	4	4	3	4
Government and government enterprises	14	31	28	24	18

Item/Sector	Campbell County (Wyoming)	Johnson County (Wyoming)	Sheridan County (Wyoming)	Wyoming	United States
Categories for which data were not disclosed	1	1	1	1	1
Source: Bureau of Economic Analysis 2012a; Bureau of Economic Analysis 2012b					
¹ Earnings by place of work differs from total personal income by the exclusion of dividends, interest, and rent, as well as adjustments to account for net transfer payments (e.g., unemployment benefits and Social Security taxes and payments) and the residential adjustment.					
² “Related activities” includes hunting and trapping, as well as agricultural services such as custom tillage.					
³ Data were not disclosed due to confidentiality reasons (BEA does not report data when there are three or fewer employers in a sector). The line item “Categories for which data were not disclosed” shows the total income attributable to these categories for each county.					
n/a not available					

Table 3.73, “Earnings and Employment for Mining Activities (2010)” (p. 620) provides a summary of mining-related earnings and employment for the planning area counties for 2010. As the table shows, coal mining accounts for the majority of mining employment in Campbell County, while mining support activities are important in all three counties. O&G extraction and related support activities contribute some employment and earnings in all three counties, principally Campbell and Sheridan.

Table 3.73. Earnings and Employment for Mining Activities (2010)

Source	Campbell County		Johnson County		Sheridan County	
	Payroll (\$)¹	Employees	Payroll (\$)¹	Employees	Payroll (\$)	Employees
Mining	575,010,000	7,571	5,199,000	111	12,661,000	246
Oil and gas extraction	71,928,000	798	n/a²	0 to 19	9,353,000	178
Mining (except oil and gas)	428,407,000	5,503	n/a²	20 to 99	n/a²	0 to 19
Coal mining	428,407,000	5,503	0	0	0	0
Metal ore mining	0	0	0	0	0	0
Nonmetallic mineral mining and quarrying	0	0	n/a²	20 to 99	n/a²	0 to 19
Mining support activities	74,675,000	1,270	4,221,000	87	3,162,000	20 to 99
Drilling oil and gas wells	27,092,000	482	1,439,000	0 to 19	759,000	25
Oil and gas operations support activities	44,490,000	718	2,749,000	20 to 99	2,356,000	20 to 99
Support activities for coal mining	2,825	62	n/a²	0 to 19	0	0
Support activities for metal mining	n/a²	0 to 19	0	0	0	0
Nonmetallic minerals support activity (except fuels)	n/a²	0 to 19	0	0	n/a²	0 to 19

Source: U.S. Census Bureau 2010c. Number of employees is for week ending March 12, 2010. Payroll data are for the entire year.

¹For most sectors, the data source reveals a range rather than an exact number of employees so as not to disclose confidential business information (because there are relatively few employers in the sector).
²The data source does not reveal data on payrolls for this sector due to confidentiality requirements (there are relatively few employers in the sector).

\$ U.S. Dollars
n/a not available

Employment

Table 3.74, “Employment by Sector, 2011” (p. 622) summarizes employment by sector for the counties in the planning area. The breakout is comparable to the earnings table above, with substantial portions of employment derived from mining, construction, and government.

However, the differences between the two tables highlight the divergence in earnings per job in different sectors. For example, whereas mining contributes 38 percent of earnings in Campbell County, it contributes proportionally fewer jobs (27%), which illustrates the relatively high wages per job in the mining sector in that county. Similarly, retail trade accounts for 9 percent of jobs in Johnson County and 11 percent of jobs in Sheridan County, but contributes just 6 percent of earnings in Johnson County and 8 percent in Sheridan County. This divergence indicates that wages per job in this sector are relatively low, either because of lower wages per hour or because some jobs in the sector are seasonal or part-time.

Table 3.74. Employment by Sector, 2011

Sector	Campbell County (Wyoming)	Johnson County (Wyoming)	Sheridan County (Wyoming)	Wyoming	United States
Farm employment (%)	2	7	4	3	1
Fishing, hunting, logging, and related activities, including agricultural services (%) ¹	0	2	1	1	0
Mining (%)	27	8	4	9	1
Utilities (%)	1	0	0	1	0
Construction (%)	9	9	8	7	5
Manufacturing (%)	2	1	2	3	7
Wholesale trade (%)	5	2	2	3	3
Retail trade (%)	8	9	11	10	10
Transportation and warehousing (%)	4	3	4	4	3
Information (%)	1	1	1	1	2
Finance and insurance (%)	2	5	5	4	5
Real estate and rental and leasing (%)	2	8	5	5	4
Professional and technical services (%)	3	4	6	4	7
Management of companies and enterprises (%)	1	n/a	0	0	1
Administrative and waste services (%)	3	3	3	3	6
Educational services (%)	0	n/a	1	1	2
Health care and social assistance (%)	4	n/a	9	7	11
Arts, entertainment, and recreation (%)	1	2	2	2	2
Accommodation and food services (%)	6	9	8	8	7
Other services, except public administration (%)	5	4	5	5	6
Government and government enterprises (%)	15	17	18	19	14
Categories for which data were not disclosed (%)	0	5	0	0	0
Total employment (number of jobs)	32,446	6,013	19,782	391,484	175,834,700
Source: Bureau of Economic Analysis 2012a; Bureau of Economic Analysis 2012b					
¹ “Related activities” includes hunting and trapping, as well as agricultural services such as custom tillage					
% percent					
n/a not available					

Table 3.75, “Average and Median Income; Average Earnings Per Job” (p. 623) shows three different measures of earnings and income for the planning area counties using the most recent available data. Average earnings per job are highest in Campbell County, as is median household income; in Johnson and Sheridan counties, both of these measures are lower than in Wyoming, and average earnings per job are lower than in the United States. Per capita income, however, is higher in all three counties than the national figure, and is highest in Sheridan County. The relative difference between average earnings per job (which measures employment income only) and per capita income (which also includes dividends, interest, rent, and transfer payments such as Social Security) in Johnson and Sheridan counties underscores the importance of non-wage income in these counties, which is also identified above in the earnings data.

Table 3.75. Average and Median Income; Average Earnings Per Job

Area	Per Capita Income (2011) (\$)	Average Earnings Per Job (2011) (\$)	Median Household Income (2011) (\$)
Campbell County	47,584	56,270	70,438
Johnson County	40,786	33,358	53,577
Sheridan County	50,803	38,866	53,217
Wyoming	47,898	44,033	56,044
United States	41,560	48,301	50,502
Sources: Bureau of Economic Analysis 2012a (per capita income and average earnings per job); U.S. Census Bureau 2011b (median household income)			
\$ U.S. Dollars			

Table 3.76, “Unemployment Rate in 2008 through April 2011 (Percent)” (p. 623) lists the unemployment rate for counties in the planning area compared to state and national levels. As the table shows, unemployment in the planning area counties from 2008 through April 2011 was lower than in the United States and comparable to the statewide rate (slightly higher in Johnson, and lower in Campbell and Sheridan counties). Unemployment in Campbell County has remained lower than the statewide rate by approximately one percentage point. The unemployment rate was highest in 2010 in the planning area, Wyoming, and in the country as a whole, and fell slightly in 2011.

Table 3.76. Unemployment Rate in 2008 through April 2011 (Percent)

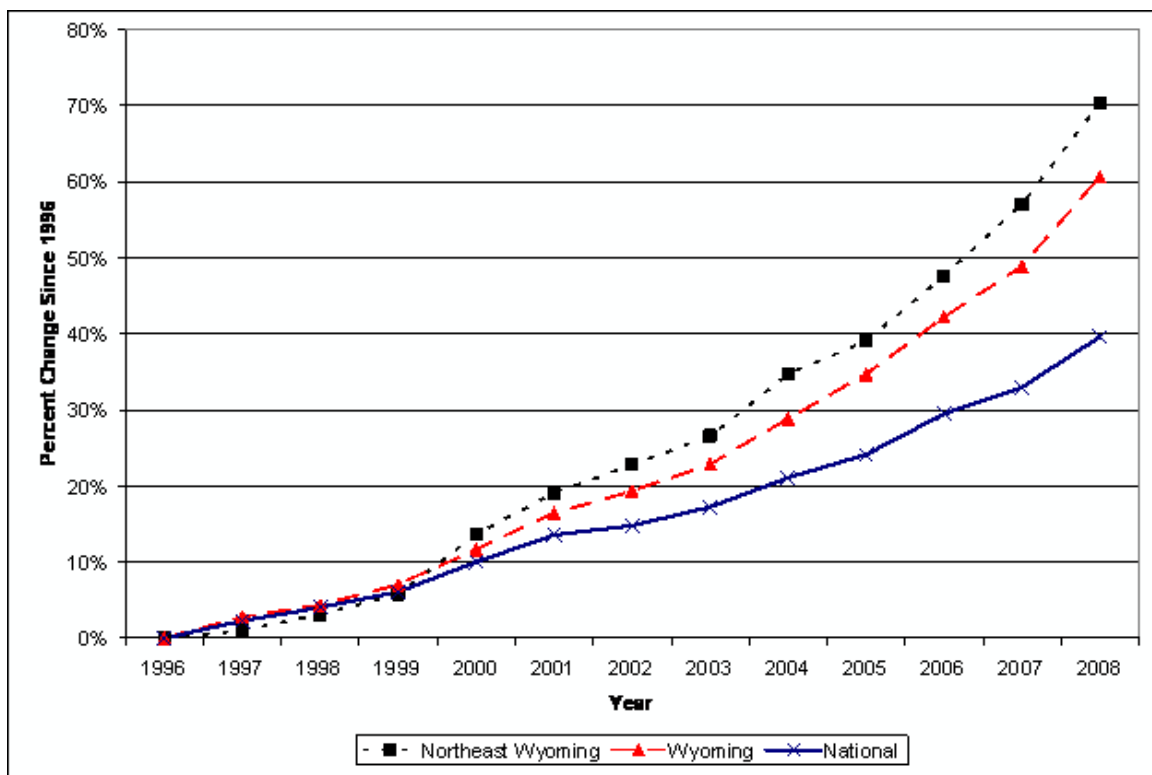
Area	2008 (annual average)	2009 (annual average)	2010 (annual average)	2011 (annual average)
Campbell County	2.0	5.4	6.0	4.6
Johnson County	3.3	7.5	8.2	7.1
Sheridan County	3.1	6.8	7.7	6.9
Wyoming	3.1	6.3	7.0	6.0
United States	5.8	9.3	9.6	8.9
Sources: Bureau of Labor Statistics 2012a; Bureau of Labor Statistics 2012b				

Cost of Living

One factor that affects economic and social trends in communities is the cost of living. The Wyoming Economic Analysis Division calculates relative changes in cost of living over time by estimating the cost of a set of goods and services that represents the average consumer’s purchases for housing, food, health care, travel costs, and other items. If the cost of living for a particular area increases faster than average income, that could mean that longtime residents, especially those on fixed incomes, could find their lifestyles less affordable over time. Over the long term,

a higher cost of living could encourage people to move out of a community and discourage people from moving into the community in conjunction with employment opportunities. Overall migration into the area will likely decrease, and the demographic and socioeconomic characteristics of those who move in will be determined partially by the cost of living in the area.

The Wyoming Economic Analysis Division (2012a) calculates the change in the cost of living over time for a five-county region in northeast Wyoming, consisting of Campbell, Crook, Johnson, Sheridan, and Weston counties. Figure 3.26, “Cost-of-Living Trends in Northeast Wyoming, the State of Wyoming, and the United States” (p. 624) shows how the cost of living in northeast Wyoming has changed in relation to the cost of living in Wyoming generally and in the United States. Starting in about 2000, the cost of living in the northeast region and Wyoming as a whole began to increase at a greater rate than the cost of living in the United States. The cost of living in the northeast region has risen slightly faster than the cost of living in the state as a whole, but only slightly.



Source: Wyoming Economic Analysis Division 2012a

Figure 3.26. Cost-of-Living Trends in Northeast Wyoming, the State of Wyoming, and the United States

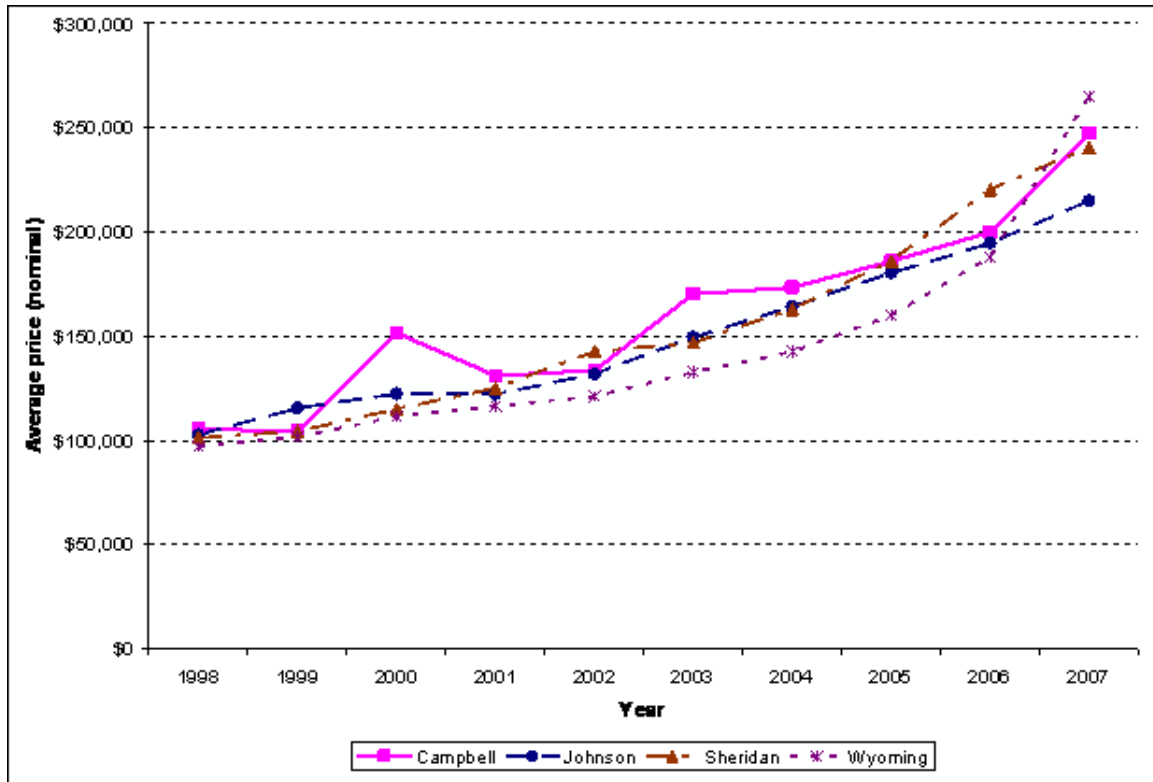
Housing

Table 3.77, “Average Housing Price, 1998-2011” (p. 625) lists average housing prices for the planning area counties from 1998 to 2011 based on sales of existing, detached single family homes on 10 acres or less sold during the previous calendar year (WHDP 2009; WHDP 2012). Figure 3.27, “Average Housing Price, 1998 through 2011” (p. 625) shows the same information graphically. The table and figure show that housing prices in the planning area counties have increased or decreased generally at the same rate, and at approximately the same rate as statewide.

From about 2004 through 2007, housing prices increased at a faster rate than from 1998 through 2003, but then declined slightly with the recent economic downturn.

Table 3.77. Average Housing Price, 1998-2011

Year	Campbell County	Johnson County	Sheridan County	Wyoming
1998 (\$)	105,356	102,678	101,160	96,906
1999 (\$)	104,221	115,531	104,167	101,517
2000 (\$)	151,615	122,354	115,003	111,437
2001 (\$)	130,981	122,192	125,000	116,469
2002 (\$)	133,582	131,782	142,565	121,140
2003 (\$)	170,218	149,472	146,776	132,708
2004 (\$)	173,420	164,125	162,917	142,501
2005 (\$)	185,874	180,209	186,095	178,183
2006 (\$)	199,945	194,500	220,225	219,438
2007 (\$)	247,150	214,710	240,779	265,044
2008 (\$)	242,341	220,549	240,270	256,045
2009 (\$)	249,507	215,744	233,281	241,622
2010 (\$)	238,208	204,277	242,635	250,958
2011 (\$)	233,900	182,250	227,833	241,301
Number of sales in 2011	223	2	229	4,238
Sources: WHDP 2009; WHDP 2012				
Note: Prices are the average for all existing detached single family homes on 10 acres or less sold during the previous calendar year, and are not adjusted for inflation.				
\$ U.S. Dollars				



Sources: WHDP 2009; WHDP 2012

Figure 3.27. Average Housing Price, 1998 through 2011

Table 3.78, “Rental Housing Availability (Percent)” (p. 627) lists information about rental housing availability (i.e., rental vacancy rates) since 2001. Vacancy rates in Campbell County were generally quite low from 2001 through 2007, while vacancy rates in Sheridan and Johnson counties were somewhat variable. In 2007, vacancy rates were low – less than two percent for all three counties – but in 2008 they increased, particularly in Campbell County, and remained relatively high since then.

Table 3.78. Rental Housing Availability (Percent)

Year	Campbell County		Johnson County		Sheridan County	
	June/July	November/December	June/July	November/December	June/July	November/December
2001	0.7	0.7	2.4	n/a	1.0	2.8
2002	1.2	3.7	n/a	9.1	2.8	4.5
2003	1.7	1.3	3.3	2.3	4.2	3.3
2004	2.5	2.8	2.5	2.1	3.3	4.5
2005	1.1	0.6	5.4	6.1	3.0	2.3
2006	0.2	0.4	n/a	2.8	1.3	0.5
2007	0.9	0.3	1.7	1.5	0.3	1.2
2008	7.2	6.8	4.8	3.9	3.2	2.5
2009	5.7	10.5	4.9	8.1	3.4	4.3
2010	8.6	8.0	5.1	6.0	5.1	4.3
2011	8.0	7.2	7.4	9.6	4.3	4.0
2012	5.5	n/a	7.4	n/a	8.1	n/a
Source: WHDP 2012						
Note: Availability is measured in percentage terms (percent of units that are vacant) based on a survey of rental agencies.						
n/a not available						

Table 3.79, “Poor-Rich Ratio, Employment Specialization, and Residential Adjustment” (p. 628) lists information about some additional economic variables of interest. The ratio of relatively low-income households to relatively high-income households, which provides an indication of the proportion of low-income households relative to high-income households, is lower in Campbell County and higher in Johnson and Sheridan counties, compared to the same statistic for the United States. The index of employment specialization is highest in Campbell County, reflecting primarily the relative concentration in the mining industry that was also seen in the earnings and employment statistics above. The index of employment specialization is higher in all three counties than the median for United States counties, which indicates that employment in all three of counties is relatively concentrated in a small number of industry sectors. This lack of diversification can mean that boom and bust cycles that affect particular industries can have a particularly acute impact in the planning area. Finally, the net residential adjustment shows the degree to which commuting across county borders affects earnings by place of work. Johnson and Sheridan counties had a positive residential adjustment in 2011, indicating that more earnings are received by people commuting out of these counties to work (the counties are “bedroom communities”). Campbell County had a relative large negative residential adjustment, indicating that considerable income is received by people commuting into the county to work (accounting for approximately 9.5% of the total personal income in the county).

Table 3.79. Poor-Rich Ratio, Employment Specialization, and Residential Adjustment

Area	Poor-Rich Ratio (2010) ¹	Employment Specialization Index (2005) ²	Net Residential Adjustment (%) (2011) ³
Campbell County	3.7	640	-9.5
Johnson County	7.2	369	3.7
Sheridan County	10.1	185	4.0
United States ⁴	5.6	155	n/a

Sources: U.S. Census Bureau 2010c; Headwaters Economics 2007a; Headwaters Economics 2007b; Headwaters Economics 2007c; Bureau of Economic Analysis 2012a

¹Measures the ratio of households with income less than \$25,000 to those with income exceeding \$200,000 (in the 2006–2010 period). For example, a ratio of 10 indicates there are 10 households with income less than \$25,000 for every household with income more than \$200,000.

²A relative measure of the diversity of the employment base of a county compared to the employment base of the United States as a whole. A lower index indicates a more diverse employment base; a higher index indicates greater specialization (employment is more concentrated in a few economic sectors).

³A positive residential adjustment indicates that more earnings are received by people who commute out of the county to work; a negative adjustment indicates that more earnings are received by people who commute into the county to work. The numeric value is the net proportion of total personal income earned across county lines.

⁴In the case of the Employment Specialization Index, represents the median for all counties in the United States (not the median value for the United States as a whole).

% percent

Tax Revenues

Economic activities on BLM-administered land and mineral estate contribute to the fiscal wellbeing of local, state, and federal governments. BLM management actions have the potential to affect tax revenues from mining and mineral production; travel, tourism, and recreation; and livestock grazing and ranching. Other BLM fiscal contributions would likely not be impacted by the choice of BLM management alternative (Payments in Lieu of Taxes) and are not discussed further.

Mineral Severance Taxes

The mining industry contributes substantially to state and local tax revenues. For example, the Wyoming State Auditor (2012) reported that state mineral severance taxes and federal mineral royalties returned to the state represented 31 percent of total state revenues in Fiscal Year 2012 – a total of \$877 million. Table 3.80, “Estimated State Severance Tax Collections in the Planning Area Counties for Production Year 2010” (p. 629) lists estimated state severance tax collections for the planning area counties and Wyoming for production year 2010.

Property Tax and Sales Tax Base (Tax Revenues)

Another way to look at the contributions of different industries in the planning area is to consider how different economic sectors contribute to local and state property values for the purpose of property tax levies, and to local and state sales taxes. Table 3.81, “Local and State Assessed Property Valuation, 2011” (p. 629) lists local and state assessed property valuation in 2011 for the planning area counties and Wyoming. Table 3.82, “State and Local Sales Tax Collections by Sector, 2011” (p. 630) lists local and state sales tax revenues by sector for each of the counties.

Table 3.80. Estimated State Severance Tax Collections in the Planning Area Counties for Production Year 2010

Mineral	Campbell County (\$)	Johnson County (\$)	Sheridan County (\$)	Wyoming (\$)
Crude and stripper oil	27,767,573	2,966,956	73,447	177,566,278
Natural gas	25,896,502	61,404,202	10,295,824	456,086,175
Coal	246,955,633	0	0	284,711,737
Uranium	0	0	0	1,306,595
Sand and gravel	100,051	31,461	23,430	457,265
Bentonite	0	73,471	0	1,283,195
Trona	0	0	0	15,039,983
Decorative stone	0	201	0	4,722
Additional minerals	0	0	0	285,781
Totals	300,695,342	64,454,768	10,378,539	936,690,809

Source: Wyoming Department of Revenue 2011

\$ U.S. Dollars

Table 3.81. Local and State Assessed Property Valuation, 2011

Area	Total (\$ millions)	Agricultural (%)	Residential (%)	Commercial (%)	Mineral (%)	Industrial (%)
Local Assessed Valuation						
Campbell County	773	1	30	10	56	3
Johnson County	200	7	34	7	50	1
Sheridan County	357	4	70	15	10	1
Wyoming	7,545	3	56	15	23	3
State Assessed Valuation						
Campbell County	4,653	0	0	0	96	4
Johnson County	1,091	0	0	0	100	0
Sheridan County	189	0	0	0	92	8
Wyoming	16,795	0	0	0	92	8
Total (State and Local) Assessed Valuation						
Campbell County	5,426	0	4	1	90	4
Johnson County	1,291	1	5	1	92	1
Sheridan County	547	2	46	10	38	3
Wyoming	24,340	1	17	5	71	6

Source: Wyoming Department of Revenue 2011

\$ U.S. Dollars
% percent

Table 3.82. State and Local Sales Tax Collections by Sector, 2011

Sector	Campbell County	Johnson County	Sheridan County	Wyoming
Agriculture, forestry, fishing, and hunting (%)	0.02	0.01	0.02	0.04
Mining (%)	28	23	8	5
Utilities (%)	6	12	5	4
Construction (%)	2	7	1	2
Manufacturing (%)	4	2	2	3
Wholesale trade (%)	15	7	4	9
Retail trade (%)	24	25	46	33
Transportation and warehousing (%)	0.04	0.1	0.04	0.2
Information (%)	1	2	4	3
Financial activities (%)	5	8	3	5
Professional and business services (%)	0.5	1	1	1
Educational and health services (%)	0.004	0.01	0.1	0.1
Leisure and hospitality (%)	4	8	13	10
Other services (%)	8	2	4	5
Public administration (%)	3	5	11	6
Total (\$ millions)	141	14	39	748
Source: Wyoming Economic Analysis Division 2012b				
% percent				

Together, the data on sales tax collections and property tax assessed valuations by sector provide insight into the economic base of the counties. The fiscal stability of local and state government depends on the viability and stability of local industries. Consistent with other data in this section, the mining sector is fundamental for property tax revenue, especially in Campbell and Johnson counties. In Sheridan County, mining-related property provides an important portion of locally assessed valuation, but in a lower proportion than average for the state. Residential property also provides important contributions to local assessed valuation. Agricultural, commercial, and industrial property contribute smaller amounts to local and state assessed valuation.

Mining and retail trade are the most important contributors to sales tax collections in the planning area counties. The wholesale trade sector in Campbell County, utilities in Johnson County, and the leisure and hospitality sector in Sheridan County also contribute with important shares of sales taxes. Separate data on sales tax revenues from retail trade, accommodation, and food sales (Table 3.83, “Retail, Accommodation, and Food Sales: State and Local Sales Tax Collections, 2011” (p. 631)) provide some additional insight into the contribution from elements that could be related to travel and tourism specifically – eating and drinking places and lodging. (A sizable portion of tax collections from eating and drinking places also accrue from local residents, and a portion of gasoline station tax collections would also accrue from tourists and business travelers.) These data suggest that travel and tourism is an important contributor to sales tax collections in the planning area counties, but do not dominate collections or make an overwhelming contribution.

Table 3.83. Retail, Accommodation, and Food Sales: State and Local Sales Tax Collections, 2011

Subsector	Campbell County	Johnson County	Sheridan County	Wyoming
Auto dealers and parts (%)	19	6	7	8
Building material and garden supplies (%)	20	21	16	15
Clothing and shoe stores (%)	2	0.4	2	3
Department stores (%)	2	0.3	3	3
Eating and drinking places (%)	10	13	16	15
Electronic and appliance stores (%)	4	3	5	4
Gasoline stations (%)	7	9	5	7
General merchandise stores (%)	14	8	21	13
Grocery and food stores (%)	2	5	2	4
Home furniture and furnishings (%)	1	1	3	2
Liquor stores (%)	1	3	2	2
Lodging services (%)	3	9	5	8
Miscellaneous retail (%)	16	22	12	15
Total (\$ millions)	\$39	\$4.4	\$17	\$321
Source: Wyoming Economic Analysis Division 2012b				
% percent				

The Wyoming Office of Travel and Tourism, estimated that in 2011 travel and tourism from business and recreational visitors accounted for \$68.4 million in state sales, use, and lodging tax revenues and \$42.0 million in local sales, use, and lodging tax revenues, not including property tax collections related to recreation infrastructure (Dean Runyan Associates 2006). These estimates are based on the data above, and additional survey data from a variety of sources. Table 3.84, “Local and State Tax Receipts Due to Travel and Tourism in Wyoming, 2011 (\$ millions)” (p. 631) shows tax receipts for the counties in the planning area.

Table 3.84. Local and State Tax Receipts Due to Travel and Tourism in Wyoming, 2011 (\$ millions)

Locality	Local Tax Receipts	State Tax Receipts
Campbell County	1.8	2.6
Johnson County	0.8	1.2
Sheridan County	2.2	2.0
State of Wyoming	52.0	68.4
Source: Dean Runyan Associates 2006		
\$ U.S. Dollars		

Non-Market Values of BLM-Administered Lands

BLM-administered lands have non-market value to residents, communities, and occupation and interest groups in the planning area. Non-market values are those not reflected in market transactions and for which there is no well-defined market price. They include values associated with the use of lands but that are not captured (or fully captured) in market transactions (e.g., recreation on BLM-administered lands, the value of the viewshed) and values associated with the simple existence of natural resources on BLM-administered lands (e.g., the value biodiversity and protection of natural habitats).

Although the BLM was unable to identify studies of non-market values for the planning area, there are non-market values that are typically associated with the types of use of BLM-administered lands in the planning area and with some of the occupation and interest groups present in the planning area. There is evidence of non-market values associated with a variety of recreational activities present on BLM-administered lands, such as hunting, fishing and off-road vehicle driving (Loomis 2005). There is also evidence of non-market values associated with the protection of rare and endangered species similar to species present in the planning area such as the Greater Sage-Grouse (Richardson and Loomis 2009). Particular occupation and interest groups are likely to attribute non-market values to specific aspects of BLM-administered lands such as the protection of natural environments (environmental groups), benefits for activities associated with specific lifestyles (e.g., ranching), or the natural scenery.

3.8.3. Health and Safety

3.8.3.1. Regional Context

The BLM Hazard Management and Resource Restoration Program addresses a variety of hazards on public surface to reduce risks to visitors and employees. Hazards can include hazardous materials; abandoned mine shafts and adits; abandoned equipment and structures; explosives and munitions; toxic gases; and spills from pipelines, tankers, and storage tanks, among others.

Activities directed toward health and safety concerns in the planning area primarily encompass the following:

- AMLs
- O&G facilities
- Hazardous wastes and materials
- Physical hazards

3.8.3.2. Indicators

Management indicators include: AMLs, coal seam fires, hazardous materials and waste, and physical hazards.

3.8.3.3. Current Condition

Abandoned Mine Lands

At present, there are there are 72 known AML sites in the planning area. These sites include sand, gravel, bentonite, coal, and other mineral mining sites. New AML sites typically are found every year; therefore, current database records might not include every AML site in the planning area (BLM 2009g).

Physical hazards are common at abandoned mine sites and these hazards are not always apparent to visitors. Abandoned mine sites have proven to be a luring and sometimes life-threatening attraction for both children and adults. Serious injury or death can occur at these sites. Common hazards include open vertical shafts; unstable overhead rock and decayed support structures; deadly gases and lack of oxygen; remnant explosives and toxic chemicals; high walls, open pits, and open drill holes; and becoming lost and disoriented while underground. Subsidence at abandoned coal mines and coal seam fires pose additional hazards. The BLM Wyoming State Office has a prioritized list of AML sites that pose the greatest risk to people and the environment.

AML sites that impact water quality are addressed using the watershed approach. Using this approach accomplishes the following objectives:

- Allows mitigation to be risk based by identifying priority sites
- Fosters collaborative efforts across federal, state, and private administrative boundaries
- Considers all issues important to water resource protection
- Reduces the cost of mitigation
- Provides the most efficient method of remediating AML sites by utilizing a wide range of available resources

The BLM and the Wyoming DEQ, AML Division, have a cooperative agreement that facilitates the reclamation of AML sites on BLM-administered lands. The state program, as required by the Surface Mining Control and Reclamation Act of 1977, focuses on public safety hazards. In addition, the BLM has received some funding from its AML Program to address environmental hazards and watershed concerns associated with abandoned mines on a site-specific basis. By combining available funding, safety hazards and environmental impacts to water quality and watershed function can continue to be addressed in a more comprehensive fashion at priority AML sites. In this collaborative partnership approach, the BLM and the Wyoming DEQ, AML Division, are undertaking several AML reclamation projects on public lands in the planning area.

Coal Seam Fires

The burning of coal seams is not an uncommon occurrence and can be started either naturally or by human activity. With the right conditions, spontaneous combustion can occur, particularly when oxygen is present. Coal seams can also ignite from lightning strikes, wildfires, or other ignition sources.

In the western United States, research has shown that numerous coal seam fires have occurred over the last several million years. The most extensive burning of coal seams has taken place in the PRB in northeastern Wyoming and southeastern Montana, resulting in the formation of large amounts of clinker (see *Mineral Resources — Salable Minerals*) (Heidel 2007). There are 43 known active and historic coal seam fires in the planning area, with the majority of these occurring on privately-owned lands (BLM 2011g).

Threats to public health and safety include gas emissions and physical hazards. Emissions from coal seam fires can include CO₂, CO, NO_x, SO₂, and trace elements such as arsenic, mercury, and selenium (Finkelman 2004). In limited testing in the PRB, elevated levels of CO and CH₄ have been detected (Coates and Heffern 1999). As a coal seam burns, the space that the coal took up is now partially empty. The rocks and soils over them are left without proper support, and they can subside, creating fissures that can reach the surface. These fissures can be several to tens of feet deep, creating a direct hazard to humans and wildlife.

Hazardous Materials and Waste

Hazardous materials in the planning area are associated with activities performed by industry and the public, and by illegal dumping of commercial or household waste. There are no approved hazardous waste dumps or repositories in the planning area. Table 3.85, “Activities and Associated Hazardous Materials” (p. 634) lists and describes potential sources of hazardous materials.

Table 3.85. Activities and Associated Hazardous Materials

Activity	Associated Hazardous Material
Hazardous materials associated with historic and ongoing mining operations	<ul style="list-style-type: none"> • Acid rock drainage • Chemicals associated with processing rock or ore, or used in laboratories • Explosives • Heavy metals • Asbestos
Illegal dumping	<ul style="list-style-type: none"> • Unauthorized landfills • Dumping of barrels or other containers with hazardous substances
Illegal activities	<ul style="list-style-type: none"> • Drug laboratory waste • Wire burns • Abandoned property
Hazardous material spills	<ul style="list-style-type: none"> • Spills from vehicle accidents • Industrial accidents
Oil and gas activities	<ul style="list-style-type: none"> • Hydrogen sulfide gas • Petroleum and chemical spills • Pipeline releases • Leaking tanks • Asbestos • Industrial accidents
Source: BLM 2009e	

Physical Hazards

In addition to hazardous materials, there is a variety of other hazards that could pose a risk to the public and the environment. These could include physical hazards such as abandoned structures or equipment, mine shafts, explosives and munitions, and solid waste dumps. Environmental hazards include petroleum or other chemical releases from pipelines, commercial vehicles, and storage facilities that are not regulated for hazardous materials.

Program Objectives

To protect human health and the environment and comply with applicable laws and regulations, the BLM Hazard Management and Resource Restoration Program has the following objectives:

1. Identify and control imminent hazards or threats to human health and the environment from hazardous substance releases on public lands.
2. Promote working partnerships with states, counties, communities, other federal agencies, and the private sector to prevent pollution and minimize hazardous waste on public lands.
3. Provide hazardous materials management training to BLM employees and educate public land users concerning laws, rules, and standards.
4. Require potentially responsible parties to undertake response actions and to pay their fair share or face cost recovery.
5. Encourage public collaboration in environmental decision making.
6. Inventory, assess, and manage the cleanup of hazardous substance release sites on public lands that present a potential risk to human health and the environment and promote healthy ecosystems.

7. Ensure that solid and hazardous waste treatment, storage, and disposal facilities that might affect public lands are properly located, designed, and constructed, consistent with the law.
8. Reduce hazardous waste produced by BLM activities and from authorized uses of public lands through waste minimization programs that include recycling, reuse, substitution, and other innovative, safe, and cost-effective methods to prevent pollution.
9. Ensure that authorized activities on public lands comply with applicable federal, state, and local laws, regulations, policies, guidance, and procedures.
10. Ensure appropriate review of authorized activities and application of effective management controls to correct weaknesses.

Management Challenges

Continued O&G development, particularly the transition from CBNG development to more conventional natural gas development, has the potential to increase hazardous materials spills from well drilling and development; pipelines; compressor stations; service vehicles and trucks; and other associated activities. Like many industries, O&G operators use specific chemicals in their drilling, recovery, and manufacturing processes. Unfortunately, “green” alternative products are not available for all chemicals used for drilling and development of oil and natural gas wells. Therefore, the focus is for the operators to minimize potential environmental impacts by properly storing, transporting, using, and disposing of hazardous materials.

With the increase in population related to energy development, increased recreational use of public land can lead to additional opportunities for illegal dumping of solid and hazardous wastes.

3.8.3.4. Trends

As the demand for oil, gas, and minerals increase, so does the potential for hazardous materials spills. Although industrial operations are regulated to minimize any potential spills, accidents can never be completely eliminated. Increased recreational activities on BLM-administered lands will put visitors at a greater risk of encountering a variety of hazards, such as chemical and physical hazards left over from past industrial operations; illegal waste dumping; and illegal drug manufacturing wastes. Although the workload could increase, the Hazard Management and Resource Restoration Program will continue to manage and respond to foreseeable hazards on BLM-administered lands the same as it does now. The program will continue to emphasize protection of public health, safety, and the environment; waste minimization; and compliance with all laws, policies, and regulations.

3.8.3.5. Key Features

There are no key features for the health and safety program.

3.8.4. Environmental Justice

Minority Populations

BLM IM 2002-164, *Guidance to Address Environmental Justice in Land Use Plans and Related NEPA Documents*, provides policy and guidance for addressing environmental justice in BLM land use planning (BLM 2002). IM 2002-164 defines minority persons as “Black/African American, Hispanic, Asian and Pacific Islander, American Indian, Eskimo, Aleut, and other non-white persons.” In addition, IM 2002-164 states that an area should be considered to contain a

minority population where either the minority population of the affected area exceeds 50 percent, or the percentage of minority population in the affected area is meaningfully greater than the percentage in the general population.

Populations of the three counties in the planning area are predominantly white and non-Hispanic. Although minority populations have increased slightly from 2000 to 2011, all counties have a larger proportion of non-Hispanic white residents than do the state or the country. Table 3.86, “Minority and Low-Income Populations in Planning Area Counties, Wyoming, and the United States in 2000 and 2011” (p. 636) lists the percent of minority population and population in poverty in the counties in the planning area in 2000 and 2010.

Table 3.87, “Minority and Low-Income Populations in Planning Area Towns, Wyoming, and the United States in 2000 and 2011” (p. 636) lists population by race, ethnicity, and percent in poverty by town in the planning area in 2000 and 2011. The town of Clearmont has the highest percent minority among the towns listed in Table 3.87, “Minority and Low-Income Populations in Planning Area Towns, Wyoming, and the United States in 2000 and 2011” (p. 636), approximately twice the percent minority in the State of Wyoming.

Table 3.88, “Racial and Ethnic Groups in Buffalo Planning Area Counties and Wyoming, 2011” (p. 637) lists population by race and ethnicity in the planning area. The largest ethnic or racial group other than non-Hispanic whites in any of the counties is Hispanic or Latino (of any race); however, in all three counties the percent of people in this ethnic group is lower than that for Wyoming as a whole. Most ethnic and racial groups comprise a very small portion of populations in the planning area counties.

Table 3.86. Minority and Low-Income Populations in Planning Area Counties, Wyoming, and the United States in 2000 and 2011

County	Percent Minority Population in 2000	Percent Minority Population in 2011	Percent in Poverty in 2000	Percent in Poverty in 2011
Campbell	6	11	8	6
Johnson	4	6	10	7
Sheridan	5	7	11	8
Wyoming	11	14	11	10
United States	31	36	12	14

Sources: U.S. Census Bureau 2000; U.S. Census Bureau 2011a

Table 3.87. Minority and Low-Income Populations in Planning Area Towns, Wyoming, and the United States in 2000 and 2011

Town	Percent Minority Population in 2000	Percent Minority Population in 2011	Percent in Poverty in 2000	Percent in Poverty in 2011
Arvada	15	3	12	0
Big Horn	2	0	1	6
Buffalo	5	29	10	6
Clearmont	6	29	20	4
Dayton	6	2	7	2
Gillette	7	12	8	7
Kaycee	2	3	15	0
Parkman	5	0	9	6
Ranchester	12	3	17	2
Sheridan	6	8	11	11
Story	2	0	15	12

Town	Percent Minority Population in 2000	Percent Minority Population in 2011	Percent in Poverty in 2000	Percent in Poverty in 2011
Wright	4	8	6	5
Wyoming	11	14	11	10
United States	31	36	12	14

Sources: U.S. Census Bureau 2000; U.S. Census Bureau 2011a

Table 3.88. Racial and Ethnic Groups in Buffalo Planning Area Counties and Wyoming, 2011

Race or Ethnicity (Percent of Population)	Campbell	Johnson	Sheridan	Wyoming
Non-Hispanic, White	89	94	93	86
Non-Hispanic, Black	1	0	0	1
Non-Hispanic, American Indian/ Alaska Native	1	0	1	2
Non-Hispanic, Asian, Native Hawaiian, or Other Pacific Islander	1	1	1	1
Non-Hispanic, two or more races	1	2	1	2
Hispanic or Latino (of any race)	7	3	3	8

Source: U.S. Census Bureau 2011a; percentages may not add up to 100 percent due to rounding

In addition to the minority populations within the planning area, nearby reservations for Native American populations constitute an important part of the regional economy and social framework in the planning area. The Crow Indian Reservation, which is located in Bighorn, Yellowstone, and Treasure Counties in Montana, is adjacent to the northern border of the planning area, and the Northern Cheyenne Indian Reservation is 25 miles north of the northern border of the planning area. Many tribal members travel to Sheridan for shopping and to obtain services.

Low-Income Populations

BLM IM 2002-164 states that low-income populations can be identified according to poverty thresholds published by the U.S. Census Bureau. In addition, the IM notes, “when considering these definitions, it is important to recognize that some low-income and minority populations may comprise transitory users of the public lands and thus not associated with a particular geographic area.”

The Council on Environmental Quality (CEQ) guidance for environmental justice analysis under NEPA defines a low-income population as “either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect (CEQ 1997).” Although CEQ guidance does not provide a quantitative threshold (e.g., a limit on the percent of persons in poverty) for determining whether a population should be considered low income, typically the percent of persons in poverty in the planning area is compared to that in a comparison area such as the state. Quantitative criteria for what constitutes a low-income population are not specified in BLM or CEQ guidance.

As Table 3.86, “Minority and Low-Income Populations in Planning Area Counties, Wyoming, and the United States in 2000 and 2011” (p. 636) shows, the percentage of people with income

below the poverty level was less than 10 for all counties in the planning area in 2011, and all three counties saw a reduction in poverty from 2000 to 2011. The percentage of people in poverty was slightly higher in Wyoming and the United States in 2011. However, the town-level data in Table 3.87, “Minority and Low-Income Populations in Planning Area Towns, Wyoming, and the United States in 2000 and 2011” (p. 636) suggest that from 2000 to 2011, most counties with larger concentrations of persons living in poverty in the planning area saw reductions in their poverty rate.

3.8.5. Tribal Treaty Rights

A treaty is a formal agreement between the U.S. Government and a Native American Tribe or Tribes that cedes land or reserves rights to the tribe(s). Impacts to tribal treaty rights can include limitations on tribal hunting, fishing, or resource collection areas that were reserved by certain treaties. EO 13084, *Consultation with Indian Tribal Governments* (May 14, 1998), and EO 13007, *Indian Sacred Sites*, provide the framework for involving Native American Tribes in the BLM planning process. Additional guidance is provided in BLM Manual 8120, *Tribal Consultation*.

BLM land use plans must address the protection of any treaty rights within the planning area. The Wind River Reservation is the only reservation in Wyoming and is over 50 miles from the planning area. There are several reservations in states bordering Wyoming with tribes that historically had treaty rights in the PRB. Tribes may retain certain rights that were not specifically ceded when treaties were abrogated.

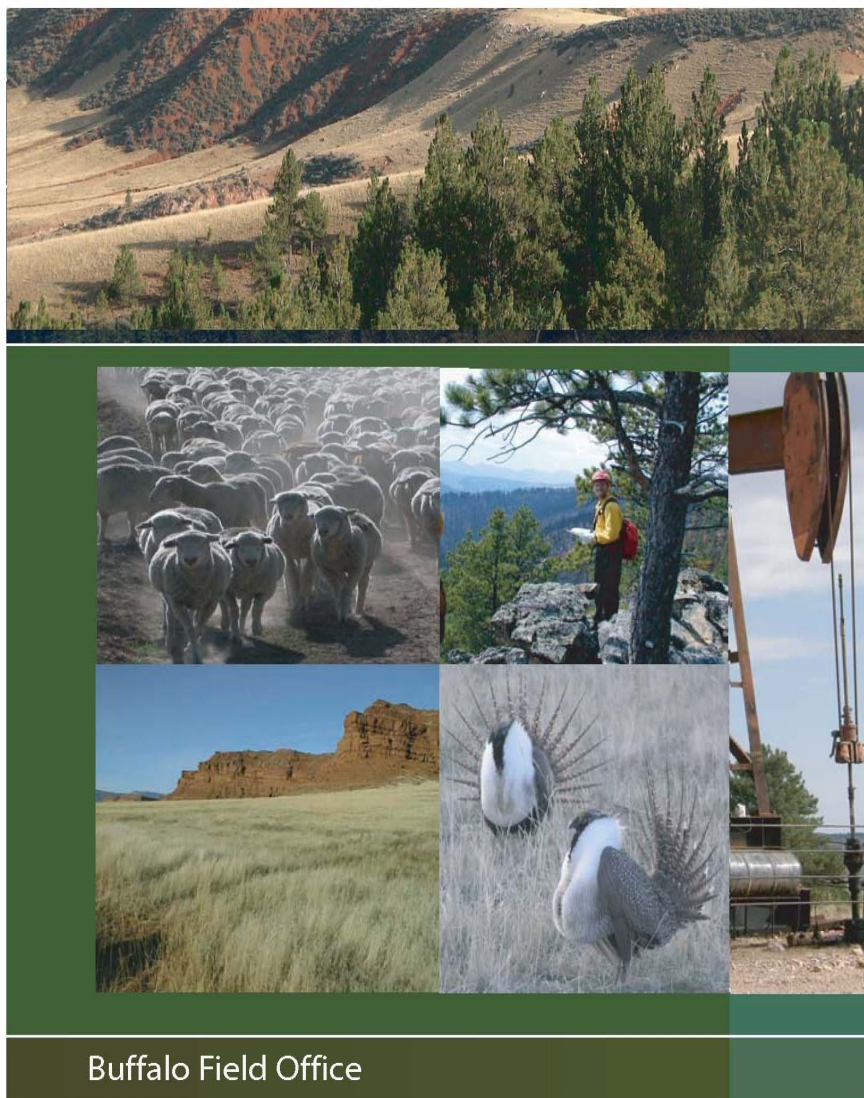
Impacts to tribal treaty rights can include limitations on tribal hunting, fishing, or resource collection areas that were reserved by certain treaties. Native Americans inhabited the planning area for thousands of years before European contact. The first treaty within the planning area was the Fort Laramie Treaty of 1851. The treaty defined the territory within the planning area west of the Powder River for the Crow Nation and the area east of the river for the Sioux Nation. The Fort Laramie Treaty of 1868 later proclaimed that Sioux Nation agreed to "relinquish all right to occupy permanently the territory outside their reservations" with their designated reservations being well outside of the planning area. The treaty also redefined the entire planning area as "unceded Indian Territory." However, the Sioux Nation did "reserve the right to hunt... ..so long as the buffalo may range thereon in such numbers as to justify the chase." within the unceded territory. The Treaty with the Crows, 1868 reduced the original territory of the Crow and also relinquished their territorial claims within the planning area. However, the tribe did retain "the right to hunt on the unoccupied lands of the United States so long as game may be found thereon, and as long as peace subsists among the whites and Indians on the borders of the hunting districts." The Treaty with the Northern Cheyenne and Northern Arapaho May 10, 1868 allowed both tribes to "...roam and hunt while game shall be found in sufficient quantities to justify the chase." within the planning area. Off reservation tribal hunting rights were debated in the courts for years, but the Supreme court decided in *Minnesota v. Mille Lacs Band of Chippewa Indians*, 526 U.S. 172 (1999) that any rights tribes did not relinquish still exist. It appears that minimally the Crow, Northern Cheyenne and Northern Arapaho still have treaty rights related to hunting within the planning area, however, these rights will not be part of BLMs planning effort since WGFD regulates hunting in Wyoming.

There are currently no trust lands, reservation lands, or tribally owned properties in the planning area as far as the BLM is aware. However, over the thousands of years of human occupation numerous other tribes have ties to the area as their ancestral territories or some tribes may have been associated with significant events that occurred within the planning area. Based on

these concerns the BFO may consult with the Cheyenne River Sioux Tribe, Oglala Lakota Nation, Rosebud Sioux Tribe, Fort Peck Sioux Tribe, Standing Rock Sioux Tribe, Lower Brule Sioux Tribe, Yankton Sioux Tribe, The Sisseton-Wahpeton Oyate, Crow Creek Sioux Tribe, Santee Sioux Tribe of Nebraska, Northern Cheyenne Tribe, Northern Arapaho Tribe, Crow Tribe, Eastern Shoshone Tribe, or the Three Affiliated Tribes regarding any Native American issues and concerns.

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Proposed Resource Management Plan and Final Environmental Impact Statement for the Buffalo Field Office Planning Area



Volume 2 of 3 Chapter 4 (up to and including Section 4.4.8)

May 2015

Buffalo Field Office



The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

Proposed Resource Management Plan and Final Environmental Impact Statement for the Buffalo Field Office Planning Area

Volume 2 of 3

Chapter 4

(up to and including section 4.4.8)

**U.S. Department of the Interior
Bureau of Land Management
Buffalo Field Office, Wyoming**

May 2015

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Chapter 4. Environmental Consequences

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Introduction

This chapter describes potential effects on the existing natural and social environmental conditions in the Bureau of Land Management (BLM) Buffalo, Wyoming, planning area (see Chapter 3) under the alternatives described in Chapter 2. BLM planning regulations and Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) implementing regulations at 40 Code of Federal Regulations (CFR) 1500–1508 require an analysis of these effects. This chapter describes potential effects under each alternative using the same order for resource topics as Chapters 2 and 3. Identical organization for the chapters allows readers to compare management actions (Chapter 2), existing environmental conditions (Chapter 3), and potential effects (Chapter 4) for the same resources.

The analysis of environmental consequences focuses on key planning issues (see Chapter 1) raised during the scoping process.

This chapter has 10 main sections:

- Physical Resources
- Mineral Resources
- Fire and Fuels Management
- Biological Resources
- Heritage and Visual Resources
- Land Resources
- Special Designations
- Socioeconomic Resources
- Irreversible or Irretrievable Commitment of Resources
- Unavoidable Adverse Impacts

The individual resource sections provide detailed analyses of effects under each alternative. The presentation order of these sections does not reflect their level of importance.

The subsection under each resource heading entitled *Impacts Common to All Alternatives* describes potential effects from management actions common to all alternatives. Effects included in this section are not repeated for individual alternatives. When effects would vary by alternative, they are addressed by alternative, and only potential effects under that alternative are described. If there would be no effects on given resource, that is stated within *Impacts Common to All Alternatives* section and there are no additional headings or discussion for that subject. Where potential effects from more than one management program would be very similar, they might be grouped under a single subheading (e.g., air quality and soil and water resources in the physical resources section).

During the effects analyses, each resource specialist considered management actions for other resources and programs areas. If no potential effects were identified by the resource specialist or by the public during scoping, the resources and programs are not further addressed. When management of a resource or program could affect the subject resource, those potential effects are described in detail.

Under all alternatives, the BLM would continue to comply with standard operating procedures resulting from federal laws, regulations, and policies. These standard operating procedures constitute day-to-day implementation of policy and management, and could result in certain projects being redesigned or eliminated from consideration, or could require mitigation measures

for potential adverse effects. Associated limitations or complications (e.g., increased processing times or costs) are not considered effects and are not further addressed in this chapter.

Sections at the end of this chapter describe irreversible or irretrievable commitments of resources and unavoidable adverse impacts.

Methods and Assumptions

This section describes methods and assumptions employed during the analyses, defines the types of effects projected throughout the impact sections, defines significance, categorizes effect levels, discusses the availability of data, and identifies several themes that relate to multiple resource classes.

Impact analyses and conclusions are based on interdisciplinary team knowledge of the resources and the planning area, information provided by BLM experts or experts from other agencies, and information in pertinent existing literature. Spatial analysis was performed using the Environmental Systems Research Institute, Inc. ArcGIS Desktop 10.0 computer software. The baseline used to determine potential effects is existing conditions as described in Chapter 3, Affected Environment. Analysis assumptions were developed to help guide the determination of effects. The Resource Management Plan (RMP) and Environmental Impact Statement (EIS) provides a broad management framework; the analyses described in this chapter represent the best estimates of effects because exact locations of development or management often are not known. Effects are quantified to the extent practical based on available data. In the absence of quantitative data, best professional judgment was the basis for the analysis. Effects are sometimes described using ranges of potential effects or in qualitative terms, if appropriate.

Analysis Assumptions

Several assumptions were made to facilitate the analysis of potential effects. These assumptions set guidelines and provide reasonably foreseeable projected levels of development in the planning area during the planning period. These assumptions should not be interpreted as constraining or redefining the management objectives and actions proposed under each alternative and described in Chapter 2. If there were no assumptions for a particular resource or program, the heading is not included in the resource section.

General Assumptions

- Key planning issues identified in Chapter 1 provide the focus for the scope of effects analyses in this chapter.
- Existing state and federal environmental legislation and regulatory programs would remain relatively unchanged and in effect (i.e., analyses are based on current, rather than projected future regulations).
- To the extent possible and within legal and regulatory parameters, BLM management and planning decisions will be consistent with the planning and management decisions of other agencies, state and local governments, and Native American tribes with jurisdictions intermingled with the Buffalo planning area.
- The life of the RMP (planning period) is 20 years.
- Reasonably foreseeable action (RFA) or activity scenarios for all land and resource uses (including minerals) have been developed and presented based on historical, existing, and projected activity levels for all programs.

- The alternative ultimately implemented will comply with standard practices, best management practices (BMPs), guidelines for surface-disturbing activities, and mitigation guidelines (see Appendix J (p. 2155) and Appendix D (p. 1863)). In other words, the practices and guidelines included identified in Appendix J (p. 2155) and Appendix D (p. 1863) are considered a component of each alternative. Appendix J (p. 2155) lists standard practices used in the planning area to mitigate the adverse effects of surface-disturbing activities (the Wyoming BLM mitigation guidelines for surface-disturbing and disruptive activities).
- The analysis of effects focuses on the anticipated effects of management actions and allowable uses proposed under each alternative. The effects of past and present actions are encompassed in the description of existing conditions (Chapter 3, Affected Environment).
- Discussions of effects are based on best available data. Knowledge of the planning area and professional judgment, based on observations and analyses of conditions and responses in similar areas, are used to infer environmental effects when data are limited.
- Acreage figures and other numbers used in the analyses are approximate projections for comparison and analytical purposes only. Readers should not assume numbers reflect exact measurements or precise calculations.
- Climate change is occurring and could affect surface resources in the planning area.
- The exact locations of future surface-disturbing activities cannot be predicted at the RMP level. For analysis purposes, surface-disturbing activities are assumed to occur in vegetation types in proportion to their availability in the planning area. Affected acreages for vegetation types are not absolute, but provide a basis for relative comparison among alternatives.
- Measures to mitigate adverse effects will be applied as described in Chapter 2 and applicable appendices.
- Sufficient funding and personnel would be available to implement the alternatives described in Chapter 2.
- Appropriate maintenance would be performed to maintain the functional capability of all developments.
- Monitoring will be completed as indicated, along with any needed adjustments or revisions.
- The comparison of effects among resources is intended to provide an impartial assessment to inform the decision maker and the public.

Types of Effects

The analyses consider direct, indirect, and cumulative effects, consistent with direction at 40 CFR 1502.16.

- *Direct effects* are caused by an action or by implementation of an alternative and occur at the same time and place as that action or implementation. For example, for the action of building a road, a direct adverse effect is surface disturbance. Surface disturbance is the effect of heavy equipment (the cause) removing existing vegetation, wildlife habitat, and topsoil as it grades the road location.
- *Indirect effects* also result from an action or implementation of an alternative, but usually occur later in time or removed in distance from the action or implementation. For the action of building a road, an indirect effect could occur days after the surface is disturbed and some distance from the disturbance. Heavy precipitation following the removal of vegetation and disturbance of the ground surface could erode soil and transport sediment into streams. This effect on stream-water quality would be considered indirect.
- *Cumulative effects* result from individually minor but collectively significant actions over time. A cumulative effect is the effect on the environment that results from the incremental effect

of the federal action when added to other past, present, and reasonably foreseeable future actions, federal and non-federal.

Actions anticipated during the planning period on all lands in the planning area, including private, State of Wyoming, and federal (U.S. [United States] Department of Defense and U.S. Department of Agriculture [USDA] U.S. Forest Service [USFS]) lands, have been considered in the analyses to the extent reasonable and practicable. Many public and private entities could make decisions about other actions in the planning area, although the locations, timing, and magnitude of these actions cannot be accurately predicted. Assumptions about actions outside of BLM jurisdiction considered in the cumulative effects analyses include:

- Mineral exploration and development will continue on state and private lands.
- Mineral exploration and development will remain minimal in the Bighorn National Forest.
- Use of communications sites will increase.

Irreversible commitments of resources result from actions that permanently change resources. Irretrievable commitments of resources result from actions that cause the permanent loss of resources. Residual effects are those that remain following the implementation of mitigation measures, and include effects for which there are no mitigation measures. Short-term uses versus long-term productivity refers to the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity of environmental resources.

Determination of Significance

Any type (e.g., direct, indirect, or cumulative) or combination of effects can be determined “significant.” A determination of significant requires consideration of the context and intensity of the effect. This means that an action must be analyzed in several contexts—such as the immediate vicinity, affected interests, and locality. Both short-term and long-term effects are relevant. Intensity refers to the severity of the effect. This environmental analysis uses the terms “negligible,” “minor,” “moderate,” and “major” to describe the significance of effects.

Determining significance is a complex process. The significance of an effect is dynamic and therefore could change during the planning period. Significance can be “actual” and supportable by fact, or “perceived” and perhaps not fully supportable even with rigorous study. For this environmental analysis, the approach to establishing significance was based on, but not limited to, legal requirements, public perception, monitoring data, and professional judgment.

Specific significance criteria are presented for each resource topic. The criteria provide thresholds beyond which effects would be considered significant. The discussion of each resource ends with a summary regarding the significance of effects.

Scale of Impacts

The following terms are used to define the extent of environmental consequences:

- Negligible – The effect on the resource would be barely detectable; less than one percent of the resource would be affected. This level of effect is considered to be not significant.
- Minor – The effect on the resource would be slight but detectable; there would be a small change in the resource. This could include effects on 1 percent to 5 percent of the resource. This level of effect is considered to be not significant.

- Moderate – The effect on the resource would be readily apparent; there would be a measurable change in the resource. This could include effects on between 5 percent and 10 percent of the resource. This level of effect is considered to be potentially significant.
- Major – The effect on the resource would be great; there would be a highly noticeable, long-term, or permanent measurable change in the resource. This could include effects on more than 10 percent of the resource. This level of effect is considered to be significant.

Availability of Data and Incomplete Information

The BLM used the best information available and pertinent to the decisions to be made through this RMP, and has expended considerable effort to acquire and convert resource data into a digital format for use in the plan. Data have been acquired from BLM sources and outside sources, such as the state.

Some information was not available for use in developing this plan, usually because there have been no inventories or inventories are not complete. Specific data not available include:

- Inventory and assessment of roads and trails
- Invasive plant species occurrence
- Definitive SSS occurrence (plant and animal)
- Certain wildlife data (definitive occurrence for many species)

Because these data are not available, effects cannot be appropriately quantified given the proposed management of certain resources. In these cases, potential effects are described in qualitative terms or, in some cases, stated as unknown. Subsequent project-level analyses will provide the opportunity to collect and examine site-specific inventory data necessary to determine the appropriate application of the RMP-level guidance. In addition, inventory efforts identified in Chapter 2 will continue to update and refine the information used to implement this plan.

Themes Relating to Multiple Resources

Split Estate

In split estate situations, different parties own the surface rights and subsurface rights (such as the rights to develop minerals) for a parcel of land. In these situations, mineral rights are considered the dominant estate, meaning they take precedence over other rights associated with the property, including those associated with owning the surface. However, the owner of the mineral estate must consider the interests of the surface estate owner. The fluid mineral rights lessee has the right to “use so much of the leased lands as is necessary to explore for, drill for, mine, extract, remove and dispose of all the leased resource” (43 CFR 3101.1-2).

During the early homesteading days, the federal government did not retain rights to the minerals or retained only the rights to coal (i.e., the Homestead Act or the Enlarged Homestead Act). However, concern grew regarding the need for strategic minerals to fuel the national economy. Later homestead acts, such as the Stockraising Homestead Act of 1916, granted land patents to private parties, but reserved the mineral rights to the federal government. The BLM must comply with the provisions of the laws under which the surface was patented. However, many of those laws do not identify the rights of the surface owner in split estate mineral development situations.

BLM involvement in split estate applies primarily to situations where the surface rights are in non-federal ownership and the rights to development of the mineral resources are publicly held and managed by the federal government. BLM authority in regards to split estate management varies by mineral type. For example with coal, Section 714 of Surface Mining Control and

Reclamation Act gives qualified surface owners veto power over surface coal leasing on their property (43 CFR 3427). The remainder of this section is specific to fluid minerals as it is the predominant use within the planning area. The Energy Policy Act requires that the BLM consult with affected property owners, representatives of the oil and gas industry, and other interested parties as it performs permit reviews (BLM 2006e). BLM policy requires that the minerals operator to engage the surface owner in negotiations for the purpose of obtaining a surface use agreement. The surface owner is invited to attend all meetings the BLM has with the minerals operator and invited to identify their concerns.

During a permit review, the BLM recommends the same level of resource protection to the surface owner's lands that would be provided on federally owned surface (BLM 2007n). The BLM carefully considers the surface owner's views and the effects on the surface owner's uses of the land before determining mitigation requirements and approving operations. The BLM must fulfill the requirements of NEPA, the National Historic Preservation Act (NHPA), the Endangered Species Act (ESA), the Clean Water Act (CWA), and other applicable laws, policies, and decisions regarding surface resources. If the surface owner's wishes are contrary to the BLM recommendations, the BLM will generally adopt the surface owner's request unless the request is contrary to the BLM's planning decisions, non-discretionary laws, current policy, or would result in avoidable significant impacts.

Split estate is a common occurrence in the planning area; the BLM manages 782,102 acres of surface estate and 4,803,277 acres of mineral estate. Table 4.1, "Surface Estate and Associated BLM-Administered Fluid Mineral Estate in the Buffalo Field Office Planning Area" (p. 648) lists surface ownership in the planning area and the number of acres of corresponding BLM-administered mineral estate.

Table 4.1. Surface Estate and Associated BLM-Administered Fluid Mineral Estate in the Buffalo Field Office Planning Area

Surface Owner	Surface Land (acres)	BLM Fluid Mineral Estate (acres)
BLM	782,102	781,013
Department of Defense	4,166	4,166
Private	5,167,265	3,963,663
State of Wyoming	538,606	54,435
Source: BLM 2012f		
Note: BLM actions are those actions that BLM authorizes		
BLM Bureau of Land Management		

Surface Disturbance

Surface disturbance is the result of any action or activity that alters vegetation, surface and near-surface soil resources, or surface geologic features beyond natural site conditions and on a scale that affects the value of other public lands (BLM 2007j). Examples of surface-disturbing activities include operation of heavy equipment to construct well pads, roads, pits and reservoirs; installation of pipelines and powerlines; and the performance of several types of vegetative treatments (e.g., prescribed fire). Surface-disturbing activities can be authorized or prohibited.

Most land and resource uses (e.g., mineral development, fire, forest products sales, rights-of-way (ROW) actions, and renewable-energy development) can result in surface disturbance and have the potential to affect multiple resources (e.g., soils, water, vegetation, wildlife, cultural and

paleontology resources, and recreation). Surface disturbance is defined here to avoid redundancy in the individual resource sections. Table 4.2, “Total Projected Surface Disturbance from Reasonable Foreseeable Actions in the Buffalo Planning Area” (p. 649) summarizes the projected surface disturbance under each alternative during the anticipated duration of the planning period.

Table 4.2. Total Projected Surface Disturbance from Reasonable Foreseeable Actions in the Buffalo Planning Area

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Total acres disturbed from BLM actions	322,026	422,903	422,544	486,957
Total acres reclaimed from BLM actions	221,888	344,752	291,923	358,871
Total acres of long-term disturbance from BLM actions	100,138	78,152	130,621	128,086
Total acres disturbed from non-BLM actions	2,123,460	1,890,239	2,531,611	2,168,799
Total acres reclaimed from non-BLM actions	1,943,463	1,766,623	2,174,564	1,965,851
Total acres of long-term disturbance from non-BLM actions	179,998	123,617	357,048	202,949
Source: Stilwell et al. 2012; Appendix G (p. 1937)				
Note: BLM Actions are those actions authorized by BLM.				
BLM Bureau of Land Management				

Disruptive Activities

Disruptive activities are uses of and activities on public land likely to alter the behavior of, displace, or cause excessive stress to existing animal or human populations, and that occur at a specific location or time. In this context, disruptive activity(ies) refers to actions that alter behavior or cause the displacement of individuals such that reproductive success is adversely affected, or an individual's physiological ability to cope with environmental stress is compromised. The term disruptive activities does not apply to the physical disturbance of the land surface, vegetation, or features. Examples of disruptive activities include noise, human foot or vehicle traffic, domestic livestock roundups, or other human presence, regardless of the activity. When the BLM restricts disruptive activities, sound above ambient levels, light greater than background levels, and the presence of people and their activities could be prohibited or limited. The term is commonly used in conjunction with protecting wildlife during crucial life stages (e.g., breeding, nesting, and birthing), although it can apply to any resource value on the public lands. This land use restriction is not intended to prohibit all activity or authorized uses.

4.1. Physical Resources

4.1.1. Air Quality

For the Buffalo planning area, air resources were evaluated to examine how potential BLM initiatives, decisions, and alternatives would affect air quality in the region (“region” includes the planning area and federal Class I areas within 100 miles). The actions associated with each alternative may affect future air quality within this region. Impacts to air quality include changes of pollutants, visibility and atmospheric deposition. Beneficial impacts are those that decrease emissions, either from control measures or a reduction in activities that generate emissions. Direct impacts are the result of the proposed action and occur at the same time. Indirect impacts may also result from the proposed action, but would occur later in time and/or are further removed from the planning area. Indirect impacts may be assessed with the application of air quality modeling tools to help identify the impacts of emissions on regional air quality and may result in the identification and implementation of BMPs or other technologies that would reduce emissions. This section evaluates the potential impacts on air quality from specific activities authorized or performed by the BLM in the Buffalo planning area for each alternative by examining the expected levels of emissions associated with various activities in the planning area. No air quality modeling was performed as part of this analysis.

4.1.1.1. Methods and Assumptions

The air quality impact analysis for the Buffalo planning area used an emissions comparison approach that included the following:

- Identify actions and activities that generate air pollutant emissions.
- Prepare current base year (2005) equipment, production, and activity data.
- Estimate future equipment and activity for the selected future years (2015 and 2024).
- Calculate base year and future emissions associated with expected activity for each alternative based on equipment, emission factors, and activity data.
- Compare future year totals with base year for each of the alternatives to evaluate changes from the baseline and among the alternatives.

The Buffalo RMP presents a qualitative description of potential impacts, and includes emission inventories of BLM actions in the Buffalo planning area. Appendix M (p. 2239) provides a detailed description of the assumptions, activity data, emission factors, and general approach followed in estimating emissions for the various resource sectors and pollutants.

The following air pollutants were identified as being pollutants that could potentially be emitted directly (or in the case of ozone produced in the atmosphere by photochemical processes), by management activities authorized, permitted, allowed or performed under this RMP. Emissions of each of these pollutants (except ozone) were estimated for each identified activity and addressed for each alternative in this analysis:

- Criteria pollutants (Carbon Monoxide [CO], Nitrogen Oxide [NO_x], Particulate Matter less than 2.5 microns in diameter [PM_{2.5}], Particulate Matter less than 10 microns in diameter [PM₁₀], Sulfur Dioxide [SO₂])
- Organics and toxics (Hazardous Air Pollutants [HAPs] and Volatile Organic Compounds [VOCs])
- Greenhouse gases (GHGs) (Carbon Dioxide [CO₂], Methane [CH₄], Nitrous Oxide [N₂O])

Components of air quality that may be impacted include visibility, air pollutant concentrations, atmospheric deposition, and lake chemistry. Impacts on these components are affected by the magnitude and spatial and temporal distribution of the primary and precursor emissions and their interaction with local and regional meteorological conditions and topographic features. For this analysis, the changes in emissions for each of the alternatives were assessed to qualitatively determine if the resulting impacts would be significant enough to potentially violate the National Ambient Air Quality Standards (NAAQS) or the Wyoming Ambient Air Quality Standards (WAAQS), or possibly exceed screening levels of concern for visibility and atmospheric deposition. Air quality modeling can be used to simulate expected future air quality concentrations and the effects on visibility and deposition, but at this stage of the planning process, sufficient project-specific data were not available for such an assessment. Future mineral development projects will be required to conduct a full NEPA analysis of the impacts of proposed projects including air quality. Because of the level of coal mining activity in the Powder River Basin (PRB), air quality modeling studies have been conducted to assess impacts for the region. The Chapter 3 *Air Quality* section provides a summary of air quality modeling projects that have been conducted in the last several years, or are ongoing.

The following list of emission generating activities were identified as those management activities authorized, permitted, allowed or performed under this RMP that could potentially emit identified air pollutants and could potentially cause impacts to air quality within the planning area and Class I areas within 100 miles (150 kilometers) of the planning area. Emissions of air pollutants were estimated for the baseline year (2005) and projected for two future years (2015 and 2024) for each identified resource activity and addressed for each alternative in this analysis.

- Leasable Fluid Minerals – Conventional Natural Gas Development
- Leasable Fluid Minerals – Coalbed Natural Gas Development
- Leasable Fluid Minerals – Oil Development
- Leasable Solid Minerals – Coal Mining
- Locatable Minerals – Bentonite Mining
- Locatable Minerals – Uranium Mining
- Salable Minerals – Sand, Gravel, and other Mineral Development
- Fire and Fuels Management – Prescribed Fire
- Forest Products
- Land Resources – Rights-of-Way and Corridors and Renewable Energy Projects
- Land Resources – Travel and Transportation Management
- Land Resources – Livestock Grazing Management

The Buffalo Field Office (BFO) resource specialists provided the construction, operations, developed acreage, and production activity data used to estimate emissions for resource emission sources. Other activity data were derived from the surface disturbance and RFA tables (Appendix G (p. 1937)). For conventional natural gas, coalbed natural gas (CBNG), and oil development, emissions were prepared for activities on federal mineral estate in the planning area. The estimation of emissions from coal mining activity relied on information contained in the Environmental Protection Agency's (EPA's) National Emission Inventory (NEI) (EPA 2011a) and the Final Mineral Occurrence and Development Potential Report (BLM 2009c) for the planning area. Because of this, the emission estimates for coal mining activities do not vary amongst the alternatives.

Emission factors used to estimate proposed emissions were obtained from (1) the EPA NONROAD2008a Emissions Model (EPA 2008); (2) the Wyoming Department of Environmental Quality (DEQ) best available control technology (BACT) standards for natural gas-fired internal

combustion engines (Wyoming DEQ 2013c); (3) the EPA MOBILE6.2.03 mobile emissions factor model for on-road motor vehicles (EPA 2003); (4) EPA AP-42 Compilation of Air Pollutant Emissions Factors (EPA 1995); (5) the American Petroleum Institute (API) Compendium of Greenhouse Gas Emissions Estimation Methodologies for Oil and Natural Gas Industry (American Petroleum Institute 2009); (6) EPA State Inventory Tool Module (EPA 2011c); (7) the Western Governors Association Western Regional Air Partnership (WRAP) (Western Regional Air Partnership 2005); (8) 40 CFR Part 98 — Subpart W; (9) Wyoming DEQ Guidance on Oil and Gas Production Facilities (Wyoming DEQ 2013a); and (10) EPA's NEI (EPA 2013b). The Technical Support Document (TSD) for Air Quality (Appendix M (p. 2239)) includes detailed information regarding the data and assumptions used to estimate emissions for each project alternative and the emission totals for each activity per year.

Methods and assumptions used in this impact analysis include the following:

- Air pollutant emissions presented in this analysis are useful for comparing the relative amounts of emissions for each alternative and may not represent actual future emissions. Emissions estimates are based on predictions of future mineral resource development scenarios rather than actual development projects.
- Stationary sources associated with oil and gas development will operate in accordance with Wyoming DEQ's *Oil and Gas Production Facilities Permitting Guidance, Chapter 6, Section 2* revised March 2010 (U.S. Secretary of the Interior 2010).
- Emissions from the following management actions were not estimated because the potential for development was considered low: phosphate mining, oil shale development, geothermal development, gemstones and other lapidary materials development.
- Emissions from the following management actions were not included because (1) the level of activity is not expected to change between alternatives, *and* (2) the magnitude of emissions from the activity is considered to be very small in comparison to other management activities, or (3) sufficient operational or production data were not available to quantify emissions: wild (unplanned) fires, invasive species and pest management, grassland and shrubland management, and activities related to heritage and visual resources, cultural resources, paleontology, recreation, socioeconomic resources, and fish and wildlife resources.
- Activity factors (or the quantification of activity for each resource provided by the BFO) are appropriate for the base year and future timeframes.
- EPA off-road emission standards were used to estimate emissions for non-road sources in project years 2005, 2015, 2024. This approach simulates the replacement of existing sources by new lower-emitting equipment with future EPA off-road emission standards.

The purpose of the Buffalo Air RMP is to further clarify air quality goals, objectives, and management actions set forth in the Buffalo RMP and EIS. The Air RMP (Appendix N (p. 2479)) was developed in cooperation with EPA Region 8, the Wyoming DEQ-Air Quality Division (AQD), and the USFS to address how the BLM will manage air resources in the planning area. The Wyoming DEQ-AQD is the state regulatory authority responsible for ensuring compliance with the NAAQS and WAAQS, and the Air RMP is not intended to circumvent that authority. The Air RMP outlines specific requirements for proponents of projects that have the potential to generate air emissions and impact air resources within the planning area. Where applicable, the Air RMP refers to the goals and objectives found in the Buffalo RMP and EIS. Table 4.3, "State of Wyoming Presumptive BACT Requirements" (p. 653) provides an overview of activities/sources and control requirements mandated by the State of Wyoming Presumptive BACT regulations. The Air RMP outlines the control requirements in greater detail. The Air RMP is a "living

document” and may be modified to comply with law, regulation, and policy to address new information and changing circumstances.

Table 4.3. State of Wyoming Presumptive BACT Requirements

Activity/Source	Minimum Control Percentage	Minimum Potential VOC Emissions (tons/year)	Notes
Flashing/Storage Tanks and Separation Vessels	98%	10	Control devices may be removed after one year if flashing emissions have decreased to below 8 tons/year.
Dehydrations Units	98%	8	Control devices may be removed after one year if flashing emissions have decreased to below 8 tons/year and all units are equipped with flash separators and still vent condensers.
Pneumatic Pumps	98%	None	
Pneumatic Controllers	None	None	Control achieved by use of low or no-bleed controllers or by the controller discharge steams being routed to a closed loop system.
VOCs volatile organic compounds			

In June 2011, the USDA, Department of the Interior (DOI), and the EPA signed the *Memorandum of Understanding (MOU) among the U.S. Department of Agriculture, U.S. Department of Interior, and U.S. Environmental Protection Agency Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions Through the National Environmental Policy Act Process*. This MOU outlines an approach to the analysis of impacts to air quality and Air Quality Related Values (AQRVs), such as visibility in Class I and sensitive Class II areas, in connection with oil and gas development on federal lands, and identifies a path to protect air quality while allowing for oil and gas development on federally managed lands. This MOU specifically addresses oil and natural gas development projects, but not other projects or resources that contribute to air quality impacts in the planning area. Because the RMP is a broad level planning document that defines allocations and projects levels of development and other land uses in a general sense, it lacks much of the specificity of future emission sources and levels that are necessary to accurately simulate future air quality impacts. Air quality impact modeling is more appropriately analyzed in the implementation level (i.e., for specific oil and gas field development projects) NEPA documents, and this type of modeling would be conducted under the guidelines of the MOU. In lieu of air quality modeling, the BLM developed the Air RMP (Appendix N (p. 2479)) which includes requirements (Section N.2.4, “Modeling” (p. 2488)) for when modeling will required.

For this analysis a base year emission inventory was developed for 2005 based on available historical equipment counts, records of production and activity, and other information. In addition to the base inventory, two future-year inventories (2015 and 2024) were prepared based on various alternative levels of activity, operations, and equipment usage for all of the activities associated with each of the managed resources. For all of the alternatives examined for the base and future years, coal mining and oil and natural gas (conventional and coalbed) development are the largest contributors to total air emissions compared to other managed activities in the

planning area. For coal mining, the emissions were estimated based on emissions prepared by the State of Wyoming as contained in EPA NEI (EPA 2011a) and production rate data and forecasts included in the Final Mineral Occurrence and Development Potential Report (BLM 2009c) for the Buffalo planning area. For oil and natural gas development, the emission estimates are based on reasonable foreseeable estimates of well counts, production and development rates, and existing technologies used in the field.

For the Buffalo planning area, activities associated with oil and natural gas development and coal mining result in the largest emissions for the majority of pollutants. Table 4.4, “Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Base Year 2005” (p. 654) presents a summary of estimated emissions (tons/year) for all resource activities for each pollutant for the base year 2005. The table presents emission estimates for oil and natural gas development sources on federal land and combined cumulative totals for these activities on federal and non-federal land within the planning area.

Table 4.4. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Base Year 2005

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
TOTAL – Federal Lands Only	6,889	1,754	933	32	3,441	11,595	1,233
TOTAL - Cumulative	7,757	1,853	1,194	35	3,580	31,352	3,258
Leasable Minerals – Natural Gas Development – Federal	28	5	96	0	48	216	33
Leasable Minerals – Coalbed Natural Gas Development – Federal	402	44	72	1	42	10,688	1,090
Leasable Minerals – Oil Development – Federal	38	4	4	0	4	0	0
Total Oil and Gas Minerals Development – Federal	469	53	172	1	94	10,904	1,123
Leasable Minerals – Natural Gas Development – All	53	10	181	0	92	413	62

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Leasable Minerals – Coalbed Natural Gas Development – All	1,204	134	243	3	133	30,247	3,086
Leasable Minerals – Oil Development – All	79	8	9	0	9	1	0
Total Oil and Gas Minerals Development – All	1,336	152	433	4	234	30,660	3,148
Leasable Solid Minerals – Coal	4,621	1,426	509	19	1,222	---	---
Locatable Minerals – Bentonite Mining	828	96	8	0	7	1	0
Locatable Minerals – Uranium Mining	38	5	26	1	10	2	41
Salable Minerals – Sand, Gravel, and other Minerals	763	89	172	4	80	13	1
Total Non-Oil and Gas Minerals	6,250	1,616	715	24	1,319	16	42
Fire and Fuels Management	73	60	20	6	685	36	4
Forests and Woodlands Management	37	4	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	39	5	14	0	7	1	0
Land Resources – Comprehensive Trails and Travel Management	18	17	11	2	1,331	638	64

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Livestock Grazing	3	0	0	0	3	0	0

Source: Appendix M (p. 2239)

CO carbon monoxide
HAPs hazardous air pollutants
NO_x nitrogen oxides
PM₁₀ particulate matter less than 10 microns in diameter
PM_{2.5} particulate matter less than 2.5 microns in diameter
SO₂ sulfur dioxide
VOCs volatile organic compounds

4.1.1.2. Impacts Common to All Alternatives

The Wyoming DEQ has the authority to implement emission controls for sources requiring air permits under Wyoming Air Quality Standards and Regulations and to ensure that these sources do not contribute to an exceedance of an ambient air quality standard. To facilitate this process, the BLM currently implements a program to share emission source information with the Wyoming DEQ and other government agencies. This program would continue under all alternatives. In addition, the BLM would require **mitigation** to minimize impacts, such as fugitive dust emissions in proximity to high use roadways, populated areas, and resource-sensitive areas.

Because of the amount of existing and planned resource development activity, emissions of NO_x, VOCs, and CO from coal mining and oil and natural gas development could impact air quality under each of the alternatives. These emissions are precursors to **ozone** and fine particulates (PM_{2.5}) which are both secondary pollutants and ambient concentrations could increase and also affect visibility and atmospheric deposition. Emissions of primary coarse (PM₁₀) and fine (PM_{2.5}) particulates from these activities could also affect local and regional air quality by decreasing visibility and increasing deposition. Emissions for SO₂ from managed activities in the planning area are relatively small and are not expected to result in any major impacts. Except for the NO_x emissions from sand and gravel sources and the CO and VOC emissions from Travel and Transportation Management (TTM) which could contribute to impacts on ambient **ozone** and particulate concentrations, the emissions from all other resource emission source categories are relatively small and are not expected to contribute to any major adverse impacts on air quality in the planning area.

Management actions and resource uses under each of the alternatives may impact AQRVs in the nearby federal Class I area of Wind Cave National Park and the Northern Cheyenne Indian Reservation, with potentially smaller impacts at the more distant Badlands Wilderness Area. Although minerals development and production (primarily coal mining), and oil and gas production would be the primary sources of emissions, other resource management actions that would produce combustive and/or fugitive dust emissions include sand and gravel development, and uranium and bentonite mining.

Prior to project approval, the BLM would conduct environmental analyses in compliance with NEPA. Appendix N (p. 2479) includes additional information on potential BMPs and mitigation measures that may be applied in the planning area. For major projects, such as the development of a large natural gas field or mineral development project (or any project that is likely to have an impact on air quality), the BLM may require proponents to demonstrate compliance with ambient air quality standards and other federal, state, and local air quality regulations. This demonstration

may include air dispersion modeling, photochemical grid modeling, and the application of mitigation measures and control technologies prior to project authorization by the BLM.

4.1.1.3. Alternative A

Under Alternative A, resources would be managed under the existing RMP (BLM 1985c). Table 4.5, “Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative A – 2015” (p. 658) and Table 4.6, “Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative A – 2024” (p. 660) present the emission estimates for planned activities associated with the No Action Alternative (Alternative A) for 2015 and 2024, respectively. These tables provide emission estimates for the activities listed above and provide totals for activities on federal land and cumulative totals for all activities under the current management scenario. The tables also present percent difference changes in the emission totals compared to the 2005 base year totals. Figure 4.1, “Contributions of Each Category to PM₁₀ Emissions under Alternative A for 2015” (p. 662) through Figure 4.7, “Contributions of Each Category to HAP Emissions under Alternative A for 2015” (p. 665) present the relative contributions of the various activities to total emissions for Alternative A for 2015 for PM₁₀, PM_{2.5}, NO_x, SO₂, CO, VOCs, and HAPs, respectively. The figures provide relative contributions from the major activity sectors: leasable fluid minerals (oil and natural gas), leasable solid minerals (coal), locatable minerals (bentonite & uranium), and salable minerals (sand & gravel), fire and fuels management, forest products, ROWs, TTM, and livestock grazing management. Because the relative contributions of emissions do not change significantly in 2024 or amongst the other alternatives, emission pie charts for 2024 and for all other alternatives are not shown.

As noted above, the major contributor to emissions of PM₁₀ and PM_{2.5} are from coal and bentonite mining. For NO_x and SO₂, the largest contributors are from coal mining and oil development. For the planning area sources, equipment, and activities associated with the non-oil and natural gas mineral development include coal, bentonite, and uranium mining and sand and gravel operations. For CO, similar relative contributions are provided from coal mining, fire and fuels management, and TTM. For VOC emissions, contributions are primarily from the travel transportation management sector reflecting emissions from off-road engines and off-road vehicles (all-terrain vehicles [ATVs], motorcycles, snowmobiles, etc.), followed by contributions from the oil and gas development sector. For HAP emissions, similar contributions are provided from the oil and gas, non-oil and gas, and TTM sectors/activities. Of all the activity sectors examined, emissions from livestock grazing management are the lowest and these activities are the minimus contributors to emissions in the planning area.

The current management scenario includes actions that either increase or decrease the development or use of certain resources and associated activities in 2015 and 2024 compared to the base year 2005, and this results in either increases and decreases in emissions for certain categories and pollutants. Specific increases in resource use include the number of federal and non-federal natural gas and oil wells in 2015 and 2024, compared to 2005. For example, there is a planned increase of nearly 40 natural gas wells and 168 oil wells under Alternative A. Specific decreases for Alternative A include a fewer number of CBNG wells developed and a slight reduction in the total acreage used for forest products. For some resources, although there are slight increases in resource development numbers (e.g., number of wells, acreage, etc.) and activities, the emission factors for equipment expected to be used in the future are lower, reflecting cleaner engine and fuel technology, resulting in a net decrease in emissions.

Overall, compared to the 2005 base year, except for VOCs and HAPs, emissions for all other pollutants are estimated to increase for Alternative A in 2015. Except for VOC and HAP emissions, emissions for all pollutants are expected to be relatively the same or slightly increase further in 2024. VOC and HAP emissions show a decrease in 2015 and further in 2024, likely reflecting the expected introduction of cleaner engine technology for off-road construction and maintenance engines and other equipment.

It is possible that increases in NO_x and PM_{2.5} emissions could lead to increases in ambient ozone concentrations and total fine particulates and may possibly contribute to violations of the current NAAQS and WAAQS.

Table 4.5. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative A – 2015

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
TOTAL – Federal Lands Only	8,913	2,271	1,780	137	4,845	6,602	679
TOTAL – Cumulative	9,672	2,390	2,864	236	5,161	18,530	1,896
Percent Change over Base Year – Federal Lands Only	29%	29%	91%	327%	41%	-43%	-45%
Percent Change over Base Year – Cumulative	25%	29%	140%	580%	44%	-41%	-42%
Leasable Minerals – Natural Gas Development – Federal	47	10	152	1	68	262	39
Leasable Minerals – Coalbed Natural Gas Development – Federal	223	24	40	0	23	5,671	573
Leasable Minerals – Oil Development – Federal	204	49	796	94	185	33	3
Total Oil and Gas Minerals Development – Federal	474	83	989	95	276	5,967	616

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Leasable Minerals – Natural Gas Development – All	92	20	299	2	133	517	77
Leasable Minerals – Coalbed Natural Gas Development – All	740	85	161	2	84	17,310	1,748
Leasable Minerals – Oil Development – All	401	97	1,612	190	375	67	7
Total Oil and Gas Minerals Development – All	1,073	185	2,049	194	578	13,448	1,383
Leasable Solid Minerals – Coal	5,700	1,759	630	23	1,507	---	---
Locatable Minerals – Bentonite Mining	1,608	177	4	0	5	1	0
Locatable Minerals – Uranium Mining	45	6	25	1	10	2	0
Salable Minerals – Sand, Gravel, and other Minerals	835	95	65	3	33	8	1
Total Non-Oil and Gas Minerals	8,188	2,038	724	27	1,556	11	1
Fire and Fuels Management	151	126	43	12	1,448	75	8
Forest and Woodlands Management	35	4	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	45	5	2	0	1	0	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Land Resources – Comprehensive Trails and Travel Management	17	15	22	2	1,559	548	55
Livestock Grazing	3	0	0	0	3	0	0
Source: Appendix M (p. 2239)							
CO carbon monoxide							
HAPs hazardous air pollutants							
NO _x nitrogen oxides							
PM ₁₀ particulate matter less than 10 microns in diameter							
PM _{2.5} particulate matter less than 2.5 microns in diameter							
SO ₂ sulfur dioxide							
VOCs volatile organic compounds							

Table 4.6. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative A – 2024

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
TOTAL – Federal Lands Only	9,258	2,380	1,779	138	4,910	1,480	164
TOTAL – Cumulative	9,779	2,474	2,849	237	5,214	5,590	594
Percent Change over Base Year – Federal Lands Only	34%	36%	91%	330%	43%	-87%	-87%
Percent Change over Base Year – Cumulative	26%	33%	139%	583%	46%	-82%	-82%
Leasable Minerals – Natural Gas Development – Federal	52	11	170	1	78	302	45
Leasable Minerals – Coalbed Natural Gas Development – Federal	47	6	16	0	8	683	69
Leasable Minerals – Oil Development – Federal	230	51	797	94	186	33	3

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Total Oil and Gas Minerals Development – Federal	329	68	984	95	271	1,018	117
Leasable Minerals – Natural Gas Development – All	102	22	340	2	154	606	90
Leasable Minerals – Coalbed Natural Gas Development – All	289	38	99	2	45	4,456	451
Leasable Minerals – Oil Development – All	458	103	1,614	190	376	67	7
Total Oil and Gas Minerals Development– All	849	163	2,053	194	575	5,129	548
Leasable Solid Minerals – Coal	6,088	1,879	672	25	1,610	---	---
Locatable Minerals – Bentonite Mining	1,608	177	2	0	5	1	0
Locatable Minerals – Uranium Mining	30	5	22	1	9	2	0
Salable Minerals – Sand, Gravel, and other Minerals	816	91	21	3	14	7	1
Total Non-Oil and Gas Minerals	8,542	2,152	717	28	1,638	9	1
Fire and Fuels Management	151	126	43	12	1,448	75	8
Forests and Woodlands Management	35	4	0	0	2	1	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Land Resources – Rights-of-Way and Renewable Energy Projects	111	11	2	0	2	1	0
Land Resources – Comprehensive Trails and Travel Management	11	10	30	3	1,463	371	37
Livestock Grazing	80	8	4	0	86	4	0

Source: Appendix M (p. 2239)

CO carbon monoxide

HAPs hazardous air pollutants

NO_x nitrogen oxides

PM₁₀ particulate matter less than 10 microns in diameter

PM_{2.5} particulate matter less than 2.5 microns in diameter

SO₂ sulfur dioxide

VOCs volatile organic compounds

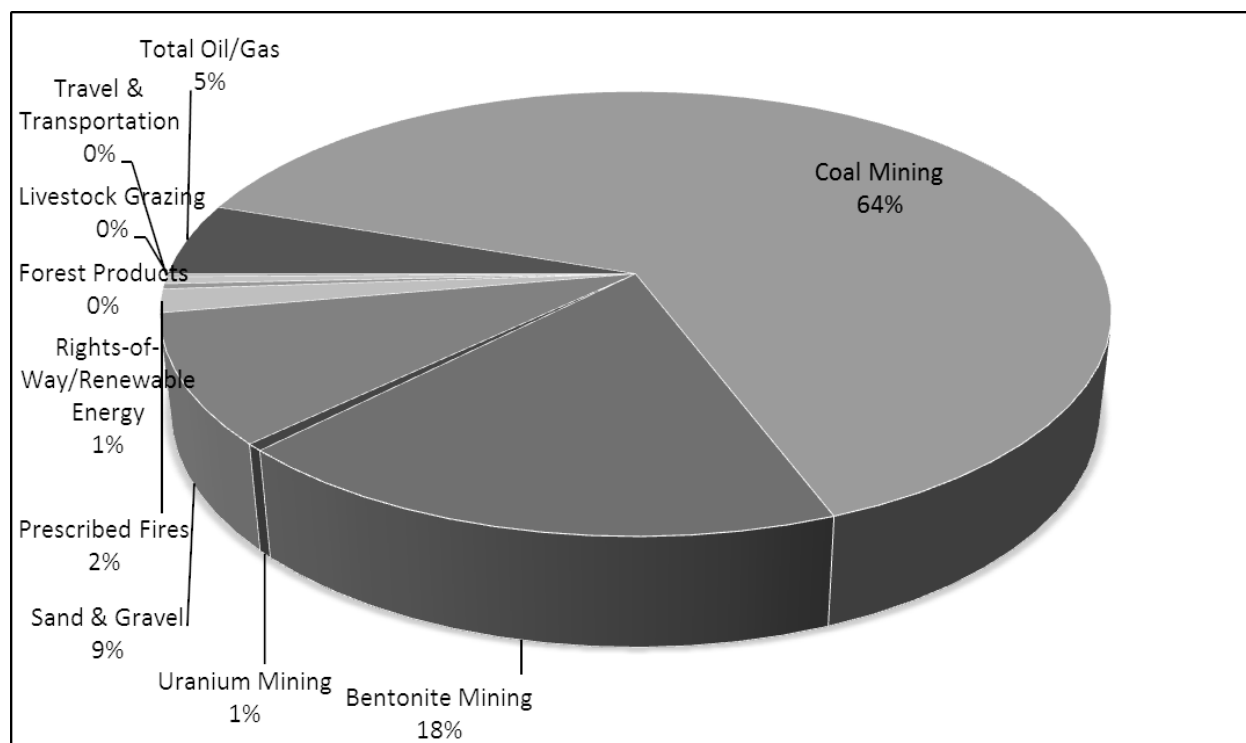


Figure 4.1. Contributions of Each Category to PM₁₀ Emissions under Alternative A for 2015

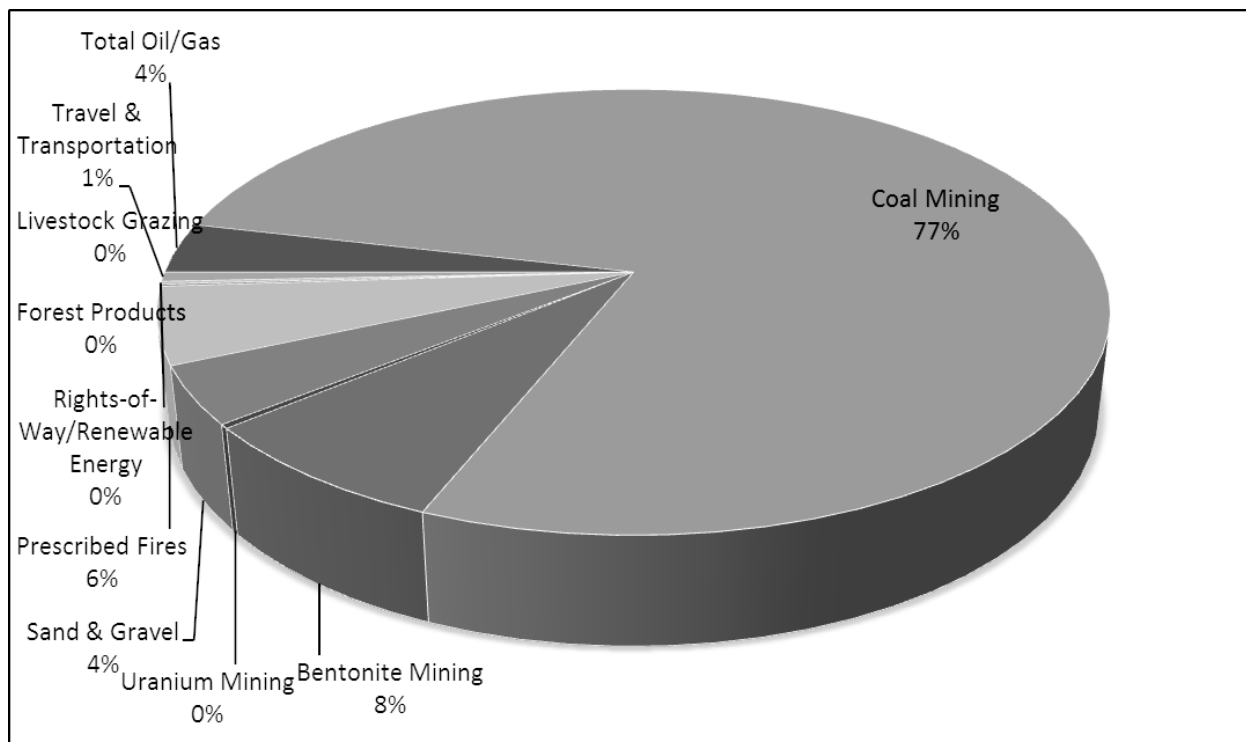


Figure 4.2. Contributions of Each Category to PM_{2.5} Emissions under Alternative A for 2015

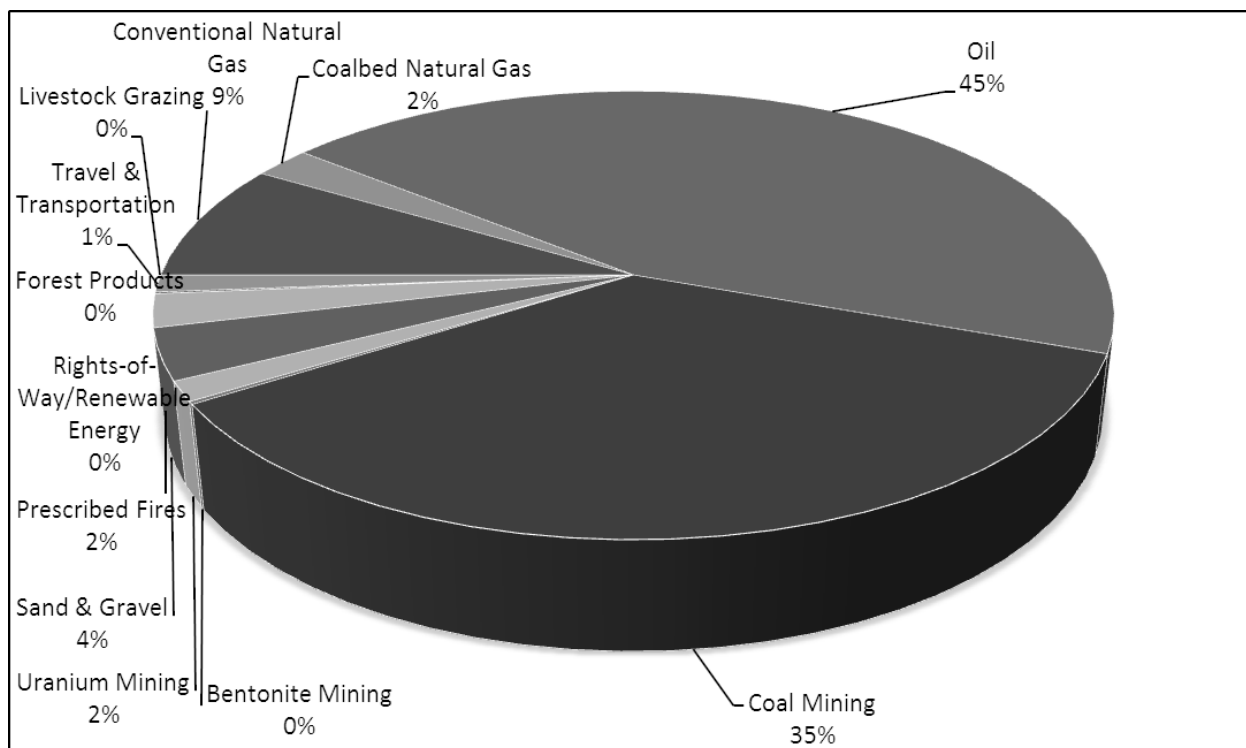


Figure 4.3. Contributions of Each Category to NO_x Emissions under Alternative A for 2015

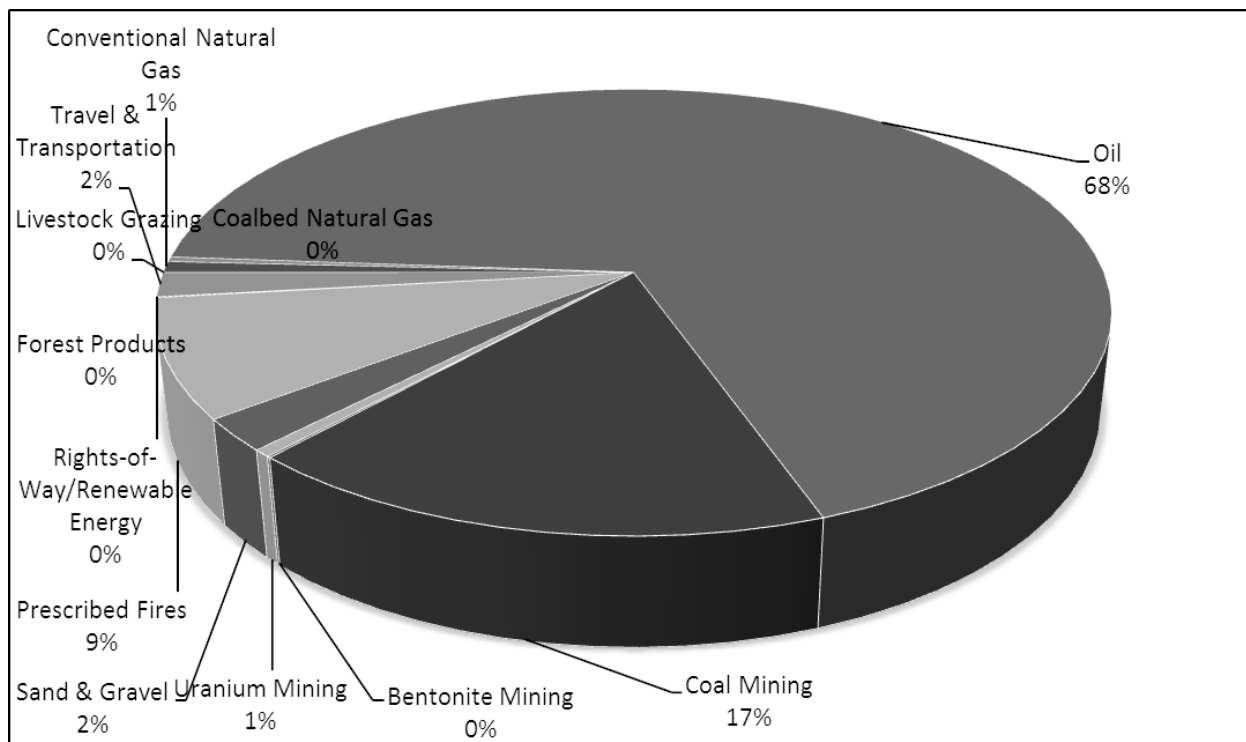


Figure 4.4. Contributions of Each Category to SO₂ Emissions under Alternative A for 2015

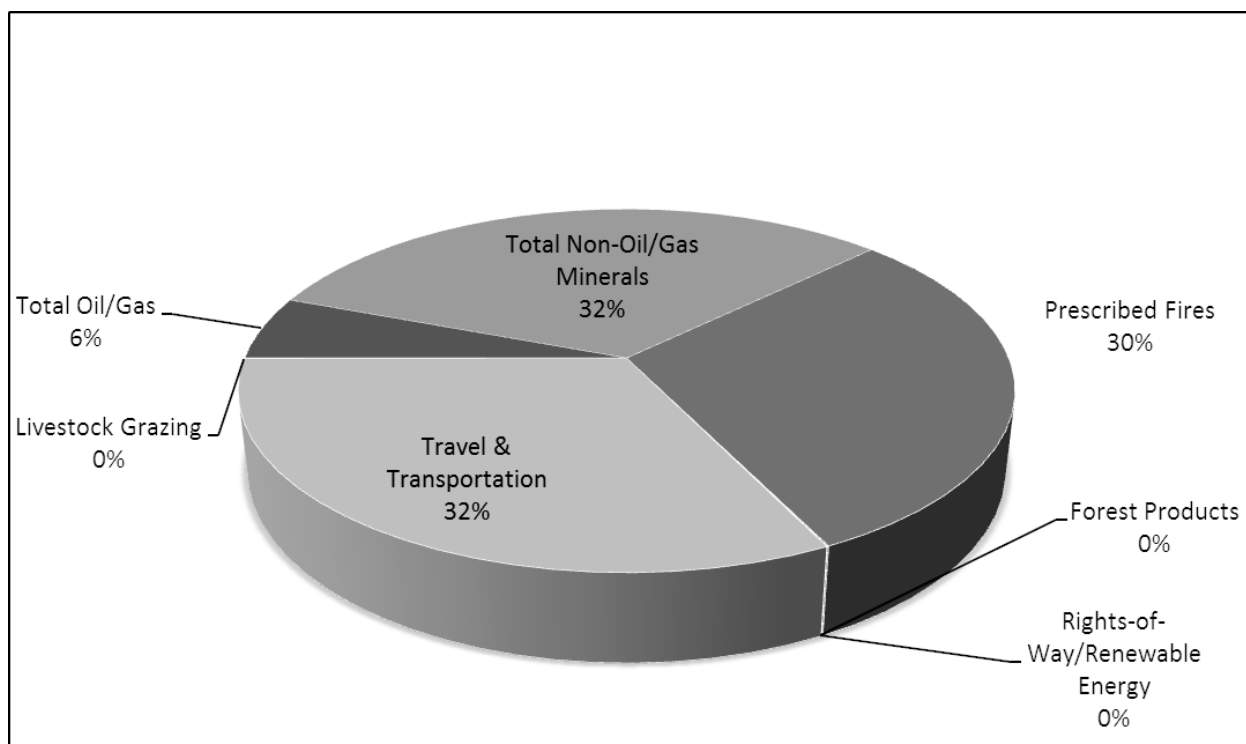


Figure 4.5. Contributions of Each Category to CO Emissions under Alternative A for 2015

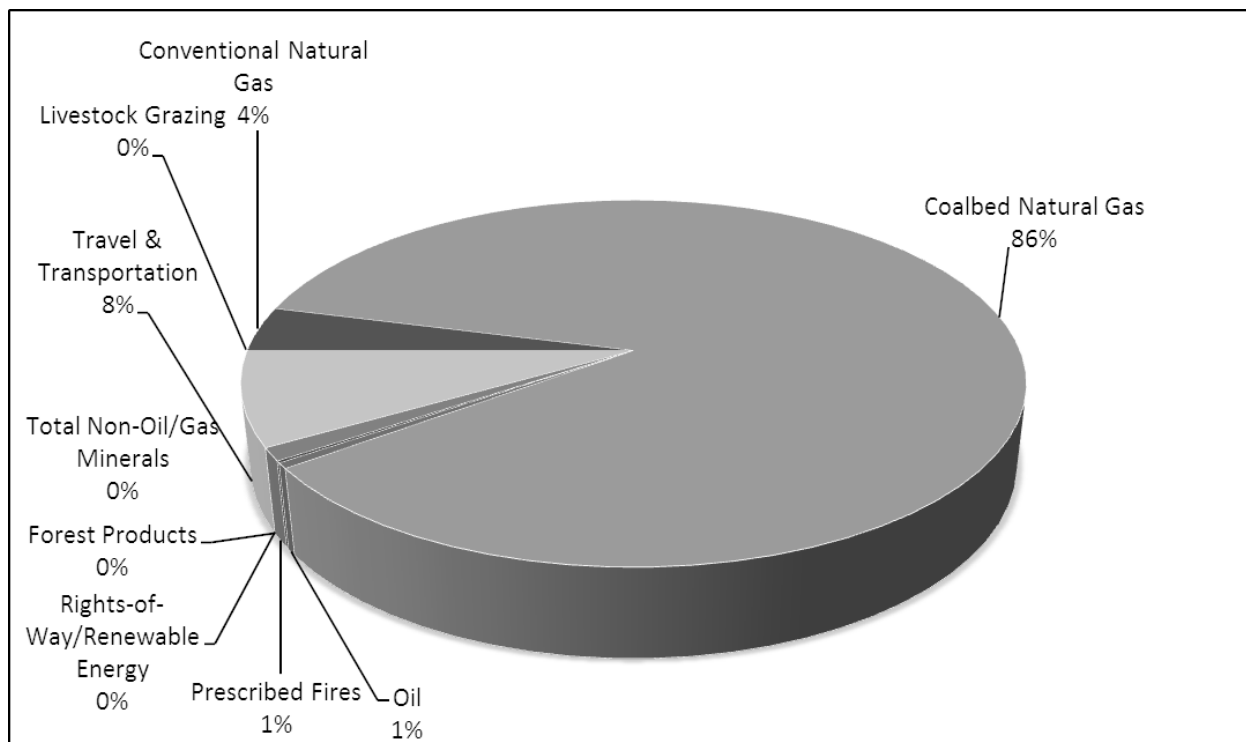


Figure 4.6. Contributions of Each Category to VOC Emissions under Alternative A for 2015

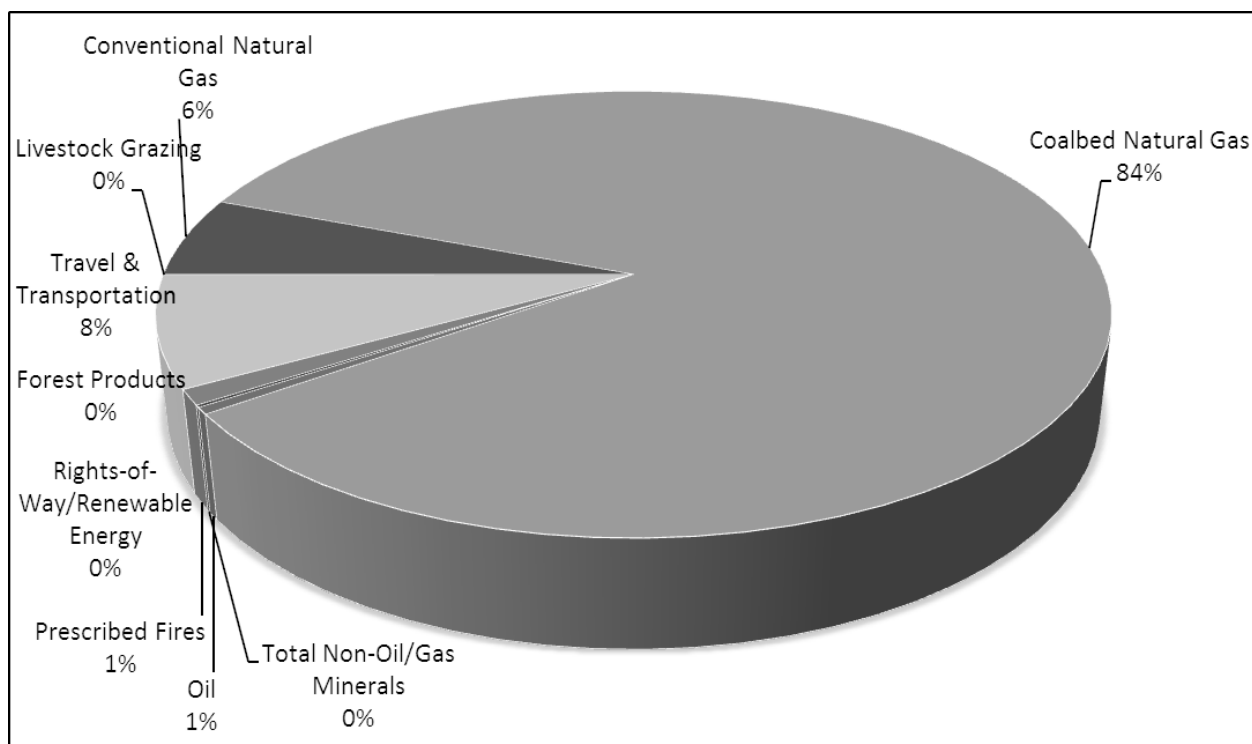


Figure 4.7. Contributions of Each Category to HAP Emissions under Alternative A for 2015

4.1.1.4. Alternative B

Alternative B represents the most restrictive use of resources reflecting the highest degree of conservation for physical, biological, heritage, and visual resources. This alternative limits the amount of resource growth and development activities, including the number of oil and natural gas wells, and the acreage developed and used in mining and other surface disturbing activities. Because of this, the emissions for this alternative are the lowest of all alternatives. Table 4.7, “Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative B – 2015” (p. 666) and Table 4.8, “Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative B – 2024” (p. 668) present the emission estimates for planned activities associated with Alternative B for 2015 and 2024, respectively. Although the overall emissions for Alternative B are lower than Alternative A, the relative contributions of the various activities to total emissions for Alternative B for 2015 and 2024 for PM₁₀, PM_{2.5}, NO_x, SO₂, CO, VOCs, and HAPs are similar to those presented for Alternative A in Figure 4.1, “Contributions of Each Category to PM₁₀ Emissions under Alternative A for 2015” (p. 662) through Figure 4.7, “Contributions of Each Category to HAP Emissions under Alternative A for 2015” (p. 665) above.

Compared to the 2005 base year, 2015 emissions are estimated to be similar or increase slightly for PM₁₀, PM_{2.5}, SO₂, and CO, and are expected to be relatively the same or slightly increase further in 2024. Emissions of NO_x, VOCs, and HAPs are expected to decrease in both 2015 and 2024 compared to 2005, likely reflecting restrictions on oil and gas development and the expected introduction of cleaner engine technology for off-road construction and maintenance engines and other equipment. Compared to 2005, emissions under this alternative are likely to contribute less to ambient ozone concentrations and total fine particulates, and overall impacts on air quality are expected to be the least of all of the alternatives.

Table 4.7. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative B – 2015

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
TOTAL – Federal Lands Only	7,200	1,966	813	31	3,514	6,113	625
TOTAL – Cumulative	7,958	2,084	1,896	130	3,830	18,039	1,842
Percent Change over Base Year – Federal Lands Only	5%	12%	-13%	-3%	2%	-47%	-49%
Percent Change over Base Year – Cumulative	3%	12%	59%	275%	7%	-42%	-43%
Leasable Minerals – Natural Gas Development – Federal	23	5	77	0	39	173	26

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Leasable Minerals – Coalbed Natural Gas Development – Federal	195	21	29	0	18	5,368	542
Leasable Minerals – Oil Development – Federal	105	11	7	0	4	1	0
Total Oil and Gas Minerals Development – Federal	323	36	113	1	61	5,541	568
Leasable Minerals – Natural Gas Development – All	68	14	224	1	104	426	64
Leasable Minerals – Coalbed Natural Gas Development – All	712	81	149	2	79	17,006	1,718
Leasable Minerals – Oil Development – All	302	59	823	96	194	34	3
Total Oil and Gas Minerals Development– All	1,081	154	1,196	100	377	17,467	1,785
Leasable Solid Minerals – Coal	5,700	1,759	630	23	1,507	---	---
Locatable Minerals – Bentonite Mining	804	89	2	0	3	0	0
Locatable Minerals – Uranium Mining	23	3	13	0	5	1	0
Salable Minerals – Sand, Gravel, and other Minerals	231	26	21	1	10	3	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Total Non-Oil and Gas Minerals	6,758	1,877	665	25	1,525	4	0
Fire and Fuels Management	38	32	11	3	362	19	2
Forest and Woodlands Management	30	3	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	32	3	2	0	1	0	0
Land Resources – Comprehensive Trails and Travel Management	17	15	22	2	1,559	548	55
Livestock Grazing	3	0	0	0	3	0	0
Source: Appendix M (p. 2239) CO carbon monoxide HAPs hazardous air pollutants NO _x nitrogen oxides PM ₁₀ particulate matter less than 10 microns in diameter PM _{2.5} particulate matter less than 2.5 microns in diameter SO ₂ sulfur dioxide VOCs volatile organic compounds							

Table 4.8. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative B – 2024

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
TOTAL – Federal Lands Only	7,355	2,056	800	32	3,487	600	66
TOTAL – Cumulative	7,874	2,150	1,868	131	3,796	4,708	497
Percent Change over Base Year – Federal Lands Only	7%	17%	-14%	0%	1%	-95%	-95%
Percent Change over Base Year – Cumulative	2%	16%	56%	278%	6%	-85%	-85%

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Leasable Minerals – Natural Gas Development – Federal	18	4	58	0	29	128	19
Leasable Minerals – Coalbed Natural Gas Development – Federal	9	1	4	0	2	77	8
Leasable Minerals – Oil Development – Federal	79	8	6	0	4	0	0
Total Oil and Gas Minerals Development – Federal	106	13	68	1	35	206	27
Leasable Minerals – Natural Gas Development – All	69	15	227	1	106	430	64
Leasable Minerals – Coalbed Natural Gas Development – All	250	33	85	2	39	3,850	390
Leasable Minerals – Oil Development – All	307	60	824	96	194	34	3
Total Oil and Gas Minerals Development – All	625	107	1,136	99	339	4,314	457
Leasable Solid Minerals – Coal	6,088	1,879	672	25	1,610	---	---
Locatable Minerals – Bentonite Mining	804	89	1	0	2	0	0
Locatable Minerals – Uranium Mining	15	2	11	0	5	1	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Salable Minerals – Sand, Gravel, and other Minerals	229	25	7	1	4	2	0
Total Non-Oil and Gas Minerals	7,136	1,995	691	26	1,621	3	0
Fire and Fuels Management	38	32	11	3	362	19	2
Forest and Woodlands Management	30	3	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	32	3	1	0	1	0	0
Land Resources – Comprehensive Trails and Travel Management	11	10	30	3	1,463	371	37
Livestock Grazing	3	0	0	0	3	0	0
Source: Appendix M (p. 2239) CO carbon monoxide HAPs hazardous air pollutants NO _x nitrogen oxides PM ₁₀ particulate matter less than 10 microns in diameter PM _{2.5} particulate matter less than 2.5 microns in diameter SO ₂ sulfur dioxide VOCs volatile organic compounds							

4.1.1.5. Alternative C

Alternative C is the least restrictive alternative in terms of planned growth and development, number of wells/projects, etc. and the emissions for this alternative are the highest of all alternatives. Table 4.9, “Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative C – 2015” (p. 671) and Table 4.10, “Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative C – 2024” (p. 673) present the emission estimates for planned activities associated with Alternative C for 2015 and 2024, respectively. The relative contributions of the various activities to total emissions for Alternative C for 2015 and 2024 for PM₁₀, PM_{2.5}, NO_x, SO₂, CO, VOCs, and HAPs are similar to those presented for Alternative A in Figure 4.1, “Contributions of Each Category to PM₁₀ Emissions under Alternative A for 2015” (p. 662) through Figure 4.7, “Contributions of Each Category to HAP Emissions under Alternative A for 2015” (p. 665) above.

Reflecting the least amount of constraint on the development and use of physical resources, Alternative C includes the allowance for additional oil and natural gas wells to be developed, increased activity in fire, fuel, and vegetation management activities, and overall increases in mining activity for leasable minerals. For example, resource development activities would be restricted in WSAs, but would be allowed in special recreation management areas (SRMAs). Compared to the 2005 base year, emissions are estimated to increase substantially in 2015 and 2024 for all pollutants except VOCs and HAPs. For 2024, emissions of VOCs and HAPs are expected to decrease compared to 2005. VOC emissions increase slightly in 2015 and then decrease in 2024 compared to 2005. HAP emissions show a decrease in 2015 and further in 2024. The longer term decreases in VOCs and HAPs likely reflect the expected introduction of cleaner engine technology for off-road construction and maintenance engines and other equipment. Compared to 2005, emissions under this alternative are likely to contribute to ambient ozone concentrations and total fine particulates, and overall impacts on air quality are expected to be the most of all of the alternatives. The increases in NO_x and PM_{2.5} emissions could lead to increases in ambient ozone concentrations and total fine particulates, including degraded visibility and increased deposition, and may possibly contribute to violations of the current WAAQS and NAAQS.

Table 4.9. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative C – 2015

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
TOTAL – Federal Lands Only	13,413	3,089	2,268	182	7,828	8,454	866
TOTAL – Cumulative	14,170	3,207	3,350	281	8,144	20,382	2,083
Percent Change over Base Year – Federal Lands Only	95%	76%	143%	468%	127%	-27%	-30%
Percent Change over Base Year – Cumulative	83%	73%	181%	711%	127%	-35%	-36%
Leasable Minerals – Natural Gas Development – Federal	49	11	159	1	71	270	41
Leasable Minerals – Coalbed Natural Gas Development – Federal	369	45	102	2	49	7,328	740
Leasable Minerals – Oil Development – Federal	213	52	866	102	201	36	4

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Total Oil and Gas Minerals Development – Federal	632	107	1,127	105	321	7,634	784
Leasable Minerals – Natural Gas Development – All	94	20	305	2	136	526	79
Leasable Minerals – Coalbed Natural Gas Development – All	885	105	222	4	110	18,967	1,916
Leasable Minerals – Oil Development – All	410	100	1,683	198	391	70	7
Total Oil and Gas Minerals Development– All	1,389	226	2,210	204	637	19,562	2,001
Leasable Solid Minerals – Coal	5,700	1,759	630	23	1,507	---	---
Locatable Minerals – Bentonite Mining	3,111	438	47	2	70	8	1
Locatable Minerals – Uranium Mining	80	11	44	1	18	4	0
Salable Minerals – Sand, Gravel, and other Minerals	3,027	339	261	13	0	32	3
Total Non-Oil and Gas Minerals	11,917	2,547	983	39	1,596	44	4
Fire and Fuels Management	453	379	128	35	4,343	225	23
Forest and Woodlands Management	194	19	0	0	2	1	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Land Resources – Rights-of-Way and Renewable Energy Projects	196	20	8	0	4	1	0
Land Resources – Comprehensive Trails and Travel Management	17	15	22	2	1,559	548	55
Livestock Grazing Management	3	0	0	0	3	0	0
Source: Appendix M (p. 2239) CO carbon monoxide HAPs hazardous air pollutants NO _x nitrogen oxides PM ₁₀ particulate matter less than 10 microns in diameter PM _{2.5} particulate matter less than 2.5 microns in diameter SO ₂ sulfur dioxide VOCs volatile organic compounds							

Table 4.10. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative C – 2024

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
TOTAL – Federal Lands Only	13,643	3,180	2,112	182	7,906	4,983	519
TOTAL – Cumulative	14,161	3,274	3,180	281	8,210	9,094	950
Percent Change over Base Year – Federal Lands Only	98%	81%	126%	467%	130	-57%	-58%
Percent Change over Base Year – Cumulative	83%	77%	166%	709%	129%	-71%	-71%
Leasable Minerals – Natural Gas Development – Federal	55	12	180	1	82	317	47
Leasable Minerals – Coalbed Natural Gas Development – Federal	252	33	85	2	38	3,994	405

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Leasable Minerals – Oil Development – Federal	243	55	867	102	202	36	4
Total Oil and Gas Minerals Development – Federal	550	100	1,133	105	322	4,348	455
Leasable Minerals – Natural Gas Development – All	105	23	350	2	159	621	92
Leasable Minerals – Coalbed Natural Gas Development – All	492	64	166	4	74	7,767	787
Leasable Minerals – Oil Development – All	471	107	1,684	198	393	70	7
Total Oil and Gas Minerals Development– All	1,068	193	2,201	204	626	8,458	886
Leasable Solid Minerals – Coal	6,088	1,879	672	25	1,610	---	---
Locatable Minerals – Bentonite Mining	3,109	437	23	2	61	7	1
Locatable Minerals – Uranium Mining	52	8	38	1	16	4	0
Salable Minerals – Sand, Gravel, and other Minerals	2,986	327	85	11	0	27	3
Total Non-Oil and Gas Minerals	12,235	2,651	819	39	1,688	38	4
Fire and Fuels Management	453	379	128	35	4,343	225	23

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Forest and Woodlands Management	194	20	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	196	20	3	0	2	1	0
Land Resources – Comprehensive Trails and Travel Management	11	10	30	3	1,463	371	37
Livestock Grazing	3	0	0	0	86	0	0
Source: Appendix M (p. 2239) CO carbon monoxide HAPs hazardous air pollutants NO _x nitrogen oxides PM ₁₀ particulate matter less than 10 microns in diameter PM _{2.5} particulate matter less than 2.5 microns in diameter SO ₂ sulfur dioxide VOCs volatile organic compounds							

4.1.1.6. Alternative D

Alternative D represents a balance between resource use and resource conservation and the level of planned activities associated with Alternative D lies between the least amount of activity in Alternative B and the greatest amount of activity associated with Alternative C. Table 4.11, “Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative D – 2015” (p. 676) and Table 4.12, “Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative D – 2024” (p. 678) present the emission estimates for planned activities associated with Alternative D (Proposed RMP) for 2015 and 2024, respectively. The relative contributions of the various activities to total emissions for Alternative D for 2015 and 2024 for PM₁₀, PM_{2.5}, NO_x, SO₂, CO, VOCs, and HAPs are similar to those presented for Alternative A in Figure 4.1, “Contributions of Each Category to PM₁₀ Emissions under Alternative A for 2015” (p. 662) through Figure 4.7, “Contributions of Each Category to HAP Emissions under Alternative A for 2015” (p. 665) above.

Compared to the 2005 base year, emissions are estimated to increase in 2015 and 2024 for all pollutants except VOCs and HAPs, which are expected to decrease slightly in 2015 and decrease further in 2024. As seen in the other alternatives, the longer term decreases in VOCs and HAPs likely reflect the expected introduction of cleaner engine and fuel technology for off-road construction and maintenance engines and other equipment.

Compared to 2005, emissions under this alternative are likely to contribute to ambient ozone concentrations and total fine particulates, affecting visibility and atmospheric deposition, with the

magnitude of impacts between those of Alternative B and Alternative C. The expected level of impacts may possibly contribute to violations of the current 8-hour average **ozone** standard.

Table 4.11. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative D – 2015

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
TOTAL – Federal Lands Only	9,886	2,449	1,896	140	5,366	7,302	752
TOTAL – Cumulative	10,647	2,567	2,980	239	6,069	19,230	1,969
Percent Change over Base Year – Federal Lands Only	44%	40%	103%	336%	56%	-37%	-39%
Percent Change over Base Year – Cumulative	37%	39%	150%	589%	70%	-39%	-40%
Leasable Minerals – Natural Gas Development – Federal	46	10	150	1	67	260	39
Leasable Minerals – Coalbed Natural Gas Development – Federal	283	33	66	1	34	6,359	642
Leasable Minerals – Oil Development – Federal	201	47	772	91	610	32	3
Total Oil and Gas Minerals Development – Federal	531	90	988	93	711	6,651	685
Leasable Minerals – Natural Gas Development – All	91	20	296	2	133	515	77
Leasable Minerals – Coalbed Natural Gas Development – All	802	93	187	3	95	17,998	1,818

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Leasable Minerals – Oil Development – All	398	96	1,589	187	1,186	66	7
Total Oil and Gas Minerals Development– All	1,291	209	2,072	192	1,414	18,579	1,901
Leasable Solid Minerals – Coal	5,700	1,759	630	23	1,507	---	---
Locatable Minerals – Bentonite Mining	1,448	231	33	1	50	6	1
Locatable Minerals – Uranium Mining	68	10	38	1	16	4	4
Salable Minerals – Sand, Gravel, and other Minerals	1,572	176	134	7	67	17	1
Total Non-Oil and Gas Minerals	8,789	2,176	836	32	1,640	26	5
Fire and Fuels Management	151	126	43	12	1,448	75	8
Forest and Woodlands Management	85	9	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	311	32	7	0	4	1	0
Land Resources – Comprehensive Trails and Travel Management	17	15	22	2	1,559	548	55

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Livestock Grazing	3	0	0	0	3	0	0
Source: Appendix M (p. 2239)							
CO carbon monoxide							
HAPs hazardous air pollutants							
NO _x nitrogen oxides							
PM ₁₀ particulate matter less than 10 microns in diameter							
PM _{2.5} particulate matter less than 2.5 microns in diameter							
SO ₂ sulfur dioxide							
VOCs volatile organic compounds							

Table 4.12. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative D – 2024

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
TOTAL – Federal Lands Only	10,098	2,541	1,825	140	5,419	2,857	305
TOTAL – Cumulative	10,619	2,636	2,895	239	6,232	6,968	736
Percent Change over Base Year – Federal Lands Only	47%	45%	96%	336%	57%	-75%	-75%
Percent Change over Base Year – Cumulative	37%	42%	142%	588%	74%	-78%	-77%
Leasable Minerals – Natural Gas Development – Federal	50	11	167	1	76	297	44
Leasable Minerals – Coalbed Natural Gas Development – Federal	132	17	45	1	20	2,059	209
Leasable Minerals – Oil Development – Federal	225	50	773	91	709	32	3
Total Oil and Gas Minerals Development – Federal	408	78	985	93	805	2,388	256

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Leasable Minerals – Natural Gas Development – All	101	22	337	2	153	600	89
Leasable Minerals – Coalbed Natural Gas Development – All	369	48	125	3	56	5,831	591
Leasable Minerals – Oil Development – All	453	101	1,590	187	1,408	66	7
Total Oil and Gas Minerals Development– All	923	171	2,052	192	1,616	6,498	686
Leasable Solid Minerals – Coal	6,088	1,879	672	25	1,610	---	---
Locatable Minerals – Bentonite Mining	1,448	230	17	1	43	5	0
Locatable Minerals – Uranium Mining	45	7	33	1	14	3	3
Salable Minerals – Sand, Gravel, and other Minerals	1,549	170	44	6	29	14	1
Total Non-Oil and Gas Minerals	9,129	2,286	765	33	1,696	22	4
Fire and Fuels Management	151	126	43	12	1,448	75	8
Forest and Woodlands Management	85	9	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	311	32	3	0	2	1	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Land Re-sources – Comprehensive Trails and Travel Management	11	10	30	3	1,463	371	37
Livestock Grazing Management	3	0	0	0	3	0	0

Source: Appendix M (p. 2239)

% percent
CO carbon monoxide
HAPs hazardous air pollutants
NO_x nitrogen oxides
PM₁₀ particulate matter less than 10 microns in diameter
PM_{2.5} particulate matter less than 2.5 microns in diameter
SO₂ sulfur dioxide
VOCs volatile organic compounds

4.1.1.7. Cumulative Impacts

Analysis of Cumulative Impacts

Because no air quality modeling was conducted as part of this analysis, cumulative impacts to air quality over the life of the plan were analyzed for each alternative by comparing cumulative emissions with statewide emission totals. The 2005 Wyoming DEQ statewide emissions inventory for 42 different source categories was obtained from the EPA National Emissions Inventory (EPA 2013c). Emissions from various resources reflecting BLM actions and activities, non-BLM activities (for oil, natural gas, and CBNG development), and the cumulative totals for the planning area are compared to Wyoming statewide emissions for all anthropogenic sources in Table 4.13, “Comparison of Emissions from BLM and Non-BLM Activities in the Buffalo Planning Area to Cumulative Annual Statewide Emissions for 2005” (p. 681) for 2005 and for each of the 2015 alternatives. Due to the uncertainty inherent in estimating emissions beyond 10 years or so in the future, comparisons are not made with the 2024 emission estimates. The totals for 2005 and each of the alternatives show that emissions from BLM-managed activities in the Buffalo planning area are 3 percent or less of statewide totals.

Emissions for BLM and non-BLM activities for natural gas, oil, and CBNG development were computed based on information provided by BLM. Information on non-federal activities was not provided for any of the other resources. Also, because of the way the emissions were calculated for TTM (e.g., for public use of snowmobiles and ATVs, etc.), these activities were assumed to take place on federal and non-federal lands. As such, the emissions included under the non-BLM actions in Table 4.13, “Comparison of Emissions from BLM and Non-BLM Activities in the Buffalo Planning Area to Cumulative Annual Statewide Emissions for 2005” (p. 681) represent those activities from non-federal oil, natural gas, and CBNG development only.

In examining the emission totals, it is evident that the concentrations of CO, NO_x, and SO₂ (and to a lesser extent PM_{2.5} and PM₁₀) in the planning area could potentially increase slightly in certain areas, but would not likely contribute to exceedances of the air quality standards. Through 2011, the peak ozone concentration in the planning area was 82 percent of the 8-hour

ozone standard, while peak 24-hour and annual PM_{2.5} and peak 24-hour PM₁₀ concentrations were less than 70 percent of the applicable standards. If the existing NAAQS for ozone is lowered in the near future by EPA, this may become an important issue in the planning area. Because the emissions from BLM activities in the planning area are relatively small compared to state totals, the potential cumulative impacts on atmospheric deposition and lake acidification would likely not change significantly over the course of the plan. Likewise, total nitrogen and sulfur deposition would likely be the same and would not exceed levels of concern, and impacts on visibility would likely be minimal over the life of the plan.

For specific future proposed large-scale development projects (i.e., development of a new natural gas field) in the planning area, the BLM will likely require a more refined assessment of incremental and cumulative impacts using appropriate air quality modeling tools. These tools are able to simulate both incremental and cumulative impacts of emissions from a variety of anthropogenic and biogenic sources contributing to observed air quality in the planning area including impacts on concentrations, deposition, and visibility. The BLM will continue to work with the EPA and the State of Wyoming to ensure that emissions from activities on BLM-administered land do not contribute to any violations of the applicable NAAQS or WAAQS.

Table 4.13. Comparison of Emissions from BLM and Non-BLM Activities in the Buffalo Planning Area to Cumulative Annual Statewide Emissions for 2005

Pollutant	Estimated BLM Emissions in the Buffalo Planning Area (tons per year)	Estimated Non-BLM Emissions in the Buffalo Planning Area (tons per year)	2005 Wyoming Statewide Emissions (tons per year)	Total (tons per year)	Percent Contribution of Activities within the Buffalo Planning Area Emissions to Statewide Emissions
Base Year - 2005					
PM ₁₀	6,889	868	846,689	854,446	0.91
PM _{2.5}	1,754	99	133,849	135,702	1.37
NO _x	933	261	185,813	187,007	0.64
SO ₂	32	3	122,389	122,424	0.03
CO	3,441	139	399,257	402,837	0.89
VOCs	11,595	19,756	79,575	110,927	28.26
Alternative A - 2015					
PM ₁₀	8,913	759	846,689	856,361	1.13
PM _{2.5}	2,271	118	133,849	136,239	1.75
NO _x	1,780	1,084	185,813	188,677	1.52
SO ₂	137	99	122,389	122,625	0.19
CO	4,845	316	399,257	404,418	1.28
VOCs	6,602	11,928	79,575	98,105	18.89
Alternative B - 2015					
PM ₁₀	7,200	758	846,689	854,509	0.93
PM _{2.5}	1,966	118	133,849	135,933	1.53
NO _x	813	1,083	185,813	187,709	1.01
SO ₂	31	99	122,389	122,519	0.11
CO	3,514	316	399,257	403,087	0.95
VOCs	6,133	11,926	79,575	97,614	18.48
Alternative C - 2015					
PM ₁₀	13,413	757	846,689	860,859	1.65
PM _{2.5}	3,089	118	133,849	137,056	2.34
NO _x	2,268	1,083	185,813	189,163	1.77

Pollutant	Estimated BLM Emissions in the Buffalo Planning Area (tons per year)	Estimated Non-BLM Emissions in the Buffalo Planning Area (tons per year)	2005 Wyoming Statewide Emissions (tons per year)	Total (tons per year)	Percent Contribution of Activities within the Buffalo Planning Area Emissions to Statewide Emissions
SO ₂	182	99	122,389	122,670	0.23
CO	7,828	316	399,257	407,401	2.00
VOCs	8,454	316	79,575	88,345	9.93
Alternative D - 2015					
PM ₁₀	9,886	760	846,689	857,336	1.24
PM _{2.5}	2,449	119	133,849	136,416	1.88
NO _x	1,896	1,084	185,813	188,793	1.58
SO ₂	140	99	122,389	122,628	0.19
CO	5,366	703	399,257	405,326	1.50
VOCs	7,302	11,928	79,575	98,805	19.46
CO carbon monoxide HAPs hazardous air pollutants NO _x nitrogen oxides PM ₁₀ particulate matter less than 10 microns in diameter PM _{2.5} particulate matter less than 2.5 microns in diameter SO ₂ sulfur dioxide VOCs volatile organic compounds					

4.1.1.8. Analysis of Greenhouse Gases

Concentrations of certain gases in the earth's atmosphere have been identified as being effective at trapping heat reflected off the earth's surface thereby creating a "greenhouse effect." As concentrations of these GHGs increase, the atmosphere warms, the composition of the atmosphere changes and global climate is affected. Concentrations of GHG have increased dramatically in the earth's atmosphere in the past century. Anthropogenic (man-made) sources and other human activities have been attributed by the EPA and others to these increases particularly for CO₂, CH₄, N₂O, and fluorinated gases (DOI 2010a).

The EPA has determined that six GHGs are air pollutants and subject to regulation under the Clean Air Act (CAA): CO₂, CH₄, N₂O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Of these GHGs, CO₂, CH₄, N₂O are commonly emitted by the types of activities included in this analysis, while the remaining three GHGs are emitted in extremely small quantities or are not emitted at all. GHG emissions from management actions and activities were estimated for each alternative in this analysis for CO₂, CH₄, and N₂O.

As the major component of natural gas, CH₄ emissions from and oil and gas exploration, production, and transportation can be considerable. Emissions of CH₄ from the extraction of coal from surface mines can also be significant. Emissions of CO₂ and N₂O from fossil fuel combustion and fire can also be of concern. This analysis quantified emissions of CO₂, CH₄, and N₂O from the management actions and activities for each alternative for all of the resources listed above.

Each GHG component has been given a Global Warming Potential (GWP) number that takes into account the intensity of the substance's heat trapping effect and its longevity in the atmosphere as compared to CO₂. This analysis used the EPA GWPs of 21 for CH₄, and 310 for N₂O. The estimated quantity emitted for each GHG was multiplied by its GWP and summed with the other

GHG to obtain total GHG emitted in CO₂ equivalents in short tons. CO₂ equivalents were then converted to million metric tons (MMt), the typical reporting unit for GHG emissions. Table 4.14, “Estimated Annual Greenhouse Gas Emissions (tons per year) Summary for Activities within the Buffalo Planning Area” (p.)” shows the estimated annual emissions of the GHG for each alternative. Appendix M (p. 2239) includes additional details on the GHG emissions calculations.

Table 4.14. Estimated Annual Greenhouse Gas Emissions (tons per year) Summary for Activities within the Buffalo Planning Area

	Greenhouse Gases				
Scenario	CO ₂	CH ₄	N ₂ O	CO ₂ equivalents	CO ₂ equivalents (million metric tons)
Base Year – 2005					
Base Year	171,773	449,830	3	9,619,295	8.74
Forecast Year – 2015					
Alternative A	238,700	489,474	8	10,520,190	9.55
Alternative B	168,872	489,311	3	10,445,431	9.48
Alternative C	318,894	485,791	18	10,526,071	9.56
Alternative D	269,562	487,824	8	10,516,397	9.55
Forecast Year – 2024					
Alternative A	243,043	498,805	8	10,720,482	9.74
Alternative B	153,937	494,876	3	10,547,311	9.58
Alternative C	330,865	506,140	18	10,965,398	9.96
Alternative D	274,398	501,211	8	10,802,378	9.81
Source: Appendix M (p. 2239)					
CH ₄ methane CO ₂ carbon dioxide N ₂ O nitrous oxide					

Alternative C shows the highest increases in GHG emissions due primarily to the higher projected oil and gas production activities. The total GHG emissions for all of the alternatives are fairly comparable because they are dominated by CH₄ emissions from surface coal mining operations in the PRB, which is the largest contributor compared to other activities in the planning area. Oil and gas production is the second major contributor to GHG emissions for all alternatives. The largest sources of GHG emissions within the oil and gas sector include CO₂ emissions from natural gas compressors and drill rig engines, and fugitive CH₄ emissions from wellhead equipment, pneumatic devices and tanks. The estimated GHG emissions are based on “worst case” estimates of production rates and operational characteristics and likely result in overestimated total GHG emissions. Considerable reductions in these estimated emissions may be realized at the time of actual development through control technologies such as electric compressor engines, “green completions,” low or no bleed pneumatic devices, and capture and control of leaks and vents.

Table 4.15, “Buffalo Planning Area GHG Emissions as Percentage of Wyoming Statewide GHG Emissions” (p. 684) shows the comparison of project related GHG emissions for each of the alternatives to a statewide inventory of GHG emissions that was completed in 2007. The inventory was compiled for the Wyoming DEQ by the Center for Climate Strategies and was based on actual emissions for 2005 and projected emissions for 2010 and 2020. GHG emissions estimated for each of the alternatives comprise approximately 13 percent of statewide GHG emissions. This is driven mainly by CH₄ emissions associated with surface coal mining in the PRB. The total estimated GHG emissions for 2015 for Alternative D (Proposed RMP) of 9.17 MMt are approximately equal to 0.13 percent of the total U.S. 2008 GHG emissions of 6,956 MMt (EPA

2010). Assessing the impacts of GHG emissions on global climate change requires modeling on a global scale which is beyond the scope of this analysis. Potential impacts on climate change are influenced by GHG emission sources from around the globe and it is not possible to distinguish the impacts to global climate change from GHG emissions originating from the planning area.

Table 4.15. Buffalo Planning Area GHG Emissions as Percentage of Wyoming Statewide GHG Emissions

Buffalo Planning Area		Wyoming Statewide Inventory		Percent Contribution
Scenario	Estimated GHG Emissions (MMt CO ₂ equivalents)	Year	Estimated GHG Emissions (MMt CO ₂ equivalents)	BFO GHGs to Wyoming GHGs
Base Year -2005	8.74	Actual Estimated 2005	55.6	15.7%
Alternative A -2015	9.76	Projected 2020	69.4	14.1%
Alternative B -2015	9.66	Projected 2020	69.4	13.9%
Alternative C -2015	9.92	Projected 2020	69.4	14.3%
Alternative D -2015	9.82	Projected 2020	69.4	14.2%

Source: Center for Climate Strategies 2007

BFO Buffalo Field Office
CO₂ carbon dioxide
GHG greenhouse gas
MMt million metric tons

Table 4.16, “Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Base Year 2005” (p. 684) presents GHG emission estimations for the 2005 base year for all resource activities, and Table 4.17, “Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative A – 2015” (p. 685) through Table 4.24, “Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative D – 2024” (p. 694) present this information for each of the alternatives for 2015 and 2024. As noted above, the largest sources of CO₂ emissions are from activities associated with the development of leasable fluid minerals while the largest source of CH₄ emissions is from coal mining operations in the PRB.

Table 4.16. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Base Year 2005

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
TOTAL – Federal Lands Only	91,489	402,230	3	8,539,190
TOTAL – Cumulative	171,773	449,830	3	9,619,295
Leasable Minerals – Natural Gas Development – Federal	38,256	1,562	0	71,166
Leasable Minerals – Coalbed Natural Gas Development – Federal	22,079	25,257	0	552,534

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
Leasable Minerals – Oil Development – Federal	1,036	0	0	1,043
Leasable Oil and Gas Minerals – Federal	61,371	26,819	1	624,743
Leasable Minerals – Natural Gas Development – All	72,278	2,950	1	134,437
Leasable Minerals – Coalbed Natural Gas Development – All	67,738	71,470	1	1,568,756
Leasable Minerals – Oil Development – All	1,640	0	0	1,655
Total Oil and Gas Minerals Development – All	141,655	74,420	1	1,704,848
Leasable Minerals – Coal	---	374,975	---	7,874,484
Locatable Minerals – Bentonite Mining	1,101	0	0	1,102
Locatable Minerals – Uranium Mining	1,256	0	0	1,262
Salable Minerals – Sand, Gravel, and other Minerals	18,170	0	---	18,174
Total Non-Oil and Gas Minerals	20,528	374,976	0	7,895,022
Fire and Fuels Management	13	37	2	1,502
Forests and Woodlands Management	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	1,508	0	---	1,508
Land Resources – Comprehensive Trails and Travel Management	7,965	8	---	8,132
Livestock Grazing	75	389	---	8,253
CO ₂ carbon dioxide CH ₄ methane N ₂ O nitrous oxide				

Table 4.17. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative A – 2015

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
TOTAL – Federal Lands Only	132,480	470,102	6	10,006,632
TOTAL – Cumulative	247,316	500,009	8	10,750,063

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
Leasable Minerals – Natural Gas Development – Federal	50,073	1,867	0	89,419
Leasable Minerals – Coalbed Natural Gas Development – Federal	12,420	13,436	0	294,609
Leasable Minerals – Oil Development – Federal	36,232	610	1	49,376
Leasable Oil and Gas Minerals – Federal	98,726	15,913	2	433,405
Leasable Minerals – Natural Gas Development – All	97,832	3,632	1	174,369
Leasable Minerals – Coalbed Natural Gas Development – All	42,846	41,002	0	903,993
Leasable Minerals – Oil Development – All	72,883	1,186	2	98,473
Total Oil and Gas Minerals Development – All	213,561	45,820	3	1,176,836
Leasable Minerals – Coal	---	453,714	---	9,527,984
Locatable Minerals – Bentonite Mining	1,130	0	0	1,130
Locatable Minerals – Uranium Mining	1,734	0	0	1,740
Salable Minerals – Sand, Gravel, and other Minerals	18,435	0	---	18,437
Total Non-Oil and Gas Minerals	21,299	453,714	0	9,549,292
Fire and Fuels Management	9	79	5	3,157
Forests and Woodlands Management	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	543	0	---	543
Land Resources – Comprehensive Trails and Travel Management	11,799	7	---	11,952
Livestock Grazing	75	389	---	8,253
CO ₂ carbon dioxide CH ₄ methane N ₂ O nitrous oxide				

Table 4.18. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative A – 2024

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
TOTAL – Federal Lands Only	134,105	487,047	6	10,364,092
TOTAL – Cumulative	243,257	498,805	8	10,720,695
Leasable Minerals – Natural Gas Development – Federal	57,505	2,170	1	103,240
Leasable Minerals – Coalbed Natural Gas Development – Federal	2,992	1,615	0	36,915
Leasable Minerals – Oil Development – Federal	36,199	709	1	51,426
Leasable Oil and Gas Minerals – Federal	96,696	4,494	2	191,581
Leasable Minerals – Natural Gas Development – All	114,450	4,309	1	205,266
Leasable Minerals – Coalbed Natural Gas Development – All	18,548	10,535	0	239,824
Leasable Minerals – Oil Development – All	72,850	1,408	2	103,095
Total Oil and Gas Minerals Development – All	205,847	16,252	3	548,184
Leasable Minerals – Coal	---	481,281	---	10,106,906
Locatable Minerals – Bentonite Mining	1,130	0	0	1,130
Locatable Minerals – Uranium Mining	1,196	0	0	1,200
Salable Minerals – Sand, Gravel, and other Minerals	18,439	0	---	18,441
Total Non-Oil and Gas Minerals	20,764	481,282	0	10,127,677
Fire and Fuels Management	9	79	5	3,157
Forests and Woodlands Management	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	1,658	0	---	1,658

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
Land Resources – Comprehensive Trails and Travel Management	13,131	6	---	13,247
Livestock Grazing	1,818	1,187	---	26,742
CO ₂ carbon dioxide CH ₄ methane N ₂ O nitrous oxide				

Table 4.19. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative B – 2015

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
TOTAL – Federal Lands Only	61,654	468,505	2	9,900,759
TOTAL – Cumulative	176,313	498,412	3	10,644,009
Leasable Minerals – Natural Gas Development – Federal	30,622	1,250	0	56,949
Leasable Minerals – Coalbed Natural Gas Development – Federal	10,562	12,719	0	277,689
Leasable Minerals – Oil Development – Federal	834	407	0	9,378
Leasable Oil and Gas Minerals – Federal	42,018	14,375	0	344,016
Leasable Minerals – Natural Gas Development – All	78,342	3,014	1	141,855
Leasable Minerals – Coalbed Natural Gas Development – All	40,851	40,285	0	886,935
Leasable Minerals – Oil Development – All	37,484	983	1	58,475
Total Oil and Gas Minerals Development – All	156,677	44,282	2	1,087,266
Leasable Minerals – Coal	---	453,714	---	9,527,984
Locatable Minerals – Bentonite Mining	563	0	0	564
Locatable Minerals – Uranium Mining	867	0	0	871
Salable Minerals – Sand, Gravel, and other Minerals	5,793	0	---	5,793
Total Non-Oil and Gas Minerals	7,222	453,714	0	9,535,212

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
Fire and Fuels Management	1	20	1	788
Forests and Woodlands Management	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	508	0	---	508
Land Resources – Travel and Transportation Management	11,799	7	---	11,952
Livestock Grazing	76	389	---	8,254
CO ₂ carbon dioxide CH ₄ methane N ₂ O nitrous oxide				

Table 4.20. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative B – 2024

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
TOTAL – Federal Lands Only	45,152	483,118	1	10,191,081
TOTAL – Cumulative	154,119	494,876	3	10,547,493
Leasable Minerals – Natural Gas Development – Federal	22,966	936	0	42,694
Leasable Minerals – Coalbed Natural Gas Development – Federal	562	181	0	4,363
Leasable Minerals – Oil Development – Federal	868	305	0	7,276
Leasable Oil and Gas Minerals – Federal	24,396	1,422	0	54,333
Leasable Minerals – Natural Gas Development – All	79,864	3,075	1	144,667
Leasable Minerals – Coalbed Natural Gas Development – All	15,980	9,101	0	207,134
Leasable Minerals – Oil Development – All	37,519	1,003	1	58,945
Total Oil and Gas Minerals Development – All	133,363	13,180	2	410,745
Leasable Minerals – Coal	---	481,281	---	10,106,906

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
Locatable Minerals – Bentonite Mining	563	0	0	564
Locatable Minerals – Uranium Mining	598	0	0	601
Salable Minerals – Sand, Gravel, and other Minerals	5,794	0	---	5,794
Total Non-Oil and Gas Minerals	6,955	481,281	0	10,113,865
Fire and Fuels Management	1	20	1	788
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	564	0	---	564
Land Resources – Travel and Transportation Management	13,131	6	---	13,247
Livestock Grazing	76	389	---	8,254
CO ₂ carbon dioxide CH ₄ methane N ₂ O nitrous oxide				

Table 4.21. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative C – 2015

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
TOTAL – Federal Lands Only	219,212	474,248	16	10,183,467
TOTAL – Cumulative	333,908	504,155	18	10,926,759
Leasable Minerals – Natural Gas Development – Federal	51,803	1,922	0	92,308
Leasable Minerals – Coalbed Natural Gas Development – Federal	22,543	17,351	0	386,954
Leasable Minerals – Oil Development – Federal	39,382	628	1	52,935
Leasable Oil and Gas Minerals – Federal	113,727	19,900	2	532,197
Leasable Minerals – Natural Gas Development – All	99,565	3,687	1	177,262
Leasable Minerals – Coalbed Natural Gas Development – All	52,826	44,917	0	996,195

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
Leasable Minerals – Oil Development – All	76,032	1,204	2	102,032
Total Oil and Gas Minerals Development – All	228,424	49,808	4	1,275,489
Leasable Minerals – Coal	---	453,714	---	9,527,984
Locatable Minerals – Bentonite Mining	14,867	0	0	14,875
Locatable Minerals – Uranium Mining	3,036	0	0	3,046
Salable Minerals – Sand, Gravel, and other Minerals	73,556	0	---	73,565
Total Non-Oil and Gas Minerals	91,459	453,715	0	9,619,470
Fire and Fuels Management	27	236	14	9,470
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	2,094	0	---	2,094
Land Resources – Travel and Transportation Management	11,800	7	---	11,953
Livestock Grazing	76	389	---	8,254
CO ₂ carbon dioxide CH ₄ methane N ₂ O nitrous oxide				

Table 4.22. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative C – 2024

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
TOTAL – Federal Lands Only	222,222	494,382	16	10,609,303
TOTAL – Cumulative	331,234	506,140	18	10,965,767
Leasable Minerals – Natural Gas Development – Federal	60,577	2,280	1	108,629
Leasable Minerals – Coalbed Natural Gas Development – Federal	16,237	9,444	0	214,590
Leasable Minerals – Oil Development – Federal	39,342	745	1	55,354

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
Leasable Oil and Gas Minerals – Federal	116,156	12,469	2	378,573
Leasable Minerals – Natural Gas Development – All	117,526	4,419	1	210,659
Leasable Minerals – Coalbed Natural Gas Development – All	31,649	18,364	0	417,355
Leasable Minerals – Oil Development – All	75,993	1,444	2	107,023
Total Oil and Gas Minerals Development – All	225,169	24,227	4	735,037
Leasable Minerals – Coal	---	481,281	---	10,106,906
Locatable Minerals – Bentonite Mining	14,869	0	0	14,876
Locatable Minerals – Uranium Mining	2,094	0	0	2,101
Salable Minerals – Sand, Gravel, and other Minerals	73,571	0	---	73,578
Total Non-Oil and Gas Minerals	90,534	481,282	0	10,197,461
Fire and Fuels Management	27	236	14	9,470
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	2,267	0	---	2,268
Land Resources – Travel and Transportation Management	13,132	6	---	13,248
Livestock Grazing	76	389	---	8,254
CO ₂ carbon dioxide CH ₄ methane N ₂ O nitrous oxide				

Table 4.23. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative D – 2015

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
TOTAL – Federal Lands Only	165,993	471,704	6	10,073,791
TOTAL – Cumulative	280,838	501,611	8	10,817,231
Leasable Minerals – Natural Gas Development – Federal	49,492	1,849	0	88,454

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
Leasable Minerals – Coalbed Natural Gas Development – Federal	16,622	15,062	0	332,967
Leasable Minerals – Oil Development – Federal	35,163	604	1	48,171
Leasable Oil and Gas Minerals – Federal	101,277	17,515	2	469,593
Leasable Minerals – Natural Gas Development – All	97,255	3,613	1	173,408
Leasable Minerals – Coalbed Natural Gas Development – All	47,053	42,628	0	942,356
Leasable Minerals – Oil Development – All	71,814	1,180	2	97,268
Total Oil and Gas Minerals Development – All	216,122	47,422	3	1,213,033
Leasable Minerals – Coal	---	453,714	---	9,527,984
Locatable Minerals – Bentonite Mining	10,533	0	0	10,539
Locatable Minerals – Uranium Mining	2,605	0	0	2,614
Salable Minerals – Sand, Gravel, and other Minerals	37,789	0	---	37,794
Total Non-Oil and Gas Minerals	50,928	453,714	0	9,578,931
Fire and Fuels Management	9	79	5	3,157
Forests and Woodlands Management	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	1,871	0	---	1,871
Land Resources – Comprehensive Trails and Travel Management	11,800	7	---	11,953
Livestock Grazing	78	389	---	8,257
CO ₂ carbon dioxide CH ₄ methane N ₂ O nitrous oxide				

Table 4.24. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative D – 2024

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
TOTAL – Federal Lands Only	165,519	489,454	6	10,446,048
TOTAL – Cumulative	274,679	501,211	8	10,802,658
Leasable Minerals – Natural Gas Development – Federal	56,479	2,134	1	101,448
Leasable Minerals – Coalbed Natural Gas Development – Federal	8,492	4,867	0	110,721
Leasable Minerals – Oil Development – Federal	35,132	697	1	50,099
Leasable Oil and Gas Minerals – Federal	100,102	7,698	2	262,267
Leasable Minerals – Natural Gas Development – All	113,427	4,273	1	203,477
Leasable Minerals – Coalbed Natural Gas Development – All	23,770	13,787	0	313,353
Leasable Minerals – Oil Development – All	71,783	1,396	2	101,767
Total Oil and Gas Minerals Development – All	209,261	19,456	3	618,877
Leasable Minerals – Coal	---	481,281	---	10,106,906
Locatable Minerals – Bentonite Mining	10,534	0	0	10,540
Locatable Minerals – Uranium Mining	1,798	0	0	1,804
Salable Minerals – Sand, Gravel, and other Minerals	37,797	0	---	37,801
Total Non-Oil and Gas Minerals	50,130	481,282	0	10,157,051
Fire and Fuels Management	9	79	5	3,157
Forests and Woodlands Management	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	2,039	0	---	2,039

Resource	Greenhouse Gases			
	CO ₂	CH ₄	N ₂ O	CO ₂ Equivalents
Land Resources – Comprehensive Trails and Travel Management	13,132	6	---	13,248
Livestock Grazing	78	389	---	8,257
CO ₂ carbon dioxide CH ₄ methane N ₂ O nitrous oxide				

4.1.1.9. Summary and Comparisons

Table 4.25, “Estimated Annual Emissions Summary (tons/year) for Activities within the Buffalo Planning Area ” (p. 696) presents emission totals by pollutant species for each of the alternatives. This information is displayed graphically in Figure 4.8, “Emission Estimates for 2015 from Activities within the Buffalo Planning Area” (p. 697) and Figure 4.9, “Emission Estimates for 2024 from Activities within the Buffalo Planning Area” (p. 697). A consistent methodology was followed to estimate emissions from BLM-managed activities within the planning area for a base year (2005) and two future years. As detailed in Appendix M (p. 2239), the emissions were estimated using available equipment counts and activity information for the base year (2005) and reasonable further development activity forecast information for the future years, by alternative, so that direct comparisons could be made with the base year emissions and among the alternatives. There likely exist inherent inaccuracies in the 2005 base year inventory, especially regarding information on equipment and activity levels within the planning area. Nevertheless, this inventory was developed and used for comparison with the future year inventories, which are based on best estimate future development, equipment usage and activity levels, so that inferences could be made on the potential impacts resulting from the expected changes in emissions and resulting air quality within the planning area.

Over the past several years, other agencies have developed both base year and future year emission estimates for the three counties (Campbell, Sheridan, and Johnson Counties) that make up the planning area. For example, the State of Wyoming has compiled state-wide emissions for all major anthropogenic source categories (electric generation units, other major point sources, area sources, non-road sources, and on-road sources) that have been provided to the EPA for inclusion in the NEI. The inventory is updated every three years, with the latest update compiled for 2011. Table 4.26, “Annual Total Emissions Summary (tons/year) for Campbell, Johnson and Sheridan Counties, WY from the National Emission Inventory” (p. 698) presents emission estimates for all source categories for the years 2005, 2008, and 2011. This table shows some wide variations in emissions totals between 2005 and 2011, possibly reflecting major changes or differences in the year-to-year level of resource development (e.g., coal mining, natural gas extraction, etc.), that were possibly affected by the national recession. It should also be recognized that the latest year (2011) emission inventory is likely more accurate due to better information (e.g., activity levels, equipment counts, etc.) or different methodologies that were followed in compiling the inventory, compared to the 2005 inventory. The emissions in this table cannot be compared directly to the emissions for BLM activities, because they include emissions from all source categories. However, one item to note is that the BLM VOC emissions for 2005 are much larger than the NEI emissions. This is possibly due to a more accurate estimate of VOC emissions from evaporation ponds for the various natural gas and oil development fields in the planning area in the BLM inventory.

Because coal mining is a major source of emissions in Campbell County, Table 4.27, “Annual Coal Mine Emissions Summary (tons/year) for Campbell County, WY from the National Emission Inventory” (p. 699) presents criteria pollutant emissions for the year 2005, 2008, and 2011 from the NEI. The emissions for coal mining for 2005 are quite different in this inventory than those estimated in the BLM analysis as presented in Table 4.4, “Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Base Year 2005” (p. 654). Again, this likely reflects differences in the quantity and quality of equipment and activity data, and differences in emission estimation methodologies (e.g., emission factors for various vehicles, engines, and other equipment) used in developing each of the inventories.

In addition to coal mining, oil and natural gas development are also major sources of criteria pollutant emissions in the planning area. As noted above, other regulatory agencies have compiled both base and future-year emission inventories for Wyoming and the Mountain West supporting various air quality planning and management activities. The WRAP, a multi-state planning group responsible for addressing regional haze and other regional air quality issues, has developed updated oil and gas development emission inventories for various basins in the Mountain West, including the PRB. Table 4.28, “Annual Oil and Gas Emissions Summary (tons/year) for Campbell, Johnson, and Sheridan Counties, Wyoming from the Western Regional Air Partnership Inventory” (p. 699), presents criteria pollutant emissions for 2006, 2009, and 2015 (projected). The 2006 and 2009 emissions are based on actual equipment and activity data for these years, while the 2015 emissions are projected from the 2006 emissions based on future development forecasts for the area.

For some species (e.g., NO_x), the WRAP emissions are significantly larger than those in the BLM inventory, but similar to the emissions for coal mines, the emissions from the WRAP inventory are not directly comparable to the BLM inventory, because of the likely differences in assumed equipment counts, activity levels, emission factors, and emission estimation methodologies used/followed in compiling the inventories. Like the BLM inventory presented in Table 4.25, “Estimated Annual Emissions Summary (tons/year) for Activities within the Buffalo Planning Area ” (p. 696), the WRAP inventory forecasts an increase of emissions between 2006 and 2015 from the oil and gas sector, which may contribute to air quality impacts in the future. However, the 2009 emission totals show larger increases for certain species (PM₁₀, PM_{2.5}, NO_x, and VOCs), but it is difficult to determine whether this is the result of better information and updated emission estimation methodologies, or reflects true increases solely due to increased development activity within the planning area.

Table 4.25. Estimated Annual Emissions Summary (tons/year) for Activities within the Buffalo Planning Area

Scenario	Criteria Pollutants					Toxics & Organics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Base Year – 2005							
Base Year	7,757	1,853	1,194	35	3,580	31,352	3,258
Forecast Year – 2015							
Alternative A	9,512	2,373	2,840	236	5,147	14,084	1,447
Alternative B	7,820	2,070	1,876	130	3,817	14,198	1,454
Alternative C	13,892	3,178	3,310	281	8,119	12,632	1,300
Alternative D	10,437	2,545	2,949	238	6,050	13,411	1,381
Forecast Year – 2024							
Alternative A	9,775	2,474	2,847	237	5,213	5,590	594
Alternative B	7,871	2,150	1,866	131	3,789	4,708	497

Scenario	Criteria Pollutants					Toxics & Organics	
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Alternative C	14,155	3,273	3,177	280	8,208	9,094	949
Alternative D	10,614	2,635	2,892	239	6,230	6,967	735

Source: Appendix M (p. 2239)

CO carbon monoxide

HAPs hazardous air pollutants

NO_x nitrogen oxides

PM₁₀ particulate matter less than 10 microns in diameter

PM_{2.5} particulate matter less than 2.5 microns in diameter

SO₂ sulfur dioxide

VOCs volatile organic compounds

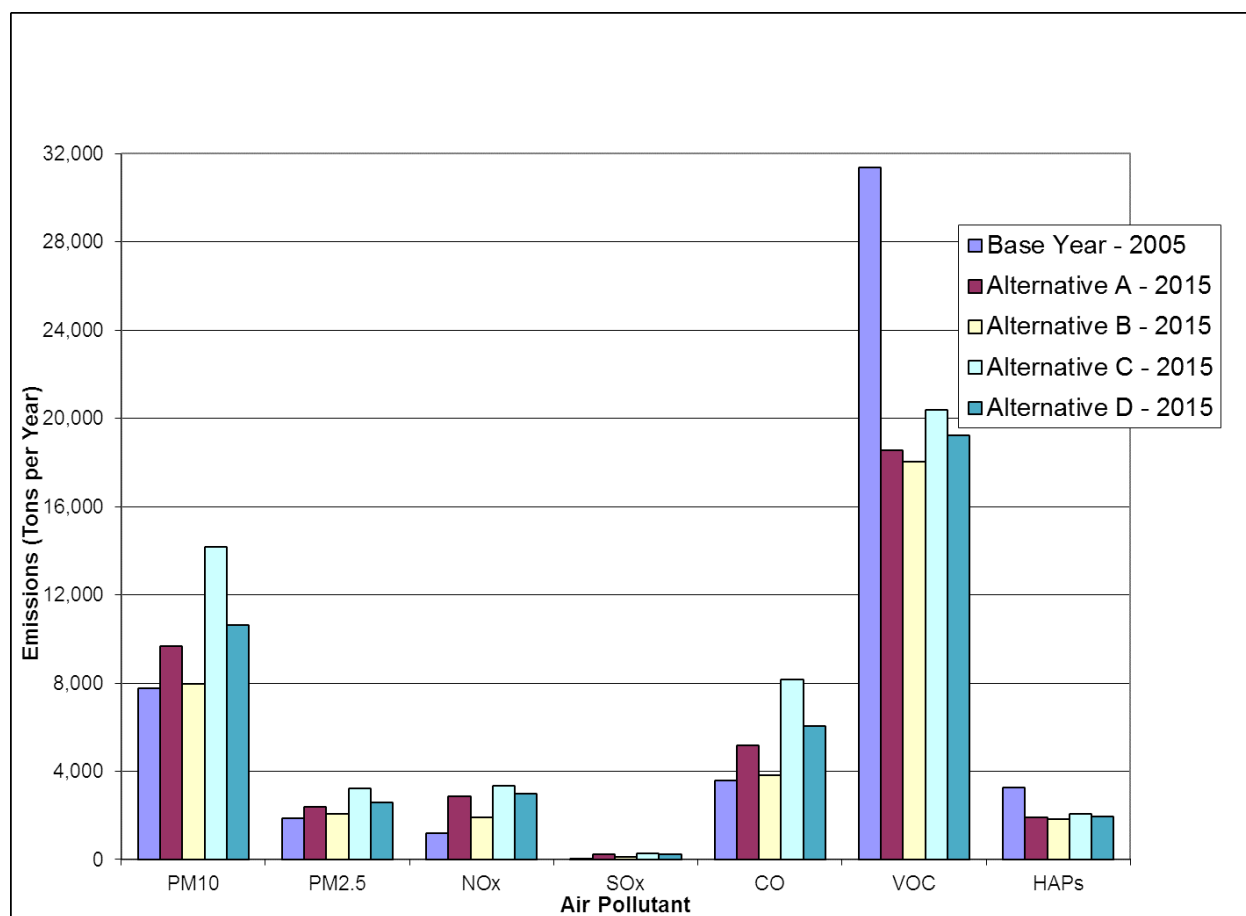


Figure 4.8. Emission Estimates for 2015 from Activities within the Buffalo Planning Area

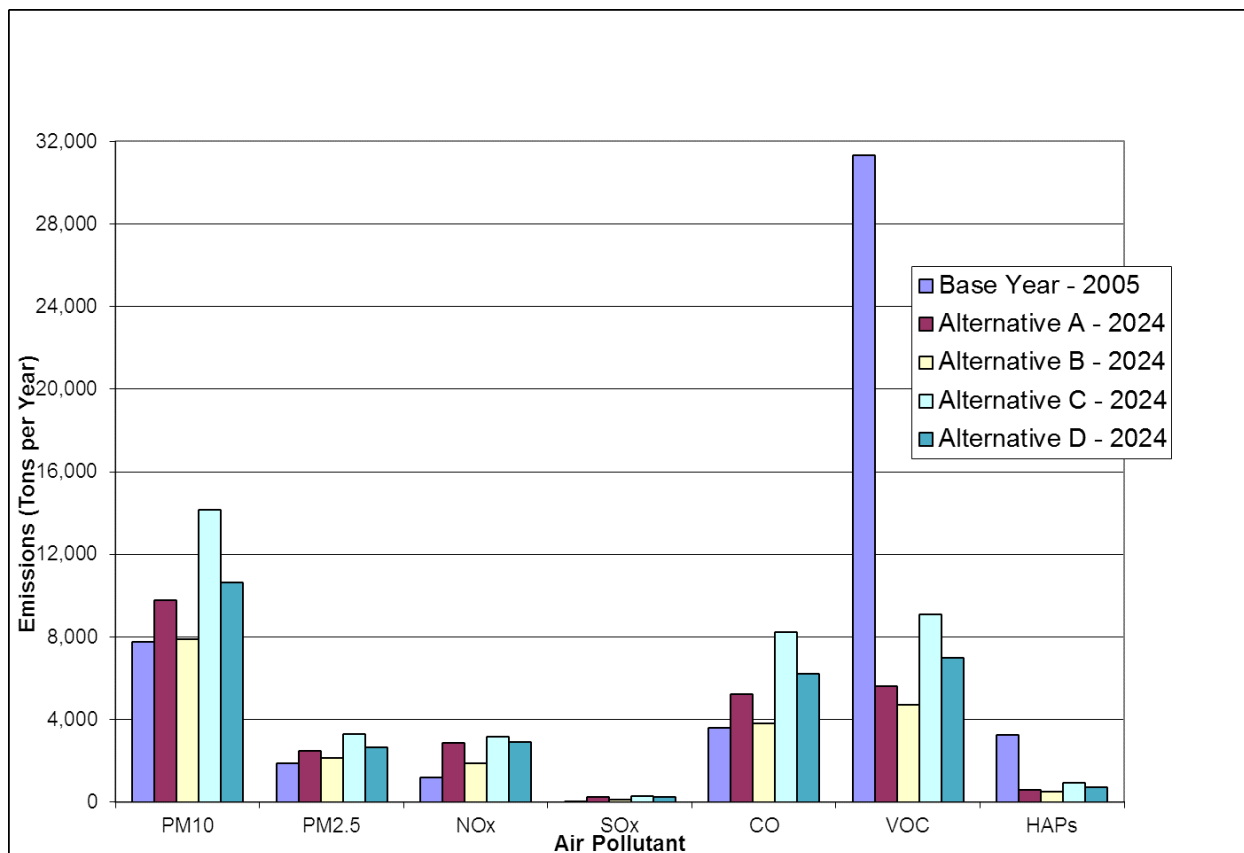


Figure 4.9. Emission Estimates for 2024 from Activities within the Buffalo Planning Area

Table 4.26. Annual Total Emissions Summary (tons/year) for Campbell, Johnson and Sheridan Counties, WY from the National Emission Inventory

Year	Criteria Pollutants					Organics
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs
2005 Annual Emissions						
EGU	1,152	838	6,221	9,316	715	87
Point	5,834	5,231	1,209	52	2,109	692
Area	40,478	6,285	6,188	868	26,995	9,348
Nonroad	177	173	4,380	328	6,703	969
Onroad	199	171	6,640	148	22,014	1,679
Total	47,841	12,698	24,638	10,713	58,536	12,775
2008 Annual Emissions						
EGU	1,871	809	6,148	9,506	1,351	86
Point	11,784	5,171	15,196	1,067	10,812	5,055
Area	162,396	21,520	10,186	659	31,636	10,824
Nonroad	230	214	5,432	85	6,498	980
Onroad	264	228	6,497	34	26,715	1,921
Total	176,546	27,942	43,459	11,352	77,011	18,865
2011 Annual Emissions						
EGU	1,494	240	4,326	4,237	1,717	86
Point	13,544	5,263	34,598	1,566	26,794	3,033
Area	28,904	7,682	5,451	399	64,085	17,184

Year	Criteria Pollutants					Organics
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs
Nonroad	59	56	479	1	4,730	894
Onroad	125	99	2,934	12	12,307	1,126
Total	44,126	13,340	47,788	6,215	109,634	22,323

Source: EPA 2013c

CO carbon monoxide
HAPs hazardous air pollutants
NO_x nitrogen oxides
PM₁₀ particulate matter less than 10 microns in diameter
PM_{2.5} particulate matter less than 2.5 microns in diameter
SO₂ sulfur dioxide
VOCs volatile organic compounds

Table 4.27. Annual Coal Mine Emissions Summary (tons/year) for Campbell County, WY from the National Emission Inventory

Year	Criteria Pollutants					Organics
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs
2005	5,825	5,223	33	23	34	4
2008	8,883	3,916	2,422	80	1,317	14
2011	11,120	4,180	27,618	565	22,198	209

Source: EPA 2013c

CO carbon monoxide
NO_x nitrogen oxides
PM₁₀ particulate matter less than 10 microns in diameter
PM_{2.5} particulate matter less than 2.5 microns in diameter
SO₂ sulfur dioxide
VOCs volatile organic compounds

Table 4.28. Annual Oil and Gas Emissions Summary (tons/year) for Campbell, Johnson, and Sheridan Counties, Wyoming from the Western Regional Air Partnership Inventory

County	Criteria Pollutants				Organics
	PM ₁₀	NO _x	SO ₂	CO	VOCs
2006 Annual Emissions					
Campbell	364	9,726	333	6,698	6,608
Johnson	95	4,135	82	1,835	1,658
Sheridan	67	1,506	64	1,088	339
Total	527	15,367	479	9,621	8,605
2009 Annual Emissions					
Campbell	283	16,089	44	12,303	10,314
Johnson	95	6,160	16	3,989	3,987
Sheridan	59	4,091	9	3,745	2,132
Total	437	26,341	69	20,037	16,432
Projected 2015 Annual Emissions					
Campbell	284	9,701	236	10,641	8,189
Johnson	129	4,594	99	3,323	2,886
Sheridan	127	2,118	113	2,278	666

County	Criteria Pollutants				Organics
	PM ₁₀	NO _x	SO ₂	CO	VOCs
Total	540	16,414	449	16,242	11,740

Source: 2006 emissions based on WRAP oil and gas emissions inventory Phase III; 2009 emissions based on WRAP oil and gas emissions inventory Phase IV; 2015 emissions based on WRAP oil and gas emissions inventory Phase III mid-term projection

CO carbon monoxide
NO_x nitrogen oxides
PM₁₀ particulate matter less than 10 microns in diameter
PM_{2.5} particulate matter less than 2.5 microns in diameter
SO₂ sulfur dioxide
VOCs volatile organic compounds
WRAP Western Regional Air Partnership

4.1.1.10. Conclusion

For this analysis, emissions were estimated for the proposed management actions in each alternative for seven criteria pollutants (PM₁₀, PM_{2.5}, NO_x, SO₂, CO, VOCs, HAPs, and the following GHGs: CO₂, CH₄, and N₂O. Emissions were estimated for the base year (2005) while emissions for all alternatives were estimated for 2015 and 2024, the latter two years reflecting short-term and long-term estimates, respectively.

Estimated emissions for the years 2015 and 2024 were compared to base year emissions to determine the expected future change in emission levels for each alternative. Except for VOC emissions, for the majority of the pollutants examined, emissions are estimated to increase slightly compared to base year levels for all alternatives except Alternative B, which shows either similar values in the future years or decreases in emissions compared to 2005. The increases in emissions for all other alternatives reflect expected projected increases primarily in oil and natural gas development and other mineral development activity in the area. The large decrease in VOC emissions in the future years reflects a decrease in the number of evaporation ponds expected to be used in oil and gas development.

An examination of emissions from all activities shows that the Alternative B estimates would be the lowest of the alternatives because this alternative includes the greatest constraints on resource development and use, especially for oil, natural gas, and mineral development. Because of this, Alternative B would result in the least amount of impacts to air quality resources. Compared to 2005 totals, Alternative B shows increases in PM₁₀, PM_{2.5}, NO_x, CO, and SO₂ emissions in both future years, and a major decrease in VOC and HAP emissions. The largest estimated increases in emissions are expected from Alternative C (except for VOCs and HAPs) because this alternative reflects the least amount of constraints on natural resource development and the greatest amount of development and resource use. As such, Alternative C is expected to result in the highest impacts on air quality resources in the planning area.

As presented above, other air quality management agencies have developed both base and future year emission estimates that support air quality management analyses in Wyoming and throughout the Mountain West. The emission inventories developed by the State of Wyoming, the WRAP, and the EPA likely differ in the quality and quantity of the equipment and activity level data used, and the methodologies followed in developing the inventories. Therefore, because of these differences, the emission inventories developed by these other agencies are useful to review and examine but cannot be directly compared to the BLM emission inventories. Nevertheless, the inventories are somewhat consistent in showing increases in criteria pollutant emissions in

the future years, which could result in impacts on air quality including ambient concentrations, visibility, and atmospheric deposition within the planning area.

As noted above, energy development activities of leasable fluid and solid minerals include sources and equipment that contribute the majority of emissions in the planning area, while a number of other resources have negligible or no impacts on Air Quality within the area.

4.1.2. Geological Resources

As discussed in Chapter 3, none of the geological features occurring on public lands in the planning area are considered unique enough to warrant special management or conservation measures. Therefore, the geological resources of the planning area consist of mineral resources. See the *Mineral Resources* section, and the subsections under that for information regarding anticipated impacts to the three federal mineral classifications (Locatables, Leasables, and Salables). See the *Paleontological Resources* section for anticipated impacts to the Dry Creek Petrified Tree Environmental Education Area (EEA) (containing public lands with exposed portions of petrified trees), and the *Cave and Karst Resources* section for anticipated impacts to cave and karst resources. See the *Health and Safety* section for anticipated impacts to various geological and natural hazards occurring in the planning area.

4.1.3. Soil

This section describes potential effects on soils in the planning area from BLM management of resources and resource uses under the alternatives. The *Soil* section of Chapter 3 describes existing soil conditions. Stable and productive soil in the planning area provides the foundation for other resources (e.g., biological resources) and for resource uses (e.g., livestock grazing). Actions that disturb or compact soil, disrupt soil stability, or reduce soil productivity are considered adverse. Conversely, actions that avoid or minimize soil compaction or erosion, stabilize soil, or increase soil productivity are considered beneficial.

4.1.3.1. Methods and Assumptions

For purposes of this broad-scale analysis, the primary indicator of adverse effects on soil resources is the amount of surface disturbance from management decisions for soils and other resources, particularly surface disturbance on soils with a severe erosion hazard, soils with Limited Reclamation Potential (LRP), soils with low reclamation suitability, and steep slopes. This chapter cumulatively refers to these areas as sensitive soils. The analysis of effects on soil resources is based on the factors contributing to site degradation and their inherent risks. The types of projected effects on soils under the alternatives are similar; however, the potential amount of acres disturbed is anticipated to vary by specific allowable uses and management actions associated with individual alternatives, as described below. The projected amount of surface disturbance in the planning area is identified in the *Reasonable Foreseeable Development and Reasonable Foreseeable Action Scenarios* (see Appendix G (p. 1937)).

Short-term adverse effects on soils would result during initial surface disturbance before revegetation is completed, or before practices are implemented or structures installed to minimize erosion. There would be long-term adverse effects due to accelerated erosion in locations where bare soils were allowed to remain exposed to water and wind. Other long-term adverse effects would be due in part to changes in vegetative communities, and the loss of productivity

in areas where facilities and structures remove or greatly alter the soil profile, restricting the reestablishment of vegetation.

Assumptions

- Spatial analysis was conducted using the Natural Resources Conservation Service (NRCS) Soil Data Viewer ArcGIS Extension and the Environmental Systems Research Institute, Inc., ArcGIS Desktop 9.3 computer software using the NRCS Soil Survey Geographic Database (SSURGO) datasets. Effects are described qualitatively and, where possible quantitatively.
- The BLM would use published and preliminary (NRCS 2011c) county soil survey information to predict soil behavior, limitations, or suitability for a given activity or action. NRCS SSURGO soils data, properties, suitabilities, limitations, and local, regional and national interpretations are used for analysis.
- For analysis purposes with the geographic information systems (GIS) tools described above, if the dominant hazard condition (%) within a Soil Map Unit (SMU) has a severe management hazard rating, the entire (SMU) is rated severe. However, there could be areas in the (SMU) that could have a rating of slight or moderate.
- Any disturbance proposed on a soil identified as a “sensitive soil” has the potential to have a major impact to the soil resource, since soil erosion affects an area larger than the physical disturbance. Reclamation in these areas is challenging. Extra steps are necessary to conserve the soil resource.
- Surface disturbance on sensitive soils is distributed across the landscape in the same proportion the soils occur on the land. In other words, if five percent of the soils in the planning area are highly erosive, it is assumed that five percent of the projected total disturbance would occur on highly erosive soils. In general on BLM-administered surface in the planning area, 28 percent of the soils have high erosion potential. This assumption applies only to Alternative C, which allows for unrestricted surface disturbance throughout the planning area.
- For analysis purposes, water erosion is the primary mechanism for loss of soil productivity.
- Using the GIS tools described above, SMUs containing miscellaneous areas such as badlands, rock outcrops, and areas susceptible to mass movement were chosen from the data sets (referred to above) for the planning area. For the analysis, the areas consisting of the miscellaneous areas could be substantially less due to generalization in the applicable GIS shape file polygons.
- The BLM will use soil survey data and interpretations to predict soil behavior, limitation, or suitability for a given activity or action. Soil interpretations are developed by the cooperators in the National Cooperative Soil Survey (NCSS) and maintained by the NRCS. Soil interpretations (see Glossary) are ever evolving; therefore, as new or updated soil interpretations become available they may supersede prior interpretations. Soil interpretations do not preclude activities or actions, rather, they provide a reasonable guide to the risks, limitations, and probable outcomes of a particular use or practice. The information is not site-specific and does not eliminate the need for onsite investigation of the soil.
- Roads and trails would be properly designed and built in accordance with BLM Manual 9113 (BLM 1985b).
- Linear disturbances such as pipelines, utility corridors, and transmission lines will be managed consistent with other resource requirements and BMP’s including but not limited to corridors and collocating disturbances.

Significance Criteria

In addition to the scale of effects identified in Methods and Assumptions, an adverse effect on soil resources would potentially be substantial if erosion were to result in soil losses to the extent that a site could no longer support the native vegetative community composition and cover.

4.1.3.2. Impacts Common to All Alternatives

Soil

Using soils surveys and onsite investigations would ensure proper use of soil resources. Applying appropriate mitigation (including project relocation or denial) and requiring an approved reclamation plan would ensure all disturbances were effectively remediated to BLM standards. The soils management actions common to all alternatives would have a major beneficial effect on soil resources.

BFO has described the existing environment for erosion potential in acres and percent of the field office and displayed as specific SMU polygons in Map 3. Erosion rates are inherently difficult to predict. The BFO chose to describe the existing environment and place restrictions on the sensitive areas. Depending upon a host of soil and site variables and disturbance type, BLM may recommend avoiding these sensitive areas or mitigating the disturbances on a site-specific basis. BLM policy is to minimize any soil loss from permitted disturbances. All proposed disturbances will have a site-specific NEPA analysis and are required to have a construction, stabilization, and reclamation plan that specifically addresses erosion based on the existing soil and site conditions. The Wyoming DEQ also requires erosion control measures in their Storm Water Pollutant Prevention Plan (SWPPP) permitting process to help prevent erosion and sediment transport.

The BFO used the Revised Universal Soil-Loss Equation model to predict the average soil loss in tons per acre per year. The Revised Universal Soil-Loss Equation model (<http://www.ars.usda.gov/Research/docs.htm?docid=5974>) is an erosion model designed to predict the longtime average annual soil loss carried from runoff from specific slopes in specified management conditions. Table 4.29, "Soil Loss by Percent Slope" (p. 703) displays the soil loss in tons per acre per year relative to slope, with the other values remaining the same. Model assumptions are bare soil conditions before the addition of BMPs.

Table 4.29. Soil Loss by Percent Slope

Slope percent	Soil Loss (Tons/Acre/Year)
0.2	0.4
0.5	0.7
1	1.2
2	2.2
3	3.1
4	4.2
5	5.2
6	6.3
8	8.4
10	11.2
12	14.4
14	17.7
16	21.0
20	27.4
25	35.3
30	42.9
40	57.1

Slope percent	Soil Loss (Tons/Acre/Year)
50	70.1
60	81.6

The Revised Universal Soil-Loss Equation model uses environmental and site features including: (R) rainfall-runoff erosivity, (K) soil erodibility, (L) length of slope and (S) slope steepness, and (C) cover management and (P) erosion control practice factor to determine predicted soil loss in tons per acre per year. The factors used in the table above include: an R of (20), K of (.32), L (100 feet), S (variable), C of (1 no cover), and P of (1.2 no BMPs). Soil loss is calculated as $\text{Soil loss} = R * K * L * S * C * P$.

Physical Resources

Management actions common to all alternatives for **Cave and Karst Resources** would not affect soil resources because the actions are procedural (inventories).

Air Quality

Air quality management actions common to all alternatives include implementation of measures to mitigate effects to air quality, such as dust suppression and cooperative efforts to reduce dust emissions. These actions would help keep soil in place, and would have a moderate beneficial effect on soil resources because the actions would reduce soil loss, but not prevent it.

Water Resources

Water management actions common to all alternatives include managing surface-disturbing activities to prevent degradation of water quality, including reducing channel and bank erosion, and managing water to meet *Wyoming Standards for Healthy Rangelands*. These actions are designed to reduce or prevent soil erosion and would be applied across the entire planning area. Therefore, water management actions would have a beneficial effect on soil resources.

Mineral Resources

Mining activities (locatable, coal, and salable) have the potential for the most long-term effects on soil resources. Soils would be completely removed from the active mining areas; therefore, soil functionality at those sites would be restored following the cessation of mining. Heavy equipment could compact soils not directly mined, and soil would be at risk for erosion, sedimentation, and ponding of surface runoff. Reclamation planning would be required and implemented to meet reclamation goals and objectives (Appendix O (p. 2495)).

The potential acreage available for mining in the planning area is extensive, but foreseeable mining activity is much less.

Locatable Minerals

BLM surface overlaying federal mineral estate in the planning area is available for potential locatable mineral exploration and development (777,310 acres) unless formally withdrawn. However, foreseeable locatable minerals development is anticipated to affect a maximum of 1,455 acres (0.2% of available area), which would have a negligible adverse effect on soil resources.

Leasable Minerals – Coal

Similarly, the potential acreage available for coal leasing is extensive, but the foreseeable activity would disturb a maximum of 195,700 acres (4.1% of available acreage) confined

to central Campbell County and north-central Sheridan County. Overall, there would be minor adverse effects on soil resources from coal leasing due to the localized extent in the planning area.

Leasable Minerals – Fluids

Federal fluid mineral estate in the planning area would be available to fluid mineral leasing unless identified as **closed**. Although fluid minerals include oil and gas and geothermal resources, there is no geothermal potential in the planning area and no geothermal development is forecast. Therefore, the fluid mineral discussion is limited to oil and gas.

Fluid minerals development would affect soils during exploration, drilling, production, and abandonment. Effects on soils could include removal of vegetation, exposure of the soil, mixing of soil horizons, loss of topsoil productivity, soil compaction, and increased susceptibility to water and wind erosion. Increased erosion and surface runoff would occur from soil compaction and the channelization of surface runoff, which reduces plant productivity, alters species composition, and increases soil surface exposed to wind and water erosion. Drainages that receive this concentrated, increased flow often erode downward, further increasing erosion and sediment loading downstream. Effects are short-term and long-term—short-term within the initial areas of surface disturbance before the soils are stabilized and vegetation reclamation is in progress; long-term when areas such as roads and facility locations are not reclaimed after initial construction.

Oil and gas development involves cross-country travel to stake well locations and associated roads and pipelines. Geophysical exploration also requires cross-country travel. Frequently, these cross-country routes are not the locations of eventual roads or pipelines. Each cross-country trip crushes native vegetation and increases soil susceptibility to erosion. Travel on steep slopes and highly erodible soils allows for a higher potential for waterborne sediments to reach drainages. In addition, surface flows increase along vehicle tracks in loamy and clayey soils from an increase in soil compaction and reduced infiltration. Research has shown that it is common for water infiltration in wheel tracks to be reduced to approximately 50 percent of the infiltration rate without traffic (House et al. 2001; Baumhardt and Jones 2002). House et al. (2001) measured reductions in infiltration rates from 12 percent to 80 percent. House et al. (2001) and Baumhardt and Jones (2002) found water content of the soil at the time of compaction had a significant effect on infiltration, as did the compacting loads. Compaction primarily destroys the large pores necessary for retaining water available for plant growth. Baumhardt and Jones (2002) found water movement in vehicle tracks is twice as quick as in non-traffic areas. Damage from compaction can persist for years (House et al. 2001).

Water disposal methods from oil and gas fluid mineral production has the potential to adversely affect soil resources. These potential methods include infiltration and evaporation ponds, discharge to drainages, land application, and subsurface disposal. Potential effects include increased erosion, changes in plant communities, and changes in soil physical, chemical, and biological properties.

Although there would be major local adverse effects where the fluid minerals development occurred, the foreseeable development scenarios for all alternatives predict less than one percent of soil area would be physically disturbed. Since soil erosion affects an area larger than the physical disturbance the overall effect would be minor adverse at the planning-area scale.

Salable Minerals

Most BLM surface overlying federal mineral estate would be available for salable minerals exploration and development (777,310 acres). Foreseeable salable minerals development

is anticipated to affect a maximum of 2,090 acres (0.3% of available federal mineral estate). Therefore, there would be negligible adverse effects on soil resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Fire and fuels management includes wildland fire response, soil stabilization following wildfire, planned or prescribed fire, and mechanical fuels treatment. In the short term, fire and fuels management actions reduce canopy and ground cover, thereby exposing soils to wind and water erosion and increasing runoff potential. Reduced infiltration from extremely hot fires in some areas would result in higher runoff and hill slope erosion. Effects on soil and water resources from resource-damaging fires include dramatic increases in peak flows (two to five times predisturbance conditions, depending on burn characteristics) and increases in salts, nutrients, and metals in the initial flush flows (1 to 2 years). Erosion, including slumps, debris flows, and other dramatic soil loss events can occur in wildland fire areas for 5 to 25 years depending on the burn characteristics, intensity of rain events, soils, and geology of the area (Hurteau et al. 2008). Over the long term, erosion would be reduced as vegetation recovers.

Suppression activities result in temporary surface disturbance and soil compaction from increased vehicle traffic, staging, and fire camps. Compared to effects on water and soil resources from wildland fire, effects from suppression activities would likely be negligible. The construction of fire lines would increase erosion as a result the removal of vegetation, duff, and the organic layer of the soil. Fire lines would vary in length, width, and depth; therefore, soil erosion would be highly variable. Concentrated surface runoff and increased erosion could occur, especially in areas with steep slopes and soils with low reclamation suitability.

Effects on soils from planned (prescribed) fire are typically less severe than from unplanned (wildland) fire. Prescribed fire ignitions can be controlled to times of year when there is less likelihood of damage to soils from excessive heating. Prescribed fires reduce fuel loading, which minimizes the risk of catastrophic wildland fires; therefore, short-term effects associated with prescribed fire generate long-term benefits by reducing the risk of highly damaging catastrophic wildland fires.

The use of prescribed fire to restore desired ecological conditions of rangelands, forests, or woodlands would improve soil quality in the long term. The use of prescribed fire to modify ecological communities, reduces canopy cover, disturbs the soil surface, and increases erosion in the short term. However, over the long term, prescribed fire effectively improves the health and vigor of the vegetative community, reducing soil erosion by reducing the chance of widespread vegetation loss from insects, disease, and catastrophic wildland fire. Improving the health and vigor of ecological systems would increase ground cover and reduce surface erosion. Generally, there should be beneficial effects on soil resources in the planning area from prescribed fire and fuels management.

Fire and fuels management actions common to all alternatives that would affect soil resources include adherence to national and local fire plans and policies, consultation with a resource advisor, implementation of stabilization and rehabilitation standards, and fireline rehabilitation. These actions would benefit soil resources at the local scale. However, at the planning-area scale, there would be negligible beneficial effects on soil resources from fire and fuels management actions because of the limited acreage predicted to be disturbed by fire.

Biological Resources

Management actions for biological resources are designed to protect biological resources typically by limiting surface-disturbing activities, which benefits soil resources. The *Physical Resources* and *Mineral Resources* sections above describe how surface-disturbing activities affect soil resources.

There are no management actions common to all alternatives for **Forests and Woodlands**, **Special Status Species – Plants**, or **Special Status Species – Fish** that would affect soil resources.

Vegetation – Grassland and Shrubland Communities

Grassland and shrubland management actions common to all alternatives that would beneficially effect soil resources include managing vegetative communities in accordance with Wyoming Standards for Healthy Rangelands, using an integrated approach to manage the health and diversity of plant communities, and managing surface-disturbing activities to reduce adverse effects on vegetation. Grasslands and shrublands are the dominant vegetative communities in the planning area, comprising 718,636 acres (92%) on BLM-administered lands. Grassland and shrubland management actions would have a major beneficial effect on soil resources.

Vegetation – Riparian/Wetland Resources

The BLM would manage riparian and wetland vegetative communities to achieve and maintain Proper Functioning Condition (PFC). Achieving or maintaining PFC in riparian areas promotes the growth of deep-rooted riparian vegetation that dissipates streamflow energy, stabilizes stream banks from cutting action, and filters sediment. PFC also promotes adequate amounts of vegetative cover to stabilize soils, provides organic material, and cycle nutrients. Vegetation management prescriptions would be implemented to meet the *Standards for Healthy Rangelands*, which would maintain soil erosion and deposition at acceptable levels. Achieving the *Standards for Healthy Rangelands* would benefit soils. Preventing the degradation, loss, or destruction of riparian and wetland habitats also would protect soils.

Collectively, riparian and wetland management actions common to all alternatives would have a negligible beneficial effect on soil resources because of the limited amount (207 acres, or 0.03%) of riparian and wetland communities on BLM-administered lands in the planning area.

Invasive Species and Pest Management

Limiting surface disturbance, using certified weed seed-free products, and requiring that disturbed areas be revegetated and treated for invasive species would benefit soil resources. Many invasive species have relatively sparse canopies and shallow roots, which results in increased erosion compared to native vegetation (BLM 2008c). For example Kentucky bluegrass (*Poa pratensis*) has a shallow root system that cannot stabilize stream banks as well as deep-rooted native species such as sedges (*Carex* spp.) and rushes (*Juncus* spp.). Invasive species can adversely affect soil function and reduce soil biodiversity. Treatments to control invasive species could result in short-term localized effects on soil stability because vegetation would be removed and make soil susceptible to erosion. However, in the long term, controlling invasive species would benefit soil if treatments resulted in increased native plant cover. These management actions would have a beneficial effect on soil resources.

Fish and Wildlife Resources – Fish

Fisheries management actions common to all alternatives include mitigation for surface-disturbing activities and managing non-native riparian vegetation for the benefit of native and desirable

non-native fish. The *Physical Resources* and *Mineral Resources* sections above describe how surface-disturbing activities affect soil resources. There are 51,745 acres (1.1%) of BLM surface associated with fish-bearing waters. Therefore, fisheries management actions would have a minor beneficial effect on soil resources.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Wildlife and special status wildlife management actions common to all alternatives include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing, maintaining, and restoring Greater Sage-Grouse habitat; and establishing a permanent disturbance-free buffer for bald eagle nests. Collectively, these wildlife and special status wildlife management actions would have a beneficial effect on soil resources because wildlife habitat is present throughout the planning area.

Heritage and Visual Resources

There are no **Cultural Resources**, **Paleontological Resources**, or **Visual Resources** actions common to all alternatives that would affect soil resources. Areas with high-quality or important paleontological resources are typically small (fewer than 40 acres), which would result in relocating activities but would not prevent surface-disturbing activities. Therefore, effects on soil resources from **Paleontological Resource** management actions would not differ among alternatives and are not further discussed in the soils section.

Land Resources

The following programs do not have any management actions common to all alternatives that would affect soil resources: **Lands and Realty**, **Renewable Energy**, and **Lands with Wilderness Characteristics**.

The lands and realty program does not include management actions common to all alternatives or that vary by alternative that would directly affect surface-disturbing activities. Therefore the **Lands and Realty** program would not affect soil resources and is not discussed in the *Soils* section.

Forest Products

Management actions common to all alternatives include a prohibition on timber harvest within 200 feet of surface waters and a personal-use forest product sales program. The amount of live plants harvested for personal use is very small and not considered to affect soil resources. The area in the planning area affected by the water buffer would be 5,584 acres, which is less than one percent of BLM surface. This would protect soils in the localized area, but result in negligible beneficial effects on soil resources at the planning area scale.

Rights-of-Way and Corridors

Management actions common to all alternatives include the designation of ROW corridors and locating new ROW adjacent to existing disturbances. These actions would minimize additional surface disturbance, but not prevent disturbance resulting in an adverse effect on soil resources.

Travel and Transportation Management

Management actions common to all alternatives include minimizing surface disturbance and

erosion, closing roads temporarily or permanently where resource damage is occurring, reclaiming roads if they are heavily eroded, and prohibiting motorized travel if soils would be damaged. TTM will follow a holistic approach, including the inventory, design, construction, maintenance, and reclamation of roads and trails, which would limit adverse effects on soil resources.

Motorized travel increases soil disturbance, resulting in increased soil compaction, rutting, surface runoff, and subsequent erosion. Effects would be greatest in areas of concentrated use that are not constructed or maintained for the present or future intended use. Travel during wet soil conditions on improperly designed and constructed roads could lead to rutting and the creation of alternative routes, parallel, and braided roads. Ruts can provide a channel for concentrated flow to accelerate soil erosion. BLM roads that are properly designed, graded, and maintained would improve road conditions. This could result in decreased soil disturbances associated with creation of parallel or braided roads and associated runoff and subsequent erosion. Poorly designed and improperly maintained roads would be the most susceptible to erosion due to runoff, compacted surfaces, and lack of vegetative cover. Typically, poorly designed and improperly maintained roads are incised and channel water, which leads to erosion within and adjacent to the road. Design standards minimize surface runoff and subsequent soil erosion for new roads. Road reclamation reduces erosion, surface runoff, nonpoint sources of sediment, and other adverse effects on soils.

Because the management actions are designed to protect soil resources, the effects are beneficial while the scarcity of public access roadways on BLM surface in the planning area, limit the beneficial effects on the soil resources. Surface disturbance related to roads constructed for other uses such as minerals development are included under ROW and the program for which the road was constructed.

Recreation

Recreation management actions common to all alternatives include avoiding riparian habitat for developed facilities and camping, and providing for dispersed recreation opportunities throughout the planning area. *Travel and Transportation Management* above addresses effects on soil resources from vehicle use for recreational purposes. Effects on soils associated with recreation include localized soil compaction and erosion. Effects would depend on duration and circumstance of use. Disturbance would be the greatest in areas of concentrated use, such as hiking trails, developed facilities, and dispersed camping sites. Improvement and maintenance of recreation sites localizes soil disturbances.

Based on the low level of recreation use and the acreage of riparian areas on BLM surface (less than one percent of BLM-administered lands in the planning area) there would be negligible adverse effects to soils resources.

Livestock Grazing Management

Most of the BLM surface acreage in the planning area would be available for livestock grazing. Livestock would be managed in accordance with the *Wyoming Standards for Healthy Rangelands* to sustain vegetative communities and special habitats.

Livestock grazing has the potential to affect soil physical properties (compaction and erosion), chemical properties (near-surface soil chemistry) and biological properties (microbiology). Livestock grazing reduces vegetative cover, causes surface disturbance from hoof action, and compacts soils in localized areas. Water or wind erosion of soils could be accelerated if insufficient litter or plant cover is left after the grazing season, or if plant composition changes. Livestock grazing can affect soil structure if biological or physical soil crusts are damaged. Overgrazing can reduce the amount of organic matter, the carbon storing ability, and the kinds and

numbers of microorganisms living in soils. The most noticeable effects occur around waterbodies, salt blocks, fencelines, and other areas where animals frequently congregate. In such areas, increased effects on soil would be expected. In contrast, dispersed distribution and periodic rotation of livestock would be expected to broaden the extent of effects on soil resources, but decrease their intensity. This would be expected to decrease the overall effects on soil resources and improve their overall resiliency to the effects of grazing.

Water sources and other range improvements improve the distribution of livestock, and prevent livestock concentration and overuse of forage that leads to increased surface runoff and soil erosion. Constructing range improvements results in short-term localized compaction and soil erosion. With proper planning and effective management of range projects, any adverse effects on soil resources would be minimized. Grazing management and range improvements would improve or maintain desired long-term range health, which would minimize adverse effects on soil resources from livestock grazing.

Management in accordance with the *Wyoming Standards for Healthy Rangelands* (Appendix P (p. 2501)) generally is effective in managing adverse effects on soils from domestic livestock grazing. Managing in accordance with these standards would have a beneficial effect on soil resources.

Special Designations

There are no management actions common to all alternatives related to **Areas of Critical Environmental Concern (ACECs), Scenic or Back Country Byways (BCBs), Wild and Scenic Rivers (WSRs), or Wilderness Study Areas (WSAs)** that would affect soil resources.

Byway designation would not affect other activities and are not addressed by alternative. WSR and WSA designation is not foreseen during the planning period. Therefore, no effect on soil resources from management of these special designations would be anticipated. The only special designation addressed by alternative in this section is ACECs.

Socioeconomic Resources

There are no **Social and Economic Conditions** or **Health and Safety** management actions common to all alternatives or under individual alternatives that would have a measurable effect on soil resources. Therefore, the soil section does not further address **Socioeconomic Resources**.

4.1.3.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained.

Soil

Surface-disturbing activities affect soils to varying degrees depending on the types, amounts, and locations of disturbance; soil type; time of year; climatic factors; and surface hydrology. Surface-disturbing activities remove protective vegetative cover and crusts and can alter soil physical, chemical, and biological properties. This increases soil susceptibility to water and wind erosion, and decreases soil quality and site productivity. Surface-disturbing activities also can affect biologic soil crusts. These crusts are comprised of cyanobacteria, lichens, and mosses, which help to stabilize soils, which reduces erosion and increases soil productivity.

All soils are susceptible to accelerated erosion. Accelerated erosion is in excess of natural erosion rates and occurs when soil particles are detached and removed as a result of human or animal activities. Soils with severe erosion hazards and soils with LRP are the most vulnerable. Once disturbed, it is difficult and costly to stabilize these areas. The potential for accelerated erosion from proposed surface disturbances on highly erosive soils is approximately 40 percent greater (USFS 2004) than predicted for less-erodible soils.

Seasonally prohibiting surface-disturbing activities in areas of severe erosion hazard would have a minor beneficial effect on soil resources. Specific mitigation and BMPs are more effective in controlling erosion than a seasonal timing restriction. Wind and water can cause severe erosion. Wind speeds, direction, and timing are variable, which makes a timing restriction ineffective for preventing wind erosion. This restriction provides protection during the normal wet period, March 1 to June 15, but provides no protection during the remainder of the year. There is a secondary precipitation peak in September and October, and major storms can occur throughout the year. The seasonal restriction also conflicts with the optimum seeding dates to stabilize the soil. Finally, the authorized officer can waive this action on a project-specific basis without defined criteria. This has been applied inconsistently, thereby allowing for potential adverse effects on soil resources.

There are 215,496 acres (28%) of BLM surface and 669,739 acres (20%) of federal mineral estate defined as having a severe erosion hazard; the BLM could apply the timing limitation to surface-disturbing activity in these areas. Although soils with severe erosion hazard do account for more than 10 percent of soils resources, because timing restrictions are generally ineffective, this management would have a lesser beneficial effect on soil resources.

Prohibiting surface-disturbing activities on slopes of more than 25 percent (see Map 4) can result in an adverse effect on soil resources when the prohibition is waived by the authorized officer. Surface occupancy is usually a long-term disturbance that results in long-term adverse effects on soil resources; steep slopes are difficult to stabilize and reclaim using traditional methods. Current management does not define waiver criteria, which has led to inconsistent restriction application thus resulting in adverse effects. Alternative A is potentially inconsistent with the Wyoming BLM guidance for mitigation of surface-disturbing and disruptive activities, and with the use of conventional construction equipment. Alternative A applies to 170,590 acres (22%) of BLM surface with slopes greater than or equal to 25 percent and 412,145 acres (12%) of federal fluid mineral estate. With the inconsistency in waiver application, and conflicts with the BLM mitigation policy, this management would have a greater adverse effect on soil resources.

Restrictions of surface-disturbing activities on soils with poor reclamation suitability do not protect soil resources, primarily because of the provision for waivers without defined criteria. The risk of BMP failure is great on low-reclamation suitability soils. Soils with poor reclamation suitability are present on 455,090 acres (58%) of BLM surface and 1,514,445 acres (45%) of federal fluid mineral estate. The inconsistent protection of soils with poor reclamation suitability would have an adverse effect

Current restrictions of surface-disturbing activities on LRP areas do not protect soil resources, primarily because of the extremely limiting soil and site conditions and the provision for waivers without defined criteria. LRP sites exhibit little opportunity for meeting the Wyoming State Reclamation Policy requirements. Reclamation of these sites is often impractical and/or unrealistic due to physical, biological, and/or chemical challenges. LRP areas potentially occur on 218,928 acres (28%) of BLM surface and 685,950 acres (20%) of federal fluid mineral estate. The inadequate protection of these sites would have an adverse effect on soil resources.

Overall, the soils management actions would result in a minor adverse effect on the soils resource.

Physical Resources

Air Quality

Air quality management actions under Alternative A would have no effect on soil resources.

Water Resources

There are two water management actions under Alternative A affecting soil resources that were not included in the 1985 RMP; they relate to on-channel reservoir placement and surface discharge of produced water. Without a previous management decision, these actions are considered on a project-specific basis, which has led to inconsistent management. Inconsistent management would have an adverse effect on soil resources on 32,912 acres (4.2%) of drainage channel on BLM surface and 397,753 acres (8%) of drainage channel over federal mineral estate.

The only water management action from the 1985 RMP affecting soil resources is a 500-foot restriction on surface-disturbing activities around springs, reservoirs, water wells, and perennial streams. Like many management actions in the 1985 RMP, the prohibition can be waived and waiver criteria were not defined; this has resulted in inconsistent management. This action would have an adverse effect on soil resources because it would fail to adequately protect the 2.5 percent (19,861 acres) of soils on BLM surface and the 2.8 percent (95,172 acres) of soils over federal fluid mineral estate within the water buffer. Overall, water management under Alternative A would have moderate adverse effects on the soil resource.

Cave and Karst Resources

Cave and karst resources are associated with steep slopes, rock outcrops, and similar sensitive soil types. Management actions that protect caves would therefore also protect soil resources. However, because there are no cave and karst management actions in the 1985 RMP, management in cave and karst areas are considered on a project-specific basis; this has led to inconsistent management of surface-disturbing activities. Cave and karst resources could be present on 13 percent (101,455 acres) of BLM surface and 4.4 percent (212,626 acres) of federal mineral estate. The potential for surface-disturbing activities in cave and karst areas is relatively low, related both to the difficult topography and limited potential for mineral resources. Although cave and karst resources comprise more than 10 percent of BLM surface, because of the limited foreseeable activity, the lack of previous management actions to consistently protect cave and karst resources would have a minor adverse effect on soil resources.

Mineral Resources

Impacts Common to All Alternatives above describes how mining activities would affect soil resources.

Locatable Minerals

Under Alternative A, 554 acres (0.1% of soils over federal locatable minerals) are predicted to be disturbed by locatable minerals development. This would have a negligible adverse effect on soil resources.

Leasable Minerals – Coal

The surface disturbance prediction of 195,700 acres of coal development is 4.1

percent of the federal mineral estate. This would have a minor adverse effect on soil resources under Alternative A.

Leasable Minerals – Fluids

Alternative A would continue to lease and allow for development of federal oil and gas. Fluid minerals development would affect soil resources as described above under *Impacts Common to All Alternatives*. Drilling and development would occur mostly in areas with high and moderate potential for oil and gas (see Map 23) spread over the next 15 to 20 years. The approximate total acres disturbed associated with the construction of well sites, access roads, and pipelines would be 10,575 acres. This represents 0.6 percent of soil resources over federal fluid mineral estate (3,386,530 acres). Since soil erosion affects an area larger than the physical disturbance the overall effect would be minor adverse at the planning-area scale.

Salable Minerals

Under Alternative A, 530 acres (0.01% of soils over federal salable minerals) of soils are predicted to be disturbed by salable minerals development. This would have a negligible adverse effect on soil resources.

Fire and Fuels Management

Impacts Common to All Alternatives above describes how fire and fuels management generally affects soil resources. The following paragraphs describe more specific effects on soil resources from management actions under Alternative A.

Unplanned Fire (Wildfire)

Response to unplanned wildland fire varies from full suppression to use of fire as a management tool under Alternative A. The use of some types of suppression equipment is limited in some areas, and fire and suppression damage will be rehabilitated. These actions would limit erosion and benefit soil resources. However, with a predicted 27,596 acres affected by wildfires, the benefits of these management actions would be negligible at the planning-area scale.

Planned Fire (Prescribed Fire)

Prescribed fire would be implemented to support vegetation and wildlife objectives, which also would result in long-term benefits to soil resources. With a predicted 14,000 acres (1.7%) of BLM surface to be treated by prescribed fire and mechanical treatments, there would be minor beneficial effects on soil resources from these management actions at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands

Timber harvest and other vegetative treatments would be designed to improve biodiversity and water quality. Disturbance associated with forest treatment activities would reduce canopy cover, disturb the soil surface, and increase erosion in the short term. Reduction of the canopy cover exposes the soil surface to rain-splash erosion and can increase rilling and gully. Forest litter, duff, and organic material forming ground cover are the most important components for protecting the mineral soil from erosion in forested systems (Elliot et al. 1996). Studies of the effects of logging roads show that post-storm turbidity can be attributed more to erosion from roads than any other source (Dunne and Leopold 1978).

Meeting the Desired Future Condition (DFC) in the long term with these vegetative treatments would contribute to properly functioning watersheds that support productive plant communities. Improving the health and vigor of forests would result in increased ground cover and would reduce surface erosion.

Up to 6,000 acres (0.8% of BLM surface) of forest and woodland treatments are predicted under Alternative A. Forest and woodland management under Alternative A would have a negligible beneficial effect on soil resources.

Vegetation – Grassland and Shrubland Communities

Impacts Common to All Alternatives above describes effects on soil resources from grassland and shrubland management. There is only one management action that varies across the alternatives. This management action relates to whether non-native species can be used during reclamation. There was no decision in the 1985 RMP regarding this management action; therefore, under Alternative A, species used for reclamation would need to be consistent with the BLM reclamation policy, which does allow the use of non-native species under specific circumstances. A primary goal of reclamation is soil stabilization, and vegetation species used in reclamation are chosen with this goal in mind. The effect on soils from this management action would be moderate and beneficial. Although this management action stabilizes all surface disturbances, the desired native ecological condition may be slow to reestablish.

Vegetation – Riparian/Wetland Resources

Surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would be prohibited. Like many management actions in the 1985 RMP, the prohibition can be waived and waiver criteria were not defined. This has led to inconsistent management. Continuing this management would have a minor adverse effect on soil resources because it fails to adequately protect the 2.5 percent (23,831 acres) of soils on BLM surface within the water buffer.

Invasive Species and Pest Management

Impacts Common to All Alternatives above describes the types of effects on soil resources from invasive species and pest management. The only related management action in the 1985 RMP was to control noxious weeds in cooperation with the counties. Under Alternative A, 8,000 acres (1.02%) of BLM surface are predicted to be treated. This would have a minor beneficial effect on soil resources.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

There are no fisheries management actions in the 1985 RMP that affect soil resources. Fisheries management is considered on a project-specific basis; therefore, mitigation has been inconsistently applied to surface-disturbing activities potentially affecting the soil resources. There are 51,745 acres (1%) of BLM surface within 0.25 mile of fish-bearing waters and 818 acres (0.1%) of BLM surface associated with special status fish bearing waters. Therefore, fisheries management under Alternative A would have a negligible beneficial effect on soil resources.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

There are a number of management actions under Alternative A that prohibit surface-disturbing activities for the protection of wildlife and special status wildlife species; these actions would benefit soil resources locally where soil disturbances are prevented. Typically, these management actions provide the opportunity for waivers, which reduces the benefits to soil resources. The timing limitations for various wildlife species also do not benefit soil resources because they simply delay surface-disturbing activities.

The two largest acreages where surface disturbances are prohibited are 138,452 acres (17.7%) of BLM surface where timber harvest is prohibited in crucial elk habitat and permanent buffers around active raptor nests (385,148 acres, or 49%, of BLM surface and 2,298,687 acres, or 48%, of federal fluid mineral estate). These actions would have a minor beneficial effect on soil resources.

Special Status Species – Plants

There are no management actions in the 1985 RMP that specifically address special status plant species; therefore, management is considered on a project-specific basis and consistent with the BLM special status species policy and the **ESA**. Surface-disturbing activities would avoid special status plant populations. In addition, special status plant species have narrow habitat requirements and therefore are not widespread in the planning area. Special status plant management under Alternative A would have a negligible beneficial effect on soil resources.

Heritage and Visual Resources

Cultural Resources

Current management includes placing a **no surface occupancy** (NSO) stipulation on mineral leases associated with the Bozeman Trail. The stipulation is typically less than 0.25 mile in width. Management of cultural resources under Alternative A would have a negligible beneficial effect on soil resources due to the limited acreage affected (0.46%) of BLM surface.

Visual Resources

The 1985 RMP manages visual resources in accordance with their **Visual Resource Management** (VRM) class. (VRM) Class II is the only class in the 1985 RMP likely to reduce surface-disturbing activities and therefore affect soil resources. The objective of (VRM) Class II designation is to retain the existing character of the landscape; management actions can be seen but they should not attract attention. There are 127,594 acres (16.3%) of BLM surface classified as (VRM) Class II. However, because surface disturbance is reduced but not prohibited and (VRM) management has been inconsistently applied, benefits to soil resources would be negligible.

Land Resources

Forest Products

Management actions under Alternative A include the sale of minor forest products, sale of commercial timber, and regeneration standards. Regeneration standards would not reduce the initial surface disturbance from harvest activities, but would help forest and woodland vegetation recover; this would reduce the duration of the long-term effects of vegetation removal. A maximum of 6,000 acres (0.8%) of forest product-related activity is predicted to occur on BLM surface. This would have a negligible adverse effect on soil resources.

Renewable Energy

There are no renewable energy decisions in the 1985 RMP; therefore, proposals are considered on a project-specific basis. Although there have been no renewable energy projects to date, 20,000 acres (2.6%) of disturbance on BLM surface are predicted during the planning period. Renewable energy development at this scale would have a minor adverse effect on the soil resources.

Rights-of-Way and Corridors

The only decision in the 1985 RMP specifically limiting ROW activity is a conditional prohibition on communications sites on North Middle Pumpkin Butte. The predicted

disturbance from ROW actions is 38,762 acres (4.96%) of BLM surface, which would have a minor adverse effect on soil resources.

Travel and Transportation Management

The 1985 RMP identified areas and routes where motorized vehicle is allowed (subject to restrictions) or excluded. However, implementation has been inconsistent. Existing roads have not been mapped for effective travel management enforcement.

Impacts Common to All Alternatives above describes road- and trail-related effects on soil resources. Off-road vehicle use can cause undue environmental degradation and accelerate soil erosion. The severity would depend on soil conditions (moist or wet versus dry or frozen), frequency, vehicle weight and type, and tire width or tread. Effects would be greatest in areas of concentrated use that are not maintained or improved. Continuous travel leads to compaction. There are several adverse environmental effects associated with compaction, including increased soil erosion, reduced soil permeability to air and water, reduced soil moisture, reduced soil depth and organic matter, and reduced nutrient cycling. While soil compaction can recover to some degree during periods of non-use, erosion usually continues whether or not use stops. Accelerated erosion resulting from motor vehicle use generally is constrained to isolated incidences. Limiting travel to designated routes confines the effects to areas disturbed or hardened from vehicle use.

TTM under Alternative A would have a minor adverse effect on soil resources based on the potential number of existing roads many of which are pioneered roads without erosion protections.

Recreation

Fluid and locatable mineral activity is not allowed in developed recreation sites under Alternative A. The prohibition on mineral activity would benefit soil resources locally. There are no decisions in the 1985 RMP limiting soils disturbance from recreational activities; therefore, recreational activities and developments are considered on a project-specific basis. This has led to inconsistent management. There would be negligible adverse effects on soil resources because of the low level of recreational use in the planning area.

Lands with Wilderness Characteristics

At present, there are no areas outside WSAs in the planning area managed for the preservation of wilderness characteristics. Therefore, there would be no effect on soil resources.

Livestock Grazing Management

Current livestock grazing management actions that directly affect soil resources include adjusting grazing use following timber harvest; allowing range improvements; conducting resource monitoring; continuing with the currently authorized areas and levels of grazing use; and resting pastures for a year followed by a year of grazing deferment following vegetative treatments.

Impacts Common to All Alternatives describes effects on soils from livestock grazing common to all alternatives. Projected surface disturbances are the same across the alternatives. At present, livestock grazing is not authorized on approximately 10,000 acres (1.3%) of BLM surface due to rugged topography and steep slopes, and where livestock grazing is determined to be incompatible with other resource uses or values. Cumulatively, these management actions would have a minor beneficial effect on soil resources.

Special Designations

Areas of Critical Environmental Concern

The 1985 RMP did not designate ACECs. Therefore, there would be no effect on soil resources from ACEC management under Alternative A.

4.1.3.4. Alternative B

Soil

Alternative B prohibits surface-disturbing activities on soils with a severe erosion hazard, which would have a beneficial effect on soil resources. Management would be consistent because Alternative B does not allow waivers. The Alternative B prohibition would apply year-round and would protect soils from erosion from wind and seasonal storms throughout the year. Alternative B would protect 215,496 acres (28%) of BLM surface and 669,739 acres (20%) of the federal fluid minerals estate.

Prohibiting surface-disturbing activities on slopes equal to or greater than 25 percent would have a beneficial effect on soil resources. This alternative would avoid most soils with a severe water erosion hazard and avoid sites susceptible to mass failure, which are frequently on steep slopes and occur throughout the planning area. This restriction also is consistent with Appendix J (p. 2155). This restriction is consistent with the use of conventional construction equipment. Alternative B would achieve consistency in application because it does not allow exemptions. Alternative B would protect 170,590 acres (22%) of BLM surface and 412,145 acres (12%) of federal fluid mineral estate.

Prohibiting surface-disturbing activities on soils with poor reclamation suitability would have a beneficial effect on soil resources. Alternative B would prevent disturbance on areas with poor reclamation **suitability**, is clearly defined, and would be consistently applied because it allows no exemptions. Alternative B would protect soils on 455,090 acres (58%) of BLM surface and 1,514,445 acres (45%) of federal fluid mineral estate.

Prohibiting surface-disturbing activities on areas identified as LRP **areas** such as but not limited to badlands, rock outcrops, and slopes susceptible to mass movement would have a beneficial effect on soil resources. These sites exhibit little opportunity for meeting the Wyoming State Reclamation Policy requirements; therefore, Alternative B prohibits disturbance of these sites. Alternative B would protect 218,928 acres (28%) of BLM surface and 685,950 acres (20%) of federal fluid mineral estate. Overall soil management actions in Alternative B would have major beneficial effects on the soil resource.

Physical Resources

Air Quality

Air quality management actions under Alternative B would not affect soil resources.

Water Resources

Alternative B includes three water management actions that would affect soils resources, as follows: a prohibition on on-channel reservoir placement, a prohibition on surface discharge of produced water, and a 500-foot prohibition of surface-disturbing activities around springs, non-CBNG, reservoirs, water wells, perennial streams, and their associated riparian habitat. These management actions are unconditional. The 500-foot buffer would protect 2.5 percent, or 19,861 acres, of the soils on BLM surface and 2.8 percent, or 95,172 acres, of soils over federal fluid mineral estate. There are 32,912 acres (4.2%) of drainage channel on BLM surface and

397,753 acres (8.3%) of drainage channel over federal mineral estate that would be protected by the on-channel reservoir and surface discharge prohibitions. Collectively, these water management actions would have a moderate beneficial effect on soil resources.

Cave and Karst Resources

Alternative B prohibits surface-disturbing activities, including minerals development and timber harvest, in cave and karst areas. The prohibitions are unconditional. Cave and karst resources could be present on 13 percent (101,455 acres) of BLM surface and 4.4 percent (212,626 acres) of federal mineral estate. Management actions to protect cave and karst resources would have a major beneficial effect on soil resources.

Mineral Resources

The *Impacts Common to All Alternatives* section above describes how minerals activities affect soil resources. In general, Alternative B substantially reduces the area available for mineral exploration and development compared to Alternative A, but does not reduce projected development as much as it reduces available area.

Locatable Minerals

Under Alternative B, 277 acres (0.03% of federal locatable minerals) of soils are predicted to be disturbed by locatable minerals development. This would have a negligible adverse effect on soil resources.

Leasable Minerals – Coal

The Alternative B surface disturbance prediction of 186,600 acres of coal development is 3.9 percent of the federal mineral estate. This represents a minor adverse effect on soil resources.

Leasable Minerals – Fluids

Alternative B would continue to lease and allow for the development of the federal fluid mineral estate, but with increased protections for soils and other resources. Alternative B would impose what are considered major constraints for development on 642,232 acres (19%) of the federal mineral estate. The approximate total acres disturbed associated with the construction of well sites, access roads, and pipelines is 286, which represents 0.3 percent of soil resources over the federal fluid minerals estate. Even with erosion extending beyond the physical disturbances, the overall affected area should remain less than one percent of the soil resources. Therefore, management under Alternative B would have a negligible adverse effect on soil resources.

Salable Minerals

Under Alternative B, salable minerals development is predicted to disturb 114 acres (0.003% of federal salable minerals). This would have a negligible adverse effect on soil resources.

Fire and Fuels Management

The *Impacts Common to All Alternatives* section above describes how fire and fuels management generally affects soil resources. The following paragraphs describe more specific effects on soil resources from management actions under Alternative B.

Unplanned Fire (Wildfire)

Under Alternative B, response to unplanned wildland fire varies from full suppression to monitoring fire as a management tool. The use of heavy equipment is limited to existing roads and trails. All fire and suppression damage will be rehabilitated. These actions would limit erosion and benefit the soil resources. However, with a predicted 27,596 acres (3.5%) of BLM surface to be affected by wildfires, the benefit of these management actions would be minor at the planning-area scale.

Planned Fire (Prescribed Fire)

Under Alternative B, prescribed fire and other vegetative treatments would be used to restore fire-adapted ecosystems, which would have a long-term beneficial effect on soil resources. With a predicted 3,500 acres (0.4%) of BLM surface to be treated by prescribed fire and mechanical treatments, the beneficial effect of these management actions would be negligible at the planning-area scale.

Biological Resources**Vegetation – Forests and Woodlands**

The discussion under Alternative A describes how forest and woodland management activities affect soil resources. Alternative B emphasizes a natural, hands-off, approach to forest and woodland management. Timber harvest and other vegetative treatments would be minimized. Mature and old-growth forests are typically productive plant communities with more ground cover and less surface erosion than early successional forest communities.

Up to 1,000 acres (0.1%) of forest and woodland treatments are predicted under Alternative B. This would have a negligible beneficial effect on soil resources.

Vegetation – Grassland and Shrubland Communities

Under Alternative B, only native species would be authorized for reclamation activities. Native species often have distinct seeding windows and are sometimes slow to establish, which allows invasive species to establish. Initial stabilization and erosion control would be less in the short term. Allowing only native species for reclamation could have a minor adverse effect on soil resources.

Vegetation – Riparian/Wetland Resources

Under Alternative B, surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would be prohibited. Other management actions that would benefit soil resources include managing for DFC in capable communities, and restoring wetland and riparian vegetation supported by (CBNG), produced-water discharge. The 500-foot buffer would protect 3.0 percent, or 23,831 acres, of soils on BLM surface and 4.2 percent, or 144,045 acres, of soils over federal fluid mineral estate. Collectively, these water management actions would have a minor beneficial effect on soil resources.

Invasive Species and Pest Management

The *Impacts Common to All Alternatives* section describes the types of effects on soil resources from invasive species. Alternative B takes an aggressive approach to managing invasive species. Under Alternative B, 15,000 acres (2%) of BLM surface are predicted to be treated, which would have a minor beneficial effect on soil resources.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Alternative B fish and special status fish management actions include maintaining, enhancing,

and restoring fish habitat; managing fish habitat toward DFC; and prohibiting surface-disturbing activities within 0.25 mile of fish-bearing waters. The *Soils* and *Mineral Resources* sections of this soils analysis describe how surface-disturbing activities effect soil resources. There are 261,870 acres (0.4%) of federal mineral estate associated with fish-bearing waters and 818 acres (0.1%) of federal mineral estate associated with special status species fish-bearing waters. Therefore, fisheries management under Alternative B would have a major beneficial effect on soil resources; special status species fish management would have a negligible beneficial effect.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

There are a number of management actions under Alternative B that prohibit surface-disturbing activities (without provisions) for the protection of wildlife and special status wildlife species; these actions would benefit soil resources locally where soil disturbances are prevented. The timing limitations for various wildlife species would not benefit soil resources because they delay, but do not prevent, surface-disturbing activities.

Under Alternative B, the largest acreages of surface disturbance prohibitions are timber harvest in crucial elk habitat (149,451 acres, or 19%, of BLM surface), disturbance activities in elk security habitat (132,148 acres, or 16.9%, of BLM surface), permanent buffers around active raptor nests (255,129 acres, or 33%, of BLM surface), disturbance activities in reptile and amphibian habitat (176,636 acres, or 23%, of BLM surface), renewable-energy projects in Greater Sage-Grouse habitat (467,897 acres, or 65.1% of BLM surface). Collectively these prohibitions would have a major beneficial effect on the soil resource.

Special Status Species – Plants

Surface-disturbing activities are prohibited within special status plant species habitat under Alternative B. This prohibition effects all programs on BLM surface (126,811 acres [16.21%]). Surface disturbance associated with federal mineral development has the potential to effect the largest acreage (243,929 acres [5.08%]) of the total federal mineral estate. Cumulatively special status plant management would have a major beneficial effect on soil resources.

Heritage and Visual Resources

Cultural Resources

Management actions under Alternative B include a prohibition of surface-disturbing activities in areas with historic properties that retain their historic setting, Traditional Cultural Properties (TCPs), sacred sites, and other culturally sensitive areas. To protect the historic settings of these sites, the prohibition on surface-disturbing activities can extend 5 miles from the sensitive cultural site, which would protect soil resources on 330,592 acres, or 42 percent, of BLM surface, and 1,854,954 acres, or 39 percent, of federal fluid mineral estate. This would have a major beneficial effect on soil resources.

Visual Resources

Under Alternative B, areas inventoried as (VRM) Class II and special emphasis areas would be managed as (VRM) Class II. There are 217,021 acres, or 27.9 percent, of BLM surface classified as (VRM) Class II. This management action could have a major beneficial effect on the soil resource. However, because surface disturbance is reduced but not prohibited, planning level impacts maybe less beneficial thus having a minor beneficial effect on the soil resources.

Land Resources

Forest Products

Management actions under Alternative B include commercial sales of saw timber, limiting timber harvest units to 5 acres, managing sales to keep forests within ecologically sustainable limits, and natural regeneration of harvest areas. The reliance on natural regeneration could increase vegetative recovery time following vegetation removal, which would adversely affect soil resources. A maximum of 1,000 acres, or 0.1 percent, of forest product-related activity is predicted on BLM surface; this would have a negligible adverse effect on soil resources.

Renewable Energy

Management under Alternative B would exclude renewable-energy projects wherever minerals development and other surface-disturbing activities are prohibited and allow renewable-energy development where other surface-disturbing activities are allowed. Approximately 5,000 acres, or 0.6 percent, of disturbance on BLM surface are predicted over the planning period. Renewable-energy development at this scale would have a negligible adverse effect on soil resources.

Rights-of-Way and Corridors

Management under Alternative B would exclude ROW activity from 706,556 acres of BLM surface and restricts communications sites. These actions would reduce additional surface disturbance. The predicted disturbance from ROW actions is 18,011 acres (2.3%) of BLM surface, which would have a minor adverse effect on soil resources.

Travel and Transportation Management

Management actions under Alternative B include closing 625,854 acres to motorized use and limiting motorized vehicle use elsewhere to designated routes, closing and reclaiming roads to protect sensitive resources, and limiting travel off designated routes to permitted activities. These actions would limit the potential adverse effects on soil resources from motorized vehicles to a negligible level.

Recreation

Alternative B would provide for recreation to be intensively managed in and would prohibit mineral leasing within a 0.5 mile buffer of SRMAs. The restriction on mineral leasing would reduce potential surface disturbance from mineral-development facilities and associated infrastructure. These management actions would prohibit surface-disturbing activities on 55,529 acres or 7.1 percent, of BLM surface, which would have a moderate beneficial effect on soil resources.

Lands with Wilderness Characteristics

Alternative B would prohibit most surface-disturbing activities on 12,237 acres, or 1.6 percent, of BLM surface to emphasize primitive recreation and natural values, which would have a minor beneficial effect on soil resources.

Livestock Grazing Management

Management actions under Alternative B include reducing grazing effects following timber harvest, limiting or prohibiting grazing where it would not be compatible with other resources, locating mineral supplements away from sensitive resources, a provision for reserve common allotments, and two years of livestock rest following vegetative treatments. The *Impacts Common to All Alternatives* section above describes effects on soil resources from livestock grazing. Projected surface disturbances are the same across alternatives. At present, livestock grazing is not authorized on approximately 10,000 acres (1.3%) of BLM surface due to rugged topography and steep slopes, and where livestock grazing is determined to be incompatible with other

resource uses or values. Livestock grazing may be further restricted in sensitive areas, increasing protections on the soil resource. This would have a direct beneficial effect on soil resources. Collectively, these management actions would have a moderate beneficial effect on soil resources.

Special Designations

Areas of Critical Environmental Concern

Alternative B would designate eight ACECs encompassing 511,000 acres, or 8.3 percent, of BLM surface and implement limitations and prohibitions on surface-disturbing activities in ACECs. ACEC designation and management would have a moderate beneficial effect on soil resources.

4.1.3.5. Alternative C

Soil

Under Alternative C, allowing surface-disturbing activities on soils with a severe erosion hazard, on slopes equal to or greater than 25 percent, on soils with poor reclamation suitability, and on LRP areas would have a major adverse effect on soil resources. These are the most sensitive soils and the most difficult to reclaim following surface-disturbing activities. Allowing activities on these soils would be inconsistent with Appendix J (p. 2155) and inconsistent with the use of conventional construction equipment. Alternative C would fail to protect 215,496 acres (28%) of BLM surface and 669,739 acres (20%) of federal fluid mineral estate that possess soils with a severe erosion hazard, 170,590 acres (22%) of BLM surface and 412,145 acres (45%) of federal fluid minerals estate with slopes equal to or greater than 25 percent, 455,090 acres (12%) of BLM surface and 1,514,445 acres (48%) of federal fluid minerals estate that possess soils with poor reclamation suitability, and 218,928 acres (28%) of BLM surface and 685,950 acres (20%) of federal fluid mineral estate with badlands, rock outcrops, or slopes susceptible to mass movement.

Physical Resources

Air Quality

Alternative C air quality management actions would not affect soil resources.

Water Resources

There are three water management actions under Alternative C that would affect soil resources — allowing on-channel reservoirs; allowing surface discharge of produced water; and allowing surface-disturbing activities near springs, non-(CBNG), reservoirs, water wells, perennial streams, and within riparian habitats. These management actions would not prevent surface-disturbing activities that would erode stream banks and soils; this would adversely affect soil resources. The absence of a 500-foot buffer would leave 2.5 percent, or 19,861 acres, of the soils on BLM surface and 2.8 percent, or 95,172 acres, of soils over federal fluid mineral estate available for development, therefore leaving soils vulnerable to impacts. Under Alternative C, there would be 32,912 acres (4.2%) of drainage channel on BLM surface and 397,753 acres (8.3%) of drainage channel over federal mineral estate available for on-channel reservoir placement and surface discharge of produced water. Collectively, these water management actions would have a moderate adverse effect on soil resources.

Cave and Karst Resources

Alternative C would allow surface-disturbing activities, including minerals development and timber harvest, in cave and karst areas. Cave and karst resources could be present on

13 percent (101,455 acres) of BLM surface and 4.4 percent (212,626 acres) of federal mineral estate. The potential for surface-disturbing activities in cave and karst areas is relatively low, related both to the difficult topography and limited potential for mineral resources. Although cave and karst resources comprise more than ten percent of BLM surface, due to the limited foreseeable activity, the overall result would be a minor adverse effect on soil resources.

Mineral Resources

The *Impacts Common to All Alternatives* section describes how minerals activities affect soil resources. In general, the amount of area available for mineral exploration and development under Alternative C is comparable to Alternative A, but there would be more development because there are fewer management constraints.

Locatable Minerals

Under Alternative C, 1,455 acres (0.02% of federal locatable minerals) are predicted to be disturbed by locatable minerals development. This would have a negligible adverse effect on soil resources.

Leasable Minerals – Coal

Under Alternative C, the surface disturbance prediction of 195,700 acres of coal development is 4.1 percent of the federal mineral estate. This is a minor adverse effect on soil resources.

Leasable Minerals – Fluids

Alternative C would allow for the development of the federal fluid minerals estate with decreased protections for soils and other resources. Alternative C would place major constraints on fluid minerals development only on what is considered the coal conflict zone, which comprises 303,601 acres (0.9%) of the federal mineral estate. The approximate total acres disturbed associated with the construction of well sites, access roads, and pipelines would be 22,255 acres. This represents 0.6 percent of soil resources over the federal fluid mineral estate. Since soil erosion affects an area larger than the physical disturbance the overall effect would be minor adverse at the planning-area scale.

Salable Minerals

Under Alternative C, 2,090 acres (0.1% of federal salable minerals) are predicted to be disturbed by salable minerals development. This would have a negligible adverse effect on soil resources.

Fire and Fuels Management

The *Impacts Common to All Alternatives* section describes how fire and fuels management generally affects soil resources. The following paragraphs describe more specific effects on soil resources from fire and fuels management actions under Alternative C.

Unplanned Fire (Wildfire)

Under Alternative C, full protection tactics would be used in response to unplanned wildland fire. Heavy equipment usage would not be limited, but would consider other resource values. These actions would do little to limit erosion and would adversely affect soil resources. With an emphasis on suppression, this alternative would increase the probability of large watershed-damaging fires over the long term. Full suppression of wildland fires would result in an accumulation of fuels and an increase in late-seral vegetative communities that are more

prone to soil-damaging catastrophic wildland fires. Greater fire suppression efforts would result in increased disturbance from suppression activities, such as building fire lines, which would increase localized soil erosion. In addition, no active rehabilitation of affected soils is predicted under Alternative C. With a predicted 27,596 acres of BLM surface to be affected by wildfires, the adverse effects of these management actions would be minor at the planning-area scale.

Planned Fire (Prescribed Fire)

Wildland fire and other vegetative treatments would be used to restore fire-adapted ecosystems for commodity production. Long-term benefits to soil resources would be tempered by additional surface-disturbing activities related to commodity production. However, commodity production would be consistent with the required management for soils and other resources to reduce effects. With a predicted 42,000 acres (5.4%) of BLM surface to be treated by prescribed fire and mechanical treatments, the beneficial effects of these management actions would be minor at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands

Timber harvest and other vegetative treatments would be designed to maximize forest health through active forest management under Alternative C. Discussion of how forest and woodland management actions affect soil resources is provided under Alternative A.

Under Alternative C, up to 24,000 acres (3.1%) of forest and woodland treatments are predicted on BLM surface. Forest and woodland management under Alternative C would have a minor beneficial effect on soil resources.

Vegetation – Grassland and Shrubland Communities

Allowing desirable non-native plant species for initial reclamation **may** help stabilize soils in a timely manner, therefore protecting soils and controlling erosion. This alternative would allow for quick-growing species to compete with annual weeds, stabilize the soil, and provide an opportunity for slower-establishing native plants to inhabit the site. Initial soil stabilization for all soil disturbances in the planning area, would result in a moderate beneficial effect on soil resources from this management action.

Vegetation – Riparian/Wetland Resources

Surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would be allowed under Alternative C. Wetland and riparian vegetation would be restored only where directly disturbed by (CBNG), activities such as dams and reservoirs. The 500-foot buffer would fail to protect 3 percent, or 23,831 acres, of the soils on BLM surface and 4.2 percent, or 144,045 acres, of soils over federal fluid mineral estate. Collectively, these water management actions would have a minor adverse effect on soil resources.

Invasive Species and Pest Management

The *Impacts Common to All Alternatives* section describes the types of effects to soil resources from invasive species. Alternative C would take a conservative approach to managing invasive species. Under Alternative C, 10,000 acres (1.3%) of BLM surface are predicted to be treated. This would have a minor beneficial effect on soil resources.

Fish and Wildlife – Fish and Special Status Species – Fish

Fish and special status fish management actions under Alternative C include considering all resources when affecting perennial waters; managing fish habitat toward PFC; allowing

surface-disturbing activities near naturally occurring waterbodies except within 500 feet of waters containing special status fish species; and restoring or improving fisheries habitat only for special status fish. The *Soils* and *Mineral Resources* sections of this soils analysis describe how surface-disturbing activities affect soil resources. There are 261,870 acres (0.4%) of federal mineral estate associated with fish-bearing waters and 4,846 acres (0.1%) of federal mineral estate associated with special status species fish-bearing waters. Therefore, allowing surface-disturbing activities under Alternative C would have a negligible adverse effect on soil resources.

Fish and Wildlife – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Most management actions under Alternative C allow surface-disturbing activities with consideration of wildlife and special status wildlife species; therefore, these actions would have little direct benefit to soil resources. Actions that would provide measurable benefits include the designation of a Wildlife Habitat Management Area (WHMA) in the Fortification Creek crucial elk ranges (32,602 acres, or 4.2%, of BLM surface), a restriction on surface-disturbing activities near active Greater Sage-Grouse leks (3,594 acres, or 0.5%, of BLM surface), and a Controlled Surface Use (CSU) limitation on fluid mineral leases near active special status raptor nests (28,437 acres, or 3.6%, of BLM surface). Although a few management actions would affect more than one percent of soil resources, the benefit to soil resources would be negligible.

Special Status Species – Plants

Under Alternative C, surface-disturbing activities would be allowed in special status plant habitat, but not in known populations. Populations are typically only a few acres in size. Special status plant species have narrow habitat requirements and therefore are not widespread in the planning area. Special status plant management under Alternative C would not affect soil resources.

Heritage and Visual Resources

Cultural Resources

Management actions under Alternative C include an allowance for surface-disturbing activities in areas with historic properties that retain their historic settings, TCPs, sacred sites, and other culturally sensitive areas when appropriate mitigation is accomplished. Cultural sites themselves are typically small in size and buffers to protect historic settings are typically less than 0.25 mile wide. These cultural resources management actions would have a negligible adverse effect soil resources.

Visual Resources

Under Alternative C, areas inventoried as (VRM) Class II and special emphasis areas would be managed as (VRM) Class III. The objective of (VRM) Class III areas is to partially retain the existing character of the landscape; management activities should not dominate the view. Class III management would likely not affect the level of surface-disturbing activities. Therefore, Alternative C visual resources management would not affect soil resources.

Land Resources

Forest Products

Management actions under Alternative C include offering an array of forest products to maximize economic returns, no limit on harvest unit size, and the planting and maintenance of trees following harvest. Planting and maintaining trees following harvest would help forest

and woodland vegetation recover and reduce the duration of long-term effects from vegetation removal. A maximum of 24,000 acres, or 3.1 percent, of forest product-related activity is predicted to occur on BLM surface. This would have a minor adverse effect on soil resources.

Renewable Energy

Management under Alternative C would allow renewable-energy development throughout the planning area consistent with other resource values. Approximately 40,000 acres (19.2%) of disturbance are predicted on BLM surface during the planning period. Renewable-energy development at this scale would have a major adverse effect on soil resources.

Rights-of-Way and Corridors

Management under Alternative C would allow for ROW activity unless specifically excluded. The predicted disturbance from ROW actions is 57,083 acres (7.3%) of BLM surface, which would have a moderate adverse effect on soil resources.

Travel and Transportation Management

Management actions under Alternative C include allowing motorized use within stock driveway, retaining all existing roads, closing areas to motorized vehicle use to protect sensitive resources, and allowing travel off designated routes for necessary tasks. Additional allowances for motorized vehicle use would result in more adverse effects on soil resources than under current management. TTM under Alternative C would have a minor adverse effect on soil resources based on the amount of area open to motorized vehicle access 754,102 acres (96.4%).

Recreation

Alternative C would provide for mineral leasing and other surface-disturbing activities. Alternative C designates 30,570 asSRMAs. However, flexible management actions in Alternative C do not necessarily restrict development or surface disturbance in SRMAs. Therefore, the impact of recreation on soils resources is negligible.

Lands with Wilderness Characteristics

There are no areas proposed to be managed for the preservation of wilderness characteristics under Alternative C. Therefore, there would be no effect on soil resources.

Livestock Grazing Management

Management actions under Alternative C soil resources include limiting or prohibiting grazing where it is currently prohibited, locating mineral supplements away from sensitive resources, and two years of livestock deferment following vegetative treatments. The *Impacts Common to All Alternatives* section above describes effects on soil resources from livestock grazing. Projected surface disturbances are the same across alternatives. At present, livestock grazing is not authorized on approximately 10,000 acres (1.3%) of BLM surface due to rugged topography and steep slopes, and where livestock grazing is determined to be incompatible with other resource uses or values. Cumulatively, these management actions would have a minor beneficial effect on soil resources.

Special Designations

Areas of Critical Environmental Concern

Alternative C would not designate any ACECs and there would be no additional limitations or prohibitions on surface-disturbing activities. Therefore, there would be no effect on soil resources.

4.1.3.6. Alternative D

Soil

Under Alternative D, surface-disturbing activities could be allowed on soils with a severe erosion hazard, on slopes equal to greater than 25 percent, and on soils with poor reclamation suitability with an approved construction, stabilization, and reclamation plan(s). Under Alternative D, LRP areas should be avoided, but in limited situations disturbances may be considered with the applicable plan(s). This would allow for surface-disturbing activities on sensitive soil resources while minimizing and mitigating the impacts to soil resources.

A construction plan should include a site evaluation, construction techniques and other practices to be employed by a proponent for surface disturbing activities. The plan is to demonstrate how surface disturbance and the associated effects will be minimized, erosion controlled, and reclamation potential will be maintained. The content of the plan will vary with the complexity of the proposal (i.e., suitability of native materials as construction material, plan and profile, engineered diagram, geotechnical investigation, etc.).

The purpose of a stabilization plan is to control erosion and maintain soil/site stability through erosion control. Soil/site stability characteristics will meet those of the Ecological Site Description (ESD) reference sheet. Erosion will be controlled to prevent irrecoverable soil loss and will be measured using BLM approved methodologies.

For a description of reclamation plans, goals and objectives, refer to Appendix O (p. 2495).

Alternative D could potentially disturb 215,496 acres (28%) of BLM surface and 669,739 acres (20%) of federal fluid mineral estate possessing soils with a severe erosion hazard; 170,590 acres (22%) of BLM surface and 412,145 acres (12%) of federal fluid mineral estate with slopes equal to or greater than 25 percent; 455,090 acres (58%) of BLM surface and 1,514,445 acres (45%) of federal fluid mineral estate possessing soils with poor reclamation suitability; and 218,928 acres (28%) of BLM surface and 685,950 acres (20%) of federal fluid mineral estate potentially containing LRP areas consisting of but not limited to badlands, rock outcrops, or slopes susceptible to mass movement. A construction, stabilization, and reclamation plan does not mean that impacts will be avoided. In the short term impacts are similar to Alternative C (because surface-disturbing activities are not prohibited) and long-term impacts would be less, dependent upon the successful implantation and maintenance of the mitigation measures applied. This management would have a minor beneficial effect on soil resources.

Physical Resources

Air Quality

Alternative D air quality management actions would not affect soil resources.

Water Resources

Under Alternative D, there are three water management actions that would affect soil resources — allowing on-channel reservoirs; allowing surface discharge of produced water; and allowing surface-disturbing activities near springs, non-(CBNG), reservoirs, water wells, perennial streams, and in riparian habitats. These management actions would allow surface-disturbing activities with limited protection in place to prevent stream bank and soil erosion. The 500-foot buffer would encompass 2.5 percent, or 19,861 acres, of the soils on BLM surface and 2.8 percent, or 95,172 acres, of soils over federal fluid mineral estate. There are 32,912 acres (4.2%)

of drainage channel on BLM surface and 397,753 acres (8.3%) of drainage channel over federal mineral estate that would be evaluated when considering on-channel reservoir placement and surface discharge. Soils associated with water are typically sensitive and even with some restrictions in place erosion is likely to occur. These areas can be difficult to reclaim. BLM's authority to manage water discharge is limited as it is under the authority of the Wyoming DEQ. Collectively, these water management actions would have a minor adverse effect on soil resources.

Cave and Karst Resources

Under Alternative D, surface-disturbing activities, including minerals development and timber harvest, would be allowed in cave and karst areas with site-specific mitigation. Protections would likely focus on protecting significant caves. The potential for surface-disturbing activities in cave and karst areas is relatively low, related both to the difficult topography and limited potential for mineral resources. Management actions to protect cave and karst resources would have a minor beneficial effect on soil resources due to the site-specific buffer near significant caves, with 13 percent of the BLM surface having a CSU for mineral development.

Mineral Resources

The *Impacts Common to All Alternatives* section above describes how minerals activities affect soil resources. In general, the amount of area available for mineral exploration and development is comparable to Alternative A, as is predicted development. Alternative D incorporates resource protections which allows mineral resources development when impacted resource objectives can be met.

Locatable Minerals

Under Alternative D, 1,252 acres (0.2% of federal locatable minerals) are predicted to be disturbed by locatable minerals development. This would have a negligible adverse effect on soil resources.

Leasable Minerals – Coal

The surface disturbance prediction of 195,700 acres of coal development is 4.1 percent of federal mineral estate. This would have a minor adverse effect on soil resources under Alternative D.

Leasable Minerals – Fluids

Alternative D would allow for the development of federal fluid mineral estate with an approved construction, stabilization, and reclamation plan(s). Development of the federal fluid mineral estate (CBNG, conventional oil vertical and horizontal) within the planning area is predicted to potentially disturb, 14,186 acres, which is 0.42 percent of soil resources over the federal fluid minerals estate. Soil disturbance is site specific and dependent upon topography, as slope increases total disturbance increases. Reasonable Foreseeable Development (RFD) predictions on the amount of disturbance is based on current proposals and activity, most current development activity is located in the southern portion of the planning area. This geographic area is characterized by gently rolling to rolling landscapes.

The RFD predicts development potential into the central portion of the planning area. These landscapes are generally steep and very steep, greatly increasing the soil disturbance associated with fluid mineral development. Soils disturbance would increase significantly from roads and infrastructure that were not included in the RFD for surface disturbance. This RMP predicts increases in initial soil disturbance of 13,164 acres (0.38%) from roads and infrastructure over the federal fluid mineral estate. Horizontal/vertical drilling locations or other large constructed

disturbances have the potential to create areas described in this document as sensitive sites (soils with poor reclamation suitability, highly erodible soils, LRP areas, and steep slopes [25% or greater]). Therefore impact to the soil resource has been elevated to a minor adverse impact.

Salable Minerals

Under Alternative D, 1,193 acres (0.03% of federal salable minerals) are predicted to be disturbed by salable minerals development. This would have a negligible adverse effect on soil resources.

Fire and Fuels Management

The *Impacts Common to All Alternatives* section above describes how fire and fuels management generally affects soil resources. The following paragraphs describe more specific effects on soil resources from management actions under Alternative D.

Unplanned Fire (Wildfire)

Under Alternative D, response to unplanned wildland fire varies from full suppression to monitoring fire as a management tool. The use of heavy equipment would be limited except when human safety is at risk, and fire and suppression damage would be rehabilitated where necessary. These actions would limit erosion and benefit soil resources. However, with a predicted 27,596 acres (3.5%) of BLM surface to be affected by wildfires, the beneficial effects of these management actions would be minor at the planning-area scale.

Planned Fire (Prescribed Fire)

Under Alternative D, wildland fire and other vegetative treatments would be used to meet desired management objectives, which would result in long-term beneficial effects on soil resources. With a predicted 14,000 acres (1.8%) of BLM surface to be treated by prescribed fire and mechanical treatments, the benefit of these management actions would be minor at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands

Forest and woodland management under Alternative D would maximize forest health through active forest management similar to Alternative C, except with fewer acres predicted to be treated. Discussion of how forest and woodland management actions effect soil resources is provided under Alternative A.

Under Alternative D, up to 20,000 acres (1.3%) of forest and woodland treatments are predicted on BLM surface. Forest and woodland management under Alternative D would have a minor beneficial effect on soil resources.

Vegetation – Grassland and Shrubland Communities

Allowing desirable non-native plant species for initial reclamation would help stabilize soils in a timely manner, thus protecting soil and controlling erosion. Alternative D would allow for quick-growing species to compete with annual weeds, which would stabilize the soil and provide an opportunity for slower-establishing native plants to inhabit the site. Initial soil stabilization for all soil disturbances in the planning area, would result in a moderate beneficial effect on soil resources from this management action.

Vegetation – Riparian/Wetland Resources

Under Alternative D, surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would be allowed when in accordance with defined criteria. Other management actions that would benefit soil resources include managing for DFC within capable communities and restoring wetland and riparian vegetation supported by (CBNG), produced-water discharge. The 500-foot buffer would protect 3 percent, or 23,831 acres, of the soils on BLM surface and 2.8 percent, or acres, of soils over federal fluid mineral estate. Collectively, these management actions would have a minor beneficial effect on soil resources.

Invasive Species and Pest Management

The *Impacts Common to All Alternatives* section above describes the types of effects on soil resources from invasive species. Under Alternative D, 12,000 acres (1.5%) of BLM surface are predicted to be treated for invasive species, which would have a minor beneficial effect on soil resources.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Fish and special status fish management actions under Alternative D include maintaining, enhancing, and restoring fish habitat; managing fish habitat toward DFC; and allowing surface-disturbing activities within 0.25 mile of fish-bearing water when appropriately mitigated unless special status fish species are present, in which case disturbance would be prohibited.

The *Soils* and *Mineral Resources* sections of this soils analysis describe how surface-disturbing activities affect soil resources. There are 261,870 acres (0.4%) of federal mineral estate associated with fish-bearing waters and 4,846 acres (0.1%) of federal mineral estate associated with special status species fish-bearing waters. Because there are allowances for surface disturbance in sensitive soils, fisheries management under Alternative D would have a moderate beneficial effect on soil resources; special status species fish management would have a negligible beneficial effect.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

There are a number of management actions under Alternative D that would allow surface-disturbing activities where wildlife and special status wildlife species could be adequately protected. These actions would benefit soil resources locally where soil disturbances are prevented.

Some of the management actions with measurable benefits to soil resources include the following: timber harvest would maintain current amounts of crucial elk habitat (149,451 acres, or 19%, of BLM surface), elk security habitat would be retained (132,148 acres, or 16.9%, of BLM surface), surface-disturbing activities would be prohibited near Greater Sage-Grouse leks (9,966 acres, or 1.27%, of BLM surface), removal of sagebrush in Greater Sage-Grouse habitats would be restricted, and surface-disturbing activities may be prohibited near special status species raptor nests (17,417 acres, or 2.2%, of BLM surface). Collectively these prohibitions would have a major beneficial effect on the soil resource.

Special Status Species – Plants

Under Alternative D, surface-disturbing activities would be allowed in special status plant habitat, but not within known populations. Populations are typically only a few acres in size. Special status plant species have narrow habitat requirements and are therefore not widespread in the planning area. Special status plant management would not affect soil resources.

Heritage and Visual Resources

Cultural Resources

Management actions under Alternative D include a prohibition on surface-disturbing activities for specifically identified historic properties that retain their historic settings, and appropriate mitigation for surface-disturbing activities for the protection of TCPs, sacred sites, and other culturally sensitive areas. To protect the settings of the identified historic properties, surface-disturbing activities could be restricted up to three miles from the sensitive cultural site. This would protect soil resources on 221,490 acres, or 28.3 percent, of BLM surface. Because these management actions limit, but do not prohibit, surface-disturbing actions, collectively they would have a moderate beneficial effect on soil resources.

Visual Resources

Under Alternative D, specifically identified areas inventoried as (VRM) Class II or special emphasis areas would be managed as (VRM) Class II. There are 112,329 acres, or 14.5 percent, of BLM surface classified as (VRM) Class II. However, because surface disturbance would be reduced but not prohibited, beneficial effects on soil resources would be minor.

Land Resources**Forest Products**

Management actions under Alternative D include offering an array of forest products managed within ecologically sustainable limits, and planting following harvest only when necessary to ensure regeneration. Regeneration standards would help forest and woodland vegetation recover, which would reduce the duration of long-term effects from vegetation removal. A maximum of 20,000 acres, or 2.6 percent, of forest product-related activity is predicted to occur on BLM surface. This would have a minor adverse effect on soil resources.

Renewable Energy

Management under Alternative D would exclude renewable-energy development in specifically identified areas and allow development in the remainder of the planning area. Approximately 75,240 acres (9.6%) of disturbance on BLM surface are predicted over the planning period. Renewable-energy development at this scale would have a moderate adverse effect on soil resources.

Rights-of-Way and Corridors

Management under Alternative D would allow for ROW activity while conserving other resources. The predicted disturbance from ROW actions is 38,762 acres (4.9%) of BLM surface, which would have a minor adverse effect on soil resources.

Travel and Transportation Management

Management actions under Alternative D include limiting the majority of motorized vehicle use to designated routes and within stock driveways, closing and reclaiming areas to protect sensitive resources, and allowing travel off designated routes for identified tasks. TTM under Alternative D would have a minor beneficial effect on soil resources.

Recreation

Alternative D would prohibit or limit mineral leasing and limit surface-disturbing activities in designated SRMAs. Alternative D would protect soils on 54,160 acres (6.9%) of BLM surface by intensively managing recreation in these areas. This management action would have a moderate beneficial effect on soil resources.

Lands with Wilderness Characteristics

Alternative D would prohibit most surface-disturbing activities on BLM surface lands with wilderness characteristics to emphasize ecosystem health, primitive recreation, and natural values. This would have a minor beneficial effect on soil resources.

Livestock Grazing Management

Management actions under Alternative D include managing grazing following timber harvest, developing range improvements in accordance with resource needs, limiting or prohibiting grazing where it would not be compatible with other resources, locating mineral supplements away from sensitive resources, a provision for reserve common allotments, and managing livestock following treatments until resource objectives are met. At present, livestock grazing is not authorized on approximately 10,000 acres (1.3%) of BLM surface. The lands where grazing could also be limited or prohibited may possess key soil features (sensitive soils). Therefore, this management action would have a beneficial effect on soil resources. Collectively, the livestock grazing management actions under Alternative D would have a moderate beneficial effect on soil resources.

Special Designations

Areas of Critical Environmental Concern

Alternative D would designate two ACECs encompassing 2,849 acres, or 0.3 percent, of BLM surface, and implement limitations and prohibitions on surface-disturbing activities in ACECs. ACEC designation and management would have a negligible beneficial effect on soil resources.

4.1.3.7. Cumulative Impacts

Chapter 4 describes effects to soil resources from past and present actions, federal and non-federal as part of the affected environment. Appendix G (p. 1937) lists projections of reasonably foreseeable federal and non-federal actions. Effects from foreseeable federal actions are described by alternative above. Non-federal actions would affect soils similar to federal actions. However, the extent of surface-disturbing activities and mitigation for effects to soil resources would differ between federal and non-federal actions.

The primary non-BLM authorized activities in the planning area relate to energy development, including ROW and livestock grazing. The extent of non-federal locatable minerals development, salable minerals development, renewable-energy development, and ROW activity is several times greater than BLM activities because the BLM administers approximately 11 percent of the surface acreage in the planning area. The coal estate is predominantly federally owned, but intermixed; therefore, coal mining follows federal authorities and mitigation. The level of non-federal coal development predicted is 15 percent of the federal coal development, which directly correlates to the non-federal coal estate. Non-federal fluid minerals development is also proportional to estate ownership; approximately 65 percent federal and 35 percent non-federal. Adverse effects on soil resources would likely be greater with non-federal fluid minerals development, because without BLM responsibility for sustainable resource management, there would be fewer mitigation measures implemented for soil resources.

Because of the intermingled ownership pattern, grazing management and the acres of livestock grazing on BLM surface versus non-federal surface does not change appreciably, and acre for acre, similar effects on soil resources would be anticipated.

4.1.3.8. Conclusion

Allowable uses and management actions described in this section for the various alternatives were used to determine anticipated effects on soil resources. Meaningful differences in long-term disturbance acreage, management tactics, and acreage of lands unavailable for surface disturbance form the basis for conclusion. Alternative B would produce the fewest potential adverse effects on soil resources, because management actions would be the most protective of soil resources and are anticipated to result in the least soil disturbance. Alternative C is the least protective of the soils resource and would produce the most soil disturbance. Alternative D attempts to balance soil protections while allowing minerals and land use activities. The primary difference between alternatives D and A is that Alternative D defines when an activity could be allowed whereas Alternative A does not. The alternatives listed in order from most beneficial to the most adverse in terms of effects on soil resources are alternatives B, D, A, and C.

4.1.4. Water Resources

This section describes effects on the quality and quantity of surface water and groundwater from management actions for other resources. Adverse effects result from actions that degrade surface water or groundwater quality, change surface water flow regimes, or change groundwater quantity. Short-term effects generally last fewer than five years while disturbed areas are reclaimed or impact mitigation measures are established. Long-term effects last more than five years.

This analysis included considerations of actions that affect erosion, sediment transport, and sedimentation processes because sediment in the transport process is a water quality parameter, often measured as turbidity. Deposited sediment (sedimentation) affects channels, which contain water resources.

This analysis also considers pollutants other than sediment, some of the more common of which in the planning area would be petroleum by-products, other chemicals, and bacterial contaminants. Petroleum and chemicals will likely be introduced through spills or oil and gas operations. Bacterial pollutants are most commonly generated by livestock and wildlife, or through improper or ineffective sewage disposal.

4.1.4.1. Methods and Assumptions

This section describes the methods and assumptions used in the water resources effects analysis. Impacts are quantified where possible; in the absence of quantitative data, best professional judgment was used to qualitatively describe effects. Impacts are sometimes described using ranges of potential effects or in qualitative terms, if appropriate, according the definitions provided below.

Analysis of effects to water resources is based on achieving the watershed objectives of managing surface land use and water resources to maintain or improve water quality to comply with the water quality standards for uses and classes as established by the State of Wyoming in the Water Quality Rules and Regulations.

Nonpoint sources of pollution can include, but are not limited to, surface disturbance from construction activities for oil and gas development activities; concentrated livestock operations areas such as holding pens, watering areas, salt-block locations, shade spots, or lambing grounds; roads; and recreation areas. A watershed can experience any or all of these activities and could possess natural features such as poor soils and steep slopes that contribute to effects and could

involve a mixture of private and public land. This means that causes and effects of pollution in waterbodies as a result of nonpoint sources can be difficult to identify. However, the BLM is committed to addressing any nonpoint pollution sources that could be directly or indirectly result from BLM-approved activities. This commitment might mean addressing such effects during activity planning (see Chapter 1). Areas also can be designated for special management (see Chapter 2, Actions for Water Quality, Watersheds, and Soils, and Actions for Special Designation/Management Areas), if new problems arise during the planning period, and if a waterbody with the potential to be added to the state's CWA section 303(d) list of impaired waters is identified. The BLM will address these issues within its legal jurisdiction as they are identified. The watershed approach to evaluating and monitoring Wyoming Standards for Healthy Rangelands will occur on a 10-year rotation schedule, and will allow the BLM to identify areas with potential water-quality problems.

The proposed management of each resource program is discussed in terms of the potential to affect water resources, either beneficially or adversely. Some BLM actions, such as surface mining, could intensively disturb project sites of limited size. In the discussion of such resource management, in instances where there is a possibility of intense disturbance of sites equaling 5 or more acres, the term “local impacts” is used to acknowledge these situations, especially when the total disturbance acreage under an alternative would be relatively small. No watersheds in the planning area are managed entirely by the BLM; therefore, the effects of management of each resource are dispersed according to the layout of public lands and federal mineral estate within the watersheds of the planning area.

Assumptions

Assumptions used in this analysis include, but are not limited to, the following:

- Surface disturbance that could affect water resources during the planning period will result mainly from road, pipeline, impoundment, and well-pad construction associated with oil, gas, and other minerals development including coal mining.
- Surface disturbance, especially in areas with highly erosive soils, can affect surface water quality by increasing sediment transported to small drainages and ultimately to larger streams during runoff events.
- The extent of unsurfaced roads (i.e., those lacking gravel or other surfacing material) is an indicator of the relative quantity of sediment delivery that could affect surface water quality within each watershed (Furniss et al. 2000). New unsurfaced roads will be constructed to access new oil and gas wells; therefore, an increase in oil and gas wells is associated with an increase in roads.
- The State of Wyoming has primacy over water quality and quantity regulations for the state. Activities of parties involved in BLM management actions can affect the quality and timing of affected water flow, but these activities must have appropriate state permits. It is assumed that any water discharged as a result of BLM actions must be permitted by the state and must meet the appropriate water quality standards.
- The BLM will help state agencies ensure that state rules and regulations are met by reviewing permitting information submitted as part of BLM actions, but does not have the authority to enforce state regulations or assume liability in cases where state water standards are not met by parties involved in BLM actions.
- Water production from individual CBNG wells is generally highest during the first year of pumping and decreases relatively rapidly thereafter. Therefore, the rate of water production

follows the pace of mineral development, and water production rates will decrease as development is completed in an area and aquifers are drawn down (BLM 2003c).

- Deep groundwater resources associated with target coal zones could be substantially drawn down or depleted as a result of CBNG development (BLM 2003c).
- Actions that protect soil and vegetative resources will generally minimize effects to water resources.
- Effects conclusions are based largely on the acreage within 500 feet of surface waters that would experience surface disturbance or be protected from surface disturbance by the management actions being analyzed; there are 19,861 acres of BLM surface and 95,172 acres of federal fluid mineral estate within 500 feet of surface waters.

Significance Criteria

In addition to the scale of impacts identified in Methods and Assumptions, an adverse effect on water resources as a result of project actions would be considered potentially significant if the following were to occur:

- Degradation of water quality beyond the designated use of the receiving waters as defined by the Wyoming DEQ, or other violations of federal or state water quality standards, or adversely affecting a waterbody on the state's CWA section 303(d) list of impaired waters.
- Unmitigated loss of wetlands or wetland function (Executive Orders [EOs] 11990 and 11988) or activities that would degrade riparian and wetland areas such that, as a minimum physical state, PFC and Wyoming Standards for Healthy Rangelands (Appendix P (p. 2501)) are not being maintained.
- Streamflow characteristics of streams are altered such that established fisheries, wildlife, livestock, recreation, domestic, municipal, and industrial uses are affected.
- The alteration of stream hydraulic geometry by accelerated runoff and erosion (i.e., undue erosion, sedimentation, or mass wasting) beyond that expected through natural processes.
- The natural flow to or level of groundwater in existing springs, seeps, artesian wells, or permitted water supply wells is reduced to the point where beneficial uses cannot be maintained.
- Groundwater quality in an aquifer is degraded such that it can no longer be classified for its current and potential use(s).

4.1.4.2. Impacts Common to All Alternatives

Water Resources

The BLM will install flow control devices on developed springs and water wells on BLM-administered surface when problems at such sites are identified. This action would minimize waste of the water resources and reduce erosion caused by overflowing water supplies. These facilities would have a beneficial effect on water resources; however, due to the small number and localized areas where this management will apply, benefits would be negligible.

Water rights will be applied for BLM surface when and where the need arises. These could be groundwater rights or surface water rights used primarily for livestock or wildlife watering. This process will allow the BLM to protect legal priority in maintaining long-term water resources. Additionally, the BLM will work to develop offsite water sources for livestock and wildlife where other activities present an opportunity or need. Acquisition of water rights and modifying water sources would have a beneficial effect on water resources; however, due to the small and localized areas where these actions would apply, the beneficial effect would be negligible.

Water resources would be managed to meet the Wyoming Standards for Healthy Rangelands (Appendix P (p. 2501)) to achieve PFC and to meet Wyoming water quality standards established by the Wyoming DEQ. Managing for these conditions in specific projects, and at the project planning stage could preserve proper watershed function and minimize adverse effects on water quantity and quality. Interdisciplinary review is performed for mineral resource development on federal lands and mineral estate. This process would allow detailed analysis of proposed actions for compliance with these goals. Current guidance will be used to assess and monitor water quality to implement Standard 5 as there is presently no BLM program in the planning area to measure water quantity and quality in relation to the Wyoming Standards for Healthy Rangelands, Standard 5.

Land uses and surface-disturbing activities would be managed to reduce channel and bank erosion, sediment transport, and sedimentation in accordance with project-specific reclamation plans and Wyoming DEQ applied SWPPPs. These activities would benefit water resources because they would limit the transport and deposition of sediment and other pollutants into surface waters.

Overall, activities described above for water resources would have a negligible beneficial effect on water resources.

Physical Resources

Air Quality

Air quality management actions common to all alternatives include the implementation of air quality impact mitigation measures such as dust suppression and cooperative efforts to reduce dust emissions. These actions reduce airborne pollutants that could precipitate into surface waters. However, due to the small amount of pollutants that could be introduced into water resources, the actions would have a negligible beneficial effect on water resources.

Soil

Surface-disturbing activities that affect soil resources are evaluated on a case-by-case basis using NRCS soil survey data and interpretations and onsite investigations. Requiring mitigation measures, relocating project disturbance, or denying authorization would reduce adverse effects on water resources by limiting disturbances and the associated deposition of sediment and chemical pollutants in surface waters. Requiring reclamation plans with authorized surface-disturbing activities would minimize long-term effects on water resources, especially in relation to transport and deposition of sediment and chemical pollutants.

Cave and Karst Resources

Management actions common to all alternatives for cave and karst resources would not affect water resources because they are procedural actions (inventories).

Mineral Resources

Locatable Minerals

There are 777,310 acres of BLM surface overlying federal mineral estate available for potential locatable minerals exploration and development, with foreseeable locatable minerals development anticipated to affect a maximum of 1,455 acres (0.2%). Because most of the available area would not be within 500 feet of surface water, the adverse effect on water resources would be negligible.

Potential surface and groundwater issues could arise from the development of In Situ Recovery (ISR) uranium. However, ISR development is under the regulatory authority of the Nuclear Regulatory Commission, and water quality impacts would be under the authority of Wyoming DEQ. In these active mining areas, the ambient groundwater is circulated as mining solution when oxidants are added for dissolving the uranium in the target formation. Mine areas are maintained in an under balanced condition with respect to water quantity, which means that slightly more water is removed than the amount injected to prevent excursion of the solution from the targeted areas. The mined area is ringed with groundwater monitor wells in the target zone as well as above and below to monitor for leakage of the mine solution. Additionally, the mines are required to determine pre-mining baseline water quality which serves to set the goal for groundwater restoration after mining is complete. The Wyoming DEQ Land Quality Division (LQD) and Water Quality Division have authority over the restoration of the groundwater in a mined area, in concert with the requirements of the Nuclear Regulatory Commission. BLM maintains responsibility for the BLM surface lands within the mine boundary.

Leasable Minerals – Coal

The potential acreage available for coal leasing is extensive, but the foreseeable activity has a maximum disturbance of 195,700 acres confined to central Campbell County and north-central Sheridan County. This would have an overall minor adverse effect on surface water resources because of the localized extent in the planning area; only 856 acres (1.3%) of the federal coal likely to be developed (coal administrative zone) is within 500 feet of surface waters. Groundwater quality has been and will be degraded in mined areas; research shows that elevated Total Dissolved Solids (TDS) levels occur until the salts made available by the greater surface area of rock fragments exposed to water draining through the spoil have been flushed out. This process creates significant short-term, if not long-term, impacts. In certain areas the elevated TDS levels are high enough to change the class of use of the groundwater. Combined, the adverse impacts to surface water and groundwater could be elevated to moderate.

Potential Impacts Associated with Surface Coal Mining

1. Reduction in surface water runoff and peak flows
2. Potential acceleration of groundwater recharge (due to replacement of excavated material with unconsolidated material)
3. Removal of coal and overburden groundwater aquifers
4. Lowered water levels in aquifers adjacent to mine
5. Increase in groundwater TDS in backfilled areas
6. Disruption of water supply for surface water rights holders
7. Disruption of groundwater wells from reduced levels of aquifers

Surface coal mining requires that any surface water be removed or relocated prior to topsoil removal. Perennial streams are diverted in coordination with the Wyoming DEQ and the U.S. Army Corps of Engineers. Other water bodies, such as impoundments or natural surface playas in the mine area are drained and removed as necessary.

Coal mining would have substantial, short-term effects on surface drainage systems and water runoff characteristics under any action alternative. Erosion and sediment discharge would likely increase in disturbed areas because of vegetation removal, but infiltration rates would likely improve after reclamation because of changes in soil structure and the presence of vegetation and more moderate topography to reduce runoff. Water flow and direction in mine areas would be altered by the removal and reconstruction of drainage channels prior to mining and from

redirected flow through the use of erosion- and sediment-control structures to manage surface water runoff from disturbed areas.

While mining is in progress, surface water quality would be protected by directing surface runoff from affected areas to various sediment-control structures including sediment ponds, traps, ditches, sumps, and mine pits. Wyoming DEQ requires that SWPPP be implemented on all disturbed areas. Any water produced in conjunction with mining operations cannot be discharged to surface waters without a Wyoming Pollutant Discharge Elimination System (WYPDES) permit. After mining and reclamation are complete, surface water flow and quality would approximate pre-mining conditions.

The groundwater quality after reclamation may differ from pre-mining conditions, but would be similar to the quality in previously reclaimed areas. Water quality would remain adequate for current uses such as livestock and wildlife. Wyoming DEQ requires that the water quality in the reclaimed areas of the mines meet the class of use determined for the zones prior to the mining activity.

The coal aquifer and any water-bearing strata in the overburden will be permanently removed and replaced with unconsolidated backfill in the area mined. Mining would also cause a moderate, short-term reduction in groundwater in aquifers beyond the mined area as a result of seepage into and dewatering from mine excavations (i.e., drawdown). The extent of drawdown depends on how long the mine excavations were open, the distance of the aquifers from the mined area, and the extent of dewatering.

Eventually, groundwater is expected to rise to similar levels as observed prior to mining, but it would not have all of the same characteristics because of the more homogeneous nature of the backfill. It is likely that recharged groundwater would be adequate for post-mining land uses such as water sources for livestock and wildlife. Mining would not disturb the aquifers below the coal (Hay Creek II Final EIS p. ES-27).

Alteration of aquifer levels could impact groundwater wells. The Wyoming State Engineer's Office (WSEO) governs the protection of groundwater water rights. Mine operators are required to provide the owner of a water right whose water source is interrupted, discontinued, or diminished by mining with water of equivalent quantity and quality (Hay Creek II Final EIS).

Leasable Minerals – Fluids

Fluid minerals development in the planning area would expose soils to erosive processes. Sediment and other pollutants could subsequently be transported to surface water and groundwater and adversely affect water quality.

Other than erosion and sedimentation, the most visible contributor to water resource impacts from oil and gas operations would be water management during CBNG development. Typical CBNG development requires the production of large quantities of water (compared to conventional gas or oil production). ReInjection of produced water to the subsurface could result in groundwater mounding and increased pressures in the injection zone, potential loss of beneficial uses of produced water, and water quality changes in the receiving aquifer. Treatment and surface discharge of water to perennial surface water systems would result in surface disturbance from the treatment site and pipelines or other infrastructure construction needed to convey the water to discharge points. A variety of treatment methodologies are used to bring the produced water within limits specified by the Wyoming DEQ in WYPDES permits. Additional information can be found in the PRB Final EIS (BLM 2003c) and in Appendix W (p. 2623).

Water produced while dewatering coal formations during CBNG development would deplete groundwater aquifers. CBNG development could lower water levels and hydrostatic pressure in springs geologically connected to the producing formations. Other potential effects on groundwater could include infiltration of poor-quality water stored in impoundments and dewatering of coal zones that could provide usable water. Additional information can be found in the PRB Final EIS (BLM 2003c) and in Appendix W (p. 2623).

Hydraulic fracturing is a process that injects water, sand, and chemicals into the mineral bearing formation to fracture the formation and increase oil and gas recovery by creating passages through which gas and liquids can flow. Additional information on hydraulic fracturing as well as other completion technologies can be found in Appendix V (p. 2599).

Minimizing impacts to groundwater quality and quantity as a management action would help preserve groundwater resources. A maximum of 5,280 new CBNG wells are projected for drilling as a part of BLM projects during the planning period, and effects on groundwater are projected as part of minerals development. Activities associated with CBNG development would be the largest contributors to effects on water resources in the planning area. At least this many additional CBNG wells would be drilled for non-BLM projects, which would affect groundwater resources associated with BLM projects. Dewatering coal zones for the purpose of producing natural gas would reduce the quantity of groundwater available for future use, a major adverse effect under all alternatives. Additional information can be found in the PRB Final EIS (BLM 2003c) and in Appendix W (p. 2623).

Deep groundwater-monitoring wells would continue to be used to assess effects on groundwater from CBNG water production over the planning period. The 2003 PRB Oil and Gas Final EIS (BLM 2003c) projected effects on groundwater quantity and quality. Effects on groundwater quality in the deep groundwater aquifers would likely be minor. Monitoring activities track potential effects to groundwater level, however, minimal monitoring of water quality in deep aquifers is conducted.

Shallow groundwater resources have the potential to be affected by water infiltrating into the subsurface from water storage impoundments, and from CBNG produced water discharged to surface drainages. However, thus far, Wyoming DEQ-required water quality monitoring as part of CBNG development suggests that effects on shallow groundwater aquifers would be minor. Limited BLM implemented shallow groundwater monitoring will continue to monitor effects to both water level and quality.

Water discharged to storage impoundments has the potential to seep or leak beyond the impoundment and affect downstream surface drainages. However, due to the low volume of water that generally resurfaces in the drainages, overall effects would be minor. Localized impacts from individual impoundments could be considered significant when water resurfaces downstream of a CBNG impoundment as a seep with poor water quality, or in areas that exhibit highly erosive conditions. If mitigation measures are not pursued when the problem is identified, there could be longer-term effects on riparian vegetation and bottomland soils.

Water discharged into ephemeral channels could affect the hydrologic characteristics of receiving drainage systems and result in the loss or gain of riparian and wetland features. Many of these systems are formed under an intermittent or ephemeral discharge regime. When the stream hydrology is changed to a perennial flow regime by the introduction of produced water discharges, channel incision, and headward and lateral erosion can occur in many locations. These erosive processes could increase chemical and sediment transport and associated sedimentation in

downstream perennial systems. BLM collects stream channel survey data throughout the PRB to assess changes to channel geometry as a result of these discharges.

Water produced by CBNG and other oil and gas developments is often beneficially used by wildlife and agricultural operations. Sometimes this is accomplished by allowing wildlife and livestock direct access to impoundments used to store produced water. Oftentimes, this beneficial use is facilitated through the use of stock tanks to allow access to the water. Such activities can cause localized erosion and sedimentation in water bodies through concentrated use of the water by livestock. However, proper placement of stock tanks minimizes the impacts by moving the livestock use away from water bodies.

Collectively, adverse effects from management of leasable fluid minerals could result in moderate adverse effects on water resources.

Salable Minerals

Local effects to water resources from salable minerals actions could be noticeable, but due to the small size of potential disturbance (fewer than 2,090 acres), adverse effects would be negligible.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Fire and fuels management actions include fuels reduction projects involving prescribed fires, and chemical, biological, and mechanical treatments. In the short term, fuels reduction projects would reduce canopy and ground cover, thereby potentially increasing surface water runoff and exposing more soil to erosion. In the long term, management actions are successful if they would limit the areal extent and frequency of intense and destructive wildland fires, thus reducing the overall effects on water resources from wildland fires. All prescribed burn projects include provisions for reclamation. This, combined with the fact that acreages projected for treatment under the various alternatives are relatively small (extreme case of 42,000 acres), adverse effects on water resources would be negligible.

Peak runoff and chemical and sediment transport via runoff can increase dramatically after wildland fires. Loss of vegetation and hydrophobic soil conditions developed during intense fires can result in increased runoff and erosion, which could increase pollutants transported to surface waters. Fire and fuels management actions would include wildfire suppression and implementing Emergency Stabilization and Burned Area Rehabilitation Standards; these actions would reduce adverse effects on water resources after wildfires. When necessary, rehabilitation and restoration efforts would reduce erosion after wildfires by using mechanical erosion control techniques and enhancing plant recovery.

Wildland fire suppression activities can result in temporary surface disturbance and soil compaction due to increased vehicle traffic, equipment staging, and fire camps, and result in negligible to minor effects on water resources impacts. Fire line construction can increase runoff and erosion due to vegetation and duff removal. Fire line construction also can provide preferential pathways for surface water runoff that can result in channelization, especially in areas with steep slopes and poor soils. Rehabilitation of fire control lines would occur after most fires, thereby minimizing the effects of runoff and erosion. Fire-retardant chemicals used during suppression activities would not be applied within 300 feet of surface water sources. Fire suppression chemicals that do enter surface waters generally only persist in the aquatic

environments for one to four days. Due to the highly localized areas in which these fires would likely occur, the overall adverse effect on water resources would be negligible.

Biological Resources

Vegetation

Vegetative communities would be managed to achieve and maintain proper ecosystem function and meet resource goals, which would benefit water resources by keeping hillslopes stable and preserving healthy watershed conditions. Vegetation management prescriptions would be implemented to meet the Wyoming Standards for Healthy Rangelands, which would maintain watershed conditions. Improving and diversifying vegetation would have the indirect benefit of improving watershed health by maintaining natural runoff peak flows, stable hillslopes, and functioning channel conditions.

Vegetation – Forests and Woodlands

There are no forests and woodlands management actions common to all alternatives that would affect water resources.

Vegetation – Grassland and Shrubland Communities

In addition to the effects described above for overall vegetation, management of grasslands and shrublands on the uplands would improve watershed health by improving the vigor of native plants and increasing surface cover, which decreases sediment transport and overland flow rates. This would have a negligible beneficial effect on water resources.

Vegetation – Riparian/Wetland Resources

Plans to manage riparian systems to move toward PFC will be implemented. Properly functioning riparian systems beneficially affect water resources by reducing erosion and filtering out sediment before it reaches surface waters. Riparian areas also will provide shaded bank conditions that will help cool water, which will slow the growth of algae that can lead to eutrophic conditions.

The BLM will work to manage loss of riparian and wetland conditions, and evaluate for retention and maintenance riparian and wetland conditions that have developed as a result of produced water discharge associated with oil and gas development. Managing riparian and wetland areas to meet PFC as part of the Wyoming Standards for Healthy Rangelands would ensure wetlands are not declining and would be able to withstand flood events. Healthy riparian and wetland vegetation decreases bank erosion and serves as a filter to remove and recycle nutrients, remove chemical and organic wastes, and reduce sediment loads that reach streams and water sources. Due to the small areas involved, management actions would have a negligible beneficial effect on water resources.

Invasive Species and Pest Management

Effects on water resources from invasive species and pest management would be negligibly beneficial to water resources by helping to maintain or restore natural streamflow characteristics through healthier watershed conditions, as discussed in the *Vegetation* section above.

Fish and Wildlife Resources – Fish

Mitigation of surface-disturbing activities would reduce erosion, sediment transport, and sedimentation. Due to the small areas involved, management actions would have a negligible beneficial effect on water resources.

Harmful non-native riparian vegetation will be managed to improve fish habitat. Some of these species, such as Tamarix (salt cedar), consume large volumes of surface water and shallow

groundwater. Managing this vegetation would reduce the consumptive loss of this water, which would potentially help restore natural flows to some streams. This would have a beneficial effect on water resources.

Barriers to fish passage will be managed under all alternatives. Many of the existing barriers are in the form of culverts that have eroded on the downstream side through improper placement or maintenance. Often this leaves an elevated culvert outlet. Water exiting the culvert can do so with tremendous energy that constitutes a substantial erosive force in the receiving stream channel. Managing these features to enhance fish passage also would alleviate much of the erosive potential of the structure. Any efforts that will minimize stream channel erosion would beneficially affect water resources. However, construction activities in the stream channels necessary to accomplish these actions would have short-term negligible effects from erosion, sediment transport, and sedimentation if effective BMPs were not implemented and until reclamation efforts were complete.

Efforts to improve public access to fish-bearing waters would increase the potential for introduction of pollutants to those waters. This would have a negligible adverse effect on water resources.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Wildlife and special status wildlife management actions common to all alternatives include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing, maintaining, and restoring Greater Sage-Grouse habitat; and establishing a permanent disturbance-free buffer for bald eagle nests. Mitigating and prohibiting surface-disturbing activities would reduce erosion, sediment transport, and sedimentation. Any efforts that decrease these processes would have a major beneficial effect on water resources.

Special Status Species – Plants

Effects on water resources from special status plant management are described under the overall vegetation discussion in this section. Due to the small areas involved, management actions would have a negligible beneficial effect on water resources.

Special Status Species – Fish

Supporting the Wyoming Game and Fish Department (WGFD) efforts to obtain water rights for the benefit of special status fish habitat would generally have a beneficial effect on water resources because it would enhance in streamflows. However, often the acquisition of a water right means that it has been taken from an alternative use. If this were the case, it could represent an adverse effect on that previous water use. Overall, the result would be a negligible beneficial effect on water resources.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

There are no cultural or paleontological resource management actions common to all alternatives that would affect water resources.

Areas with paleontological resources of high quality or importance are typically small (fewer than 40 acres), which would result in the displacement, not prevention, of any surface-disturbing activities. There would be no effect on water resources from any of the paleontological

management actions under any alternative; therefore, paleontological resources are not further discussed in this section.

Visual Resources

The three WSAs and proposed Middle Fork Powder River WSR would be managed as VRM Class I, with an objective to preserve the existing character of the landscape. Most surface-disturbing activities would be prohibited. There are 2,982 acres (15.0%) of BLM surface within 500 feet of surface water in the WSAs (2,300 acres) and Middle Fork Powder River WSR (682 acres). VRM would have a major beneficial effect on water resources.

Land Resources

Lands and Realty

There are no lands and realty management actions common to all alternatives that would affect water resources.

The lands and realty program does not have any management actions that vary by alternative that would affect surface-disturbing activities. Therefore, lands and realty management is not further discussed in this section.

Forest Products

Depending on the methodology used for timber harvesting, soils can be exposed to accelerated erosion during the harvesting process. This activity can increase erosion, sediment transport, and sedimentation potential. Under all alternatives, timber harvesting would be prohibited within 200 feet of surface waters. This management action would maintain vegetative buffers adjacent to surface waters that filter out mobilized sediment before it reaches areas of runoff concentration. This would mitigate many of the adverse effects on water quality as a result of timber harvesting. Due to the small areas involved, management actions would have a negligible beneficial effect on water resources.

Rights-of-Way and Corridors

The designation of ROW corridors would create less dispersed disturbance by locating utilities in or adjacent to existing disturbed areas associated with existing ROW, constructed roads, or highways. The BLM would designate ROW corridors to minimize surface disturbance and adverse effects on other resources. Due to the small areas involved, management actions would have a negligible adverse effect on water resources.

Travel and Transportation Management

Management actions common to all alternatives include minimizing surface disturbance and erosion, closing roads temporarily or permanently where resource damage is occurring, reclaiming roads if they are heavily eroded, and prohibiting motorized travel if damage to soils would result. TTM would follow a holistic approach, including the inventory, design, construction, maintenance, and reclamation of roads and trails, which would limit adverse effects on water resources. Road closures and maintenance would reduce erosion, surface runoff, sediment transport, and sedimentation of downstream waters.

Public input would be considered for appropriate motorized vehicle use areas consistent with other resource values. Motor vehicle use could result in localized increases in erosion caused by soil compaction and runoff concentration in tire ruts on roads and routes. Where roads and routes bisect or parallel stream channels and riparian and wetland areas, there could be increased runoff and sedimentation. In areas where resource damage is a concern or where there are risks to

public health or safety, temporary closures to motorized vehicle use would be allowed. Motorized vehicle travel would be prohibited on soils if damage to vegetation, soils, or water quality would result. These management actions would result in localized beneficial, but negligible, impacts to water resources by reducing pollutant transport, including sediment, into surface waters.

Recreation

Recreation management areas (RMAs) would avoid riparian habitat or develop and manage recreational sites, recreation facilities, and recreational access in a manner that minimizes adverse effects on riparian habitat. Dispersed camping and commercial camps would be prohibited within 200 feet of perennial surface waters, and developed recreational sites would be closed to livestock grazing. These actions would reduce erosion, sediment transport, and sedimentation to surface waters in the localized RMAs. Due to the small areas involved, recreation management actions would have a negligible beneficial effect on water resources.

Livestock Grazing Management

Most BLM-administered lands in the planning area would be available for livestock grazing, except for limited areas included in developed recreation sites and areas where livestock grazing would not be compatible with other resource values. Livestock grazing can reduce vegetative cover, cause surface disturbance from hoof action, and compact soils in localized areas. The most noticeable of such impacts would be around waterbodies, salt blocks, fencelines, and other areas where animals frequently congregate. In contrast, dispersed distribution and periodic livestock grazing rotation would be expected to reduce the intensity of localized impacts. This would be expected to decrease the overall adverse effects on water resources, but the potential for adverse effects on water resources could be major. Reducing vegetative cover could result in increased surface runoff, erosion, sediment transport, and sedimentation from affected areas. However, continued implementation of livestock management to achieve the Wyoming Standards for Healthy Rangelands (Appendix P (p. 2501)) would reduce adverse effects on water resources from livestock grazing. Conservation and mitigation measures for livestock operations would be implemented, and where successful, would reduce adverse effects on water resources from livestock grazing.

Livestock grazing on public lands can result in periodic increases of fecal coliform when streamflow rates are low and livestock concentrations are high (e.g., *E. coli* is a bacteria that can be present in animal feces and causes human health problems). Several waterbodies in the planning area are currently listed as “Impaired” or “Not Supporting” on the state’s CWA section 303(d) list of impaired waters for *E. coli*. If a waterbody were found to exceed standards for *E. coli* due to livestock grazing, adjustments to management would be implemented where appropriate and in coordination with the Wyoming DEQ.

Water storage reservoirs, water wells, water troughs and pipelines would be provided to disperse grazing use. In addition, livestock would be managed to sustain riparian, wetland, and other special habitats. These actions would reduce adverse effects on water resources and would be considered a moderate benefit.

Overall, management actions associated with livestock grazing could result in a minor adverse effect on water resources.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways

There are no management actions common to all alternatives for ACECs or Scenic or BCBs that would affect water resources.

Byway designation would not affect other activities; therefore, Scenic or BCBs are not discussed by alternative. WSR and WSA designation is not predicted during the planning period; therefore, such special designations are not anticipated to affect water resources. The only special designation addressed by alternative is ACECs.

Wild and Scenic Rivers

Managing surface waters to maintain WSR characteristics would preclude alternative surface water uses and developments such as reservoir construction for irrigation and recreational use. Because the designation would be limited to the Middle Fork Powder River, and the likelihood of any such projects being completed during the planning period is minimal, beneficial effects from precluding development would be negligible.

Wilderness Study Areas

These areas would be managed to maintain or enhance their natural characteristics, which would protect surface water from the adverse effects of development. Use would emphasize primitive, nonmotorized activities to maintain current natural values. These actions would have a negligible beneficial effect on water resources due to the small size of the affected areas. Public use could increase in these areas, but that is not likely due to limited public access to the WSAs.

Socioeconomic Resources**Social and Economic Conditions**

The social and economic management actions have no direct relationship with water resources and therefore there would be no effect. Social and economic resources will not be considered further in this section.

Health and Safety

This resource includes management provisions designed to prevent accidental spills of hazardous materials, which would benefit surface water and groundwater resources. There is a potential for accidental spills of hazardous waste in the planning area because such materials, including oil, drilling fluids, water treatment system chemicals and end products, pesticides, and cleaning solvents, are being produced, used and transported in the planning area. Spills, misuse, or improper disposal of such materials have the potential to adversely affect water resources. There could be locally significant impacts to water quality from accidental spills or inappropriate use and disposal; however, given the large size of the planning area and the sparse concentration of hazardous materials sources, the overall potential adverse effects on water resources would be negligible. Effects on water resources from health and safety management would be the same under all alternatives.

4.1.4.3. Alternative A**Water Resources**

Under Alternative A, adverse effects on water resources would continue (the *Impacts Common to All Alternatives* section above describes some of these effects). Many of the issues that came to the forefront with the onset of CBNG development were not considered in the 1985 RMP. Therefore, all management actions under Alternative A had no previous decision except for

the prohibition on surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams unless waived by the authorized officer. Consequently, Alternative A does not include most of the management actions included under other alternatives.

Prohibiting surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams unless waived by the authorized officer would benefit water quality through the filtering effects of buffer strips near surface waters. This action reduces the potential for surface contamination around wells to infiltrate shallow groundwater. In some or many cases, the 500-foot prohibition could be waived, which could result in major effects at localized sites. However, with proper analysis, adverse effects should be negligible. Under the current plan, the 500-foot setback distance has been waived many times because it was judged to be too restrictive. One example of where the setback distance has typically been judged to be too restrictive is around surface water impoundments that were constructed as part of a CBNG development, and their value as a resource to be protected is limited. The option of waiving the setback distance would still be available under Alternative A. In any event, the waiver option can lead to inconsistent decisions and poor management of adverse effects.

Physical Resources

Air Quality

Air quality modeling would have no effect on water resources.

Soil

The Alternative A seasonal prohibition on surface-disturbing activities on soils with severe erosion hazard and year-round prohibition on surface disturbance on slopes equal to or greater than 25 percent unless waived by the authorized officer, could have a major beneficial effect on water resources, especially regarding erosion, sediment transport, and sedimentation associated with surface-disturbing activities. However, the lack of defined criteria and inconsistent use of waivers in the past reduce beneficial effects to moderate.

Cave and Karst Resources

Because there are no cave and karst management actions in the 1985 RMP, management of cave and karst areas is considered on a project specific basis. This has led to inconsistent management of surface-disturbing activities. Karst formations are present on 32 percent (63,171 acres) of BLM surface within 500 feet of water. The potential for surface-disturbing activities in cave and karst areas is low, related both to the difficult topography and limited potential for mineral resources. Although karst formations comprise more than ten percent of BLM surface, due to limited foreseeable activity and the fact that protection would likely be in the form of a buffer limiting surface-disturbing activities around the caves themselves (and not the karst formation), the result would be a negligible beneficial effect on water resources. At present, there are five significant caves identified within 500 feet of surface water.

Mineral Resources

Locatable Minerals

Under Alternative A, 554 acres (0.1% of soils over federal locatable minerals) are predicted to be disturbed by locatable minerals development. Little of this would likely be within 500 feet of surface water resources, and therefore would have a negligible adverse effect on water resources. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*.

Leasable Minerals – Coal

The foreseeable area for coal development could affect 1.3 percent (856 acres) of the federal mineral estate within 500 feet of surface water, which would have a minor adverse effect on water resources under Alternative A. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*.

Leasable Minerals – Fluids

Oil and natural gas exploration and development, both conventional and CBNG would result in almost 31,572 acres of new surface disturbance. This represents 0.9 percent of the federal fluid mineral estate (3,386,530 acres), and therefore would have a negligible adverse effect on water resources. Effects to surface water are expected to be greater due to wells near streams and the effects of produced water discharges into surface waters. This would result in overall minor adverse effects on water resources through processes described under *Impacts Common to All Alternatives*.

Salable Minerals

Alternative A management actions would result in effects similar to those described under *Impacts Common to All Alternatives*. Surface-disturbing activities associated with mineral extraction could result in locally intense disturbance that could have short- and long-term locally adverse effects on water resources near sites through chemical and sediment loading. However, the total acreage predicted for salable minerals development, is relatively low (530 acres, or 0.01% of federal salable minerals). This would have a negligible adverse effect on water resources. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*.

Fire and Fuels Management**Unplanned Fire (Wildfire)**

Under Alternative A, response to unplanned wildland fire varies from full suppression to use of fire as a management tool. The use of some types of suppression equipment would be limited in some areas, and fire and suppression damage would be rehabilitated. These actions would limit erosion and benefit water resources. However, with a prediction of 27,596 acres of BLM surface to be affected by wildfires, the benefit of these management actions would be negligible at the planning-area scale.

Planned Fire (Prescribed Fire)

Prescribed fire and chemical, mechanical, and biological treatments would be implemented to support vegetation and wildlife objectives, which would result in long-term benefits to water resources. The use of these processes would reduce canopy cover, disturb the soil surface, and increase erosion in the short term. Over the long term, fire and fuels management actions would improve the health and vigor of the vegetation and improve watershed condition by reducing the chance of widespread vegetation loss through insects, disease, and wildfire. Such a widespread loss of vegetation would contribute to accelerated runoff due to lower vegetation density and increase erosion, sediment transport, and sedimentation by exposing the soils to erosive processes caused by higher overland flow rates. Loss of root mass also would be a long-term factor in hillslope condition. Fire lines built with heavy equipment are more difficult to reclaim, and create more disturbance on the landscape (about 10 feet wide as opposed to 1 foot wide for hand lines), but all disturbances are projected to be reclaimed under this alternative. With a forecast of 14,000 acres (1.8%) of BLM surface to be treated by prescribed fire and mechanical treatments, the benefit of these management actions would be minor at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands

Timber harvest and other vegetative treatments would be designed to improve biodiversity and water quality. Disturbance associated with forest treatment activities would reduce canopy cover, disturb the soil surface, and increase erosion in the short term. Reducing the canopy cover would expose the soil surface to rain-splash erosion and could increase rilling and gullyng. Forest litter, duff, and organic material forming ground cover are the most important components for protecting the mineral soil from erosion in forested systems (Elliot et al. 1996).

Meeting the DFC in the long term with these vegetative treatments would contribute to properly functioning watersheds that support productive plant communities. Improving the health and vigor of forests would result in increased ground cover and would reduce surface erosion.

Under Alternative A, up to 6,000 acres of forest and woodland treatments are predicted (0.8% of BLM surface). Forest and woodland management under Alternative A would have a negligible beneficial effect on water resources.

Vegetation – Grassland and Shrubland Communities

There is only one grasslands and shrublands management action that varies across the alternatives. This management action relates to whether non-native species can be used during reclamation. There was no decision in the 1985 RMP regarding this management action; therefore, species used for reclamation would need to be consistent with the BLM reclamation policy, which does allow the use of non-native species. A primary goal of reclamation is soil stabilization, and vegetation species used in reclamation are chosen with this goal in mind. Allowing the use of non-native species would be beneficial to water resources by reducing potential erosion. However, because little of the potential surface disturbance would occur within 500 feet of surface waters, this beneficial effect would be negligible.

Vegetation – Riparian/Wetland Resources

Under Alternative A, surface-disturbing activities would be prohibited within 500 feet of springs, water wells, and perennial streams unless waived by the authorized officer. Like many management actions in the 1985 RMP, the prohibition can be waived and waiver criteria were not defined. This has resulted in inconsistent management. *Impacts Common to All Alternatives* describes the benefits to water resources from protecting riparian and wetland communities. This management action would keep most erosion resulting from surface-disturbing activities from reaching surface waters; however, due to the provision for waivers and the resulting reduction in protection, this management would have a moderate beneficial effect on water resources.

Invasive Species and Pest Management

Impacts Common to All Alternatives describes impacts to water resources from invasive species and pest management. The only management action related to invasive species in the 1985 RMP was to control noxious weeds in cooperation with the counties. Under Alternative A, 8,000 acres (1.02%) of BLM surface predicted to be treated. Because most of the treatment areas would be more than 500 feet from surface water, the result would be a negligible beneficial effect on water resources.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Reservoirs are occasionally maintained, and are designed to enhance fisheries. This alternative would generally benefit water resources, but could add to potential erosion, sediment transport,

and sedimentation during maintenance processes. Maintenance actions would cause short-term adverse effects, but long-term beneficial effects. However, due to limited applicability of this action in the planning area, overall beneficial effects on water resources would be negligible.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

There are a number of management actions under Alternative A that prohibit surface-disturbing activities for the protection of wildlife and special status wildlife species; these actions would benefit water resources locally where surface disturbance is prevented. Typically, these management actions provide the opportunity for waivers without defined criteria, which reduce the benefits to water resources because the waivers have been inconsistently applied. In practice, prohibitions on surface-disturbing activities to protect wildlife rarely prevent surface-disturbing activities; rather, they cause the activities to be relocated outside the protected area, which would not benefit water resources. Timing limitations on surface-disturbing activities for various wildlife species also do not benefit water resources because they simply delay surface-disturbing activities.

The management action affecting the largest acreage is the permanent buffer around active raptor nests (10,686 acres, or 53.8% of BLM surface within 500 feet of surface water). However, despite this large acreage, the benefit to water resources would be minor because of the inconsistent application of waivers.

Special Status Species – Plants

There were no decisions regarding special status plants in the 1985 RMP; therefore, management would be considered on a project-specific basis. Surface disturbance prohibitions would likely be limited to identified plant populations, which are typically widespread and small. Ute-ladies'-tresses orchid is the only riparian-dependent special status plant species, at present there are no documented populations in the planning area. Because there are no documented populations of special status plant species and populations are typically small, the benefit to water resources would be negligible.

Heritage and Visual Resources

Cultural Resources

Protection or preservation of cultural sites would benefit water resources by limiting or excluding surface-disturbing activities on or near specific sites. Surface-disturbing activities would be avoided within 0.25 mile or the visual horizon, whichever is closer, of the Bozeman Trail, Crazy Woman Battle Site, and other sites selected on a project-specific basis. These avoidance areas would reduce activities that cause surface disturbance in these locations. However, it is likely that these avoidance areas would change the individual locations of facilities and not the total acres of surface disturbance. New locations might not necessarily be better sited from a watershed-impact perspective. Impacts to water resources, such as increased local erosion and overland flow, would be considered on the activity-planning and decision level, and impacts would be avoided when possible. Data recovery as a result of cultural site disturbance typically occurs in areas that have already been disturbed. Scientific data recovery projects are extremely rare and protection measures afforded by the NHPA and required reclamation would mitigate any adverse effects to acceptable levels.

Beneficial effects on water resources from the management of cultural resources would be negligible due to the relocation of projects and the small amount of acreage affected (180 acres, 0.9% of the Bozeman Trail within 500 feet of surface water).

Visual Resources

The 1985 RMP manages visual resources in accordance with their VRM classes. VRM Class II is the only class in the 1985 RMP likely to reduce surface-disturbing activities and therefore benefit water resources. The objective of VRM Class II is to retain the existing character of the landscape; management actions can be seen but they should not attract attention. There are 9,891 acres, or 50 percent, of BLM surface classified as VRM Class II within 500 feet of surface water. However, because surface disturbance is reduced and not prohibited and VRM management has been inconsistently applied, benefits to water resources would be moderate.

Land Resources

Forest Products

A maximum of 6,000 acres (0.8%) of BLM surface would be available for commercial wood products harvesting, most of which is in the southern Big Horn Mountains. As roads are upgraded to provide access to commercial products, impacts would include changes in surface hydrology and increased local erosion where runoff would concentrate in ditches and culverts. Reduction of the canopy cover resulting from logging opens the soil surface to erosion processes. Forest litter, duff, and organic material forming ground cover are the most important components for protecting soil from erosion in forested systems (Eiswerth and Shonkwiler 2006). Any harvesting techniques that remove ground cover would contribute more to rain-splash and hillslope erosion processes. Hillslope erosion could increase sediment transport and sedimentation in receiving waters. This is especially true for logging in areas with steep slopes and riparian areas. Therefore, harvesting techniques designed to reduce soil disturbance would be applied where possible during timber cutting activities. Reclamation techniques and erosion and sediment control BMPs would be used on all cutting areas, thus limiting the severity and longevity of adverse effects. Because of the sensitive nature and important function of these potential harvest areas for watershed resources, direct effects to water resources from commercial logging activities would be expected to be locally significant. However, the overall adverse effect on water resources in the planning area be negligible due to the small amount of acreage.

Renewable Energy

The 1985 RMP does not include decisions on renewable energy. Under Alternative A, proposals for renewable-energy development would be considered, and it is expected that several small wind-energy facilities would be proposed. Road construction and use and surface disturbance for facilities related to wind-energy development would increase local erosion. However, due to the small number of acres of BLM surface suitable for wind-energy development, renewable-energy management actions under Alternative A would have a negligible adverse effect on water resources.

Rights-of-Way and Corridors

ROW and corridors management and effects under Alternative A would be the same as described under *Impacts Common to All Alternatives*. In addition, surface-disturbing activities and surface occupancy would not be allowed on slopes equal to or greater than 25 percent. This would result in a negligible beneficial effect on water resources because it would reduce soil erosion, sediment transport, and sedimentation.

Travel and Transportation Management

Under current management, approximately 3,650 acres (4.6%) of BLM-administered lands are Closed to Off-highway Vehicle (OHV) use in specially designated areas, and would continue under this alternative. OHV use would be Limited to existing or designated roads and trails.

Approximately 37,646 acres (16%) of BLM-administered lands would be seasonally Closed to motorized vehicle use.

Under this alternative TTM would be largely unchanged. Therefore, adverse effects to water resources would continue. However, as land use increases, adverse effects on water resources would increase. More vehicle access would contribute to accelerated erosion, sediment transport, and sedimentation. Depending on the rate of land use increases, this alternative could result in a negligible adverse effect on water resources.

Recreation

Effects on water resources from recreation resource management would be similar to those described under *Impacts Common to All Alternatives*, with the addition of a prohibition on surface-disturbing activities associated with oil and gas development within 0.5 mile of certain RMAs. This change would have a negligible beneficial effect on water quality due to the minimal likelihood of oil and gas development in the area.

Lands with Wilderness Characteristics

Parcels that meet the size and naturalness requirements have been evaluated for wilderness characteristics. Newly acquired lands will be evaluated for wilderness characteristics. The likelihood of acquiring any areas meeting the wilderness characteristics requirements is minimal. Therefore, beneficial impacts to water resources from this action would be negligible.

Livestock Grazing Management

Impacts from livestock grazing management would be the same as those described under *Impacts Common to All Alternatives*. With proper planning and effective management of range improvements, any adverse effects on water resources would be minimized. Range improvements would be designed to maintain or improve the distribution of livestock within each allotment and prevent livestock concentration and overuse of forage that leads to increased surface runoff and soil erosion. Adverse effects from range improvement projects would be negligible due to the small number of acres associated with such projects. Grazing systems and range improvements would improve or maintain desired range conditions, which would minimize adverse effects on water resources from livestock grazing. Overall, BLM actions could disturb 225,609 acres, mostly through grazing allotment use. As discussed under *Impacts Common to All Alternatives*, concentrated livestock use of areas near water has the potential to adversely affect water resources. A minor adverse effect on water resources would be expected under Alternative A.

Special Designations

Areas of Critical Environmental Concern

There are no areas proposed for ACEC designation under this alternative; therefore, there would be no effect on water resources.

4.1.4.4. Alternative B

Water Resources

As previously discussed, management of water produced in association with CBNG development can have major adverse effects on water resources. Historically, much of this water has been managed by discharging it into on-channel reservoirs where it was allowed to infiltrate and evaporate. Under Alternative B, development of new on-channel reservoirs for this purpose would no longer be authorized.

On-channel reservoirs have the effect of altering the natural flow characteristics of a drainage. The reservoir captures runoff from upstream precipitation events, and unless the reservoir is full or a drainage gate is open, no water will pass the dam. This phenomenon has the effect of attenuating the natural streamflow hydrograph, resulting in lower peak flows with potentially longer durations. Reducing peak flows would have the beneficial effect of decreasing the erosive forces of elevated streamflow and reducing the effects of flash flooding. However, the same attenuating effects would alter the natural channel characteristics and vegetation that have evolved to rely on these “flashy” systems. In addition, on-channel reservoirs can capture natural runoff that downstream water users rely on for agricultural purposes. This effect is most pronounced when there are multiple reservoirs in a drainage basin. Capturing natural runoff can adversely affect aquatic life, wildlife habitat, and wetland conditions that have formed under a more natural flow regime. Alternative B would likely cause on-channel reservoir development to be relocated outside BLM authority, and therefore would have only a minor to moderate beneficial effect on regional water resources.

There have been a few cases in which on-channel reservoirs have leaked to downstream channels or hillslopes. At times, vegetation exposed to the leakage was killed due to poor water quality or the vegetation was not adapted to the altered soil moisture. In addition, altered vegetative conditions or soil moisture can provide favorable conditions that induce the spread of invasive plant species, such as Tamarix (salt cedar). Therefore, eliminating additional on-channel reservoirs would have a beneficial effect related to these issues. Adverse effects from prohibiting on-channel reservoirs would include the loss of the potential for shallow aquifer recharge from impounded water, whether that water is from natural runoff or produced from oil and gas operations. In addition, not authorizing on-channel reservoirs could adversely affect the availability of year-round water for livestock use.

Not authorizing surface discharge of CBNG produced water would have multiple beneficial effects. Potential channel degradation as a result of enhanced flows would be eliminated. This channel degradation could be in the form of headward or lateral stream channel erosion, or vegetation changes that could induce stream channel or bank instability. Vegetation changes caused by the addition of CBNG produced water also could alter forage availability for livestock and wildlife. Adverse effects would include the loss of additional water sources for wildlife and livestock. In some cases, this would constitute a loss of artificial irrigation that would reduce available forage for livestock and wildlife. It also could adversely affect the establishment or enhancement of riparian conditions that help stabilize stream channels and provide additional wildlife habitat.

Water users have adapted to plentiful water provided by CBNG development. Not authorizing new on-channel impoundments or surface discharge would force CBNG operators to find alternative methods to manage produced water or cut back on production. Both of these options would reduce or halt water availability to water users, particularly agricultural users. As water production from existing CBNG projects declined, water users would have to find other sources of water or cut back on usage to meet supply. Under Alternative B, abandoned CBNG wells would not be converted to water supply wells to help meet that demand. In localized areas, some landowners would likely develop new water wells to compensate for the loss of CBNG produced water. However, due to cost, this would not be likely to be widespread. In most areas of the PRB, non-federal CBNG development is relatively close by. Because this non-federal development would not be subject to the restrictions under this alternative, that development might be able to compensate for some of the lost water. However, there are areas where all of the development is federally attached. In these areas, there might not be a practical alternative water source available.

Due to the potential availability of non-federal water sources, this alternative would have a minor to moderate effect on water resources.

An NSO restriction within 500 feet of springs, non-CBNG reservoirs, water wells, perennial surface water, and riparian areas would reduce the potential for sediment to be transported to the water feature and subsequent sedimentation in that feature that would contribute to the degradation of water quality. The beneficial effect of this decision are described under Alternative A. Like Alternative A, under Alternative B surface disturbance could be modified or displaced in many cases as a result of this management action. Therefore, the beneficial effect of this action could be moderate. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*.

Overall, these management actions are anticipated to have a moderate beneficial effect on water resources.

Physical Resources

Air Quality

Air quality modeling would have no effect on water resources.

Soil

The effects of this alternative on water resources would be similar to under Alternative A, except that restrictions on surface-disturbing activities in areas with severe erosion hazard, slopes equal to or more than 25 percent, and soils with poor reclamation potential would be year-round. In addition to these restrictions, prohibiting disturbance on badlands, rock outcrops, and slopes prone to mass movement would be applied on highly erodible soils. The prohibition on surface-disturbing activities on soils with poor reclamation potential would protect soils on 455,090 acres (58%) of BLM surface and 1,514,445 acres (45%) of federal fluid mineral estate. It is anticipated that a similar percentage of water resources would benefit from these prohibitions. This would have a major beneficial effect on water resources.

Cave and Karst Resources

Under Alternative B, all surface-disturbing activities, including minerals development and timber harvest, would be prohibited in cave and karst areas. The prohibitions would be absolute, and there would be no exceptions. Karst formations are present on 32 percent (63,171 acres) of BLM surface within 500 feet of water. Management actions to protect cave and karst resources would have a major beneficial effect on water resources.

Mineral Resources

Locatable Minerals

Under Alternative B, 277 acres (0.03% of federal locatable minerals) are predicted to be disturbed by locatable minerals development. It is likely that little of this disturbance would be within 500 feet of surface water resources. Management under Alternative B would have a negligible adverse effect on water resources. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*.

Leasable Minerals – Coal

The foreseeable area for coal development could affect 1.3 percent (856 acres) of the federal mineral estate within 500 feet of surface water. This would result in a minor adverse

effect on water resources. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*.

Leasable Minerals – Fluids

Oil and natural gas (both conventional and CBNG) exploration and development would result in approximately 286 acres of surface disturbance. This would result in the potential for adverse effects on water resources through processes described under Impacts Common to All Alternatives. Reclamation procedures and the application of BMPs would reduce long-term effects, such as increased erosion and surface runoff, on water resources. Even with successful reclamation and full implementation of BMPs, minerals management actions would lead to direct adverse effects on water resources and these effects could be major in local areas and therefore are considered minor at the planning area scale despite the small acreage affected.

Salable Minerals

Under Alternative B, salable minerals development is predicted to disturb 114 acres (0.003% of federal salable minerals). This would have a negligible adverse effect on water resources. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*.

Fire and Fuels Management

Unplanned Fire (Wildfire)

Under Alternative B, response to unplanned wildland fire would vary from full suppression to monitoring fire as a management tool. The use of heavy equipment would be limited to existing roads and trails, and all fire and suppression damage would be rehabilitated. These actions would limit erosion and be beneficial to water resources. With a forecast of 27,596 acres (3.5% of BLM surface) to be affected by wildfires, the benefit of these management actions would be negligible at the planning-area scale. This alternative would result in a higher accumulation of fuels than Alternative A, and could eventually increase the likelihood of high-intensity watershed-damaging wildfires.

Planned Fire (Prescribed Fire)

Wildland fire and other vegetative treatments would be used to restore fire-adapted ecosystems, which would result in long-term benefits to water resources. With a forecast of 3,500 acres (0.4%) of BLM surface to be treated by planned fire and mechanical treatments, the benefit of these management actions would be negligible at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands

Alternative B emphasizes a natural, hands-off, approach to forest and woodland management. Timber harvest and other vegetative treatments would be minimized. Mature and old-growth forests are typically productive plant communities with increased ground cover and reduced surface erosion. Insects, disease, wildland fire, and other stochastic events would be allowed to run their course. Old-growth forest stands would be managed to emphasize old-growth characteristics. This alternative would likely increase fuels availability significantly. In the event of a severe wildfire, this action could have substantial localized adverse effects on water resources. Depending on topography, soils, vegetative characteristics, and fire intensity, a severe wildfire could result in severe erosion and sediment transport if not controlled. In some cases this could result in ecosystem-destroying sedimentation in the surface waters. At the planning area scale the overall effect would be negligible.

Vegetation – Grassland and Shrubland Communities

Under Alternative B, only native species would be authorized for reclamation activities. Native species often have distinct seeding windows and are sometimes slow to establish, allowing invasive species to establish. Allowing only native species for reclamation could have a negligible adverse effect on water resources.

Vegetation – Riparian/Wetland Resources

Under Alternative B, surface-disturbing activities would be prohibited within 500 feet of springs, water wells, and perennial streams. Adverse effects from surface-disturbing activities would be largely avoided, which would be a major benefit to water resources.

Invasive Species and Pest Management

Impacts to water resources from invasive species and pest management are described under Impacts Common to All Alternatives. Alternative B takes an aggressive approach to managing invasive species. Under Alternative B, 15,000 acres (2%) of BLM surface are predicted to be treated. However, because much of the treated areas would be more than 500 feet from surface water, the result would be a negligible beneficial effect on water resources.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Under Alternative B, reservoirs and riparian areas would be managed to enhance fisheries. This management would generally benefit water resources, but could add to potential erosion, sediment transport, and sedimentation during maintenance processes.

Reservoirs would be required to be designed to include fisheries. This management would generally benefit water resources, but could add to potential erosion, sediment transport, and sedimentation during maintenance processes.

Perennial waters that affect fish habitat would be maintained or enhanced. This management would generally benefit water resources.

Surface-disturbing and disruptive activities would be prohibited within 0.25 mile of naturally occurring waterbodies containing native or desirable non-native fish species. This management would minimize the likelihood of sediment being transported to waterbodies that would result in sedimentation of the water. This action would affect 10,529 acres within 500 feet of surface water, or 53 percent of water resources, a major beneficial effect. Yellowstone cutthroat trout could be present in streams associated with 182 acres (0.9%) of BLM surface within 500 feet of water, a negligible beneficial effect.

Restoration of important stream segments for fish habitat would be in accordance with WGFD priorities. This management would generally provide a minor benefit to water resources, but could add to potential erosion, sediment transport, and sedimentation during maintenance processes.

**Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife
(including Greater Sage-Grouse)**

There are a number of management actions under Alternative B that prohibit surface-disturbing activities, without exception provisions, for the protection of wildlife and special status wildlife species; these actions would benefit water resources locally where soil disturbances are prevented. Timing limitations for surface-disturbing activities for various wildlife species also would not benefit water resources because those restrictions delay, but do not prevent, surface-disturbing activities.

Two of the largest surface disturbance prohibitions in terms of acreage include permanent buffers around active raptor nests (6,415 acres, or 32%, of BLM surface within 500 feet of surface water) and in reptile and amphibian habitat (13,909 acres, or 70%, of BLM surface within 500 feet of surface water).

Special Status Species – Plants

Alternative B would prohibit surface-disturbing activities that could adversely affect special status plant habitat. Ute-ladies'-tresses orchid is the only riparian-dependent special status plant species; therefore, adverse impacts from surface-disturbing activities would be largely avoided within 500 feet of surface water. This would have a major beneficial impact on water resources.

Heritage and Visual Resources

Cultural Resources

Management actions under Alternative B include a prohibition on surface-disturbing activities in areas with historic properties that retain their historic setting, TCPs, sacred sites, and other culturally sensitive areas.

Benefits to water resources from cultural resources management would be major due to the amount of acreage affected (8,671 acres [44%] of BLM surface within 500 feet of surface water).

Visual Resources

Under Alternative B, areas inventoried as VRM Class II and special emphasis areas would be managed as VRM Class II. There are 217,021 acres, or 28 percent, of BLM surface classified as VRM Class II. However, because surface disturbance would be reduced but not prohibited, the benefits to water resources would be moderate.

Land Resources

Forest Products

Forest resources management under Alternative B would emphasize natural processes to achieve forest health goals. Commercial timber harvesting would be limited to 5 acres per select group and to remove timber after catastrophic events for safety reasons. This management would have negligible adverse effects on water resources because of the limited area where harvest, and therefore erosion, would occur.

Renewable Energy

Renewable-energy projects would be excluded in certain otherwise restricted areas. The likelihood of these areas coinciding with areas suitable for renewable-energy development is minimal. Due to these considerations, effects on water resources would be negligible, but would be beneficial if they occurred.

Rights-of-Way and Corridors

Alternative B management of ROW corridors would be as described under *Impacts Common to All Alternatives*. In addition, 706,556 acres would be excluded from ROW, 56,857 acres would be identified for ROW avoidance, and 18,689 acres would have minor ROW constraints. ROW would be excluded on slopes equal to or greater than 25 percent and in areas with highly erodible soils. This would result in a minor beneficial effect on water resources because it will reduce the occurrence of soil erosion, sediment transport, and sedimentation.

Travel and Transportation Management

Under Alternative B, 625,854 acres in selected areas would be closed to motorized vehicle use. Motorized vehicle use would be limited to designated roads on 137,126 acres, and an additional 18,259 acres would have seasonal prohibitions on motor vehicle use. These actions would reduce erosion, sediment transport, and sedimentation associated with motor vehicle activity, thereby providing a minor beneficial effect on water resources.

Recreation

Alternative B effects on water resources from recreation resource management would be similar to those described under *Impacts Common to All Alternatives* and under Alternative A, with the addition of a recommendation to withdraw some appropriations under the mining laws. This alternative also would prohibit minerals leasing within a half mile of designated SRMAs. Designated SRMAs overlap the Tongue River and Middle Fork Powder River. Recreation management alternatives might afford some additional protection for waterways within SRMAs. The Middle Fork is currently protected by the WSR provisions; however, an SRMA may extend additional protection from major surface-disturbing development. These management actions would have a negligible beneficial effect on water quality due to the small areas involved.

Lands with Wilderness Characteristics

Areas with wilderness characteristics would prevent or minimize exposure to motorized vehicle traffic, close areas to mineral leasing, recommend withdrawal from locatable minerals entry, close areas to salable minerals, exclude ROW, prohibit commercial woodcutting, and prohibit all other surface-disturbing activities. Due to the small area involved, 12,237 acres, these actions would have a negligible beneficial effect on water resources.

Livestock Grazing Management

Alternative B livestock grazing management effects would be similar to those under Alternative A, except grazing systems and range improvements would be implemented to enhance wildlife, watershed, and riparian values, instead of designing improvements to achieve livestock management objectives. Actions to enhance watershed and riparian values would reduce erosion and sediment loading to nearby streams, maintain adequate vegetative cover, and enhance soil productivity. Livestock salt or mineral supplements would be placed a minimum of 0.5 mile from water sources and riparian areas. Livestock grazing would be prohibited in areas where it has been determined to be incompatible with other resources. These actions would have a minor beneficial effect on water resources.

Special Designations

Areas of Critical Environmental Concern

If the eight proposed ACECs were designated, local water resources would benefit because ACEC designation would prevent disturbance and potential degradation of surface water quality and protect relatively undisturbed watersheds. The BLM would evaluate authorized activities and develop mitigation measures to protect the integrity of the characteristics for which the ACEC was designated. These areas would be managed for preservation and would minimize potential future development. This management would maintain or improve water resources by limiting surface disturbance that could contribute to erosion and nonpoint sources of sediment and other pollutants. However, the designation of ACECs could increase popularity with recreationists in several of the ACECs, resulting in increased potential for degradation of surface water resources

if overuse or misuse were to occur. Management under Alternative B would have a negligible beneficial effect on water resources because of the small areas involved.

4.1.4.5. Alternative C

Water Resources

The potential effects from on-channel reservoirs are addressed under Alternative B (p. 751). Allowing on-channel reservoirs in consideration of other resource values would contain natural streamflow and storm water runoff, thereby resulting in adverse effects on flow regimes. Alternative C would not cause the on-channel reservoir development to be displaced to locations outside BLM authority, as suggested under Alternative B. Because neither alternative presents a significant difference in scale of reservoir development, just the location of the development, Alternative C would have a minor to moderate adverse effect on water resources.

Reservoir leakage, as described under Alternative B (p. 751), would be more likely to occur under Alternative C. Adverse effects from leaking impoundments would primarily involve impacts to vegetation and soils from altered water quality as well as from accelerated erosion. Beneficial effects of on-channel reservoirs would be the potential for shallow aquifer recharge from CBNG waters and additional artificial water sources for wildlife and livestock. However, because effects would be small and localized, adverse effects on water resources would be minor.

Authorizing surface discharge of CBNG produced water would have multiple adverse effects. There would be potential channel degradation as a result of enhanced flows. This channel degradation could be in the form of headward or lateral stream channel erosion, or vegetation changes that could make stream channels or banks unstable. Vegetation changes caused by the addition of CBNG produced water also could alter forage availability for livestock and wildlife. Beneficial impacts would include the supply of additional water sources for wildlife and livestock. In some cases, this would constitute artificial irrigation that would enhance available forage for livestock and wildlife. It could also promote the establishment or enhancement of riparian conditions that help stabilize stream channels and provide additional wildlife habitat.

Water users have adapted to plentiful water provided by CBNG development. As water production from CBNG projects declines, water users will have to find other sources of water or cut back on usage to meet supply. Under Alternative C, the option of converting abandoned CBNG wells to water supply wells to help meet that demand would be available. Historically, operators have had varying degrees of success at converting these wells for water supplies. The adverse side of taking over these wells on BLM-managed surface is that the BLM assumes all down-hole liability – that is, if problems arise in the future, the BLM could face a substantial costs associated with plugging and abandoning or rehabilitation. This can be minimized if adequate down-hole construction information is available (or can be supported with geophysical logs or video inspection) and the conversion is properly designed and supervised by an experienced geohydrologist or petroleum engineer. Often, problematic well conversions are local issues related to the availability of a suitable water-bearing zone. Other times, the issue is related to the cost of re-completing a well. Because of these and other issues, the likelihood of large numbers of CBNG wells being converted is minimal. Therefore, this alternative would have a minor to moderate adverse effect on water resources.

Allowing surface occupancy within 500 feet of springs, non-CBNG reservoirs, water wells, perennial surface water, and riparian areas would increase the potential for sediment transport to the water feature and subsequent sedimentation in that feature that would contribute to

the degradation of water quality. The beneficial effects of this decision are described under Alternative A. Proper implementation of BMPs would minimize the effects of this management action to negligibly adverse.

Maintaining existing water supply sources and adding new sources would meet current demand and allow for added use. New water sources would have an adverse effect for more locations of concentrated use, but the potential beneficial effect would be the dispersion of existing usage, thereby possibly allowing for some recovery. Not requiring alternative energy sources at new water sources would have a negligible adverse effect on water resources due to the possible erosion and sedimentation involved with the development of conventional power sources.

Allowing surface disturbance and surface occupancy within 500 feet of perennial surface water, springs, non-CBNG reservoirs, and wetland and riparian areas would greatly increase the potential for erosion, sediment loading of runoff, and degradation of water quality. However, since not allowing the disturbance and occupancy would likely merely relocate the disturbance, and the proper implementation of BMPs would minimize the effects, this action would only have a minor adverse effect on water resources

Under Alternative C, unneeded CBNG-related surface water impoundments would be removed and reclaimed. Reclamation of disturbed impoundment sites must follow the Wyoming Reclamation Policy (BLM 2012i) and the BFO Impoundment Reclamation Guidance (BLM 2012 e). This action would provide beneficial effects of restoring channel capacity and stability, and reestablishing natural down-gradient flow regimes. It would also cause short-term adverse impacts by exposing the local area to erosion and sedimentation.

Overall, the management actions under Alternative C would have a moderate adverse effect on water resources.

Physical Resources

Air Quality

There would be no effect on water resources from Alternative C air quality management.

Soil

Alternative C would remove all restrictions on surface disturbance and occupancy in areas with severe erosion hazard, on slopes equal to or more than 25 percent, and on soils with poor reclamation potential. These actions would have a major adverse effect on water resource, because allowing disturbance and occupancy on all soil types would increase the likelihood of soil erosion, sediment transport, and sedimentation in receiving waterbodies.

Cave and Karst Resources

Under Alternative C, surface-disturbing activities, including minerals development and timber harvest, would be allowed in cave and karst areas. Karst formations are present on 32 percent (63,171 acres) of BLM surface within 500 feet of water. The potential for surface-disturbing activities in cave and karst areas would be relatively low, related both to the difficult topography and limited potential for minerals resources. Although cave and karst resources comprise more than ten percent of BLM surface, due to the limited foreseeable minerals activities, the result would be a minor adverse effect on water resources.

Mineral Resources

Locatable Minerals

Under Alternative C, 1,455 acres (0.002% of federal locatable minerals) are predicted to be disturbed by locatable minerals development. It is likely that little of this acreage would be within 500 feet of surface water resources. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*. Therefore, Alternative C would have a negligible adverse effect on water resources.

Leasable Minerals – Coal

Under Alternative C, all lands in the planning area would be open to coal exploration. However, during the planning period, there is minimal likelihood of significant coal development beyond the high-potential development areas previously described in *Impacts Common to All Alternatives*. New coal development would have a major effect on localized groundwater resources, but due to the low probability of extensive development, the effect would be minor. The foreseeable area for coal development could affect 1.3 percent (856 acres) of the federal mineral estate within 500 feet of surface water. This would have a minor adverse effect on water resources.

In addition, federal coal resources would be available for coal-gasification projects and from methanogenesis. Little data are available on the associated effects because the processes are relatively new. However, it is anticipated that localized aquifer drawdown would be required. This dewatering process would produce water that would need to be managed. Some projects have proposed injecting the produced water on the margins of the project area to control the gasification process. Other water management options will likely resemble methodologies used for CBNG development. Any proposed coal-gasification project would have associated surface disturbance, which would involve erosion and sedimentation issues like all surface-disturbing activities. Any methanogenesis project would be evaluated under project-specific NEPA analysis. Regardless of the water-handling methodologies employed, the effect on water resources would be minimal due to the small, localized areas that would be subjected to the processes.

Leasable Minerals – Fluids

Under Alternative C, no lands would be closed to oil and gas leasing. Oil and natural gas (conventional and CBNG) exploration and development would result in approximately 43,252 acres (1.3% of fluid mineral estate) of surface disturbance. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*. This alternative would have a moderate adverse effect on water resources associated with the level of surface disturbance.

Salable Minerals

The total acreage predicted for salable minerals development under Alternative C is 2,090 acres (0.1% of federal salable minerals). If all development occurred within 500 feet of surface waters, the predicted development represents 1.2 percent of the total federal mineral estate within 500 feet of surface waters. However, the true acreage likely to be developed within 500 feet of surface water would be much less. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*. Therefore, the result would be a negligible adverse effect on water resources.

Fire and Fuels Management

Unplanned Fire (Wildfire)

Under Alternative C, full suppression tactics would be used in response to unplanned wildland fire. Heavy equipment use would not be limited, but would consider other

resource values. These actions would do little to limit erosion and would have adverse effects on water resources. With an emphasis on suppression, this alternative would increase the probability of large watershed-damaging fires over the long term. Full suppression of wildland fires would result in an accumulation of fuels and an increase in late-seral vegetative communities that are more prone to catastrophic wildland fires. Wildland fires reduce canopy and ground cover, thereby exposing soils to erosion and increasing the potential for hillslope runoff. In addition, physical soil properties could be adversely affected, such that infiltration rates are lowered in some cases, thus increasing surface runoff. Wildland fire would increase sediment loading and impact downstream water quality, depending on the severity of the fire and its location within the watershed. Evapotranspiration and other hydrologic properties also would be altered in some locations because of increases in late-seral vegetation resulting from wildland fire suppression.

Greater fire suppression efforts would result in increased disturbance from suppression activities such as building fire lines, which increase localized soil erosion. In addition, no active rehabilitation of affected soils is forecast. This alternative could result in changes to water quality in the form of sedimentation, and increased surface runoff in some locations, if a large wildland fire could not be suppressed. With a forecast of 27,596 acres (3.5% of BLM surface) to be affected by wildfires, the adverse effect of these management actions would be minor at the planning-area scale.

Planned Fire (Prescribed Fire)

Under Alternative C, wildland fire and other vegetative treatments would be used to restore fire-adapted ecosystems for commodity production. Long-term benefits to water resources would be tempered by additional surface-disturbing activities related to commodity production. However, commodity production would be consistent with the required management for water and other resources to reduce impacts. With a forecast of 42,000 acres (5.4%) of BLM surface to be treated by planned fire and mechanical treatments, the benefit of these management actions would be minor at the planning-area scale because not all the treated areas would be near surface water.

Biological Resources

Vegetation – Forests and Woodlands

Intensive management tactics, such as large clear cuts, would be used to manage for desired forest health. If not properly managed, these actions could increase erosion, sediment transport, and sedimentation that would have an adverse effect on water resources. Under Alternative C, up to 24,000 acres (3.1%) of BLM surface of forest and woodland treatments are predicted. Forest and woodland management under Alternative C would have a minor adverse effect on water resources.

Vegetation – Grassland and Shrubland Communities

Allowing desirable non-native plant species for initial reclamation would help stabilize soils in a timely manner, thus controlling erosion. Alternative C would allow for quick-growing species to compete with annual weeds and provide an opportunity for slower-establishing native plants to inhabit the site. Given the amount of potential soil disturbance within 500 feet of surface water, the beneficial effect on water resources from this management action would be negligible.

Vegetation – Riparian/Wetland Resources

Surface-disturbing activities would be allowed within 500 feet of springs, water wells, and perennial streams consistent with other resource values. Wetland and riparian vegetation would

be restored only where directly disturbed by CBNG activities such as the construction of dams and reservoirs. These management actions would have a minor adverse effect on water resources.

Invasive Species and Pest Management

Impacts Common to All Alternatives describes effects on water resources from invasive species and pest management. Alternative C would take a conservative approach to managing invasive species. Under Alternative C, 10,000 acres (1.3%) of BLM surface are predicted to be treated; most treatment areas would be more than 500 feet from surface waters. This management would have negligible beneficial effects on water resources.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Reservoir designers would be encouraged to be design reservoirs to enhance fisheries, this would generally benefit water resources in the long term, but could add to potential erosion, sediment transport, and sedimentation during construction and maintenance processes.

Reservoirs and riparian areas would be managed to enhance fisheries as a secondary concern. This alternative would likely add to potential erosion, sediment transport, and sedimentation during construction and maintenance processes.

All resource values would be considered regarding actions that would affect perennial waters. This alternative would increase the likelihood of sediment being transported to waterbodies, which would result in sedimentation of the water. However, consistency with other resource values would temper the effect.

Surface-disturbing and disruptive activities would be allowed within 0.25 mile of naturally occurring waterbodies consistent with other resources. Alternative C would increase the likelihood of sediment being transported to waterbodies that would result in sedimentation of the water. This action allows surface-disturbing activities on 10,529 acres within 500 feet of surface water, or 53 percent of water resources, which would be a major adverse effect.

Important stream segments for fish habitat would be restored on a project-specific basis, resulting in a long-term benefit to water resources, but could add to potential erosion, sediment transport, and sedimentation during maintenance processes.

Overall, the alternative would result in major long-term adverse effects from general fisheries management and negligible adverse effects from special status species fisheries management due to the limited range of Yellowstone cutthroat **trout**.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Most management actions under Alternative C would allow surface-disturbing activities with consideration of wildlife and special status wildlife species; these actions would provide little direct benefit to water resources. Actions that would still provide a measurable benefit include a restriction on surface-disturbing activities near active Greater Sage-Grouse leks (85 acres, or 0.4%, of BLM surface within 500 feet of surface water) and a disturbance-free buffer zone for bald eagle nest sites and winter roosts (150 acres, or 0.8%, of BLM surface within 500 feet of surface water). Due to the limited area protected by these management actions and allowance for surface disturbance under other management actions, the overall benefit to water resources would be negligible.

Special Status Species – Plants

Alternative C would limit surface disturbance prohibitions to identified plant populations, which are typically rare and small. Ute-ladies'-tresses orchid is the only riparian-dependent special status plant species; at present there are no documented populations in the planning area. Because there are currently no documented populations and populations are typically small, the benefit to water resources would be negligible.

Heritage and Visual Resources

Cultural Resources

Management actions under Alternative C include an allowance for surface-disturbing activities in areas with historic properties that retain their historic settings, TCPs, sacred sites, and other culturally sensitive areas when appropriate mitigation is accomplished. Cultural sites themselves are typically small and buffers to protect historic settings are typically less than 0.25 mile wide. Therefore, minerals activities would likely be displaced, but not prevented. Fewer restrictions on surface disturbance could result in a negligible adverse effect on water resources.

Visual Resources

Under Alternative C, areas inventoried as VRM Class II and special emphasis areas would be managed as VRM Class III. The objective of VRM Class III areas is to partially retain the existing character of the landscape (management activities should not dominate the view). Class III management would likely not affect the level of surface-disturbing activities. Therefore, there would be no effect on water resources.

Land Resources

Forest Products

Forest products management actions under Alternative C would be similar to those under Alternative A, except that Alternative C would focus more on commercial timber harvest instead of natural processes. Effects on water resources would be the same nature as under *Impacts Common to All Alternatives*. 24,000 acres would be harvested during the planning period. Rather than natural processes, commercial treatments would primarily be tool to achieve forest health objectives. This action would require more aggressive management and would likely require the use of more roads and off-road vehicle use. Under Alternative C, there likely would be an increase in human disturbances in remote areas that would undergo natural processes under other alternatives. Therefore, compared to Alternative A, adverse effects from roads and disturbance under Alternative C would likely increase in some locations. Mitigation and BMPs would still be applied to forest management activities to reduce these effects where possible. Adverse impacts on water resources would be negligible from the application of mitigation and due to the limited area of commercial forests within 500 feet of water resources.

Renewable Energy

Alternative C would allow renewable-energy development anywhere in the planning area if consistent with other resource values. However, there is very little likelihood that large areas suitable for renewable-energy development would coincide with areas where management of other resource values would allow such activities. Therefore, this alternative would have a negligible adverse effect on water resources.

Rights-of-Way and Corridors

Alternative C management of ROW corridors would be as described under *Impacts*

Common to All Alternatives. In addition, 28,554 acres would be excluded from ROW, 27,706 acres would be identified for ROW avoidance, and 199,829 acres would have minor ROW constraints. Areas with slopes equal to or greater than 25 percent and highly erodible soils will not be excluded from ROW. This would have a minor adverse effect on water resources.

Travel and Transportation Management

Under Alternative C, motor vehicle access would be allowed in special status species habitat consistent with the travel management plan. This action could have adverse effects on water resources from accelerated erosion, sediment transport, and sedimentation related to vehicular traffic.

Some areas near sensitive resources would be Closed to motor vehicle use. Motor vehicle travel would be Limited to designated roads and trails on 723,497 acres, and there would be seasonal motor vehicle prohibitions in selected areas of the southern Big Horn Mountains. These actions would reduce erosion, sediment transport, and sedimentation associated with motor vehicle activity, which would have a negligible beneficial impact on water resources as motor vehicle use levels would likely not be affected.

Recreation

Alternative C recreation management would have negligible beneficial effects on water resources similar to those described under *Impacts Common to All Alternatives*.

Lands with Wilderness Characteristics

Under Alternative C, areas with wilderness characteristics would be managed the same as the surrounding areas. Due to the small areas involved, these actions would have a negligible adverse effect on water resources.

Livestock Grazing Management

Under Alternative C, livestock grazing management would result in effects to water resources similar to those described for Alternative B, except that livestock salt or mineral supplements would be placed a minimum of 500 feet from water sources and riparian areas, and grazing would be restricted only in areas where it is currently restricted. These actions would have a negligible adverse effect on water resources.

Special Designations

Areas of Critical Environmental Concern

There would be no effects on water resources from ACEC management under Alternative C as no ACECs would be designated.

4.1.4.6. Alternative D

Physical Resources

Water Resources

Alternative D allows for the flexibility to not authorize certain activities when the adverse effects would be excessive. Surface discharge of CBNG produced water, on-channel reservoirs, and surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams would be allowed if the water resources are adequately protected and other resource values warrant the authorization. Appendix W (p. 2623) describes the processes by which projects

would be evaluated for these conditions. In addition, unneeded reservoirs would be evaluated on an individual basis for removal and reclamation. This alternative would provide a moderate benefit to water resources because it gives the BLM authority to mitigate effects on a site-specific basis within established limits as described in Appendix W (p. 2623).

Air Quality

Under Alternative D, mitigating adverse impacts to air quality could have limited effect on water resources by reducing erosion sources. This would be a negligible beneficial effect.

Soil

Under Alternative D, surface-disturbing activities in areas with severe erosion potential, on slopes equal to or greater than 25 percent, and on soils with poor reclamation potential would be allowed on a project-specific basis. The use of stringent criteria would cause these areas to be avoided in most cases. When these areas could not be avoided, specific measures would be applied to mitigate or prevent adverse effects on water resources. This alternative would provide a moderate benefit to water resources because it gives the BLM authority to reduce effects on a site-specific basis.

Cave and Karst Resources

Under Alternative D, surface-disturbing activities, including mineral development and timber harvest, would be allowed in cave and karst areas, with site-specific mitigation. Protections would likely focus on protecting significant caves. At present, there are five identified significant caves within 500 feet of surface water. The potential for surface-disturbing activities in cave and karst areas is relatively low, related both to the difficult topography and limited potential for mineral resources. Management actions to protect cave and karst resources would have a negligible beneficial effect on water resources.

Mineral Resources

Locatable Minerals

Under Alternative D, 1,252 acres (0.2% of federal locatable minerals) are predicted to be disturbed by locatable minerals development. It is likely that little of this be within 500 feet of surface water resources. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*. Therefore, this would have a negligible adverse effect on water resources.

Leasable Minerals – Coal

The foreseeable area for coal development could affect 1.3 percent (856 acres) of federal mineral estate within 500 feet of surface water; this would have a minor adverse effect on water resources. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*.

Federal coal lands would be available for in situ gasification and methanogenesis which also would have a minor adverse effect on water resources. Impacts associated with coal methanogenesis would be similar to those impacts described under Alternative C.

Leasable Minerals – Fluids

Oil and natural gas (conventional and CBNG) exploration and development would result in approximately 35,185 acres (1% of federal fluid mineral estate) of surface disturbance. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*. This would have minor adverse effects on water resources.

Salable Minerals

The total acreage predicted for salable minerals development under Alternative D is 1,193 (0.3% of federal salable minerals) acres. Other potential impacts will be similar to those described in *Impacts Common to All Alternatives*. Due to the small areas involved, adverse effects on water resources would be negligible.

Fire and Fuels Management

Unplanned Fire (Wildfire)

Under Alternative D, response to unplanned wildland fire varies from full suppression to monitoring fire as a management tool. The use of heavy equipment is limited except when human safety is at risk, and fire and suppression damage would be rehabilitated where necessary. These actions would limit erosion and benefit water resources. However, with a predicted 27,596 acres (3.5%) of BLM surface to be affected by wildfires, the benefit of these management actions would be negligible at the planning-area scale as few of these acres are likely to be within 500 feet of water resources.

Planned Fire (Prescribed Fire)

Under Alternative D, wildland fire and other vegetative treatments would be used to meet desired management objectives, which would result in long-term beneficial effects on water resources. With a predicted 14,000 acres (1.8%) of BLM surface to be treated by prescribed fire and mechanical treatments, the benefit of these management actions would be minor at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative D, intensive management tactics would be used to manage for desired forest health. If not properly managed, these actions could increase erosion, sediment transport, and sedimentation, which would have an adverse effect on water resources. Under Alternative D, up to 20,000 acres (1.3% of BLM surface) of forest and woodland treatments are predicted. Due to the acreage in the planning area where these treatments would be applied, adverse effects on water resources would be minor.

Vegetation – Grasslands and Shrubland Communities

Allowing desirable non-native plant species for initial reclamation would help stabilize soils in a timely manner, thus controlling erosion. Alternative D would allow for quick-growing species to compete with annual weeds and provide an opportunity for slower-establishing native plants to inhabit the site. Given the amount of potential surface disturbance within 500 feet of surface water, there would be a negligible beneficial effect to water resources.

Vegetation – Riparian/Wetland Resources

Under Alternative D, surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would be allowed when the resources could be protected. Other management actions that would benefit water resources include managing for DFC within capable communities and restoring wetland and riparian vegetation supported by CBNG produced-water discharge. The 500-foot buffer would protect surface waters unless a waiver was granted. The ability to grant waivers would reduce the beneficial effect to moderate.

Invasive Species and Pest Management

The *Impacts Common to All Alternatives* section above describes the types of effects on soil resources from invasive species. Alternative D would take a moderate approach to managing invasive species. Under Alternative D, 12,000 acres (1.5%) of BLM surface are predicted to be treated. Due to the small areas where invasive species management would overlap water resources, the beneficial effect on water resources would be negligible.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Alternative D would maintain or enhance streams and riparian areas associated with Class I and II streams, the Powder River, the Tongue River, and appropriate areas for desired fisheries potential. This management would generally have a beneficial effect on water resources. Fisheries enhancement would be incorporated into reservoir designs consistent with other resource values. This alternative would generally benefit water resources, but could add to potential erosion, sediment transport, and sedimentation during construction and maintenance processes. Perennial waters that affect fish habitat would be maintained or enhanced consistent with other resource values. This would generally benefit water resources.

Surface-disturbing and disruptive activities would be allowed within 0.25 mile of naturally occurring waterbodies that contain native or desirable non-native fish species in accordance with fisheries objectives. This alternative would reduce the likelihood of sediment being transported to waterbodies that would result in sedimentation of the water. This alternative would allow surface-disturbing activities on 10,529 acres within 500 feet of surface water, or 53.0 percent of water resources, when adverse effects on water and other resources are adequately mitigated. Yellowstone cutthroat trout could be present in streams associated with 182 acres (0.9%) of BLM surface within 500 feet of water.

Important stream segments for fish habitat would be restored in accordance with WGFD priorities. Alternative D would generally benefit water resources, but could add to potential erosion, sediment transport, and sedimentation during maintenance processes.

Overall, activities to maintain or enhance fish habitat would benefit water resources. However, due to the provision for waivers under defined conditions, the beneficial effects would be moderate for fish and negligible for special status fish because of their limited distribution.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

There are a number of management actions under Alternative D that allow surface-disturbing activities where wildlife and special status wildlife species could be adequately protected. These actions would benefit water resources locally where surface disturbances are prevented by reducing erosion, sediment transport, and sedimentation. Any efforts that would minimize these processes would beneficially affect water resources. However, because most management actions regulate, but do not prohibit surface disturbance, and the small amount of land in close proximity to water resources, the benefit to water resources would be minor.

Special Status Species – Plants

Alternative D would limit surface disturbance prohibitions mostly to identified populations, which are typically widespread and small. Ute-ladies'-tresses orchid is the only riparian-dependent special status plant species; at present there are no documented populations in the planning area. Because there are documented populations and populations are typically small, beneficial effects on water resources would be negligible.

Heritage and Visual Resources

Cultural Resources

Management actions under Alternative D include a prohibition on surface-disturbing activities for specifically identified sites with historic properties that retain their historic settings, and appropriate mitigation of surface-disturbing activities for the protection of TCPs, sacred sites, and other culturally sensitive areas. To protect the settings of the identified historic properties, surface-disturbing activities could be restricted up to 3 miles from sensitive cultural sites. Water resource would be protected on 627 acres, or 3.2 percent, of BLM surface within 500 feet of surface water. This would have a minor beneficial impact on water resources.

Visual Resources

Under Alternative D, specifically identified areas inventoried as VRM Class II or as special emphasis areas would be managed as VRM Class II. There are 4,825 acres, or 24 percent, of BLM surface within 500 feet of surface water classified as VRM Class II. However, because surface disturbance is reduced but not prohibited, the benefits to water resources would be moderate.

Land Resources

Forest Products

Alternative D would result in effects similar to Alternative B, except that Alternative D provides more latitude to manage forest product sales within ecologically sustainable limits to maximize economic return. It also provides increased flexibility to perform rehabilitation activities to create healthy and economically sustainable forest stands in consideration of other resource values. Due to the limited areas where these actions would correspond to water resources, adverse effects on water resources would be negligible.

Renewable Energy

Alternative D would exclude renewable-energy projects in certain otherwise restricted areas. The likelihood of these areas coinciding with areas suitable for renewable energy is minimal. Therefore, effects on water resources would be negligible, but would be beneficial if they occurred.

Rights-of-Way and Corridors

Alternative D management of ROW corridors would be the same as described under *Impacts Common to All Alternatives*. In addition, Alternative D would exclude 79,777 acres from ROW and identify 321,149 acres for ROW avoidance. Areas with slopes equal to or greater than 25 percent and highly erodible soils would be avoided. This would result in a minor adverse effect on water resources compared to alternatives A and B, but would represent a decrease in adverse effects compared to Alternative C.

Travel and Transportation Management

Alternative D would allow motor vehicle use in special status species habitat consistent with travel management designations and within routes designated to protect habitat. This action would benefit water resources because it would minimize erosion, sediment transport and sedimentation caused by motor vehicle use, but would allow needed flexibility to control catastrophic wildfires that could result in much worse effects on water resources.

Existing routes would be evaluated for closure and reclamation consistent with other resource values. Approximately 37,389 acres in selected areas would be Closed to motorized vehicle use. Motorized vehicle use would be Limited to designated roads on 661,726 acres, and an

additional 18,259 acres would have seasonal motor vehicle prohibitions. These actions would reduce erosion, sediment transport, and sedimentation associated with motor vehicle activity, thereby having a minor beneficial effect on water resources.

Recreation

Alternative D effects on water resources would be similar to those under Alternative B.

Lands with Wilderness Characteristics

Alternative D would manage 6,864 acres to emphasize ecosystem health, natural values, and primitive recreational opportunities. Due to the small areas involved, these actions would have a negligible beneficial effect on water resources.

Livestock Grazing Management

Alternative D would give watershed protection priority over forage and habitat concerns regarding vegetation production. This could have a minor to moderate beneficial effect on water resources because it would restore natural streamflows and reduce adverse effects on water quality. Livestock grazing would be allowed on all public lands except in areas that determined to be incompatible with other resource values. This would have a minor adverse effect on water resources, but would be consistent with existing conditions. Livestock salt or mineral supplements would be placed a minimum of 500 feet from water sources and riparian areas, which would have a minor beneficial effect on water resources.

Special Designations

Areas of Critical Environmental Concern

Alternative D effects from ACEC management would be similar to those under Alternative B but for a reduced acreage. Due to the limited areas where these actions would correspond to water resources, the effects would be beneficial but negligible.

4.1.4.7. Cumulative Impacts

The BLM manages approximately 11 percent of the surface lands in the planning area, but manages approximately 65 percent of the mineral resources (90% of coal resources). In addition, the authority over water resources primarily lies with the WSEO or the Wyoming DEQ. The WSEO has authority over all issues related to water supply, production, and availability, while the Wyoming DEQ has primacy over all issues related to water quality. This leaves the BLM with the ability to manage actions that could subsequently affect water resources, such as surface disturbance that could supply pollutants to water resources. Given that most water resource management decisions lie with the state, effects are relatively consistent throughout the planning area, regardless of land ownership. Therefore, it is reasonable to assume that impacts assessments related to areas where the BLM only has authority over the surface could be multiplied by 0.89 to estimate the total effect on water resources in the planning area. In addition, it would be reasonable to estimate all effects related to minerals development; multiply impacts by 0.35 to account for all effects.

Water resources impacts for CBNG are thoroughly addressed in the PRB Final EIS. Impacts as a result of coal mining are addressed in the Hay Creek II Coal Lease Application Final EIS as well as other coal leasing NEPA documents. Both of these documents assess cumulative impacts associated with overlapping development.

To summarize, most overlapping impacts to water resources would occur near the coal mines in the south eastern part of the planning area. The impact most likely to be observed will be aquifer drawdown where CBNG production is dewatering coal zone aquifers and shallower. Coal mines will simultaneously be dewatering coal production zones and overburden aquifers above the coal. The impacts associated with aquifer drawdown is described above.

Coal developers and CBNG developers are required to manage any surface water discharges in accordance with Wyoming DEQ WYPDES permit requirements. However, coal producers typically use most of the water they produce for mining operations, so there is very little overlapping impacts associated with discharge.

There are few cumulative or overlapping impacts to water resources associated with conventional oil production. Direct impacts with this type of production is discussed above and in Appendix W (p. 2623) and Appendix V (p. 2599).

4.1.4.8. Conclusion

Allowable uses and management actions described in this section were used to determine potential effects on water resources. Meaningful differences in long-term disturbance acreage; acreage of highly erosive soils; number of oil and gas (including CBNG) wells; and produced-water discharge form the basis for the conclusion described here. Alternative B would result in the least adverse effects on water resources because management actions under this alternative would result in the least amount of change to surface water and groundwater quality and quantity. Therefore, Alternative B provides the greatest protection to surface water and groundwater resources. Alternative A is consistent with current management and provides moderate levels of water resource protection and results in somewhat more adverse effects on water resources than Alternative B. Alternative D would result in fewer adverse effects on surface water than Alternative A, and effects similar to Alternative A related to groundwater quality and quantity. In ascending order from the least adverse to the most adverse effects on water resources, the alternatives rank as follows: Alternative B, Alternative D, Alternative A, and Alternative C.

4.1.5. Cave and Karst Resources

This section describes potential effects on cave and karst resources from proposed management of all other resources. Chapter 3 describes existing cave and karst conditions. Actions that disturb or destroy cave and karst resources or disrupt the habitat of flora or fauna that utilize cave and karst areas are considered adverse; actions that avoid or prevent adverse impacts are beneficial.

The Federal Cave Resources Protection Act of 1988 requires inventory and determinations of significance for cave resources under federal management. Cave resources determined to be significant will be protected from all actions that could adversely impact the resources. This could result in the modification or denial of certain proposals. Cave resources are vulnerable to unauthorized uses and vandalism. Significant cave resources damaged or destroyed by unauthorized uses or vandalism might require protective measures, up to and including closing caves.

Cavities in bedrock can occur anywhere in the planning area. However, only caves found in the karst regions of the Big Horn Mountains are likely to be significant. Those in plains areas will be sandstone rock shelters. The only potential element of significance in rock shelters will be cultural resources, which will be protected under the NHPA. Therefore, for purposes of this

analysis, only areas of the Big Horn Mountains likely to contain cave and karst resources are considered in this analysis. This focus area is comprised of 101,455 acres of BLM surface and 212,626 acres of federal fluid mineral estate.

4.1.5.1. Methods and Assumptions

The analyses of impacts to cave and karst resources under the alternatives are the result of coordination with BLM interdisciplinary team members, review of various publications, and information provided by interested cooperators.

Assumptions

The assumptions include, but are not limited to, the following:

- As populations grow and more people recreate, impacts to cave and karst resources of the Buffalo planning area will increase.
- Given the large amount of karst topography in the planning area, it is very likely that more caves will be discovered. Therefore, it is necessary to protect areas with formations likely to contain cave and karst resources.
- It is very likely that there will be additional discoveries of sensitive species in planning area caves. Therefore, protecting areas likely to contain cave and karst resources also will protect habitat for sensitive species.

4.1.5.2. Impacts Common to All Alternatives

Cave and Karst

All alternatives will meet Federal Cave Resources Protection Act of 1988 requirements and will bring the BFO into compliance. Cave and Karst management that protects these sensitive resources will have a major beneficial effect on cave and karst resources.

Physical Resources

Air Quality

Air quality management actions common to all alternatives or unique to each alternative will not effect cave and karst resources. Therefore, the *Cave and Karst Resources* section does not further address air quality management.

Soil

Runoff from destabilized soils can affect not only the water sources that are integral to cave and karst development, but also potentially impact the plant and animal life that inhabit caves. Using soil surveys and onsite investigations would ensure protection of soil resources. Applying appropriate mitigation (including relocation or denial of projects) and requiring an approved reclamation plan would ensure all disturbances were effectively remediated to BLM standards. This would have a major beneficial effect on cave and karst resources.

Water Resources

Cave and Karst formations are created by the hydraulic and chemical processes of water eroding and reacting with sediment and rock. Cave and karst resources often are present near water resources and riparian areas. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the

potential impacts of any water-related management actions. Water management actions common to all alternatives that would affect cave and karst resources include managing surface-disturbing activities to prevent degradation of water quality and preventing the loss of riparian areas and these actions would have a moderate beneficial effect on cave and karst resources.

Mineral Resources

Mining activities (locatable, leasable, and salable minerals) would have no impact to cave and karst resources. Minerals development in cave and karst areas is not expected. There are no known deposits of leasable minerals in cave and karst areas. Locatable minerals in the form of metallurgical grade limestone has a moderate potential for occurring in the limestone formations that partially make up the cave and karst formation areas; however, the potential for development, if located, is low. Salable mineral deposits overlap with cave and karst formations by one percent; current salable development overlaps with cave and karst areas by 51 acres. It is possible, although unlikely, that deposits of salable, locatable, or leasable minerals could be found in cave and karst areas. However, due to the inherent difficulty of development in these areas, no impacts to cave and karst resources are anticipated. Therefore, the *Cave and Karst Resources* section does not further address management of mineral resources.

Fire and Fuels Management

There are no management actions common to all alternatives or unique to each alternative for fire and fuels management that would affect cave and karst resources. Therefore, the cave and karst section does not further address these resources.

Biological Resources

Management actions for biological resources are designed to protect biological resources, typically by limiting surface-disturbing activities and preventing erosion and degradation of water quality. Limiting these types of disturbances benefits cave and karst resources (see *Water - Impacts Common to All Alternatives*).

There are no management actions common to all alternatives for special status species-plants that affect cave and karst resources.

There are no management actions common to all alternatives or unique to each alternative for **Grassland and Shrubland Communities, Invasive Species and Pest Management, Special Status Species – Fish, or Forest and Woodlands** that would affect cave and karst resources. Therefore, the *Cave and Karst Resources* section does not further address these resources.

Vegetation – Riparian/Wetland Resources

Cave and karst resources often are present near water resources and riparian areas. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions. Cave and Karst formations are created by the hydraulic and chemical processes of water eroding and reacting with sediment and rock. Preventing the degradation, loss, or destruction of riparian and wetland habitat would have a moderate beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Fish

Cave and Karst formations are created by the hydraulic and chemical processes of water eroding

and reacting with sediment and rock. Cave and karst resources often are present near water resources and riparian areas. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions. Fisheries management actions common to all alternatives that would affect cave and karst resources include mitigation for surface-disturbing activities. Surface disturbing activities that impact the quality or flow of water in cave and karst areas could impact cave and karst resources. Mitigating surface disturbing activities in cave and karst areas would have a moderate beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Wildlife

Wildlife management actions common to all alternatives that affect cave and karst resources include mitigation for surface-disturbing activities to prevent erosion and degradation of water quality. Preventing erosion and degradation of water quality would moderately benefit cave and karst resources (see above *Fish and Wildlife Resources – Fish*).

Special Status Species – Wildlife (including Greater Sage-Grouse)

Several Greater Sage-Grouse leks, located on the eastern slopes of the southern Big Horns, are in close proximity to the eastern edge of karst formations. Management actions that would prevent degradations to Greater Sage-Grouse habitat could potentially benefit cave and karst resources. However, the formation areas in question are marginal, both in terms of location and quality, and are not expected to produce caves of significance. Therefore any effects to cave and karst resources from Greater Sage-Grouse management would be negligible and will not be discussed further in the *Cave and Karst Resources* section.

There are no other common to all alternatives from Special Status Species that would affect cave and karst resources.

Heritage and Visual Resources

There are no **Cultural Resource**, **Paleontological Resource**, or **Visual Resource Management** actions common to all alternatives or unique to each alternatives that would affect cave and karst resources. Therefore, the *Cave and Karst Resources* section does not further address these resources.

Land Resources

The following programs do not have any management actions common to all alternatives that would affect cave and karst resources: **Renewable Energy** and **Lands with Wilderness Characteristics**.

The following programs do not have any management actions common to all alternatives or unique to each alternative that would affect cave and karst resources: **Lands and Realty** and **Travel and Transportation Management**. Therefore, the *Cave and Karst Resources* section does not further address these resources.

Forest Products

Management actions common to all alternatives include a prohibition on timber harvest within 200 feet of surface waters. Because adverse impacts to water quality in cave and karst areas could adversely impact cave and karst resources (see *Water - Impacts Common to All Alternatives*), this management action would have a moderate beneficial effect on cave and karst resources.

Rights-of-Way and Corridors

Management actions common to all alternatives include the designation of ROW corridors to minimize surface disturbance and impacts to resources. Surface disturbing activities that impact the quality or flow of water in cave and karst areas could impact cave and karst resources. However, the likelihood of significant ROW corridors occurring in cave and karst areas is minimal given the rugged topography where cave and karst resources occur. Minimizing the potential for impacts to water resources near cave and karst areas through ROW management would have a minor beneficial effect on cave and karst resources.

Recreation

Management actions common to all alternatives include opening the planning area to casual, diverse, and dispersed recreation; avoidance of riparian habitat for developed facilities and camping; and managing caves through a cave management plan. Increased human visitation to caves can adversely impact cave resources. Actions such as vandalism, disturbance of plants and animals, and looting of cultural resources are all probable results. Opening the planning area to dispersed recreational opportunities increases these risks, which would have an adverse effect on cave and karst resources. Protecting cave and karst resources through cave management plans would minimize impacts on cave and karst resources.

Livestock Grazing Management

Under all alternatives, most of the BLM surface acreage within the planning area would be available for livestock grazing. Livestock grazing would be managed in accordance with the *Wyoming Standards for Healthy Rangelands* to sustain vegetative communities and special status species habitats. Multiple special status species inhabit cave and karst areas, however very little of these areas are suitable for grazing. Therefore, while grazing management would sustain special status species habitat, the small overlap would reduce the benefit to minor.

Special Designations

There are no **Areas of Critical Environmental Concern** or **Scenic or Back Country Byways** management actions common to all alternatives or unique to each alternative that would affect cave and karst resources. Therefore, the *Cave and Karst Resources* section does not further address these resources.

Wild and Scenic Rivers

Management actions common to all alternatives include managing the proposed Middle Fork Powder River WSR in accordance with the Middle Fork Interim Management Plan. Many of the known significant caves in the planning area are in the Middle Fork Canyon area. The Interim Management Plan would help protect this important area, which would have a major beneficial effect on cave and karst resources.

Wilderness Study Areas

Management actions common to all alternatives include managing WSAs for natural conditions and primitive recreation. While WSAs only overlap with cave and karst areas by seven percent, these areas are known to have cave and karst formations that could be significant. Protecting the areas through WSA management would have a major beneficial effect on cave and karst resources.

Socioeconomic Resources

There are no social, economic, or health and safety management actions common to all alternatives or unique to each alternative that would affect cave and karst resources. Therefore, the cave and karst resources section does not further address this resource.

4.1.5.3. Alternative A

Cave and Karst Resources

Alternative A does not include management of cave and karst resources. Current management could potentially allow significant cave and karst resources to be impacted without analysis. This would have a major adverse effect on cave and karst resources.

Physical Resources

Soil

Cave and karst resources are associated with steep slopes, rock outcrops, and other sensitive soil types. Under Alternative A, management or prohibition of surface disturbance on soils with severe erosion hazards would have a beneficial effect on cave and karst resources; management or prohibition of surface disturbance on steep slopes and on soils with poor reclamation suitability would have a beneficial effect on cave and karst resources. Alternative A considers surface disturbance on rock outcrops on a project-specific basis. Therefore, it is not possible to determine a level of impact to cave and karst resources from soil resources management on rock outcrops. Overall, management actions under Alternative A for soil will be a major benefit to cave and karst resources.

Water Resources

Cave and karst resources often are present near water resources and riparian areas. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions. Under Alternative A, prohibiting surface-disturbing activities within 500 feet of any spring or perennial stream to prevent erosion and degradation of water quality would have a moderate beneficial effect on cave and karst resources (see *Water - Impacts Common to All Alternatives*).

Biological Resources

Vegetation – Riparian/Wetland Resources

Cave and karst resources often are found in or near riparian areas. Under Alternative A, prohibiting surface-disturbing activities to prevent erosion and degradation of water quality would have a moderate beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Fish

Cave and karst resources often are found in or near riparian areas. Under Alternative A, prohibiting surface-disturbing activities to prevent erosion and degradation of water quality would have a moderate beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Wildlife

Management actions under Alternative A that prohibit surface-disturbing activities for the protection of wildlife would beneficially impact cave and karst resources by preventing erosion and habitat disruption. A small portion of cave and karst areas are overlapped by big-game wintering areas. Prohibiting development in big game winter ranges would have a minor beneficial effect on cave and karst resources.

Special Status Species – Plants and Wildlife (including Greater Sage-Grouse)

Large portions of cave and karst formation areas are overlapped by limber pine habitat. Amphibians, reptiles, and bats often utilize cave and karst resources. Management of surface-disturbing activities to prevent disruption and degradation of limber pine, amphibian, reptile, and bat habitat would have a major beneficial effect on cave and karst resources. However, Alternative A considers actions on a project-specific basis, so it is not possible to have adverse impacts limiting the benefits to moderate.

Land Resources**Forest Products**

Management actions under Alternative A include the sale of minor forest products. The areas of potential harvest overlap cave and karst areas by seven percent. However, most caves in the planning area are in terrain that does not allow for timber harvest. Therefore, adverse effects (e.g., erosion and habitat disruption) on cave and karst resources resulting from timber harvest would be negligible.

Renewable Energy

Alternative A considers renewable-energy development on a project-specific basis. Although there have been no renewable energy projects to date, 20,000 acres (2.6%) of BLM surface are predicted over the planning period. The southern Big Horn Mountains have excellent wind energy potential and contain most of the cave and karst resources in the planning area. Construction of wind farms in the southern Big Horn Mountains would likely impact cave and karst resources. While wind farms would not necessarily physically damage cave and karst areas, they would pose a significant risk to the bats that utilize these resources. Because these actions are considered on a project-specific basis, some caves and bat populations would likely be protected and others would not, so that the level of impact to cave and karst resources would likely be moderate.

Rights-of-Way and Corridors

Cave and karst resources are often found on steep slopes and highly erodible soils. Under Alternative A, prohibiting surface disturbance on slopes equal to or greater than 25 percent and on highly erodible soils would prevent erosion and water degradation and would apply to most cave and karst areas. However, the likelihood of major ROW permits being issued in cave and karst areas due to difficult topography reduces the benefit to minor.

Recreation

Significant cave and karst resources are located in areas being considered for SRMA designation. Designation and management of cave and karst areas as SRMAs would benefit cave and karst resources by preventing erosion and degradation of habitat. However, Alternative A does not include such management and would not result in this beneficial effect on cave and karst resources. Therefore current management results in moderate adverse impacts to cave and karst resources.

Lands with Wilderness Characteristics

Cave and karst resources often are found in areas with wilderness characteristics. Alternative A is implemented on a project-specific basis and does not currently provide cave and karst protection. Therefore current management results in minor adverse impacts to cave and karst resources as 12,237 acres have been determined to have wilderness characteristics.

Livestock Grazing Management

Cave and karst resources often are found in areas not compatible with livestock grazing. While

livestock have a difficult time accessing many cave and karst areas, some animals successfully negotiate the rugged terrain and steep slopes. While the total number of animals are limited, allowing livestock access to cave and karst areas creates erosion and habitat disruption. Under Alternative A, limiting or prohibiting livestock grazing where it is not compatible with other resources would have a minor beneficial effect on cave and karst resources.

Special Designations

Wild and Scenic Rivers

Many of the planning area's known significant caves fall within the proposed WSR. While this action is considered on a project-specific basis, current management is protective of cave and karst resources and is a major benefit.

Wilderness Study Areas

WSAs contain seven percent of total cave and karst area. If Congress does not designate the WSAs as wilderness, they will be opened for oil and gas leasing. While this means that seven percent of cave and karst resource areas would be opened for oil and gas leasing, the fact that there are no known deposits of oil or gas in these areas reduces the potential major impact to negligible.

4.1.5.4. Alternative B

Cave and Karst Resources

Alternative B includes the highest levels of cave and karst protections. Surface- and subsurface-disturbing activities would be prohibited in cave and karst areas. This would include all mineral exploration and development, timber harvest, and ROWs. In addition, each cave containing significant resources would be managed under an individual cave management plan. Caves with significant resources also would be fenced to exclude livestock from entering. These actions would have a major beneficial effect on cave and karst resources.

Physical Resources

Soil

Cave and karst resources are associated with steep slopes, rock outcrops, and other sensitive soil types. The Alternative B prohibition on surface-disturbing activities on soils with a severe erosion hazard would have a beneficial effect on cave and karst resources. Prohibiting surface-disturbing activities on slopes equal to or greater than 25 percent would have a beneficial effect on cave and karst resources. Prohibiting surface-disturbing activities on soils with poor reclamation suitability would have a beneficial effect on cave and karst resources. Prohibiting surface-disturbing activities on badlands, rock outcrops, biologic crusts, and slopes susceptible to mass movement would have a beneficial effect on cave and karst resources. Overall soil alternatives will have a major beneficial effect on cave and karst resources.

Water Resources

Cave and karst resources often are present near water resources and riparian areas. Alternative B management actions that prohibit surface-disturbing activities within 500 feet of springs, perennial streams, and their associated riparian habitat would have a moderate beneficial effect on cave and karst resources.

Biological Resources

Vegetation – Riparian/Wetland Resources

Cave and karst resources often are found in or near riparian areas. Alternative B management actions that prohibit surface-disturbing activities within 500 feet of riparian habitat would have a moderate beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Fish

Cave and karst resources often are found in or near riparian areas. The Alternative B prohibition on surface-disturbing activities within 0.25 mile of naturally occurring waterbodies that contain fish would have a major beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Wildlife

Management actions under Alternative B that prohibit surface-disturbing activities for the protection of wildlife would benefit cave and karst resources by preventing erosion and habitat disruption. Some big game wintering areas overlap cave and karst resources. Prohibiting development in big game winter ranges would have a minor beneficial effect on cave and karst resources.

Special Status Species – Plants and Wildlife (including Greater Sage-Grouse)

Management actions under Alternative B that prohibit surface-disturbing activities for the protection of special status plant and wildlife species would beneficially impact cave and karst resources. Large portions of cave and karst formation areas are overlapped by limber pine habitat. Prohibiting development in limber pine habitat would have a major beneficial effect on cave and karst resources. Amphibians, reptiles, and bats often utilize cave and karst resources. Management of surface-disturbing activities to prevent disruption and degradation of amphibian, reptile, and bat habitat would have a major beneficial effect on cave and karst resources.

Land Resources

Forest Products

Management actions under Alternative B include the sale of saw timber. The areas of potential harvest overlap with cave and karst areas by seven percent. However, most caves in the planning area are in terrain that does not allow for timber harvest. Therefore, adverse effects (erosion and habitat disruption) on cave and karst resources resulting from timber harvest would be negligible.

Renewable Energy

Alternative B would avoid development of renewable-energy projects in cave and karst areas. This would have a major beneficial effect on cave and karst resources.

Rights-of-Way and Corridors

Cave and karst resources are often found on steep slopes and highly erodible soils. Under Alternative A, prohibiting surface disturbance on slopes equal to or greater than 25 percent and on highly erodible soils would prevent erosion and water degradation and would apply to most cave and karst areas. However, the likelihood of major ROW permits being issued in cave and karst areas due to difficult topography is slim.

Recreation

Cave and karst resources often are found in areas with recreation potential. Designation and management of cave and karst areas as SRMAs would benefit cave and karst resources.

Alternative B would provide for recreation to be intensively managed and not allow mineral leasing throughout most of the proposed SRMAs. The restriction on mineral leasing would reduce potential surface disturbance from facilities and associated infrastructure of mineral development. Although the proposed SRMAs only overlap cave and karst areas by three percent, that three percent contains many of the planning area's significant caves. Designating the Middle Fork Powder River as an SRMA would have a moderate beneficial effect on cave and karst resources.

Lands with Wilderness Characteristics

Cave and karst resources often are found in areas with wilderness characteristics. Alternative B would prohibit most surface-disturbing activities on five percent of cave and karst areas to emphasize primitive recreation and natural values and would also prevent erosion and habitat degradation. This would have a moderate beneficial effect on cave and karst resources.

Livestock Grazing Management

Cave and karst resources often are found in areas not compatible with livestock grazing. While livestock have a difficult time accessing many cave and karst areas, some animals successfully negotiate the rugged terrain and steep slopes. While the total number of animals are limited, allowing livestock access to cave and karst areas creates erosion and habitat disruption. Alternative B would limit or prohibit livestock grazing where it would not be compatible with other resources. This would have a minor beneficial effect on cave and karst resources.

Special Designations

Wild and Scenic Rivers

Many of the planning area's known significant caves fall within the proposed WSR. If Congress denies the WSR nomination, management will retain current characteristics. Current management benefits cave resources by precluding development that has the potential to create erosion and habitat disruption.

Wilderness Study Areas

If Congress does not designate the WSAs as Wilderness, Alternative B WSA management would likely include prohibiting most surface-disturbing development. While the WSAs include seven percent of cave and karst formations, major surface- and subsurface-disturbing activities are not expected to occur in these areas. Therefore surface disturbance prohibitions in these areas would be a negligible benefit.

4.1.5.5. Alternative C

Cave and Karst Resources

Alternative C would include medium levels of protections for cave and karst resources. All surface- and subsurface-disturbing activities would be required to maintain buffers around significant cave entrances and passages. This would include all mineral exploration and development, timber harvest, and ROWs. Caves containing significant resources would be managed under a planning area cave management plan. Grazing would not be restricted in areas with cave and karst resources except in areas restricted under current management. These management actions would have a major beneficial effect on cave and karst resources by preventing erosion and habitat degradation.

Physical Resources

Soil

Cave and karst resources are associated with steep slopes, rock outcrops, and other sensitive soil types. Allowing activities that may cause erosion and habitat degradation in these areas would adversely impact cave and karst resources to a major degree.

Water Resources

Cave and karst resources often are present near water resources and riparian areas. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions. Alternative C management actions allowing surface-disturbing activities within 500 feet of springs, perennial streams, and their associated riparian habitat would have a moderate adverse effect on cave and karst resources (e.g., erosion and habitat disruption).

Biological Resources**Vegetation – Riparian/Wetland Resources**

Alternative C would allow surface-disturbing activities within 500 feet of springs and perennial streams. These actions would have a moderate adverse effect on cave and karst resources (see Water above).

Fish and Wildlife Resources – Fish

Cave and karst formations are created by the hydraulic and chemical processes of water eroding and reacting with sediment and rock. Cave and karst resources often are present near water resources and riparian areas. Surface-disturbing activities that impact the quality or flow of water in cave and karst areas could impact cave and karst resources. Allowing surface-disturbing activities near naturally occurring waterbodies would have a major adverse effect on cave and karst resources.

Fish and Wildlife Resources – Wildlife

A small portion of cave and karst areas are overlapped by big-game wintering areas. Management actions under Alternative C that allow surface-disturbing activities in big-game winter ranges would adversely impact cave and karst resources by potentially allowing erosion and habitat disruption. Allowing development in big-game winter ranges would have a minor adverse effect on cave and karst resources.

Special Status Species – Plants and Wildlife (including Greater Sage-Grouse)

Large portions of cave and karst formation areas are overlapped by limber pine habitat. Amphibians, reptiles, and bats often utilize cave and karst resources. Allowing surface-disturbing activities may cause erosion and disruption and degradation of limber pine, amphibian, reptile, and bat habitat. Allowing surface-disturbing activities in limber pine, reptile, and bat habitat would result in major adverse effects.

Land Resources**Forest Products**

Management actions under Alternative C include the sale of multiple forest products. The areas of potential harvest overlap with cave and karst areas by seven percent. However, most caves in the planning area are in terrain that does not allow for timber harvest. Therefore, adverse effects (erosion and habitat disruption) to cave and karst resources resulting from timber harvest would be negligible.

Renewable Energy

The southern Big Horn Mountains have excellent wind energy potential and contain most of the cave and karst resources in the planning area. Construction of wind farms in the southern Big Horn Mountains would likely impact cave and karst resources. While wind farms would not necessarily physically damage cave and karst areas, they would pose a significant risk to the bats that utilize these resources. Management under Alternative C would allow renewable-energy development throughout the planning area consistent with other resource values. This would have a major adverse effect on cave and karst resources.

Rights-of-Way and Corridors

Cave and karst resources are often found on steep slopes and highly erodible soils. Any surface disturbance in these areas could potentially cause erosion and habitat disruption. Management under Alternative C would allow for ROW activity unless it is specifically excluded. However, the likelihood of significant ROW corridors occurring in cave and karst areas is minimal given the rugged topography where cave and karst resources occur. This would have a minor adverse effect on cave and karst resources.

Recreation

Alternative C provides for mineral leasing and other surface-disturbing activities in SRMAs. Any surface disturbance in these areas could potentially cause erosion and habitat disruption. Although the proposed SRMAs under Alternative C overlap cave and karst areas by only 0.5 percent, that 0.5 percent contains some of the planning area's significant caves. Designating the Middle Fork Powder River as a SRMA, but allowing surface-disturbing activities in the SRMA would have moderate adverse effect on cave and karst resources.

Lands with Wilderness Characteristics

Alternative C would follow management recommendations outlined in other resource areas in the RMP. Because lands with wilderness characteristics are completely included within a large and contiguous cave and karst formation area, Alternative C recommendations for cave and karst would be followed; this would result in moderate beneficial effects by reducing surface disturbance and habitat disruption.

Livestock Grazing Management

Under Alternative C, limiting or prohibiting livestock grazing where it is currently prohibited would have a minor beneficial effect on cave and karst resources by reducing surface disturbance and habitat disruption.

Special Designations**Wild and Scenic Rivers**

If Congress denies the WSR nomination, management will follow the prescriptions outlined in Alternative C of this RMP. No special provisions will be made for the management of the river's free flowing characteristics or primitive values. If selected, Alternative C will potentially allow for the construction of a dam in Middle Fork Canyon, creating a large reservoir and destroying numerous significant caves. While Alternative C could remove major protections for the Middle Fork Canyon, the likelihood of Congress denying the WSR and development being proposed are low, therefore the adverse impacts are minor.

Wilderness Study Areas

If Congress does not designate the WSAs as Wilderness, Alternative C WSA

management would include allowing surface-disturbing development. While the WSAs include seven percent of cave and karst formations, major surface and subsurface disturbing activities are not expected to occur in these areas. Therefore allowing surface disturbance in these areas would be a negligible adverse effect.

4.1.5.6. Alternative D

Cave and Karst Resources

Alternative D includes adequate levels of protections for cave and karst resources. Under Alternative D, all surface- and subsurface-disturbing activities would be required to maintain buffers around significant cave entrances and passages. This would include all mineral exploration and development, timber harvest, and ROWs. Caves with significant resources would be managed under a planning area cave management plan with cave-specific components. Grazing would only be restricted from the entrances to significant caves. These management actions would have a major beneficial effect on cave and karst resources.

Physical Resources

Soil

Under Alternative D, allowing surface-disturbing activities on soils with a severe erosion hazard; on slopes equal to or greater than 25 percent; and on miscellaneous soil types with approved reclamation and stabilization plans when soil resources objectives can be met would have minor beneficial effects.

Water Resources

Alternative D would allow surface-disturbing activities near springs, near perennial streams, and in riparian habitats when adequate protection is in place to prevent stream bank and soil erosion. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions; the anticipated benefit of these actions is moderate.

Biological Resources

Vegetation – Riparian/Wetland Resources

Alternative D would allow surface-disturbing activities within 500 feet of springs and perennial streams when resource objectives can be met. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions; the anticipated benefit of these actions is moderate.

Fish and Wildlife Resources – Fish

Fish management actions under Alternative D include allowing surface-disturbing activities within 0.25 mile of fish-bearing waterbodies when appropriately mitigated. Any disturbance that potentially allows erosion and habitat disruption will adversely impact cave and karst resources. However, if the surface disturbances are carefully mitigated no adverse impacts should occur. This would have a major beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Wildlife

Management actions under Alternative D that prohibit surface-disturbing activities for the protection of wildlife would benefit cave and karst resources by preventing erosion and habitat

disruption. Some big game wintering areas overlap cave and karst resources. Prohibiting development in big game winter ranges would have a minor beneficial effect on cave and karst resources.

Special Status Species – Plants and Wildlife (including Greater Sage-Grouse)

Large portions of cave and karst formation areas are overlapped by limber pine habitat. Amphibians, reptiles, and bats often utilize cave and karst resources. Allowing surface-disturbing activities in limber pine, reptile, and bat habitat would result in adverse effects to cave and karst resources by potentially causing erosion and habitat disruption. However, requiring site specific surveys to locate existing populations of special status species would also identify and protect cave and karst resources in the proposed project locations. These mitigating factors result in a minor beneficial effect under Alternative D.

Land Resources

Forest Products

Under Alternative D, the harvest of forest products in accordance with cave and karst resources protection would not disrupt habitat or cause erosion and will be a negligible benefit.

Renewable Energy

The southern Big Horn Mountains have excellent wind energy potential and contain most of the cave and karst resources in the planning area. Prohibiting development of renewable-energy projects in the southern Big Horn Mountains would have a major beneficial effect on cave and karst resources.

Rights-of-Way and Corridors

Cave and karst resources are often found on steep slopes and highly erodible soils. Under Alternative D, avoiding surface disturbance on slopes equal to or greater than 25 percent and on highly erodible soils would prevent erosion and water degradation and would apply to most cave and karst areas. However, the likelihood of major ROW permits being issued in cave and karst areas due to difficult topography reduces the benefit to minor.

Recreation

Designation and management of cave and karst areas as SRMAs and not allowing surface-disturbing activities in those areas would have a major beneficial effect on cave and karst resources by preventing erosion and habitat disruption.

Lands with Wilderness Characteristics

Alternative D would prohibit most surface-disturbing activities on 6,864 acres of cave and karst areas to emphasize primitive recreation and natural values and would prevent erosion and habitat disruption. This would have a minor beneficial effect on cave and karst resources.

Livestock Grazing Management

Alternative D proposes limiting or prohibiting livestock grazing where it would not be compatible with other resources. This would have a minor beneficial effect by keeping livestock away from significant caves.

Special Designations

Wild and Scenic Rivers

If Congress denies the WSR nomination, management under Alternative D would continue to prohibit surface disturbing activities, a major beneficial effect.

Wilderness Study Areas

If Congress does not designate the WSAs as Wilderness, Alternative D WSA management would likely be the same as surrounding areas and allow most surface-disturbing development. While the WSAs include seven percent of cave and karst formations, major surface- and subsurface-disturbing activities are not expected to occur in these areas. Therefore surface disturbance prohibitions in these areas would be a negligible adverse effect.

4.1.5.7. Cumulative Impacts

A lack of past management decisions has adversely affected cave and karst resources. This RMP will provide management actions that will result in major beneficial effects on cave and karst resources. Little is known about cave and karst resources on private property in the planning area. The few known caves on private surface are strictly protected by the surface owners. Cave and karst resources across the planning area, on both public and private surface, are well protected through private regulation, future RMP management actions, and general difficulty of access.

4.1.5.8. Conclusion

Allowable uses and management actions described in this section for the alternatives A, B, C, and D were used to determine potential impacts to cave and karst resources. Alternative B would result in the fewest adverse effects on cave and karst resources because management actions under that alternative would result in the least amount of direct and indirect change to the quality and quantity of cave and karst resources. Therefore, Alternative B provides the greatest protection to cave and karst resources. Alternative A is largely consistent with current management, provides moderate levels of cave and karst resources protection, and would result in more adverse effects on cave and karst resources than Alternative B. Alternative D would result in fewer adverse effects on cave and karst resources than Alternative A, and significantly fewer than Alternative C. In ascending order from the least adverse to the most adverse impacts to cave and karst resources, the alternatives rank as follows: Alternative B, Alternative D, Alternative A, and Alternative C.

4.2. Mineral Resources

4.2.1. Locatable Minerals

The BLM manages locatable minerals, which are made available by the various mineral laws, such as the General Mining Law of 1872, as amended. Locatable minerals tend to be the uncommon varieties of minerals, including many metals (such as gold, silver, platinum, copper, and uranium), gemstones, and certain clays, among many others. All the historic and current locatable minerals mining development projects in the planning area are comprised of sodium bentonite (also called Wyoming-type bentonite, a very special clay) and uranium. This section describes potential effects on the locatable minerals resource and/or activities from management actions for other resources and other management programs. The *Locatable Minerals* section of Chapter 3 describes existing locatable minerals resource conditions, and likely trends during the planning period.

The Chapter 3 *Mineral Resources* section presents a discussion regarding the various mineral estate types, and which mineral classifications (Leasable, Locatable, and/or Salable) BLM administers for each major mineral estate type present in the planning area. That section also discusses how split estate lands, which are lands with different ownerships for the surface estate and mineral estate, are administered by BLM, and for which mineral classifications. The total federal locatable minerals resource in the planning area is comprised of all lands in which the federal government owns all minerals (on the Master Title Plats this is shown as “All Mins”), except those areas under the administration of USFS. However, BLM has surface management authority over only those lands containing both all federally owned mineral estate and BLM-administered surface estate. Therefore, although the total federal locatable minerals resource in the planning area is quite large, approximately 3,348,121 acres, the federal locatable minerals resource that BLM administers is much smaller, 777,310 acres. It is this smaller acreage that is analyzed below, as these are the only acres of the total federal locatable minerals resource in the planning area that BLM administers (see the *Mineral Resources* section in Chapter 3).

An unsuitability review was conducted at the planning area level. This review involved identifying areas within the planning area that may best serve the multiple resource use mission of the BLM by being designated as unsuitable for (and recommended for withdrawal from) mineral entry, in order to conserve or protect other resource values. Closure to (withdrawal from) or segregation from mineral entry for these areas is being (recommended), in lieu of designation of unsuitability. After an RMP or plan amendment in which lands are designated unsuitable for mineral entry (and/or closure to or segregation from mineral entry) is approved, the authorized officer shall take all necessary steps to implement the results of this review as it applies to locatable minerals. This would involve recommending the proposed withdrawals to the Secretary of the Interior for appropriate action pursuant to Section 204(a) of Federal Land Policy and Management Act (FLPMA). Withdrawals of 5,000 acres or more would necessitate compliance with the congressional notice provisions of Section 204(c) of FLPMA (43 United States Code [U.S.C.] 1714(c)). Areas that are petitioned for designation as unsuitable for mineral entry (or withdrawal/closure or segregation) shall receive public review and hearings as appropriate. The areas in the planning area identified in this RMP as unsuitable for mineral entry are listed in Table 4.30, “Current Areas Withdrawn From or Containing Restrictions On Mineral Entry under All Alternatives” (p. 820). The areas listed in Table 4.31, “Areas Recommended for Withdrawal from Mineral Entry under All Alternatives” (p. 820) are recommended for withdrawal from mineral entry on behalf of a number of other resources: Wildlife Resources, Cultural Resources, Paleontological Resources, Recreation (SRMAs), Lands with Wilderness Characteristics, and Special Designations (ACECs, WSAs, and WSRs). Each of these areas was recommended for withdrawal from mineral entry after careful consideration of all resource values known to be present in that area. Although these areas were recommended for withdrawal to conserve or protect more than one resource, a number of additional resources may also benefit from closure of these areas. For more information, see the main resource on whose behalf a given withdrawal from mineral entry was recommended, as listed in Table 4.31, “Areas Recommended for Withdrawal from Mineral Entry under All Alternatives” (p. 820).

4.2.1.1. Methods and Assumptions

This section describes the methods and assumptions used in the effects analysis for the locatable minerals resource. The *Locatable Minerals* section of Chapter 3 describes existing locatable minerals resource conditions. In general, the greater the number of acres affected, the greater the effect on the resource. Actions that limit, or impose restrictions upon, the acres of locatable

minerals resource open to mineral entry are considered adverse. Other actions may affect the accessibility to the locatable minerals resource, and these will likely lead to increased project costs by delaying operations or production, or making operations inaccessible during certain times of the year. However, these actions would not affect the locatable minerals resource itself, and are not discussed in detail. Actions that increase the acres of locatable minerals resource (those open to mineral entry) are considered beneficial. Also considered beneficial would be actions that would lead to a reduction in the number of acres currently under restrictions, reduced locatable minerals activities costs, increased opportunities for locatable minerals activities, and/or increased health and safety of workers and/or the general public in/near areas where these activities are occurring or are likely to occur.

Assumptions

The assumptions may include, but are not limited to:

- The occurrence of a locatable mineral does not imply that the mineral can be economically developed.
- Mineral occurrence potential includes both exploitable and potentially exploitable occurrences.
- The potential development activity for the locatable minerals uranium and Wyoming-type bentonite is moderate to high during the planning period.
- The potential development activity for other locatable minerals (e.g., gypsum, metallurgical-grade limestone, many metals and non-metals, gemstones, and Rare Earth Elements (REEs), among others) is low during the planning period.
- The development potential for the locatable mineral Wyoming-type bentonite is high in southwestern Johnson County.
- The development potential for the locatable mineral uranium is moderate to high in southwestern Campbell County and southeastern Johnson County.
- The potential for occurrence in commercial quantities of other locatable minerals (e.g., gypsum, metallurgical-grade limestone, gemstones, and many other metals and non-metals, including REEs and others) across the planning area is low.
- The administration of locatable minerals and related surface-disturbing activities would involve BLM cooperation with the Wyoming DEQ, as outlined in the current BLM Wyoming DEQ MOU for locatable minerals. This MOU (dated November 19, 2003) is entitled “Supplement to MOU No. WY-19 between the DOI, BLM, and the Wyoming DEQ, LQD, for Management of Surface Mining and Exploration for Locatable Minerals on Public Lands” (DOI and State of Wyoming 2003).
- The locatable minerals resource discussed and analyzed in this document consists of only those acres of mineral ownership type “All Mins” for only those lands also having BLM surface ownership (see the *Mineral Resources* section in Chapter 3). Not included are lands in the Bighorn National Forest and the Thunder Basin National Grasslands, as the USFS administers the locatable minerals resource on those lands. Also not included are lands under Department of Defense jurisdiction (e.g., the lands attached to the Veteran's Hospital northwest of Sheridan), as the mineral estate of those lands was transferred to the Department of Defense.
- Notice-level operations do not require approval from the BLM (i.e., no federal action is required). However, such operations are still bound by statutory requirements, including the ESA, the NHPA, and the requirement under the FLPMA and 43 CFR 3809.5 to prevent unnecessary and undue degradation of public lands.
- Development of locatable minerals resources may or may not involve BLM, but must involve only active mining claims. Federally owned locatable minerals resource in lands with BLM surface (the resource analyzed here) is developed through BLM-approved actions

(see the *Mineral Resources* section in Chapter 3). Development of federally owned locatable minerals resources in lands with private or state surface are approved and handled by those entities. However, if an operator cannot obtain the private surface owner's written consent on Stock Raising Homestead Act or certain other lands, BLM will administer the surface estate according to regulations in 43 CFR 3809 for surface-disturbing activities (in accordance with 43 CFR 3809.31). The administration of mineral estate in other lands, including those that have been sold, transferred, or acquired by the federal government, may operate differently (see 43 CFR 3800). For lands where BLM owns the surface estate but not the mineral estate, the mineral estate owner would administer the locatable minerals on those lands; this is extremely uncommon in the planning area, and no projects involving this type of situation are known to currently exist here. Operations not involving BLM are still subject to all appropriate statutory and regulatory requirements.

- Any alternative that restricts locatable minerals activities (mining claim location, exploration, and development) would have some adverse effect on the potential use of the locatable minerals resource.
- Restrictions on the locatable minerals resource (acres open to activities) and/or activities (mining claim location, exploration, and development) apply for the duration of the planning period. However, there could be changes through RMP amendments or changes in regulations.
- Only a few management actions under the alternatives could affect the locatable minerals resource (acres open to locatable minerals activities). These would involve either withdrawing or segregating areas from mineral entry (operation under the mining laws). These actions (withdrawal or segregation) would close those areas to all locatable minerals activities (mining claim location, exploration, and development), subject to valid existing rights.
- Numerous management actions could place restrictions (e.g., timing limitations on certain activities to decrease effects to wildlife) or requirements (e.g., management of topsoil or reclamation activities) on surface-disturbing activities, therefore possibly affecting locatable minerals projects (exploration and development). These restrictions or requirements might increase project costs, but would not affect the available (open) acres of locatable minerals resource, as restrictions can only be imposed to meet the performance standards at 43 CFR 3809.420 for avoiding unnecessary and undue degradation. The WSAs are managed to maintain the suitability of these areas while still under review by Congress regarding their formal designation. They are open to mineral entry, but such activities must be performed so as to not impair their suitability (per 43 CFR 3802), and thus have certain restrictions on locatable minerals activities.
- Except in areas withdrawn or segregated from mineral entry, mining claimants (as defined in 43 CFR 3830.3 and 3830.5) have an inherent right to locate claims, explore, and mine. The BLM cannot revoke this right.

Significance Criteria

In addition to the scale of effects identified above, an adverse effect on the locatable minerals resource as a result of management actions would be considered potentially significant if any of the following were to occur:

- An action would violate objectives associated with locatable minerals resource management (including the *General Mining Law of 1872*, as amended), and its magnitude would be such that special mitigation would be warranted.
- An action would violate the decisions, resolutions, and goals outlined in the current BLM Wyoming DEQ MOU for locatable minerals activities, and its magnitude would be such that special mitigation would be warranted.

- An approved locatable minerals project (an accepted Notice or approved Plan of Operations (POO)) became restricted to the point it would not be feasible to continue operations.
- An approved locatable minerals project (an accepted Notice or approved POO) became restricted to the point it would not be feasible to begin operations.
- New opportunities for locatable minerals exploration and/or development on BLM-administered lands would be substantially reduced.

4.2.1.2. Impacts Common to All Alternatives

This section summarizes management actions common to all alternatives and the likely resulting effects on the federal locatable minerals resource and activities during the planning period due to their implementation. The acres of locatable minerals resource that could be affected, and the percent of the locatable minerals resource those acres represent, indicate the likely possible maximum that would be affected by the given management actions; the actual acres affected could be fewer.

Locatable Minerals

All lands in the planning area not formally withdrawn or segregated from mineral entry (locatable minerals activities) are open to the location of mining claims, and the exploration and development of locatable minerals. The entire resource remains open (777,310 acres, 100%). These acres do not include the three areas already withdrawn from mineral entry (the three WHMAs totalling 11,373 acres, see Table 4.30, “Current Areas Withdrawn From or Containing Restrictions On Mineral Entry under All Alternatives” (p. 820), which were withdrawn on behalf of wildlife resources (see *Wildlife*, below).

Physical Resources

Air Quality

Air quality management actions include implementing mitigation measures, such as dust suppression and cooperative efforts, to reduce dust emissions. These actions could require ongoing monitoring for compliance, which would have a negligible adverse effect on locatable minerals projects through increased costs.

Soil

Soils management actions include an onsite evaluation of proposed projects, mitigation of possible adverse effects on soils, and site-specific reclamation plans. These actions would have a negligible adverse effect on locatable minerals projects through increased costs, for potential additional soil-handling and reclamation steps, and/or amending project site areas or access routes.

Water Resources

Water management actions include managing surface-disturbing activities to prevent degradation of water quality, managing water to meet Wyoming Standards for Healthy Rangelands, and reducing channel and bank erosion. Similar types of mitigation measures are already required for Wyoming DEQ LQD Mine Permits, which are required for locatable minerals development projects. Increased project costs may occur; an overall negligible adverse effect.

Cave and Karst Resources

The cave and karst resources management actions common to all alternatives will not affect the locatable minerals resource or activities.

Mineral Resources

Nearly the entire planning area is available for exploration and development of locatable, leasable, and salable minerals. Existing and future mining of minerals in areas currently open and to become open to those activities could affect the locatable minerals resource by increasing the acres where conflicts with other minerals projects might occur. However, multiple mineral resource uses in the same area are not always physically incompatible. Most potential incompatibility issues would likely result from differences in timing between the projects. This would likely result in increased project costs for one or both projects, due to delays in approval as timing issues are worked out between proponents. If timing cannot be worked out satisfactorily, it is likely one or more proponents would pursue similar projects in another or nearby area, depending on the particular projects they are pursuing.

Leasable Minerals – Coal

Federal coal lands identified as acceptable for further coal leasing consideration, via the April 2001 RMP Revision (BLM 2001a), are available for Lease by Applications (LBAs), lease modifications, emergency leases, and exchanges; potential effect is major adverse (115,372 acres, 15%). However, very little of these acres contain known potentially exploitable occurrences of locatable minerals; the potential effect is likely to be much smaller. Also, coal exploration, leasing, and development do not close any of these lands to mineral entry. Most impacts would likely consist of increased projects costs due to delays and temporary inaccessibility to some sites; effect is likely to be negligible adverse.

Leasable Minerals – Fluids

Effects on locatable minerals projects could be up to minor adverse (20,955 acres, 2.7%) by opening all unleased federal fluid mineral estate to leasing. However, the areas where locatable minerals development would most likely occur during the planning period have moderate to low development potential for oil and gas. Geothermal energy development potential in the planning area is low; therefore, conflicts with this resource are not likely during the planning period. Overall, negligible adverse effects are likely.

Salable Minerals

All lands are open to salable minerals activities except those closed to them. The two main areas where locatable minerals projects are currently developed also contain potentially exploitable salable minerals. However, it's unlikely salable minerals will be sought to be developed in these areas during the planning period as they are plentiful elsewhere. Therefore, the potential effect is likely to be negligible adverse.

Fire and Fuels Management

Fire and fuels management actions could result in increased costs for some locatable minerals projects by temporarily limiting access to certain areas. However, these effects will likely be of short duration, small in areal extent, occur only occasionally, and affect very few projects (negligible adverse).

Biological Resources

Vegetation – Forests and Woodlands

There are no management actions common to all alternatives for forests and woodlands.

Vegetation – Grassland and Shrubland Communities

To reduce effects on grasslands and shrublands, which cover most of the planning area, locatable minerals projects and access roads may need to be sited or redesigned to reduce adverse effects to vegetation. This would increase project costs; a negligible adverse effect.

Vegetation – Riparian/Wetland Resources

To reduce effects on riparian and wetlands areas, which are not uncommon in the planning area, locatable minerals projects and access roads may need to be sited or redesigned to prevent the degradation, loss, or reduction of these resources. Similar types of mitigation measures are already required for Wyoming DEQ Mine Permits, which are required for locatable minerals development projects. Increased project costs likely to result; an overall negligible adverse effect.

Invasive Species and Pest Management

Locatable minerals projects would be recommended to limit surface disturbance to prevent weed spread, required to use certified weed seed-free products during reclamation, and treat reclaimed areas for invasive species, all likely to increase project costs. However, as these treatments should limit the spread of undesirable species, and assist in achieving more successful reclamation, proponents could see decreased overall project costs through avoidance of some planned or additional expenses, resulting in an overall negligible beneficial effect.

Fish and Wildlife Resources – Fish

Barriers to fish passage and activities potentially affecting native and desirable non-native fish species are to be managed with WGFD and other stakeholders. Increased project costs through redesign of water crossings are possible; negligible adverse.

Fish and Wildlife Resources – Wildlife

A number of management actions may lead to temporary inaccessibility to, and/or increase project costs in, certain areas: maintain or improve important wildlife habitats through various treatments and methods; consult with WGFD when applying mitigation, and before waiving, allowing exceptions to, or modifying wildlife-related land use restrictions and mitigation; provide, to the extent possible, suitable habitat and forage to support WGFD (and sometimes BLM modified) wildlife population objectives; manage access to protect crucial habitats; utilize current research, management and conservation plans, and other documents to guide wildlife habitat management; construct new fences to avoid adverse effects to wildlife; work with the WGFD in augmentation and/or reintroduction programs for acceptable wildlife species in suitable habitats; promote maintenance and improvement of habitat for migratory birds of conservation concern consistent with national, regional, and statewide conservation priorities. Overall negligible adverse.

Special Status Species – Plants

Implement actions in recovery plans, conservation measures, terms and conditions, and BMPs, and reasonable and prudent measures within biological opinions for threatened and endangered (T&E) plant species. Allow treatments within habitat and known populations proven to benefit the species. These management actions may temporarily or permanently affect access to, and/or increase project costs in, certain areas. Overall likely negligible adverse effect.

Special Status Species – Fish

A number of management actions may lead to temporary or permanent inaccessibility to, and/or increase project costs in, certain areas: Require modification of projects that may affect Special Status Species (SSS) fish; require the BLM to assist in the restoration, reintroduction, augmentation, or reestablishment of SSS fish populations and habitats; implement actions in recovery plans, conservation measures, terms and conditions, and BMPs, and

reasonable and prudent measures within biological opinions for T&E fish species. Overall likely negligible adverse effect.

Special Status Species – Wildlife (including Greater Sage-Grouse)

A number of management actions may lead to temporary or permanent inaccessibility to, and/or increase project costs in, certain areas: utilize current research, management, and conservation plans and similar related documents to guide SSS wildlife habitat management; implement actions in recovery plans, conservation measures, terms and conditions, protection measures, and appropriate BMPs, and reasonable and prudent measures within biological opinions for T&E wildlife species; maintain seeps, springs, wet meadows, and riparian vegetation in a functional diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas; restore Greater Sage-Grouse brood-rearing habitats in wetland/riparian areas; manage vegetation composition, diversity, and structure to achieve Greater Sage-Grouse habitat management objectives; minimize disturbance that would alter springs and riparian Greater Sage-Grouse habitat, and develop water sources to replace affected or destroyed natural sources; and design water facilities and fences to reduce effects to Greater Sage-Grouse and habitat. Year-round disturbance-free buffer of known active bald eagle nests (329 acres, 0.04%), and seasonal limited access buffer of known active nests (1,366 acres, 0.18%). Some of these areas fall within areas likely to be developed for locatable minerals. Likely overall negligible adverse effect.

Heritage and Visual Resources

Cultural Resources

Maintain and develop relationships with tribes to identify resources important to them and manage these resources to minimize disturbance are the common to all management actions that would affect locatable mineral development. The likely effect would be negligible adverse, as some projects may have increased costs for some projects due to needing to adjust project areas, and also due to some temporary inaccessibility to some project areas.

Paleontological Resources

Retaining public lands with significant paleontological resources would also mean retention of locatable minerals acres. However, as these lands would likely be recommended to be avoided to conserve the paleontological resource, this may result in amending of some project areas; likely overall negligible adverse effect.

Visual Resources

Locatable minerals activities in areas with established VRM classifications would need to conform to the facility siting and design criteria for that classification, thereby blending with the surrounding landscape. Areas with no previously-established visual resource inventory (VRI) rating would be managed to match surrounding VRM classification. Mitigation for adverse effects on visual resources would increase costs for some locatable minerals projects in areas of certain VRM classifications (mostly II, and sometimes III); a likely negligible adverse effect.

Land Resources

Forest Products and Renewable Energy

There are no management actions common to all alternatives for Forest Products or Renewable Energy that would affect the locatable minerals resource or activities.

Lands and Realty

Management actions include the prohibiting of subsequent uses of Recreation and Public Purpose (R&PP) lands if not compatible with that authorization, withdrawals or segregations of surface and/or mineral lands, disposing of lands meeting certain criteria, and modifying, revoking, or terminating certain withdrawals and segregations. Many of these actions could effect the acres of, or restrictions on certain acres of, the locatable minerals resource. Certain withdrawals would result in permanent decreases in the acres of locatable minerals resource. It is likely that more lands will become closed (withdrawn or segregated) to locatable minerals activities due to such actions; minor adverse effect is likely.

Rights-of-Way and Corridors

Management actions include siting new ROWs adjacent to existing disturbances to minimize surface disturbance, which may necessitate modifying the siting of some roads and access routes. ROW for locatable minerals projects are very uncommon: most locatable minerals project-related uses of many areas of BLM surface in/near areas being explored or mined would qualify as legitimate occupancy under 43 CFR 3809 and 3715, making the need for a ROW for those projects unnecessary. Likely a negligible adverse effect, due to possible increased costs for extremely few projects.

Travel and Transportation Management

Management actions include minimizing surface disturbance and erosion, closing roads temporarily or permanently where resource damage is occurring, reclaiming roads if they are heavily eroded, and prohibiting motorized travel if soils would be damaged. These actions may necessitate redesigning and/or reconstructing all or portions of certain roads, and restricting use of certain roads during certain time periods. All these actions would result in increased costs for some projects; as this is not likely to be common, an overall negligible adverse effect is likely.

Recreation

Recreation management actions include allowing dispersed recreation and casual use of public lands throughout the planning area, and minimizing noise and light pollution. More dispersed recreation will result in more vehicles and people travelling across and/or temporarily occupying public lands. This would increase potential hazards to the safety of the public in general, and some project operators. Approximately 20–25 percent of the lands in current authorized locatable minerals projects are BLM surface lands, and several operators must cross other BLM surface lands to access their project sites. This potential increased traffic at some project sites may lead to increased soil compaction, erosion, and/or trash and waste, also leading to increased operational and reclamation costs for these project proponents. Minimization of noise and light pollution near recreation facilities will likely lead to increased costs for some locatable minerals projects. Not likely to affect more than a few projects; overall effect likely to be minor adverse.

Lands with Wilderness Characteristics

Evaluating newly acquired lands and other parcels meeting size and naturalness requirements for wilderness characteristics could temporarily preclude these lands from experiencing locatable minerals activities. This restriction may become permanent for any such designated lands that become officially withdrawn from mineral entry. However, as all lands in the planning area have already been evaluated (see Alternative B), and acquired lands are not open to mineral entry, the likelihood of any further lands (existing or newly acquired) in the planning area meeting such characteristics is extremely low; negligible adverse effect likely.

Livestock Grazing Management

Temporarily fencing off areas being explored and/or mined might be needed to protect livestock, possibly resulting in short-term loss of grazing resources in relatively small areas. This loss will likely be very small, and will be reversed upon completion of reclamation. Costs for some locatable minerals projects will increase due to fencing costs; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern

Currently, there are no designated ACECs in the planning area. However, should any ACECs be designated with the implementation of this RMP revision, management actions common to all include evaluating BLM-authorized activities and developing mitigation to protect the integrity of the characteristics for which the ACECs were designated. As approximately half the authorized and pending locatable minerals projects occur in or near potential ACECs, this management will likely increase costs or restrict certain activities for those projects. However, until particular ACECs are designated, it is difficult to accurately predict the likely impact. Potentially up to a major adverse effect.

Scenic or Back Country Byways

Currently, there are no designated byways in the planning area. However, should any byways be designated after this RMP revision is approved, management actions common to all include managing byways with the objective of protecting the resource values of the area. Such designation likely will not involve instituting any restrictions to size, frequency, or timing of large truck traffic, or the institution of a viewshed buffer along the byway within which few or very select disturbances may occur. Although approximately 50 percent of current authorized and pending locatable minerals projects utilize, or are near, the roads that have been identified as potentially being designated as byways, there will likely be no effect.

Wild and Scenic Rivers

Currently, there are no designated WSRs in the planning area. Management actions common to all include continuing to implement the Manual 6400 – *Wild and Scenic Rivers* for the one proposed WSR (2,664 acres, 0.34%), which involves restricting surface disturbance within that area until Congress acts on the designation. Although some metallurgical-grade limestone is known to occur in this area, it is not likely to be an exploration or development target due the rugged terrain and long distance to market; such material can be found in other areas much easier to access and/or closer to market. In addition, Congress is not expected to act during the planning period. Negligible adverse effect.

Wilderness Study Areas

Currently, there are three WSAs in the planning area (28,931 acres, 3.72%). Management actions common to all include continuing to implement the *BLM Manual 6330 - Management of Wilderness Study Areas* for these WSAs, which includes restriction on certain locatable minerals activities in these areas (per 43 CFR 3802) until Congress acts on these proposals. As Congress is not expected to act during the planning period, and the BLM's recommendation is to not officially designate these areas, these areas will remain restricted from only certain locatable minerals activities, not closed to mineral entry. None of these areas are known to contain commercial amounts of locatable minerals, and are therefore unlikely targets for exploration or development activities. The effect is likely negligible adverse.

Socioeconomic Resources

Social and Economic Conditions

The BLM will utilize local and state socioeconomic plans, quantify socioeconomic effects where possible, and manage in consideration of the fact that BLM actions are integrally connected with the socioeconomic and cultural health of the planning area. Effects on locatable minerals projects would likely be increased costs; negligible adverse.

Health and Safety

Health and safety management actions seek primarily to ensure proper health and safety measures are included in mine plans, including proper procedures for handling spills and releases of hazardous substances. Waste minimization practices are encouraged, including reusing, recycling, and substituting when appropriate. Effects to locatable minerals projects would likely be increased costs; however, many of these measures are already included in their Wyoming DEQ Mine Permits, so few additional expenses would be likely. The resulting increases to the health and safety of the public, and those very few affected operators, is incalculable though. Overall negligible beneficial.

4.2.1.3. Alternative A

This section summarizes management actions under Alternative A, which is the continuation of current management, and the likely resulting effects on the federal locatable minerals resource and/or activities during the planning period due to their implementation.

Locatable Minerals

Currently, there are three WSAs, totaling 28,931 acres (3.72%), in the planning area where certain locatable minerals activities are allowed while these areas are under Congressional review. This leaves 748,379 acres (96%) open to mineral entry with certain restrictions, per 43 CFR 3802. See *Special Designations – Wilderness Study Areas* below for discussion of their impact.

Physical Resources

Air Quality

The requirement for analysis of anticipated effects of proposed activities on air quality, and modeling on a project-specific basis, would likely increase locatable minerals project costs; a negligible adverse effect.

Soil

Soils management actions include prohibitions on surface-disturbing activities on slopes equal to or greater than 25 percent (170,590 acres, 22%), in areas with poor reclamation suitability (455,090 acres, 58%), and seasonally in areas of severe erosion hazard (215,496 acres, 28%); all these prohibitions have provision for waivers, however. Prohibitions also on surface-disturbing activities have been applied on a project-specific basis for areas of LRP, such as badlands, rock outcrops, biologic crusts, and slopes susceptible to mass wasting (218,928 acres, 28%). Topsoil is to be salvaged during project activities and reapplied during reclamation. Approximately 50 percent of BLM surface lands within currently authorized and pending locatable minerals projects occur in areas containing rock outcrops and/or steep slopes. Rock outcrops and steep slopes are typical targets for location of mining claims, and exploration and development activities, as these areas tend to reveal and expose geology that is often hidden elsewhere (sometimes close by) under overlying soil and/or rock layers. As the RFA for locatable minerals is that 556 acres of the federal locatable mineral resource that BLM administers are expected to be disturbed during the planning period (0.07%), the effect will likely be higher, and due almost

entirely to increased costs associated with potential additional topsoil handling and reclamation requirements; likely effects are negligible adverse.

Water Resources

Prohibition on surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams may have up to a minor adverse effect (19,861 acres, 2.5%). However, some mitigation measures regarding these features are already required for Wyoming DEQ Mine Permits. In addition, as these areas are usually undesirable for locatable minerals projects due to such areas' inherent issues, and other considerations (such as grazing), much of this restriction is actually already taken into account when sites are selected. In addition locatable minerals RFA is 554 acres of disturbance (0.07%); a negligible adverse effect is likely.

Cave and Karst Resources

Prohibitions on surface disturbance within a buffer around significant cave entrances may be applied on a project-specific basis (up to 11 acres, less than 0.01%); however, none have affected locatable minerals projects. No locatable minerals projects exist in these areas, and the likelihood of any being proposed here is quite low; although some metallurgical-grade limestone is known to occur in these areas, the terrain is generally rugged, and these areas are some distance from where the materials might be used or sold. These factors would very likely increase mining and transportation costs beyond economic feasibility, and this resource can be mined in many other areas economically. Low probability of projects and possible increased project costs from redesigning or amending project sites. In addition, locatable minerals RFA is for 554 acres (0.07%); negligible adverse.

Mineral Resources

Leasable Minerals – Coal

The RFA for coal projects is 195,700 acres, and 554 acres for locatable. If these two resources conflicted over all 554 acres, which is unlikely as commercial quantities of locatable minerals are typically found elsewhere in the planning area, none of these lands would be closed, withdrawn, or segregated from mineral entry; negligible adverse.

Leasable Minerals – Fluids

Although fluid mineral development could conflict with a large percentage of the locatable minerals resource, those areas most likely to experience exploration and development for locatable minerals have mostly moderate to low potential for oil and gas development. The RFA for oil and gas projects is that 10,575 acres will be developed; 554 acres for locatable minerals projects. Even if there were conflicts between the two resources over all 554 acres, none of these lands would be closed, withdrawn, or segregated from mineral entry; negligible adverse. Geothermal energy development potential in the planning area is low, therefore, conflicts with this resource are not likely during the planning period.

Salable Minerals

The RFA for salable minerals is 530 acres, and locatables is 554. Even if there were conflicts between the two resources over all 530 acres, no lands would be closed, withdrawn, or segregated from mineral entry; negligible adverse effect.

Fire and Fuels Management

Inadvertent damage to property and facilities or temporary access limitations to locatable minerals project sites could occur during fire suppression or prescribed fire activities. Such effects likely would be of short duration, small in areal extent, and occur only occasionally. These limitations may increase project costs for a relatively few projects.

Biological Resources

Vegetation – Forests and Woodlands

Timber harvest and other vegetative treatments may temporarily limit access to certain locatable minerals project sites. However, such limitations would likely be of relatively short duration, small in areal extent, and occur only occasionally, and relatively few areas with known commercial quantities of locatable minerals occur in or near wooded areas. Project costs would likely increase, but for relatively few projects; negligible adverse.

Vegetation – Grassland and Shrubland Communities

Use of non-native species in reclamation seed mixtures has been approved on a project-specific basis. The BLM reclamation policy allows the use of non-native species; a primary goal of reclamation is soil stabilization, and vegetation species are chosen towards that end. Changes in seed mix may increase project costs; however, more successful reclamation would likely lead to minimization of reclamation costs. Overall, the effect may likely be negligible beneficial.

Vegetation – Riparian/Wetland Resources

Prohibitions on surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams may affect up to 23,831 acres (3.07%); however, this prohibition can be waived. In addition, some mitigation and avoidance measures for such areas are already required for Wyoming DEQ Mine Permits, and many of these areas are already avoided due to their inherent issues. Negligible adverse effect likely.

Invasive Species and Pest Management

Invasive species and pest management actions could include areas treated and/or species-specific treatment strategies, applied on a project-specific basis to public lands. These treatments may increase locatable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species, resulting in likely lower planned project expenses or avoidance of additional project costs; negligible beneficial.

Fish and Wildlife Resources – Fish

Project-specific prohibitions on surface-disturbing and disruptive activities within 0.25 mile of naturally occurring water bodies containing acceptable fish species could result in an adverse effect to locatable mineral development (51,745 acres, 6.66%). Maintenance of reservoirs and riparian areas to enhance potential fisheries could have a negligible adverse effect. Other restrictions may also apply which will likely increase project costs. However, these areas will likely be avoided for locatable minerals development; Wyoming DEQ Mine Permits should already include mitigation to avoid some of these areas. Overall negligible adverse, due to likely increased project costs.

Fish and Wildlife Resources – Wildlife

Wildlife management actions include a number of distance and/or timing limitations or prohibitions on surface disturbance and occupancy in certain areas and habitats, and all will have adverse effects: year-round within the three big game WHMAs (4,583 acres, 0.59%); within 0.5 mile of big game migration corridors (9,587 acres, 2.00%), within 750 feet of sharp-tailed grouse

leks (940 acres, 0.12%), and within the biologic buffer of active raptor nests (255,129 acres, 33%); seasonally within elk crucial winter range and calving areas (75,175 acres, 9.67%), and, within 0.64 mile of sharp-tailed grouse leks (7,607 acres, 0.98%). Other restrictions may also apply which will likely increase project costs, such as no removal of elk security habitat (132,148 acres, 17%). Approximately 25 percent of BLM surface lands within locatable minerals projects occur in/near these areas. The likely effect will be negligible adverse, from increased project costs due to amending project designs and/or areas and delays.

Special Status Species – Plants

Project-specific restrictions to protect SSS plants would have an adverse effect on the locatable minerals resource (126,811 acres of suitable habitat on BLM surface, 16%). Surface-disturbing activities would avoid SSS plant populations, leading to adjustments of some project sites and/or access roads, or temporary inaccessibility to sites. SSS plants have very specific habitat requirements and therefore tend to occur in small areas, and with an RFA of 554 acres for locatable minerals, overall likely effect is negligible adverse.

Special Status Species – Fish

Year-round project-specific restrictions to protect SSS fish (within 0.25 mile of any waters containing SSS fish) may have a negligible adverse effect (818 acres, 0.10%). Other restrictions may also apply which will likely increase project costs. Overall negligible adverse.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Measures to protect SSS wildlife include a number of distance and/or timing restrictions or prohibitions for certain areas and habitats, and all will have an adverse effect on the locatable minerals resource: within prairie dog colonies (6,156 acres, 0.79%); near Greater Sage-Grouse strutting grounds (year-round restricted [0.25 mile] – 3,594 acres, 0.46%; seasonally prohibited [2 miles] – 203,724 acres, 26%); near bald eagle winter roosts, hunting, and concentration areas (year-round – 402 acres, less than 0.05%; seasonally – 3,013 acres, 0.4%); near raptor nesting areas (17,345 acres, 2.2%). Other restrictions may also apply which will likely increase project costs. Approximately 25 percent of locatable minerals projects occur in or near these areas, and with an RFA of 554 acres for locatable minerals projects, the likely effect will be negligible adverse.

Heritage and Visual Resources

Cultural Resources

Prohibitions of surface-disturbing activities within 0.25 mile or visual horizon of portions of the Bozeman Trail and Crazy Woman Battle Site could affect the locatable minerals resource (3,588 acres, 0.46%). Project-specific prohibitions on surface-disturbing activities in certain areas containing historic properties or sensitive or sacred sites (such as TCPs, which includes the Pumpkin Buttes TCP) may adversely affect locatable minerals development. Other project-specific requirements (such as archeological and/or Native American monitors) would likely increase locatable minerals project costs. Many of these areas are already protected to a certain degree by other means; however, many will only be discovered through surface-disturbing activities. Also, locatable mineral deposits are plentiful in other areas, and some projects can be mitigated or redesigned to reduce impacts. The likely up to minor beneficial effect to Cultural Resources (due to new discoveries of Cultural Resources) will mostly offset the likely negligible adverse effect to locatable minerals activities.

Paleontological Resources

Project-specific prohibitions in areas identified as containing paleontological resources of high quality or importance may have a negligible adverse effect (860 acres, 0.11%). Other project-specific requirements (such as paleontological field surveys) would likely increase locatable minerals project costs. Similar to Cultural Resources, the up to negligible beneficial effect to Paleontological Resources (due to new discoveries through surface-disturbing activities), will be mostly offset by the negligible adverse effect to the Locatable Minerals Resource (due to prohibitions); negligible adverse effect likely.

Visual Resources

Locatable minerals activities in areas with established VRM classifications would be required to conform to the objectives and characteristics of that classification, especially regarding the siting and design of facilities. Areas with BLM surface not rated will be managed to conform to the surrounding classification. Other project-specific requirements (such as visual simulation and mitigation design) may be applied. These limitations and requirements would likely increase project costs, with likely a negligible adverse effect.

Land Resources

Forest Products

Management actions include the sale of forest products, and fencing of regeneration areas. Some portion of the forest product-related activity is predicted to occur on BLM-managed woodlands and noncommercial forestlands. These activities may temporarily limit access to certain locatable minerals projects; such limitations would likely be temporary, small, and occasional. As relatively few locatable minerals projects occur in/near wooded areas, and with an RFA of 554 acres, the likely effect would be negligible adverse.

Lands and Realty

Land tenure adjustments may occur on behalf of other resources and even other agencies, and these could increase or decrease BLM surface and/or federal mineral acres. Neither increasing BLM surface acres nor federal mineral acres would increase the locatable minerals resource, (both the total resource, and the BLM-administered portion of there source), as acquired lands are not open to mineral entry (locatable minerals activities). Decreasing BLM surface acres or federal mineral acres might decrease the locatable mineral resource (total resource, and BLM-administered portion), depending on the types of mineral ownerships of the lands involved. Lands identified for acquisition are those adjacent to large blocks of BLM surface and in areas of high recreational potential (118,254 acres, 15%), while lands identified for disposal include those with agricultural potential or water (76,223 acres, 9.81%) and small isolated parcels (totaling 120,722 acres, 15%). It is extremely difficult to predict exactly which land tenure adjustments will occur during the planning period: exchanges and sales are usually initiated by those parties interested in obtaining those lands; donations are typically initiated by the donors; and, acquisitions are often initiated by the sellers, or by BLM in response to an eminent need. In addition, such land tenure adjustments can take a number of years to complete. The identified acquisitions and disposals, should they all occur during the planning period, would lead to an overall decrease in the locatable minerals resource (78,691 acres, 10%). As discussed, it is much more likely that much fewer acres will be affected, however; overall, likely up to minor adverse effect.

Renewable Energy

Approved renewable-energy projects on public lands would result in segregations of those

acres from mineral entry, removing those acres from the locatable minerals resource. Some renewable-energy projects will be long-lived, and others not as long lived, and some may not be incompatible with certain locatable minerals activities. Those lands segregated would be made open again after the renewable-energy site is released from the segregation. Although no renewable-energy projects on public lands in the planning area have been received to date, it is predicted that 20,000 acres (2.57%) of BLM surface will be disturbed during the planning period for these projects. Only approximately 15-25 percent of the acres currently identified as most likely to be developed for renewable energy projects are in areas likely to be developed for locatable minerals projects, in/near the Southern Big Horn Mountains. Renewable energy projects are not likely to be approved in these areas, however (see Chapter 3, *Renewable Energy* section). Although the locatable minerals RFA is just 1,256 acres (0.16%), the level of impact from renewable energy could be up to that total amount (20,000 acres, 2.57%). However, it is more likely that much fewer acres will be affected; minor adverse effect.

Rights-of-Way and Corridors

Some proposed ROW (for roads, access routes, and/or facilities) may need to be modified to be placed within existing ROW, and away from major transportation routes. The RFA for ROWs is 38,762 acres, and that for locatable minerals is 556 acres, and conflict over all 556 acres would be a negligible adverse impact (0.07%). In addition, ROWs for locatable minerals projects are extremely rare (see *Impacts Common to All Alternatives*), so any ROWs issued for such uses would likely be very few and likely only to increase costs for very few projects. No CCS projects have been received for public lands in the planning area to date. It is likely that some will be, as the current political climate appears to favor this type of action for managing GHGs, and much of the planning area contains geological formations currently believed to be amenable to these projects. Current management direction is to approve these as Land Use Application Permits (see the *Geological Resources* section in Chapter 3). Impacts from these types of permits could be up to the total locatable minerals resource (777,310 acres, 100%). However, as these projects will likely take some time to approve due to their complexity and the current financial climate, it is much more likely that the effect will be minor adverse.

Travel and Transportation Management

A number of area-specific restrictions to motor vehicle use, seasonally or year-round, may increase locatable minerals project costs for project proponents. However, these areas would not be completely inaccessible for exploration as a number of activities can be performed without motorized vehicles, a negligible adverse effect is likely.

Recreation

No SRMAs are proposed under Alternative A, although surface disturbance would be prohibited within 0.5 mile of the Dry Creek Petrified Tree EEA. However, there are no known commercial deposits of locatable minerals within the EEA, and given an RFA of 554 acres (0.07%) for locatable minerals, an overall negligible adverse effect is expected.

Lands with Wilderness Characteristics

Acquired lands would be evaluated for wilderness characteristics. It is unlikely any acquisitions would contain wilderness characteristics, and acquired lands are not open to mineral entry. No effect.

Livestock Grazing Management

Temporarily fencing off of some areas being explored and/or mined might be needed to protect livestock. Locatable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern

There are presently no ACECs or Byways designated, and none are proposed under Alternative A; therefore, no effect.

Wild and Scenic Rivers

There are no Alternative A management actions for WSR that would result in an effect.

Wilderness Study Areas

Currently, there are three areas in the planning area where locatable minerals activities are restricted while under Congressional review: the WSAs, totaling 28,931 acres, (3.72%). As Congress is not expected to act during the planning period, and the BLM's recommendation is to not officially designate these areas, these areas will remain open to certain locatable minerals activities. However, such activities must comply with the regulations at 43 CFR 3802, which have stringent requirements. No effect.

Socioeconomic Resources

Social and Economic Conditions

The BLM will recognize and consider local and regional economic development and land use plans. BLM management could further restrict or limit certain lands, or not limit or restrict others, as a result of the implementation of this action. The effect is difficult to predict, but may result in slightly more area placed under restrictions; negligible adverse.

4.2.1.4. Alternative B

This section summarizes management actions under Alternative B, which emphasizes resource conservation, and the likely resulting effects on the federal locatable minerals resource and/or activities during the planning period due to their implementation.

Locatable Minerals

The three WSAs (totaling 28,931 acres, 3.72%) are open to certain locatable minerals activities, per 43 CFR 3802, which outlines stringent requirements. Conservation measures implemented for other resources under Alternative B would result in a total of 717,741 acres (92%) being recommended for withdrawal from mineral entry (includes the three WSAs). If all these acres were to become withdrawn, this would leave just 59,569 acres open to mineral entry (7.66% of the resource). However, as all these withdrawals are proposed on behalf of other resources (Wildlife Resources, Cultural Resources, Paleontological Resources, Recreation, Lands with Wilderness Characteristics, ACECs, WSRs, and WSAs), the impacts of these withdrawals are discussed under those resources, below.

Physical Resources

Air Quality

Quantitative air quality modeling, and mitigation to ensure project emissions would approach or exceed emissions standards, are required. This would likely increase project costs; negligible adverse.

Soil

Management actions for soils include prohibitions on surface-disturbing activities in areas with severe erosion hazard (215,496 acres, 28%), on slopes equal to or greater than 25 percent (170,590 acres, 22%), in areas with poor reclamation suitability (455,090 acres, 58%), and on areas with LRP (218,928 acres, 28%). Approximately 25 percent of BLM surface lands within currently authorized and pending locatable minerals projects occur in such areas; also, locatable minerals RFA is 277 acres, (0.04%). Likely negligible adverse effect, due to increased costs for certain projects; these lands are not closed to locatable minerals activities.

Water Resources

Surface disturbance is prohibited within 500 feet of springs, reservoirs, water wells, and perennial streams (19,861 acres, 2.56%). These areas are usually undesirable and avoided due to their related inherent problems, and other considerations; the effect will likely be negligible adverse.

Cave and Karst Resources

Surface disturbance is prohibited within cave and karst areas (101,455 acres, 13%). The likelihood of locatable minerals projects being proposed in cave and karst areas is quite low, due to rugged terrain, and long distance to market. The impact to locatable minerals projects is likely negligible adverse, from increased project costs due to redesigning or amending very few project sites to avoid these areas, and these areas are not closed to locatable minerals activities.

Mineral Resources

Leasable Minerals – Coal

The RFA for coal projects is 186,600 acres and 278 for locatable minerals. Even if there are conflicts between these two resources over all 278 acres, that is 0.04 percent of the locatable minerals resource. Conflict in those areas is unlikely though, as known commercial deposits of locatable minerals are mined outside areas most likely to be developed for coal. Also coal projects do not result in closures of such areas to mineral entry. Negligible adverse effects are anticipated due to increased project costs from delays due to possible conflicts.

Leasable Minerals – Fluids

Conflict with oil and gas projects could potentially affect up to 332,931 acres of the locatable minerals resource, 42.83 percent. However, the RFA for oil and gas projects is 286 acres; 277 for locatable minerals. Even if there are conflicts between these two resources over all 277 acres, that is 0.04 percent of the locatable minerals resource. Conflict in those areas is unlikely, though, as locatable minerals in commercial quantities are not known to occur in most areas likely to be developed for oil and gas projects. Negligible adverse effects are expected due to increased project costs from delays due to possible conflicts.

Salable Minerals

A total of 3,218,690 acres will be closed to salable minerals activities under Alternative B, leaving 129,431 acres open. Conflicts between these two minerals could affect up to 24,232 acres of the locatable minerals resource (3.12%). However, the RFA for salables is 114 acres, and locatables 277. It is unlikely salable minerals will be sought to be developed in the two known areas where locatable minerals occur in commercial quantities, as they are plentiful elsewhere. Therefore, the potential effect is likely to be much smaller; negligible adverse, due to increased project costs from possible delays.

Fire and Fuels Management

Not all fires will be suppressed, likely resulting in types and extents of effects similar overall to those under Alternative A. Most affected locatable minerals projects, not likely to be many, may experience lesser extents, and a few greater, if in an area that experiences a larger burn due to non-suppression. Overall negligible adverse, due to increased project costs.

Biological Resources

Vegetation – Forests and Woodlands

Types of effects are similar to, but likely of lesser extent than, those under Alternative A, as silviculture and pest control treatments, techniques, and methods will be less extensively used (negligible adverse).

Vegetation – Grassland and Shrubland Communities

Requiring use of only native species for all reclamation activities may lead to increased project costs due to higher costs for some native seed species. Overall, likely negligible adverse effect.

Vegetation – Riparian/Wetland Resources

Prohibitions on surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams may effect up to 23,831 acres (3.07%); however, an RFA of 278 acres for locatable minerals (0.04%) and little of this development would be likely in riparian or wetland areas. Negligible adverse effect.

Invasive Species and Pest Management

Invasive species and pest management actions could include area- and/or species-specific treatment strategies, applied on a project-specific basis to public lands. These treatments may increase locatable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species to project sites, resulting in likely lower planned project expenses or avoidance of additional project costs; beneficial effect likely.

Fish and Wildlife Resources – Fish

Surface-disturbing and disruptive activities are prohibited within 0.25 mile of naturally occurring water bodies containing acceptable fish species (51,745 acres, 6.66%). Reservoirs and riparian areas are managed to enhance potential fisheries. Other actions will likely increase project costs. These areas are already mostly avoided due to mitigation on Wyoming DEQ Mine Permits, and given the locatable minerals RFA is 277 acres, an overall negligible adverse effect is likely, from increased project costs.

Fish and Wildlife Resources – Wildlife

All distance and/or timing limitations or prohibitions are required in Alternative B, and all will adversely affect the locatable minerals resource or projects. These are within: big-game WHMAs (11,373 acres, 1.46%); 0.5 mile of big game migration corridors (9,587 acres, 2.00%); Elk crucial winter range and calving areas (75,175 acres, 9.67%); within 750 feet of sharp-tailed grouse leks year-round (940 acres, 0.12%) and 0.64 mile seasonally (7,607 acres, 0.98%); biologic buffers of active raptor nests (255,129 acres, 33%), and species of conservation concern (171,859 acres, 22.11%). Also, removal of elk security habitat is restricted (132,148 acres, 17%). Other restrictions also apply which will likely increase project costs, including applying seasonal restrictions on existing projects (approximately 530 acres, 0.07%). With approximately 25 percent of locatable minerals projects occurring in/near these areas, and an RFA of 277 acres, the likely effect will be negligible adverse, from increased project costs due to amending relatively few

project designs and/or areas and delays. However, a WHMA is recommended to be designated for the Fortification Creek area elk herd's crucial and yearlong ranges, with these areas recommended for withdrawal from mineral entry (12,419 acres, 1.60%); minor adverse impact.

Special Status Species – Plants

Surface-disturbing activities are required to avoid SSS plant habitat (126,811 acres, 16%), necessitating possible modifications of some project sites and/or access roads. These habitat areas are quite small, and given an RFA of 277 acres for locatable minerals, likely effect is negligible adverse.

Special Status Species – Fish

Surface-disturbing and disruptive activities are prohibited 0.25 mile of any waters containing SSS fish (818 acres, 0.11%). Other prohibitions and requirements apply, likely increasing project costs. Overall negligible adverse.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Restricted and prohibited for all projects are surface-disturbing, disruptive, and/or occupancy activities, and other management actions, to conserve SSS wildlife within the following areas: prairie dog colonies (6,156 acres, 0.79%, minor adverse); Greater Sage-Grouse areas (4.0-mile perimeter around occupied and undetermined leks and winter concentration areas, regardless of habitat suitability – 510,100 acres, 65.62%; greater than 4.0 miles of occupied and undetermined leks in nesting and brood-rearing habitat seasonally – 91,528 acres, 12%; 4.0 miles of winter concentration areas seasonally – 346,987 acres, 45%; habitat greater than 4.0 miles of winter concentration areas seasonally – 79,547 acres, 10%); seasonally within 1.5 miles of SSS raptor nests (183,269 acres, 24%); biologic buffer of special status raptors (113,784 acres, 15%); and habitats of SSS amphibians and reptiles (246,201 acres, 32%). Other requirements also apply which will likely increase project costs: restoration of disturbed sagebrush communities, increasing visibility of existing fencing in Greater Sage-Grouse habitat, and anti-perching devices on powerlines. Some projects may not be approved if they would result in more than one disturbance or 3 percent of total surface disturbance per 640 acres within 4.0 miles of Greater Sage-Grouse leks or winter concentration areas. Approximately 50 percent of locatable minerals projects occur in these areas (approximately 265 acres); and an RFA of 277 acres for locatable minerals projects (0.04%). Likely effect will be negligible adverse, from increased costs for certain projects.

Heritage and Visual Resources

Cultural Resources

Surface-disturbing activities are prohibited within 5 miles or visual horizon of portions of historic properties that retain their integrity of setting (222,978 acres, 29%). Withdrawal from mineral entry is recommended for areas containing historic properties that retain their historic setting (totaling 128,338 acres, 17%); withdrawal of all these acres will result in a major adverse impact. Other requirements will likely increase locatable minerals project costs: archeological monitors for all surface-disturbing activities, and Native American monitors when requested by tribes.

Paleontological Resources

Areas containing paleontological resources of high quality or importance are prohibited to locatable minerals activities (860 acres, 0.11%); these areas would be designated for special management, as they are identified. Withdrawal from mineral entry is recommended for certain areas containing paleontological resources of high quality or importance (40 acres,

less than 0.01%); withdrawal of these acres will result in a negligible adverse impact. Other requirements would likely increase locatable minerals project costs: paleontological field surveys for all Potential Fossil Yield Classification (PFYC) Class 3, 4, and 5 formations; monitoring of surface-disturbing activities on all PFYC Class 4 and 5 formations, and Class 3 as needed.

Visual Resources

Areas will be managed according to their VRM classes. Visual simulation and mitigation design is required within or viewable from areas of VRM Classes I to III; this will likely increase project costs. Likely negligible adverse.

Land Resources

Forest Products

Required temporary fencing of regeneration areas increase costs to certain locatable minerals projects, although relatively few locatable minerals projects occur in/near wooded areas. The likely effect is negligible adverse due to increased project costs from temporary inaccessibility to certain sites.

Lands and Realty

Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate (see Alternative A). Lands having resource value will be retained (76,223 acres, 9.81%). Lands identified for disposal (120,722 acres, 15%) will be disposed of, with longest retention of those with higher resource values. Lands will be acquired as willing sellers make them available, with no priority to those adjacent to large blocks of BLM surface or areas of high recreational potential. Although it is difficult to predict which land tenure adjustments will occur during the planning period, if all those currently identified were to occur, the locatable minerals resource would decrease (44,449 acres, 5.72%). It is more likely that much fewer acres will be disposed of (see Alternative A). Overall, likely up to negligible adverse impact.

Renewable Energy

Approved renewable-energy projects on public lands would result in segregations of those acres from mineral entry, closing those acres to locatable minerals activities until they are released from those segregations. Some renewable-energy projects may not be incompatible with certain salable minerals activities; see Alternative A. It is predicted that 5,000 acres of BLM surface (0.64% of BLM-administered locatable minerals resource) will be disturbed during the planning period for these projects. Effect could potentially be up to that total amount, negligible adverse.

Rights-of-Way and Corridors

ROWs will need to be placed within identified corridors, and away from major transportation routes. The RFA for ROWs is 18,011 acres (2.32% of BLM-administered locatable minerals resource), and that for locatables is 278; conflict over all 278 acres would be negligible adverse impacts (0.04%), due to increased costs for few projects. Carbon Capture and Storage (CCS) research and projects would be prohibited. In addition, ROWs for locatable minerals projects are extremely rare (see *Impacts Common to All Alternatives*). Overall negligible adverse effect.

Travel and Transportation Management

A number of area-specific restrictions to motor vehicle use may increase locatable minerals project costs for certain project proponents. However, these areas might not be completely inaccessible as a number of exploration activities can be performed without motorized vehicles.

Projects in these areas are not likely to be common as locatable minerals are plentiful elsewhere, likely negligible adverse effect, from increased costs for relatively few projects.

Recreation

A total of two Extensive Recreation Management Areas (ERMAs) (totaling 726,573 acres, 93%) and eight SRMAs (totaling 54,590 acres, 7.02%) are proposed for designation, with withdrawal from mineral entry recommended for all SRMAs designated via this RMP. This could result in up to a moderate adverse effect, if all eight SRMAs are designated and withdrawn from mineral entry. Some of these potential SRMAs are already under some restrictions, and some are in areas not likely to be sought for locatable mineral activities due to ruggedness of terrain and distance to likely markets.

Lands with Wilderness Characteristics

One area of lands with wilderness characteristics (12,237 acres, 1.57%) is recommended to be managed to emphasize primitive recreational opportunities and natural values, which includes recommendation for withdrawal from mineral entry; up to minor adverse impact. Much of the lands with wilderness characteristics area is not likely to be sought for locatable minerals activities, however, due to rugged terrain and long distance to markets.

Livestock Grazing Management

Temporarily fencing off areas being explored and/or mined might be needed to protect livestock. Locatable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern

A total of eight ACECs are proposed for designation (totaling 511,000 acres, 69%). Withdrawal from mineral entry is recommended for ACECs designated, resulting in up to a major adverse impact. One of these eight ACECs, the Sagebrush Ecosystem ACEC, was proposed to help protect sagebrush habitat, which would help protect the Greater Sage-Grouse (467,897 acres, 60%). However, some of these potential ACECs are already under some restrictions, and some are in areas not likely to be sought for locatable mineral activities due to ruggedness of terrain and distance to markets.

Scenic or Back Country Byways

A number of roads (up to 89 miles or more) will be evaluated during the planning period for their eligibility to be proposed as National Back Country or Scenic Byways. No effect is anticipated, as designation would not preclude locatable mineral activities.

Wild and Scenic Rivers

One WSR (2,664 acres, 0.34%) is under Congressional review, and is managed according to Manual 6400 - *Wild and Scenic Rivers*, which includes surface disturbance restrictions. This area is also recommended for withdrawal from mineral entry. If Congress does not designate this WSR, the present restrictions would likely continue until Congress acts on the designation. Although Congress is not expected to act during the planning period, these restrictions result in negligible adverse impact to the locatable minerals resource; withdrawal would permanently remove these acres, the same type and degree of impact. However, this area is not a likely target for locatable minerals activities, given its remote location and rugged terrain.

Wilderness Study Areas

Currently, there are three areas in the planning area where locatable minerals activities are restricted while under Congressional review: the WSAs, totaling 28,931 acres (3.72%). As Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas; however, they are recommended for withdrawal from mineral entry. These areas are currently open to certain locatable minerals activities under the regulations at 43 CFR 3802, which includes stringent requirements for retaining the areas' characteristics. If these areas are withdrawn, these areas become closed to all locatable minerals activities; up to minor adverse impact.

Socioeconomic Resources

Social and Economic Conditions

The BLM will consider local and regional economic development and land use plans. BLM management could further restrict or limit certain lands, or not limit or restrict others, as a result of the implementation of this action. In addition, mitigation strategies will be developed as needed to resolve conflicts that have detrimental effects to multiple resources. Effect is difficult to predict, but may result in slightly more area placed under restrictions; negligible adverse.

4.2.1.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource utilization, and the likely resulting effects on the federal locatable minerals resource and/or activities during the planning period due to their implementation.

Locatable Minerals

The three WSAs (totaling 28,931 acres, 3.72%) are open to certain locatable minerals activities, per 43 CFR 3802, which includes stringent requirements. Conservation measures implemented for other resources under Alternative C would result in these 28,931 acres continuing to be closed to certain locatable minerals activities; this would leave 748,379 acres open to all locatable mineral activities, 96.3% of the current resource. As this restriction is on behalf of WSAs, see that resource below for this impact.

Physical Resources

Air Quality

Quantitative air quality modeling is not required. No effect.

Soil

Surface-disturbing activities are allowed, as consistent with other resource values. These include in areas with severe erosion hazard, poor reclamation suitability, LRP, and on slopes equal to or greater than 25 percent. There will be no effect to the locatable mineral resource.

Water Resources

Surface disturbance is allowed within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams. No effect.

Cave and Karst Resources

A buffer is required around significant cave entrances (10 acres, less than 0.01%), negligible adverse.

Mineral Resources

Leasable Minerals – Coal

The RFA for coal projects is 195,700 acres and 1,460 for locatable minerals. Even if there are conflicts between these two resources over all 1,460 acres, that is 0.19 percent of the locatable minerals resource. Conflict in those areas is unlikely though, as known commercial deposits of locatable minerals are mined outside areas most likely to be developed for coal. Also coal projects do not close those areas to mineral entry. Negligible adverse effects are anticipated due to increased project costs from delays due to possible conflicts.

Leasable Minerals – Fluids

A total of 30,520 acres will be closed to fluid mineral leasing, leaving 3,356,010 acres open to oil and gas projects. Conflict with oil and gas projects could potentially effect up to the entire locatable minerals resource. However, the RFA for oil and gas projects is 22,255 acres, 1,455 acres for locatable minerals. Even if there are conflicts between these two resources over all 1,455 acres, that is 0.19 percent of the locatable minerals resource. Conflict in those areas is unlikely, though, as locatable minerals are not known to occur in commercial quantities in most areas likely to be developed for oil and gas projects.

Salable Minerals

A total of 57,213 acres will be closed to salable minerals activities under Alternative C, leaving 3,290,908 acres open. Conflicts between these two minerals could affect up to 24,232 acres of the locatable minerals resource, 3.12 percent. The RFA of salable is 2,090 acres, and locatables is 1,455 acres. It's unlikely salable minerals will be sought to be developed in the two known areas where locatable minerals occur in commercial quantities, as they are plentiful elsewhere. Therefore, the potential effect is likely to be much smaller; negligible adverse, due to potentially increased project costs from possible project delays.

Fire and Fuels Management

Full protection strategies and tactics will be used across the entire planning area, likely resulting in types and extents of effects similar, to those discussed under Alternative A. Not likely to be many locatable minerals projects affected due to temporary inaccessibility to project areas, and those effects would likely be increased project costs due to delays.

Biological Resources

Vegetation – Forests and Woodlands

Types of effects are similar to, but likely of greater extent than those under Alternative A, as silviculture and pest control treatments, techniques, and methods will be more extensively used. A negligible adverse effect to locatable minerals activities, due to potentially increased costs.

Vegetation – Grassland and Shrubland Communities

Desirable non-native species will be allowed for initial reclamation activities, likely leading to possible decreased project costs (see Alternative A); likely negligible beneficial effect.

Vegetation – Riparian/Wetland Resources

Surface-disturbing activities are allowed within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains, as consistent with other resource values. The required Wyoming DEQ LQD Mine Permits already include avoidance, or minimization/mitigation for such areas,

although most of these types of areas would be avoided due to problems inherent to them. There would be no effect to the locatable mineral resource.

Invasive Species and Pest Management

Invasive species and pest management actions could include species-specific treatment strategies, applied either in specific areas or across the planning area. These treatments may increase locatable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species, resulting in likely lower planned project expenses or avoidance of additional project costs; negligible beneficial effect likely.

Fish & Wildlife Resources – Fish

Surface-disturbing activities are allowed within 0.25 mile of naturally occurring water bodies containing acceptable fish species. Reservoirs and riparian areas are managed to improve or enhance other resources first and potential fisheries second. Other actions may also increase project costs, a negligible adverse effect is likely.

Fish & Wildlife Resources – Wildlife

Only two seasonal restrictions occur under Alternative C: a WHMA is proposed to be designated for the Fortification Creek elk herd's crucial range (12,419 acres, 1.60%); and a seasonal prohibition within 0.5 mile of active raptor nests (4,855 acres, 0.62%). With few locatable minerals projects occurring in/near these areas, the likely effect will be negligible adverse due to increased costs for few projects.

Special Status Species – Plants

Surface-disturbing activities that could adversely affect SSS plant habitat are allowed, but not within known populations (126,811 acres, 16%). These habitat areas are quite small, leading to a relatively small amount of lands to avoid; the likely effect is negligible adverse.

Special Status Species – Fish

Surface-disturbing and disruptive activities are prohibited are within 0.25 mile of any waters containing SSS fish, when their effects cannot be mitigated (818 acres, 0.11%). Negligible adverse.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Restrictions occurring under Alternative C include: maintain current habitat utilized by SSS; manage traditional wildlife migration and travel corridors consistent with other resources; manage surface-disturbing and disruptive activities consistent with other resources; require anti-perching devices on new powerlines within occupied Greater Sage-Grouse habitat; restrictions/prohibitions on surface-disturbing and disruptive activities and sometimes occupancy within 0.25 mile of the perimeter of occupied leks (3,594 acres, 0.46%), seasonally within two miles of occupied leks (203,724 acres, 26%), seasonally in identified nesting and early brood-rearing habitat outside the 2-mile lek buffer, and seasonally within Greater Sage-Grouse winter concentration areas; and a year-round disturbance-free buffer of at least 0.5 mile around known bald eagle winter roosts (402 acres, 0.05%), a seasonal limited activity zone within 1 mile of known roosts (3,013 acres, 0.39%), and seasonal species-specific prohibitions for SSS raptor nests (4,855 acres, 0.6%). Approximately 50 percent of locatable minerals projects occur in/near these areas so a fair number of such projects might need to be modified the likely effect will be negligible adverse due to increased project costs.

Heritage and Visual Resources

Cultural Resources

Surface disturbances are allowed in areas containing historic properties when appropriate mitigation is accomplished. Archeological monitors are required on a project-specific basis, increasing project costs; Native American monitors are not required. Overall a negligible adverse effect.

Paleontological Resources

Paleontological field surveys are required for all projects potentially affecting PFYC Class 4 and 5 formations, increasing costs for some projects. Identification and designation of casual collection areas for common invertebrate, plant, and petrified wood fossils. Negligible adverse effect likely.

Visual Resources

Visual simulation may be utilized on a project-specific basis, increasing some projects' costs; overall, a negligible adverse effect likely.

Land Resources

Forest Products

An array of forest products will be available from across the entire planning area; a negligible adverse effect is likely due to increased likelihood of temporary lack of access to certain sites.

Lands and Realty

Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate. Lands having agricultural potential or water are identified for disposal (76,223 acres, 9.81%). Other lands identified for disposal (120,722 acres, 15%) will be disposed of, with longest retention of those with higher resource values. It is difficult to predict which land tenure adjustments will occur during the planning period (see Alternative A). If all these lands are disposed of (totaling 196,945 acres, 25%), the locatable minerals resource could decrease by up to that amount, depending on the surface and mineral estate ownerships of the various lands. It is much more likely that much fewer acres will be disposed of (see Alternative A). Likely up to minor adverse effect.

Renewable Energy

Although no renewable energy projects for public lands have been received to date, it is predicted that 40,000 acres (5.15%) of BLM surface will be disturbed for these projects during the planning period. Although renewable-energy projects are not necessarily incompatible with locatable minerals activities, these lands will be segregated from mineral entry (see Alternative A), thus decreasing the locatable minerals resource by up to that amount; overall likely up to minor adverse impact, though.

Rights-of-Way and Corridors

Above-ground facilities such as powerlines are to be placed along major transportation routes; as few current or historic locatable minerals projects utilize powerlines, this will likely only increase costs for few projects. ROWs for locatable minerals projects are extremely rare (see *Impacts Common to All Alternatives*). The RFA for ROWs for other uses (such as for oil/gas roads and facilities) is 57,083 acres (7.34%). However, ROWs are not necessarily incompatible with locatable minerals projects (see *Impacts Common to All Alternatives*). CCS research and projects are allowed, where consistent with other resource values; this could occur over up to the entire locatable minerals resource (777,310 acres, 100%, see Alternative A), although it

is more likely that fewer acres will be affected. However, CCS projects are not necessarily incompatible with locatable minerals projects (see *Impacts Common to All Alternatives*). Overall effect likely up to minor adverse.

Travel and Transportation Management

Some areas are restricted or closed to motorized travel, seasonally or year-round. These areas are not completely inaccessible to locatable minerals activities, but these restrictions would make exploration and development activities more challenging and increase costs. A negligible adverse effect is likely.

Recreation

A total of six SRMAs are recommended for designation (totaling 30,570 acres, 3.93%), and none designated would be pursued for withdrawal from mineral entry. No effect.

Lands with Wilderness Characteristics

No lands will be managed for wilderness characteristics, no effect.

Livestock Grazing Management

Temporarily fencing off areas being explored and/or mined might be needed to protect livestock, thereby increasing some locatable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern

No ACECs are recommended for designation, no effect.

Scenic or Back Country Byways

No roads will be evaluated during the planning period for their eligibility to be proposed as National Back Country or Scenic Byways; no effect.

Wild and Scenic Rivers

One WSR is under Congressional review, and is managed according to Manual 6400 - *Management of Wild and Scenic Rivers*, which includes surface disturbance restrictions. If Congress does not designate the WSR (and Congress is not expected to act during the planning period), these restrictions will be lifted. This area is not a likely target for locatable minerals activities, however, given its' remote location and rugged terrain. No effect.

Wilderness Study Areas

Currently, there are three areas in the planning area where locatable minerals activities are restricted while under Congressional review: the WSAs, totaling 28,931 acres (3.72%). In addition, all motorized and mechanized equipment will be prohibited in these areas. Congress is not expected to act during the planning period, and the BLM's recommendation is to not officially designate these areas. However, any WSAs released by Congress would be subject to consideration for lands with wilderness characteristics. The current surface disturbance restrictions will continue to apply until Congress acts, after which a plan amendment would be completed.

Socioeconomic Resources

Social and Economic Conditions

The BLM is to develop management strategies to recognize and point out conflicts expected to affect multiple resource use, and to incorporate to the extent possible local and regional economic development and land use plans. Effect is difficult to predict, but may result in slightly more area placed under restrictions; negligible adverse.

4.2.1.6. Alternative D

This section describes management actions under Alternative D, the **Proposed RMP** which strikes a balance between resource use and resource conservation, and the likely resulting effects on the federal locatable minerals resource and/or activities during the planning period due to their implementation.

Locatable Minerals

The three WSAs (totaling 28,931 acres, 3.72%) are open to certain locatable minerals activities, per 43 CFR 3802, **which includes** stringent requirements. Conservation measures implemented for other resources under Alternative D would result in a total of 61,818 acres (7.95%) being recommended for withdrawal from mineral entry **(includes the three WSAs)**. If all these acres were to become withdrawn, this would leave 715,492 acres open to certain locatable mineral activities; 92 percent of the current resource. **As these withdrawals are recommended on behalf of various resources (Recreation, Lands with Wilderness Characteristics, and ACECs), these impacts are discussed under those resources.**

Physical Resources

Air Quality

Quantitative air quality modeling, and mitigation to ensure project emissions would approach or exceed emissions standards, are required. This would likely increase project costs; negligible adverse.

Soil

Surface-disturbing activities in areas with severe erosion hazard, poor reclamation suitability, **LRP**, and on slopes equal to or greater than 25 percent are not prohibited unless the soil resource cannot be conserved. Less than 10 percent of current locatable minerals projects are in such areas on BLM surface, and soils are conserved **during project operations**. Likely negligible adverse effect.

Water Resources

Surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams is allowed where resource objectives are met. **As these areas are already avoided due to their related inherent problems, and other locatable minerals projects can avoid surface water resources.** The effect will likely be negligible adverse.

Cave and Karst Resources

Surface-disturbing activities are prohibited are within a site-specific buffer around significant cave entrances (11 acres, **less than 0.01%**). Locatable minerals projects are not likely in these areas due to the rugged terrain and long distance to markets. The effect to locatable minerals projects is likely to be negligible adverse, **from increased costs for some projects.**

Mineral Resources

Leasable Minerals – Coal

The RFA for coal projects is 195,700 acres and 1,256 for locatable minerals. Even if there are conflicts between these two resources over all 1,256 acres, that is 0.16 percent of the locatable minerals resource. Conflict in areas of likely coal development are unlikely though, as known commercial deposits of locatable minerals are mined outside these areas. Also coal projects do not close those areas to mineral entry. Negligible adverse effects are anticipated due to increased project costs from delays due to possible timing/location conflicts.

Leasable Minerals – Fluids

A total of 72,276 acres will be closed to fluid mineral leasing, leaving 3,314,254 acres open to oil and gas projects. Conflict with oil and gas projects could potentially affect up to that number of acres of the locatable minerals resource. However, the RFA for oil and gas projects is 14,869 acres and 1,256 for locatable minerals. Even if there are conflicts over all 1,256 acres, that is 0.16 percent of the locatable minerals resource; a negligible adverse effect. Conflict in those areas is unlikely, as locatable minerals are plentiful outside the areas likely to be developed for oil and gas projects; overall effect is likely negligible adverse, due to delays and increased costs for certain projects.

Salable Minerals

A total of 623,061 acres will be closed to salable minerals activities under Alternative D, leaving 2,725,060 acres open. However, the RFA for salable is 1,198 acres, and locatable 1,256. It is unlikely salable minerals will be sought to be developed in the two known areas where locatable minerals occur in commercial quantities, as they are plentiful elsewhere. Therefore, the potential effect is likely to be much smaller; a negligible adverse effect, due to increased project costs from possible delays.

Fire and Fuels Management

Fire response and treatment will vary to meet other resource objectives; likely types and extents of effects will be similar overall to those under Alternative A. Relatively few locatable minerals projects might be effected through temporary restriction of access to sites.

Biological Resources**Vegetation – Forests and Woodlands**

Types of effects are similar to, but likely of slightly lesser extent than, those under Alternative A; some silviculture and pest control treatments, techniques, and methods will be less extensively used and some more. Few locatable minerals projects occur in/near forests and woodlands; negligible adverse effect likely from increased costs for few projects.

Vegetation – Grassland and Shrubland Communities

Desirable non-native species are allowed for short-term reclamation activities, but only with native species during final reclamation. Increased project costs are possible with requirements for native seed species, a negligible adverse effect.

Vegetation – Riparian/Wetland Resources

Surface-disturbing activities are allowed within 500 feet of riparian/wetland systems and aquatic habitats where other resource objectives are met. These areas are usually avoided for locatable mineral development; likely negligible adverse effect.

Invasive Species and Pest Management

Planning and actions would be required to manage invasive species, these would increase project costs but decrease the spread and of invasive species; negligible beneficial effect.

Fish and Wildlife Resources – Fish

Surface-disturbing activities are allowed within 0.25 mile of naturally occurring water bodies containing acceptable fish species where fish resource objectives can be met (51,745 acres, 6.66%). Fisheries enhancement in reservoir design is utilized consistent with other resources. Other actions will likely increase project costs. These areas are already mostly avoided due to mitigation on Wyoming DEQ Mine Permits; negligible adverse effect likely, due to increased costs for few projects.

Fish and Wildlife Resources – Wildlife

Distance and/or timing limitations will adversely affect the locatable minerals resource. These are within: big-game WHMA (totaling 11,373 acres, 1.46%); 0.5 mile of big game priority travel corridors (9,587 acres, 2.00%); big game crucial winter range and elk calving areas (98,411 acres, 13%); 0.25 mile year-round of occupied sharp-tailed grouse leks (940 acres, 0.12%), and seasonally within two miles of occupied leks in potential nesting and early brood-rearing habitat (48,127 acres, 6.19%); and within either year-round or seasonally within U.S. Fish and Wildlife Service (USFWS) Wyoming Ecological Services' recommended spatial buffers for breeding raptors (255,129 acres, 33%). In addition, retention of 85 percent of existing elk security habitat is required (existing acreage 132,148 acres, 17%). A WHMA is not recommended to be designated for the Fortification elk herd; instead, the current management (BLM 2011c) is to be retained. Other restrictions also apply which will likely increase project costs, including applying seasonal restrictions on existing projects when wildlife resources are not met (approximately 530 acres, 0.07%). With approximately 25 percent of locatable minerals projects occurring in/near these areas, the likely effect will be negligible adverse due to increased costs for few projects.

Special Status Species – Plants

Surface-disturbing activities are prohibited within SSS plant habitat when the populations would not be conserved (126,811 acres, 16%). Also, predisturbance flowering season surveys are required prior to project approval. These habitat areas are typically quite small, and few projects are likely in these areas. Likely effect is negligible adverse.

Special Status Species – Fish

Surface-disturbing activities are prohibited within 0.25 mile of any waters containing SSS fish species, unless it benefits the species (818 acres, 0.11%). Other prohibitions and requirements apply, likely increasing project costs. Overall negligible adverse.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Restricted and prohibited for all projects are surface-disturbing, disruptive, and/or occupancy activities, and other management actions, to conserve SSS wildlife within following areas: prairie dog colonies, unless suitable habitat for SSS dependent upon prairie dogs is not affected (6,156 acres, 0.79%); year-round within at least 0.5 mile (adjusted based on site-specific USFWS information) of bald eagle riparian corridors; seasonally within USFWS recommended buffer and year-round within species-specific biologic buffer of active SSS raptor nests (17,417 acres, 2.24%); and habitats of SSS amphibians, reptiles, and bats, unless populations and habitat can be conserved (176,636 acres, 23%). Powerlines are to be designed to minimize wildlife-related impacts, are to avoid certain areas of high avian use, and are prohibited within certain distances of Greater Sage-Grouse leks, areas, or habitat; this will likely lead to increased project costs.

The prohibitions, restrictions, and other requirements that will be instituted under Alternative D to prevent unnecessary or undue degradation in Greater Sage-Grouse populations and habitat (below) do not apply to locatable minerals activities, as the Greater Sage-Grouse is not a proposed or listed T&E species (per 43 CFR 3809.11(c)(6), and 3809.420(b)(3)(iii)(7)); see also Instruction Memorandum [IM] Washington Office [WO]-2012-043, dated December 22, 2011). BLM can request for project proponents to follow these measures, however, compliance is not mandatory.

- Greater Sage-Grouse Core Population Areas:

Prohibit surface disturbing activities, disruptive activities, and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability). Allow no more than one oil and gas or mining location and no more than 5 percent disturbance per 640 acres within the Disturbance Density Calculation Tool (DDCT) analysis area (4 mile buffer of occupied leks within 4 miles of proposed surface disturbance restricted to Core Population Area and Connectivity Corridor). Design and manage facilities to prevent West Nile Virus (WNV) transmission. Avoid overhead electric transmission lines and bury electrical distribution lines where possible; if not possible, then locate overhead lines at least 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards. Prohibit electric overhead transmission lines unless within one-half mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than one mile. Limit noise sources to 10 A-weighted decibels (dBA) above ambient noise measured at the perimeter of occupied Greater Sage-Grouse leks from March 1 to May 15, 6 PM to 8 AM, unless scientific findings indicate a different noise level is appropriate. In addition, limit noise sources in other important Greater Sage-Grouse habitats if research and/or policy indicate the need. Locate new roads, used to transport products or waste, greater than 1.9 miles and other new roads, such as roads for site access, greater than 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks. Construct roads to minimum design standards needed. Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. Prohibit surface disturbing and disruptive activities from March 15 to June 30 (independent of habitat suitability). Prohibit surface disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas from December 1 to March 14.

- Greater Sage-Grouse Core Population Connectivity Corridors:

Prohibit surface-disturbing activities, disruptive activities and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability). Allow no more than 5 percent total surface disturbance per 640 acres within the DDCT analysis area (4 mile buffer of occupied leks within 4 miles of proposed surface disturbance, restricted to Core Population and Core Population Connectivity Corridors. Design and manage facilities to prevent WNV transmission. Avoid overhead electric transmission lines and bury electric distribution lines where possible; if not possible, locate overhead lines at least 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards. Locate new roads, used to transport products or waste, greater than 1.9 miles and other, new such as site access, greater than 0.6 mile from the perimeter of the occupied Greater Sage-Grouse leks. Construct roads to minimum design standards needed, and facilities with motion, light sources, noise (10 decibels above ambient), with a height greater than 4.5 feet. Restore disturbed

sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. Prohibit surface disturbing and disruptive activities within 4 miles of occupied Greater Sage-Grouse leks from March 15 to June 30 (independent of habitat suitability, restricted to within Core Population Connectivity Corridors). Prohibit surface disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas, from December 1 to March 14.

- Occupied Greater Sage-Grouse habitat outside of Core Population Areas and Core Population Connectivity Corridors:

Prohibit or restrict surface-disturbing and disruptive activities within 0.25 mile of the perimeter of occupied Greater Sage-Grouse leks. Reduce surface disturbance for authorizations within 0.25 mile of occupied Greater Sage-Grouse leks. Design and manage facilities to prevent WNV transmission. Bury electric distribution lines where possible; if not possible, then locate overhead lines at least 0.5 mile from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards. Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. Recommend for all surface-disturbing activities on BLM surface adjacent to priority habitat, within or adjacent to lands involved in Greater Sage-Grouse conservation projects, or support an 85 percent Greater Sage-Grouse population density. BLM parcels less than 640 acres that only meet the population density factor may be excluded. Prohibit surface disturbing and disruptive activities within 2.0 miles of occupied Greater Sage-Grouse leks, from March 15 to June 30 (independent of habitat suitability), and within Greater Sage-Grouse winter concentration areas from December 1 to March 14.

Approximately 50 percent of locatable minerals projects occur in or near SSS habitat; likely effect will be to increase project costs for some projects — negligible adverse effect likely.

Heritage and Visual Resources

Cultural Resources

Surface disturbance is prohibited within Pumpkin Buttes, Cantonment Reno, Dull Knife Battle, Crazy Woman Battle, contributing and unevaluated segments of the Bozeman Trail, all rock art sites, rock shelter sites, and Native American burials. Surface disturbance is allowed in within three miles of those areas, if the development is not visible or will result in a weak contrast rating to the setting (154,697 acres, 20%). Prohibitions and other measures will be used to mitigate adverse effects to sensitive sites such as TCPs and or sacred sites (1,105 acres, 0.14%). Other requirements include: requiring archeological monitors for projects according to established strategy; establishing agreements to provide tribal access to Pumpkin Buttes, other TCPs, and sacred sites on BLM surface, and requiring Native American monitoring for surface-disturbing projects in accordance with agreements or on a project-specific basis. Cultural Resources Project Plans (CRPPs) will be developed for Pumpkin Buttes, sites associated with Red Cloud's War

and the Great Sioux War, and the South Big Horn Mountains; it is uncertain at this time what restrictions or requirements might be included in these CRPP. Many of such areas are already protected to a certain degree by other means, locatable minerals are plentiful in other areas; effect will most likely be negligible adverse.

Paleontological Resources

Areas containing paleontological resources of high quality or importance would be designated for special management as they are identified (860 acres, 0.11%); these areas are to be avoided by locatable minerals activities. Requiring paleontological field surveys for all PFYC Class 4 and 5 formations, and Class 3 as needed, with monitoring of surface-disturbing activities in such areas as based on the survey results, would increase project costs. Overall, a negligible adverse effect.

Visual Resources

Areas will be managed according to their VRM classes, except certain areas (such as SRMAs, ACECs, lands with wilderness characteristics, Powder River Breaks, Fortification Creek); some of these areas will be managed according to more scenic management. Required within VRM Class II areas is completion of visual simulation and mitigation design; these may be required on a project-specific basis within VRM Class III areas with high visual sensitivity. These will likely increase project costs; effect is likely negligible adverse.

Land Resources

Forest Products

Temporarily fencing off of regeneration or treatment areas may be needed, and may temporarily limit access to certain locatable minerals projects. Relatively few locatable minerals projects occur in/near wooded areas; likely effect negligible adverse.

Lands and Realty

Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate (see Alternative A). Lands will be acquired and disposed of based on resource values, including but not limited to, disposals of lands with agricultural potential and water (76,223 acres, 9.81%). Other management actions include: disposal of BLM surface lands identified for disposal (120,722 acres, 16%), and other lands not identified but meeting appropriate disposal criteria, would be available for disposal. Acquisition of lands from willing sellers would occur consistent with other resource values, with priority given to those lands adjacent to large blocks of BLM surface (before those in other areas). It is difficult to predict which land tenure adjustments will occur during the planning period. Although currently identified disposals total 196,945 acres (25%), it is much more likely that fewer acres will be affected (see Alternative A). Overall more likely up to minor adverse effect.

Renewable Energy

Although no renewable energy projects for public lands in the planning area have been received to date, it is predicted that 75,240 acres of BLM surface will be disturbed for these projects during the planning period (9.68%). Although not all renewable-energy projects are incompatible with locatable minerals activities, these lands would be segregated from mineral entry (see Alternative A), thereby reducing the locatable minerals resource by that amount. It is much more likely that fewer acres will be affected, however (see Alternative A); effect is likely to be up to minor adverse.

Rights-of-Way and Corridors

Transmission lines and above-ground facilities will be placed within existing ROW and other disturbed areas. ROW for locatable minerals projects are uncommon (see *Impacts Common to All Alternatives*); these actions would likely have an overall negligible adverse effect, due to possible increased costs for extremely few projects. The predicted disturbance from other ROWs is 38,762 acres of BLM surface (4.99%). However, ROWs are not necessarily incompatible with locatable minerals projects (see Alternative A). It is more likely that fewer acres will be affected; likely up to minor adverse effect. CCS proposals will be evaluated; assessing the likely level of effect on the locatable minerals resource from these opportunities is difficult, as no projects for public lands in the planning area have been received to date. However, up to the entire locatable minerals resource (777,310 acres, 100%) could be affected (see Alternative A), although CCS projects are not necessarily incompatible with locatable minerals projects.

Travel and Transportation Management

A number of area-specific restrictions to motor vehicle and OHV use, seasonally or year-round, may increase locatable minerals project costs for certain project proponents, but these areas might not be completely inaccessible as a number of locatable minerals activities can be performed without motorized vehicles. These actions may require redesigning and/or reconstructing certain roads, and restricting use of certain roads during certain time periods, increasing project costs. Projects in these areas are not likely to be common as locatable minerals are plentiful elsewhere, but will have increased costs; negligible adverse effect is likely.

Recreation

The planning area is proposed to be divided into eight ERMA (349,663 acres, 45%), and seven SRMA (53,221 acres, 6.85%). Designation of ERMA would not close those areas to locatable mineral activities, but would likely add some requirements for analysis and/or mitigation, increasing project costs. All designated SRMA are recommended for withdrawal from mineral entry, so if all seven SRMA are withdrawn, the locatable minerals resource would be moderately adversely affected through loss of those acres. The effect could be up to moderate adverse.

Lands with Wilderness Characteristics

One area of lands with wilderness characteristics is recommended for withdrawal from mineral entry. Although this area is not likely to be sought for locatable minerals activities, due to rugged terrain and long distance to markets, if it is withdrawn, the locatable minerals resource would decrease by these acres (6,864 acres, 0.88%); negligible adverse effect.

Livestock Grazing Management

Temporarily fencing off areas being explored and/or mined might be needed to protect livestock. Locatable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern

A total of two ACECs are recommended for designation, totaling 2,849 acres, (0.3%). These areas would be managed under site-specific management plans, which includes recommending them for withdrawal from mineral entry. Some of these potential ACECs are already under some restrictions, and some are in areas not likely to be sought for locatable mineral activities due to ruggedness of terrain and distance to markets. Negligible adverse effect likely.

Scenic or Back Country Byways

A number of roads will be evaluated during the planning period for their eligibility to be proposed as National Back Country or Scenic Byways. No effect.

Wild and Scenic Rivers

One WSR is under Congressional review, and is managed according to Manual 6400 - *Wild and Scenic Rivers*, which includes surface disturbance restrictions. If Congress denies its designation, these restrictions will continue to retain the areas' characteristics. Congress is not expected to act during the planning period, however. These restrictions result in negligible adverse effect to the locatable minerals resource (2,664 acres, 0.34%). This area is not a likely target for locatable minerals activities, however, given its remote location and rugged terrain.

Wilderness Study Areas

Currently, there are three areas in the planning area where locatable minerals activities are restricted while under Congressional review: the WSAs, (totalling 28,931 acres, 3.72%). In addition, all motorized and mechanized equipment will be prohibited in these areas. Congress is not expected to act during the planning period, and the BLM's recommendation is to not officially designate these areas. However, any WSAs released by Congress would be subject to consideration for lands with wilderness characteristics. The current surface disturbance restrictions will continue to apply until Congress acts, after which a plan amendment would be completed; effect is up to minor adverse.

Socioeconomic Resources

Social and Economic Conditions

The BLM is to work with other entities (local, state, federal, private) to develop mitigation strategies for promoting a healthy and sustainable social and economic environment. The BLM is to work with all stakeholders to identify socioeconomic effects of BLM actions and develop strategies to mitigate those effects where possible to promote sustainability in a multiple resource use environment. Effect is difficult to predict, but may result in slightly more area being restricted, or more requirements that would increase project costs; negligible adverse.

4.2.1.7. Cumulative Impacts

The current total available federal locatable minerals resource that BLM administers is comprised of BLM-administered surface and all minerals; this amounts to 777,310 acres. The current total available locatable minerals resource that BLM does not administer comprises the remainder of the planning area, 6,567,691 acres (7,356,374 total acres in the planning area, less 777,310 acres that are BLM-administered locatable minerals, and less the 11,373 acres already withdrawn from mineral entry). The existence of federal mineral estate does not imply the presence of locatable minerals of sufficient quality and/or quantity to make them economically viable to develop in those lands (see Chapter 3). Alternative A forecasts that approximately 554 acres of federal mineral estate will be disturbed during federally-authorized exploration and development activities ("BLM"), and approximately 7,989 acres of non-federal mineral estate during similar activities not involving or requiring BLM authorization ("non-BLM"); see Appendix G (p. 1937). Under the other alternatives, these acres are: Alternative B – 277 acres BLM, 23,968 acres non-BLM; Alternative C – 1,455 acres BLM, 11,984 acres non-BLM; Alternative D – 1,256 acres BLM, 17,975 acres non-BLM. Under all alternatives, the actual current acres (Alternative A) and projected potential acres (alternatives B through D) of the BLM-administered portion of the

federal locatable minerals resource explored and/or developed are all less than 2 percent of this resource; the equivalent non-BLM acres (given above, and in Appendix G (p. 1937)) are less than 1 percent of that resource.

The current acres under exploration/development were obtained from BLM's LR2000 database (BLM acres) and Wyoming DEQ LQD's files (non-BLM acres). The projected acres under alternatives B through D were obtained by approximating how much locatable minerals mining might occur under each of those scenarios: Alternative B is the most restrictive for BLM-administered lands, while Alternative C is the least restrictive, and Alternative D is anticipated to lie between those two extremes. Alternative B's BLM acres were approximated to be 50 percent of that for Alternative A — this approximation takes into account the actual number of BLM-administered acres that are already authorized to continue to be mined and yet to be mined, as well as those actual and approximated acres that will be reclaimed during the planning period. Alternative B Non-BLM acres were approximated to be quite large, taking two important factors into account: (1) as BLM-administered lands are greatly restricted under Alternative B (and a large percentage of the resource is proposed to be withdrawn from mineral entry (92%)), this likely will result in more non-BLM acres being mined to make up for the decrease in BLM-administered lands available for mining and/or mineral entry, and (2) the additional very likely potential for mining to increase in the planning area overall. Alternatives B through D, for both types of acres, take into account the very real likelihood that mining will continue to increase in the planning area due to the nation's and world's continually increasing populations and technological advances: our needs for minerals are likely to increase, and continue increasing, into the future. In addition, for those 2 locatable minerals currently mined in the planning area (Wyoming-type bentonite, and uranium), there are currently few substances that can be used in their stead, given their special characteristics. Alternative C's BLM acres were approximated to be roughly 260 percent of that for Alternative A (an increase of roughly 160% over what is currently occurring) — this approximation takes into account the likelihood that more BLM-administered acres will be mined, given the lesser restrictions on these lands; non-BLM acres are also projected to increase, though not as greatly as under Alternative B. Alternative D's BLM and non-BLM acres were both approximated to be roughly 225 percent of that for Alternative A (an increase of roughly 125% over what is currently occurring) — this approximation takes into account the likelihood that all lands will likely experience more mining into the future, and that much fewer acres are proposed to be withdrawn (8% of the resource).

In general, BLM-authorized locatable minerals activities disturb far fewer acres in the planning area than do BLM-authorized oil and gas or coal activities (see Appendix G (p. 1937)), and that such BLM-authorized activities disturb fewer acres in the planning area than do non-BLM activities. Locatable minerals demand and production has been increasing over the last several years. Bentonite production has been steadily increasing, while uranium production has made a comeback in the planning area with more growth yet to come. Uranium demand has been somewhat stagnant somewhat recently, as the price also stagnated. However, nuclear power generation is one of the key components for meeting modern power generation needs, and the importance of this role very likely will increase over time (see Chapter 3). Overall, the forecast is that locatable minerals demand will rise during the planning period. Table 4.30, "Current Areas Withdrawn From or Containing Restrictions On Mineral Entry under All Alternatives" (p. 820) identifies the current areas withdrawn or restricted from mineral entry under all alternatives. Table 4.31, "Areas Recommended for Withdrawal from Mineral Entry under All Alternatives" (p. 820) identifies areas recommended for withdrawal from mineral entry by resource and by alternative.

Table 4.30. Current Areas Withdrawn From or Containing Restrictions On Mineral Entry under All Alternatives

Area Withdrawn or Restricted From Mineral Entry	Acreage
Existing Withdrawals from Mineral Entry (acres)	
Amsden Creek WHMA	523
Kerns WHMA	155
Middle Fork Canyon (aka Ed O. Taylor) WHMA	10,695
Total Acres Withdrawn	11,373
Existing Restrictions from Mineral Entry (acres)	
Fortification Creek WSA	12,419
Gardner Mountain WSA	6,423
North Fork WSA	10,089
Total Acres Restricted	28,931
Total Acres Withdrawn or Restricted from Locatable Mineral Activities	43,089
Source: BLM 2012f	
WHMA Wildlife Habitat Management Area WSA Wilderness Study Area	

Table 4.31. Areas Recommended for Withdrawal from Mineral Entry under All Alternatives

	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
For Wildlife Resources:				
Elk crucial range within Fortification Creek WHMA	N/A	12,419	N/A	N/A
Total Acres	N/A	12,419	N/A	N/A
For Cultural Resources:				
Bozeman Trail, Crazy Woman Battle Site, and other areas containing sensitive sites (such as TCPs and/or sacred sites)	N/A	128,338	N/A	N/A
Total Acres	N/A	128,338	N/A	N/A
For Paleontological Resources:				
Areas containing paleontological resources of high quality or importance	N/A	40	N/A	N/A
Total Acres	N/A	40	N/A	N/A
For Recreation:				
Burnt Hollow SRMA	N/A	17,280	N/A	17,280
Cabin Canyon SRMA	N/A	1,369	N/A	N/A
Dry Creek Petrified Tree EEA SRMA	N/A	2,567	N/A	2,567
Hole-in-the-Wall SRMA	N/A	11,952	N/A	11,952
Middle Fork Powder River SRMA	N/A	10,083	N/A	10,083
Mosier Gulch SRMA	N/A	1,026	N/A	1,026
Welch Ranch SRMA	N/A	809	N/A	809

	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Weston Hills SRMA	N/A	9,504	N/A	9,504
Total Acres	N/A	54,590	N/A	53,221
For Wilderness Characteristics:				
Lands with Wilderness Characteristics Consideration	N/A	12,237	N/A	6,864
Total Acres	N/A	12,237	N/A	6,864
For ACECs:				
Burnt Hollow ACEC	N/A	17,280	N/A	N/A
Cantonment Reno ACEC	N/A	523	N/A	N/A
Dry Creek Petrified Tree EEA ACEC	N/A	2,567	N/A	N/A
Fortification Creek Elk Area ACEC	N/A	32,602	N/A	32,602
Hole-in-the-Wall ACEC	N/A	11,952	N/A	N/A
Pumpkin Buttes ACEC	N/A	1,731	N/A	1,731
Sagebrush Ecosystem ACEC	N/A	467,897	N/A	N/A
Welch Ranch ACEC	N/A	809	N/A	809
Total Acres	N/A	535,365	N/A	2,542
For WSR:				
Middle Fork Powder River WSR	N/A	2,664	N/A	N/A
Total Acres	N/A	2,664	N/A	N/A
For WSAs:				
Fortification Creek WSA	N/A	12,419	N/A	N/A
Gardner Mountain WSA	N/A	6,423	N/A	N/A
North Fork WSA	N/A	10,089	N/A	N/A
Total Acres	N/A	28,931	N/A	N/A
Total Acres Recommended for Withdrawal (summed Totals by Resource, less those acres for areas recommended under more than one Resource)	N/A	717,741	N/A	61,818
Source: BLM 2012f				
ACEC Area of Critical Environmental Concern EEA Environmental Education Area N/A Not Applicable SRMA Special Recreation Management Area TCP Traditional Cultural Property WSA Wilderness Study Area WSR Wild and Scenic Rivers				

4.2.1.8. Conclusion

The alternatives listed in ascending order from least to most adverse in terms of effects on the locatable minerals resource are alternatives A, C, D, and B.

Alternative A is the continuation of current management. Alternative B emphasizes resource conservation, and therefore generally places the most constraints on, and is the most restrictive to, development. Alternative C emphasizes resource use, and therefore places the least constraints on, and is the least restrictive to, development. Alternative D is the Proposed RMP, which strikes a middle ground between resource conservation and resource use, and therefore places a more moderate amount of constraints on development.

4.2.2. Leasable Minerals – Coal

This section estimates the effects on coal resources from management actions under each alternative. The effects on coal exploration, leasing, and development under each alternative can be direct, indirect, short-term, and long-term. As appropriate, effects are described as beneficial or adverse. Direct effects result from actions that either specifically prohibit or allow coal exploration and development. An example of a direct effect would be when an area is identified as unsuitable for coal mining so as to protect another resource value. An example of an indirect effect would be a timing restriction on exploration activity in a certain area, which would delay, but not prohibit, exploration in that location. Short-term effects are limited in time, while long-term effects would generally extend over the entire planning period.

4.2.2.1. Methods and Assumptions

Methods and assumptions used in this analysis include the following:

- The coal screening process has been completed for all coal lands categorized as having high potential for coal development. These are in two defined areas, one in Campbell County and one in Sheridan County. Upon receipt of a lease-by-application, the BLM will review previous coal planning decisions using current, site-specific data, and reapplying the coal screens as necessary, before determining if those lands would be acceptable for further consideration for leasing.
- For coal lands determined acceptable for further consideration in the two defined areas, leasing could occur under LBA, lease modification, emergency lease, or exchange. At present, there are 12 pending LBAs in the Campbell County area with high potential for coal development.
- Coal lands outside the two high-potential areas are not being evaluated for acceptability for further consideration for coal leasing in this RMP. The BLM assumes interest in leasing these lands would not be likely during the planning period based on the lack of a response to the call for coal development interest during the scoping of this RMP, as well as forecasting and active management of resource depletion and replacement over the last two decades.
- Coal lands outside the two high-potential areas would be considered open for coal exploration; however, the BLM also assumes that interest in exploration would not be likely during the planning period. However, exploration for coal suitable for *in situ* production methods (gasification) may be more likely.
- Exploration operations use several pieces of equipment including one or two pickup trucks, a water truck, and a rubber-tired drill rig with a 1,000 or 1,500-foot depth rating. These vehicles travel to the drill site along existing roads, trails, or along routes that have been surveyed for archeological resources and aligned to avoid cultural sites. The rig sets up at the drill location

and is not moved until drilling is completed. The water truck could make one trip out of the site and the pickup trucks several trips. Drilling of most holes can be completed in half a day or less. Four core holes are generally drilled per section, unless more detailed information is needed, such as to define an outcrop.

- Major restrictions on coal exploration include areas with occupancy prohibitions or overlapping timing requirements that leave insufficient open times to perform exploration operations.
- Moderate restrictions on coal exploration include seasonal restrictions or surface use restrictions.
- Restrictions for other resources apply to the entire planning period, but can be changed through RMP amendments.

Exploration, leasing, and development activity was estimated for the entire planning period. An analysis was performed using production forecasts for the Wyoming PRB, reserves available to current operators, and the amount of leasing necessary to replace depleted reserves during the planning period. In addition, acres of disturbance and reclamation were estimated based on production forecasts. The PRB Coal Review, Task 2 report (ENSR 2009a) was used for data to 2020, and the BLM projected these data to 2030 for this RMP. The BLM is currently updating the Task 2 report to 2030, and the report is expected to be complete at about the same time as the Buffalo RMP.

The BLM has estimated that it would issue 60 exploration licenses in the two high-potential areas over the next 20 years (the planning period). The BLM also estimates that approximately five licenses could result from interest in coal leasing outside those two areas, likely as a result of new coal conversion technologies. Exploration activity is estimated to disturb 600 acres in the two high-potential areas, and 100 acres outside those areas. This disturbance would be very short-term (1 to 2 days), with immediate reclamation.

The BLM has estimated that it would issue 28 coal leases encompassing 106,400 acres with approximately 10.2 billion tons of coal and encompassing 106,400 acres in the two high-potential areas over the next 20 years. The majority, if not all, of these leases would be to provide reserves so that the already operating mines can continue to operate. This is the ongoing production maintenance leasing program currently in effect for the PRB Coal Production Region (see the Chapter 3 *Leasable Minerals – Coal* section).

The 28 leases issued in the two high-potential areas are expected to be needed to maintain production at operating mines in the Buffalo planning area.

Exploration outside the areas identified as acceptable for further coal leasing consideration is expected to be associated with new coal recovery ventures. Such ventures include the possibility of technologies to convert coal, in situ, to either natural gas or liquid hydrocarbons (gasification or liquefaction) or technology that would commercially and beneficially develop deeper or currently uneconomical coals.

The BLM also is aware of a potential commercial technology that employs a biogenic process that would use a portion of the coal to manufacture natural gas. This process has been called methanogenesis, but is referred to as CH₄ farming in this section. The manufacture of the natural gas would be accomplished by injecting materials into the coal to stimulate organisms that are naturally occurring in PRB coal. These organisms biogenically consume hydrogen and carbon in the coal to manufacture hydrocarbons. These hydrocarbons would be produced or extracted for commercial use through existing wellbores. The result would be that depleted CBNG wells can be caused to yield hydrocarbons. It is likely that if this process is viable, the CBNG wells

would stay active longer before being plugged and reclaimed. Another result is that the coal in place would be partially altered, primarily in terms of chemical changes that could lower the coal's commercial value.

Significance Criteria

In addition to a major effect based on the scale of effect, an adverse effect on coal resources as a result of multiple-use constraints would be considered potentially significant if the following were to occur (Table 4.32, "Coal Resources Affected" (p. 824)):

Table 4.32. Coal Resources Affected

Percent of coal resource affected	Areas with high potential for coal development	Coals presently not economical to develop by surface mining methods
Less than 1		
1 to 5	X	
5 to 10		
More than 10		X

4.2.2.2. Impacts Common to All Alternatives

Leasable Minerals – Coal

Processing and consideration of LBAs and other leasing actions allowed in a decertified federal coal production region would continue in the two areas of coal lands with high potential for coal development. At present, there are seven LBAs being processed. The impacts associated with leasing have been or will be addressed in EISs, combining leases similarly located in space and application timing. Separate Records of Decision (RODs) will be issued for each LBA, with a decision of whether each LBA tract would be offered for competitive sale. At the time of this writing, four RODs have been issued. Two sales have been held (Maysdorf II North and Hay Creek II). No bids were received for the Maysdorf II North sale; the other tract associated with this LBA, Maysdorf II South, has not been scheduled for sale. One bid was received for the Hay Creek II sale that did not meet the BLM's estimation of fair market value. It is anticipated that the Hay Creek II tract will be reoffered at a later date. The seven LBAs total approximately 27,000 acres and contain approximately 3.5 billion tons of coal reserves. It is expected that these LBAs will be completed during the period 2013 to 2022. If leased, the reserves currently under LBA would meet coal production demand for the respective applicant mines for approximately ten to twelve years.

At this time, no other leasing is being considered. It is expected that additional leasing will be requested for surface coal mining in the areas identified as acceptable for further coal leasing consideration during the planning period. Assuming the existing LBAs are offered and leases issued, it is estimated that approximately five to six billion tons of recoverable reserves (approximately 68,000 to 81,600 acres) in addition to the existing LBAs would need to be leased during the planning period to replace depleted reserves at operating mines.

Coal lands outside the two high-potential areas have not been screened under the requirements of the coal regulations. If a coal leasing action was proposed outside the established areas with high-potential for coal development, the four coal planning screens will be applied to those lands and prior to leasing an amendment to this RMP will be required. Based on screening, only coal lands found acceptable for further consideration for leasing would be considered for potential lease. Given the conditions under which the decertified PRB federal coal production region

operates, it would not be likely that leasing for surface mining would occur outside the two high-potential areas. There has been interest shown in non-conventional coal utilization, such as *in situ* (in place) conversion of coal to hydrocarbons. Although commercial production of *in situ* coal gasification has not occurred in the PRB, there were two test sites for this technology in the 1970s near Gillette, Wyoming, and Linc Energy operates a pilot gasification project in the PRB on State of Wyoming surface and minerals. Upon receipt of an application for *in situ* coal gasification or conversion outside of the areas identified for further coal leasing consideration, a land use plan amendment would be initiated and the four coal screens would be applied to the area of interest.

Physical Resources

Air Quality, Soil, and Water Resources

Air management actions common to all alternatives include the implementation of mitigation measures to reduce emissions and to work cooperatively to reduce dust emissions. The coal mines are a primary emissions source within the planning area. A reclamation plan is required for the authorization of all surface-disturbing activities for the protection of soil, water and other resources. Surface-disturbing activities are managed to prevent degradation of water quality. These management actions would increase costs but would not prevent any coal operations; therefore, their effect is minor adverse.

Cave and Karst Resources

Karst formations are limited to the Big Horn Mountains portion of the planning area, outside of the PRB coal deposits. There would be no effect from cave and karst management on the coal program; therefore, cave and karst will not be discussed further in this section.

Mineral Resources

Locatable Minerals and Salable Minerals

The predominant locatable minerals within the planning area are uranium and bentonite. Uranium deposits are found primarily in south western Campbell County and south eastern Johnson County. Bentonite is found primarily in south western Johnson County. Commercial quantities of locatable minerals do not overlap with the high coal development potential areas. Salable mineral deposits are widespread throughout the planning area. Sufficient salable mineral deposits are available outside of foreseeable coal LBA areas. Neither locatable or salable minerals management would affect coal management; they will not be discussed further in this section.

Leasable Minerals – Fluids

Oil and gas fields underlie the coal lands in the Buffalo planning area. The development and production of these fields could affect the timing of leasing and development of federal coal lands. WO IM 2006-153, Policy and Guidance on Conflicts between CBNG and Surface Coal Mine Development in the PRB, dated May 11, 2006, provides updated direction on resolving conflicts between surface coal mining and CBNG operations on federal oil and gas leases (BLM 2006c). Conflict Administration Zones (CAZ) have been defined in areas where federal oil and gas leases are in effect on federal coal lands in the path of projected mining. Conflict resolution to optimize the production of both coal and oil and gas resources in the CAZ is the same under all alternatives. Coal leasing in producing conventional oil and gas fields could be deferred unless or until coal development would not interfere with the economic recovery of the oil and gas resource. This is determined on a project-specific (case-by-case) basis during coal lease tract processing. The effect is moderate adverse as coal mining could be delayed several years.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Fire and fuels management actions common to all alternatives would not effect coal exploration or development. Fire management within active coal mining areas would not differ across the alternatives and therefore will not be discussed in this section.

Biological Resources

Vegetation – Forests and Woodlands

There are no management actions common to all alternatives for the forest and woodland resources, there would be no effect on the coal program. Forest and woodland management actions by alternative predominantly relate to forest (old-growth, aspen, etc.) and mixed-shrubland management. These vegetation communities are present only within the northern Sheridan County high coal areas identified as acceptable for further coal leasing consideration. The presence of forest and woodland communities would not affect a potential coal lease or exploration activities; therefore, there would be no effect on the coal program and forest and woodland management will not be discussed further in this section.

Vegetation – Grassland and Shrubland Communities

Coal operations would be required to reestablish disturbed sites to healthy plant communities, and to manage the reclaimed lands for sustainable forage levels in accordance with the Wyoming Standards for Healthy Rangelands. These management actions would not prevent or restrict mining activities but would increase operational costs, the effect is minor.

There is only one management action which varies by alternative, regarding non-native species use in reclamation efforts. Seed requirements would not effect coal exploration or development activities; therefore, grassland and shrubland communities are not discussed further in this section.

Vegetation – Riparian/Wetland Resources

Management actions common to all alternatives would require coal operators to restore riparian/wetland habitats to enhance forage conditions and improve water quality as part of mine reclamation in order to achieve the Wyoming Standards for Healthy Rangelands. These actions would increase the cost of coal activities but would not prohibit coal exploration or development, the effect would be minor adverse.

Invasive Species and Pest Management

Coal operations would be required to revegetate and treat invasive species on disturbed areas through an Integrated Pest Management (IPM) program using certified weed seed-free products. These management actions would not prevent or restrict mining activities but would increase operational costs, the effect is minor.

Management actions that vary by alternative further regulate invasive species and pest management but would not restrict coal exploration or development or vary substantially in their effect; therefore, invasive species and pest management will not be discussed further in this section.

Fish and Wildlife Resources – Fish and Special Status Species – Plants and Fish

There are no potential fisheries or SSS plant habitat within the high coal development potential areas identified as acceptable for further coal leasing consideration, there will be no effect from

fish or SSS plant management on coal exploration or development. These resources will not be discussed any further in this section.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Management actions common to all alternatives would require coal operators to restore wildlife habitats as part of mine reclamation. New fences would be constructed to avoid adverse wildlife impacts. These actions would increase the cost of coal activities but would not prohibit coal exploration or development, the effect would be minor adverse.

Heritage and Visual Resources

Cultural Resources

Management actions common to all alternatives do not restrict coal exploration or development and therefore would have no effect on the coal resource.

Paleontological Resources

Paleontological management actions common to all alternatives and management actions which vary by alternative regulate the management of important and high-quality paleontological resources. High-quality resources would most likely be found within PFYC Class 4 or 5 areas which do not overlap with the areas identified as acceptable for further coal leasing consideration, there would be no effect on coal exploration or development from paleontological resource management and it will not be discussed further in this section.

Visual Resources

VRM actions, common to all alternatives would not effect coal exploration or development, there are no WSAs or WSRs in the areas identified as acceptable for further coal leasing consideration.

Land Resources

Forest Products, Renewable Energy, Rights-of-Way and Corridors, Travel and Transportation Management, and Lands with Wilderness Characteristics

The areas identified as acceptable for further coal leasing consideration do not include the commercial forest areas, areas with wind potential of good or higher, or lands with wilderness characteristics; there will be no effect from forest product, renewable energy, or wilderness characteristics management on the coal resource. ROWs and corridors, and TTM actions, common to all alternatives and by alternative, would not effect the coal resource. Established coal leases and foreseeable leases do not require ROWs, utilities are managed with the lease. Transportation management regulates public access to BLM surface and does not pertain to coal management. The public is typically excluded from active mining areas. None of these resources will be discussed further in this section.

Lands and Realty

The common to all management actions do not direct land acquisitions or disposals, only that they will be considered on a project specific basis. Since the management actions do not direct land tenure change proposals there would not be a discernible effect on the coal resource.

Recreation

The recreation common to all management actions do not regulate other land uses and therefore would not effect coal management.

Livestock Grazing Management

Livestock grazing is authorized on BLM surface within the areas identified as acceptable for further coal leasing consideration. The livestock grazing management actions common to all alternatives, and by alternative, do not regulate other land uses and therefore would not effect coal management. Livestock grazing will not be discussed further in this section.

Special Designations

Areas of Critical Environmental Concern

The Welch Ranch ACEC evaluation area is within the northern Sheridan County area identified as acceptable for further coal leasing consideration and the Burnt Hollow ACEC evaluation area is adjacent to the Campbell County area identified as acceptable for further coal leasing consideration. ACEC management actions common to all alternatives do not effect the on-the-ground management of the potential ACECs and therefore would not effect the coal resource.

Scenic or Back Country Byways, Wild and Scenic Rivers, and Wilderness Study Areas

None of the areas evaluated for these special designations are within an area identified as acceptable for further coal leasing consideration. There will be no effect from management actions, common to all alternatives or by alternative, for these special designations that would effect the coal resource, these special designations will not be discussed further in this section.

Socioeconomic Resources

Social and Economic Conditions

Social and economic management actions, common to all alternatives and by alternative, do not effect the on-the-ground exploration or development of coal and therefore would not effect the coal resource. Social and economic resources will not be discussed further in this section.

Health and Safety

Health and safety management actions common to all alternatives would increase the cost of coal operations but would not prohibit exploration or development activities. The impact of increased operational costs is minor adverse. There are no health and safety management actions which vary by alternative.

4.2.2.3. Alternative A

Leasable Minerals – Coal

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This alternative would allow for coal exploration on all federal coal lands, subject to license stipulations necessary to protect other resource values. Coal exploration involves the use of truck-mounted drill rigs and support vehicles to drill shallow core holes. Historically, exploration has been active, averaging six licenses open (active) at any time, with three new licenses approved annually. This trend is expected to continue through the planning period. Restrictions on coal exploration are consistent with resource protection requirements for other short-term surface-disturbing activities. It is estimated that 65 exploration licenses would be issued during the planning period. The average license is assumed to authorize 20 exploration locations (wells), each disturbing 0.5 acre and each reclaimed within 1 year of drilling.

Sixty licenses are expected in the two areas identified as acceptable for further coal leasing consideration, with 600 acres disturbed and reclaimed during the planning period.

Although possible, new exploration on unleased lands outside the areas identified as acceptable for further coal leasing consideration would be unlikely during the planning period. It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons will increase during the planning period. Therefore, it is assumed five exploration licenses would be applied for on coal lands outside high-potential areas during the planning period. These licenses would likely cover a larger area because of the relative scarcity of data about coal outside the high-potential areas, with 100 acres disturbed and reclaimed during the planning period.

Leasing in the two areas identified as acceptable for further coal leasing consideration is expected to continue. Leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study. From 2020 to 2030, the rate of production increase is conservatively forecast at one percent per year, approximately half the rate of the present electric power demand forecast. The reduced rate of coal demand is predicated on an increased emphasis on non-fossil fuels and a corresponding reduction in coal's participation in the portfolio of electric generation sources, and conservation of electricity as a result of electricity costs.

Under Alternative A, it is estimated that 28 new leases would be issued to existing operators during the planning period. It is assumed that surface-disturbing activities would lag leasing by five years to allow for Wyoming DEQ and Office of Surface Mining Reclamation and Enforcement (OSM) permitting timeframes. Surface disturbance estimates assume roughly contemporaneous reclamation at existing mines, with reclamation assumptions accounting for long-term mine facilities, and a ten percent increase in mine disturbance footprints to account for larger laybacks as coal depth increases.

Table 4.33, "Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives" (p. 843) lists estimates of disturbance and reclamation during the planning period. Under Alternative A, by 2030, it is expected that mining in the two areas identified as acceptable for further coal leasing consideration would have disturbed a total of 195,700 acres. These 195,700 acres comprise 120,700 acres that have been reclaimed, 45,500 acres in active mining areas and areas not yet recontoured or reseeded, and 75,000 acres occupied by facilities, stockpiles, ponds, haul roads, and other long-term structures.

There is developing interest in leasing coal lands for *in situ* coal gasification. This is a process that consumes coal that is in place underground and converts that coal by a physical process to hydrocarbons that can be recovered using wellbores. This process has been tested but not implemented commercially in the PRB; however, it has been implemented internationally. To have a project of this type on federal coal lands, a coal lease would be required.

It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons would increase during the planning period, and such interest would likely focus on coal outside of those areas already identified as acceptable for further coal leasing consideration. If a coal leasing action was proposed outside the established high-potential areas, the four coal planning screens will be applied to those lands, and prior to leasing an amendment to this RMP will be required.

At present, there is no management or specific policy guidance for managing CH₄ farming, the commercial manufacture of natural or hydrocarbon gases or liquids through physical or biological processes that convert coal *in situ*. Until there is such a policy, interim or permanent, the coal resource could be adversely affected if such processes are employed on federal coal

lands. For federal coal lands that also have federal oil and gas leases, there would be a minor effect from CH₄ farming. On these lands, if a federal well's productive life is extended by CH₄ farming, it might not be depleted and abandoned as normally occurs as coal mining approaches and available gas is depleted. However, the public could receive a royalty on the manufactured gas where a federal oil and gas lease is in effect. For federal coal lands where the oil and gas rights are non-federal, the effect of CH₄ farming could be significant because there would be no authorization to provide a mechanism for addressing conflicts between CH₄ farming and federal coal leases. Furthermore, if coal value is diminished, there is no mechanism to recover this lost value for the public benefit, except to pursue damages through trespass or similar actions. The BLM is expected to pursue policy resolution during the development of this RMP.

Physical Resources

Air Quality

There is one management action that varies by alternative regarding air quality modeling. Alternative A would require air quality monitoring on a project specific basis, typically when there could be an air quality standard exceedance. Modeling has regularly been performed for the PRB coal mines collectively and this holistic approach is anticipated to continue throughout the planning period. Modeling increases the cost for coal operations but it does not prohibit coal activities. Mitigation resulting from air quality modeling may also increase operational costs but is not anticipated to prevent coal mining. The modeling and costs would be a minor adverse effect to coal exploration and development. Since air quality monitoring for coal development is anticipated to occur in all alternatives there is no difference between alternatives in regards to coal and therefore air quality will not be discussed further in this section.

Soil and Water Resources

Current management prohibits surface-disturbing activities on sensitive soils and near water resources with exception provisions. These management actions would not effect coal mine siting but would regulate the location of exploration and non-conventional conversion operations. Project proponents can likely avoid sensitive soils and water resources when planning their projects therefore the effect of these management actions would be minor adverse.

Mineral Resources

Leasable Minerals – Fluids

Under Alternative A, coal development experiences a minor beneficial effect from lease stipulations on oil and gas leases for leased coal lands that are permitted for mining. Oil and gas operations that interfere with permitted mining do not adversely affect coal production as a result of these lease stipulations. However, this alternative does not provide for placing similar stipulations on oil and gas leases in areas not yet leased for coal development but that have high potential for coal leasing.

Under this alternative, the PRB CAZ would remain in effect. The CAZ is a defined area established by the BLM and based on the area that is expected to be mined over the next ten years. In that area, oil and gas lessees are notified of the expected mining and offered royalty incentives to expedite CBNG recovery in advance of mining. The CAZ is modified annually to reflect the progress of mining activities.

Biological Resources

Vegetation – Riparian/Wetland Resources

Current management prohibits surface-disturbing activities near riparian and wetland resources with exception provisions. These management actions would likely not effect coal mine siting but would regulate the location of exploration and non-conventional conversion operations. Project proponents can avoid riparian and wetland resources when planning their projects therefore the effect of these management actions would be minor adverse.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Current management prohibits surface-disturbing activities near important wildlife sites (WGFD WHMAs, grouse breeding sites, raptor nests, bald eagle nest and communal roost sites) and seasonally within sensitive habitats (big-game crucial winter range and calving areas, raptor nests, grouse nesting habitat, bald eagle nest and communal roost sites). Exceptions are provided for a portion of one Greater Sage-Grouse Core Population Area is within the area identified as acceptable for further coal leasing consideration in Campbell County and bald eagle nest and roost sites are present within the area identified as acceptable for further coal leasing consideration in Sheridan County. The presence of sensitive wildlife habitats is unlikely to effect coal mine siting as the areas identified as acceptable for further coal leasing consideration have already been screened accounting for these wildlife resources. These management actions would regulate the location of exploration and non-conventional conversion operations. Project proponents may not be able to avoid all wildlife protection areas when planning their projects therefore the effect of these management actions would be moderate adverse.

Heritage and Visual Resources

Cultural Resources

Current management stipulates fluid mineral leases for the protection of the Bozeman Trail and the Crazy Woman Battle Site. The Bozeman Trail passes through the identified as acceptable for further coal leasing consideration in Sheridan County. Although the current management action is fluid mineral specific, exploration and non-conventional coal conversion operations would likely be mitigated on a project specific basis for the protection of cultural resources. Cultural sites can typically be avoided or mitigated so that the effect on coal operations would be negligible.

Visual Resources

The high coal areas identified as acceptable for further coal leasing consideration contain VRM Classes II, III, IV, and V. The objective of VRM Class II is to retain the existing character of the landscape, management activities may be seen but should not attract attention. VRM Class III provides for moderate landscape change, activities may attract attention but should not dominate the view. Management activities may dominate the view in VRM Classes IV and V. Coal exploration and development activities particularly within VRM Classes II and III would be affected as projects would be required to include design features to comply with the appropriate VRM objectives. This could include limiting the size and placement of pits and infrastructure. The level of impact would be minor as there is little VRM Class II in the Campbell County area identified as acceptable for further coal leasing consideration and although VRM Class II makes up a large component of the Sheridan County area identified as acceptable for further coal leasing consideration less development is forecasted and the rough topography could be used to screen coal activities.

Land Resources

Lands and Realty

The current program for land tenure adjustments is proponent driven, the BLM is not actively pursuing potential acquisitions or disposals. There are parcels of BLM surface within both areas identified as acceptable for further coal leasing consideration identified for disposal and BLM surface within the Campbell County area identified for acquisition. It is most likely that realty actions would include only the surface estate and not the mineral estate; therefore, there would be no effect to the coal resource.

Recreation

Welch Ranch in northern Sheridan County is the only recreation site completely within an area identified as acceptable for further coal leasing consideration. Burnt Hollow is adjacent to, and Weston Hills lies in close proximity to, the Campbell County area identified as acceptable for further coal leasing consideration. Mineral activities would be managed on a project-specific basis within the recreation areas, which could include prohibiting coal exploration and development. Because a coal proposal is unlikely at Welch Ranch, the effect of recreation management on coal activities would be negligible adverse.

Special Designations

Areas of Critical Environmental Concern

The Welch Ranch ACEC evaluation area is within the northern Sheridan County area identified as acceptable for further coal leasing consideration and the Burnt Hollow ACEC evaluation area is adjacent to the Campbell County area identified as acceptable for further coal leasing consideration. There presently are no ACECs within the planning area therefore ACEC management would not affect the coal resource.

4.2.2.4. Alternative B

Leasable Minerals – Coal

Alternative B emphasizes resource conservation, and would allow for coal exploration only on federal coal lands in the two high-potential areas, subject to license stipulations necessary to protect other resource values. Coal exploration involves the use of truck-mounted drill rigs and support vehicles to drill shallow core holes. Historically, exploration has been active, averaging six licenses open (active) at any time, with three new licenses approved annually. This trend is expected to continue during the planning period. Restrictions on coal exploration are consistent with resource protection requirements for other short-term surface-disturbing activities. Under Alternative B, it is estimated that 60 exploration licenses would be issued during the planning period. The average license is assumed to authorize 20 exploration locations (wells), each disturbing 0.5 acre, and each reclaimed within one year of drilling, with 600 acres disturbed and reclaimed during the planning period.

Leasing in the two areas identified as acceptable for further coal leasing consideration is expected to continue under this alternative. Leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study through 2020. From 2020 to 2030, the rate of production increase is conservatively forecast at one percent per year, approximately half the rate of the present electric power demand forecast. The reduced rate of coal demand is predicated on an increased emphasis on non-fossil fuels and a corresponding reduction of coal participation as a generation fuel, and conservation of electricity as a result of electricity costs.

Under Alternative B, it is estimated that 28 new leases would be issued to existing operators during the planning period. It is assumed that surface-disturbing activities would lag leasing by five years to allow for Wyoming DEQ and OSM permitting timeframes. Surface disturbance estimates assume roughly contemporaneous reclamation at existing mines, with reclamation assumptions accounting for long-term mine facilities, and a ten percent increase in mine disturbance footprints to account for larger laybacks as coal depth increases.

Table 4.33, “Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives” (p. 843) lists estimates of disturbance and reclamation during the planning period. Under this alternative, by 2030 it is expected that mining in the two areas identified as acceptable for further coal leasing consideration could disturb a total of 186,600 acres. These 186,600 acres comprise 120,600 acres that have been reclaimed, 36,500 acres in active mining areas, and 66,000 acres occupied by facilities, stockpiles, ponds, haul roads, and other long-term structures.

It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons will increase during the planning period. Under Alternative B, lands outside the two high-potential areas would be closed to exploration. As a result of these constraints, no exploration for new coal recovery ventures would be expected during the planning period. This is considered a major effect, because it would remove an extensive portion of the national coal resource from non-conventional conversion. However the commercial feasibility of this technology is uncertain.

As noted under Alternative A, there is no existing management or specific policy guidance for managing CH₄ farming. Under Alternative B, all coal lands in the Buffalo planning area would be closed to CH₄ farming. For federal coal lands that also have federal oil and gas leases, there would be a major effect as these lands become closed to potential gas manufacture. For federal coal lands where the oil and gas rights are non-federal, the effect of CH₄ farming could be significant because there would be no authorization to provide a mechanism for addressing conflicts between CH₄ farming and federal coal leases. Furthermore, if coal value is diminished, there is no mechanism to recover this lost value for the public benefit, except to pursue damages through trespass or similar actions.

Physical Resources

Soil and Water Resources

Alternative B prohibits surface-disturbing activities on sensitive soils and near water resources. These management actions could influence the siting of new coal mines but is unlikely to prevent their authorization. Exploration and non-conventional conversion operations would be prohibited for the protection of soil and water resources. Proponents of exploration and non-conventional conversion operations should be able to avoid sensitive soils and water resources when planning their projects. The effect of these management actions would be moderate adverse as the siting of coal exploration and development activities would be affected on more than ten percent of the planning area but proponents would be able to find suitable project locations.

Mineral Resources

Leasable Minerals – Fluids

Under Alternative B, new leases would be delineated to avoid active oil and gas operations in cases where it is demonstrated that reasonably foreseeable coal operations would interfere with economic recovery of conventional oil and gas resources, and new leases would

be stipulated with a requirement that coal development would accommodate preexisting oil and gas recovery operations. Existing coal leases would not be adversely affected under this alternative, unless these leases are stipulated with a requirement that coal development would accommodate preexisting oil and gas recovery operations when the existing leases are readjusted. The requirement to avoid oil and gas operations would have a major effect on coal recovery because there would be extensive areas of coal left in place to avoid oil and gas activity.

Under this alternative, the BLM policy established for the PRB that provides for a CAZ would remain in effect.

Biological Resources

Vegetation Resources – Riparian/Wetland

Alternative B prohibits surface-disturbing activities near riparian and wetland areas. These management actions could influence the siting of new coal mines but is unlikely to prevent their authorization. Exploration and non-conventional conversion operations would be prohibited for the protection of riparian and wetland resources. Proponents of exploration and non-conventional conversion operations would be able to avoid riparian and wetland communities when planning their projects. The effect of these management actions would be moderate adverse as the siting of coal exploration and development activities would be affected on more than ten percent of the planning area but proponents would be able to find suitable project locations.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative B prohibits surface-disturbing activities near important wildlife sites (WGFD WHMA, grouse breeding sites, raptor nests, bald eagle nest and communal roost sites) and seasonally within sensitive habitats (big-game crucial winter range and calving areas, raptor nests, grouse nesting habitat, bald eagle nest and communal roost sites). Greater Sage-Grouse nesting habitat and herptile breeding habitat are present within both areas identified as acceptable for further coal leasing and bald eagle nest and roost sites are present within the Sheridan County potential area identified as acceptable for further coal leasing consideration. The presence of SSS wildlife habitats could influence coal mine leasing and siting. These management actions would regulate the location of exploration and non-conventional conversion operations. Project proponents would be unable to avoid all wildlife protection areas when planning their projects and projects or certain activities could be prohibited therefore the effect of these management actions would be major adverse.

Heritage and Visual Resources

Cultural Resources

Areas containing historic properties that retain their historic setting would be closed to mineral leasing, including coal. This management actions would prohibit coal leasing within five miles of the Bozeman Trail and other historic sites and would effect both areas identified as acceptable for further coal leasing consideration. This management action would prohibit coal mine leasing, exploration, and non-conventional coal operations in more than ten percent of the areas identified as acceptable for further coal leasing consideration, a major adverse effect.

Visual Resources

The Sheridan County areas identified as acceptable for further coal leasing consideration contains VRM Classes II, III, and IV; the Campbell County area identified as acceptable for further coal

leasing consideration is largely comprised of VRM Class IV with some VRM Class III. The objective of VRM Class II is to retain the existing character of the landscape, management activities may be seen but should not attract attention. VRM Class III provides for moderate landscape change, activities may attract attention but should not dominate the view. Management activities may dominate the view in VRM Class IV. Coal exploration and development activities particularly within VRM Classes II and III would be affected as projects would be required to include design features to comply with the appropriate VRM objectives. This could include limiting the size and placement of mine pits and infrastructure. The level of impact would be minor as there is no VRM Class II in the Campbell County high coal development potential area and although VRM Class II makes up approximately one-third of the Sheridan County area identified as acceptable for further coal leasing consideration little development is forecasted and the rough topography could be used to screen coal activities.

Land Resources

Lands and Realty

Alternative B would retain all lands identified for disposal having resource value, mineral estate would be considered a resource value. The parcels identified for disposal within both areas identified as acceptable for further coal leasing consideration would be retained. Acquisition actions would likely include acquisition of the mineral estate. Retaining all federal coal and the acquisition of additional federal coal lands would be a major benefit to the coal program.

Recreation

Welch Ranch in northern Sheridan County is the only SRMA completely within an area identified as acceptable for further coal leasing consideration. Three SRMAs lie partially within (Cabin Canyon), adjacent to (Burnt Hollow), or in close proximity to (Weston Hills) the Campbell County area identified as acceptable for further coal leasing consideration. Mineral leasing and exploration activities would be prohibited within and one-half mile surrounding the SRMAs. The effect of the prohibition would be minor as the Campbell County SRMAs are along the eastern edge of the area identified as acceptable for further coal leasing consideration and would likely impact few proposals. Coal activities are even less likely near the Welch Ranch SRMA in Sheridan County.

Special Designations

Areas of Critical Environmental Concern

The Welch Ranch ACEC is within the northern Sheridan County area identified as acceptable for further coal leasing consideration and the Burnt Hollow ACEC is adjacent to the Campbell County area identified as acceptable for further coal leasing consideration. Mineral activities would be prohibited within the ACECs. There is no management buffer surrounding the ACECs. Coal activity is not likely at the Welch Ranch therefore the prohibition effect would be negligible.

4.2.2.5. Alternative C

Leasable Minerals – Coal

Alternative C would emphasize resource use. This alternative would allow for coal exploration on all federal coal lands. Coal exploration involves the use of truck-mounted drill rigs and support vehicles to drill shallow core holes. Historically, exploration has been active, averaging six licenses open (active) at any time, with three new licenses approved annually. This

trend is expected to continue during the planning period. Restrictions on coal exploration are consistent with resource protection requirements for other short-term surface-disturbing activities. It is estimated that 65 exploration licenses would be issued during the planning period. The average license is assumed to authorize 20 exploration locations (wells), each disturbing 0.5 acre and each reclaimed within one year of drilling. Sixty licenses are expected in the two areas identified as acceptable for further coal leasing consideration, with 600 acres disturbed and reclaimed over the life of the plan.

New exploration on unleased lands outside the areas identified as acceptable for further coal leasing consideration is possible, but unlikely, during the planning period. It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons would increase during the planning period. Therefore, during the planning period, it is assumed that five new licenses would be submitted on coal lands outside the areas identified as acceptable for further coal leasing consideration. It is assumed these licenses would cover a larger area, due to the relative scarcity of coal data outside the areas identified as acceptable for further coal leasing consideration, with 100 acres disturbed and reclaimed during the planning period.

Leasing in the two areas identified as acceptable for further coal leasing consideration is expected to continue. Leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study. From 2020 to 2030, the rate of production increase is conservatively forecast at one percent per year, approximately half the rate of the present electric power demand forecast. The reduced rate of coal demand is predicated on an increased emphasis on non-fossil fuels and a corresponding reduction of coal participation as a generation fuel, and conservation of electricity as a result of electricity costs.

Under Alternative C, it is estimated that 28 new leases would be issued to existing operators during the planning period. It is assumed that surface-disturbing activities would lag leasing by five years to allow for Wyoming DEQ and OSM permitting timeframes. Surface disturbance estimates assume roughly contemporaneous reclamation at existing mines, with reclamation assumptions accounting for long-term mine facilities, and a 10 percent increase in mine disturbance footprints to account for larger laybacks as coal depth increases.

Table 4.33, “Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives” (p. 843) lists estimates of disturbance and reclamation during the planning period. Under this alternative, by 2030 it is expected that mining in the two areas identified as acceptable for further coal leasing consideration would have disturbed a total of 195,700 acres. These 195,700 acres comprise 120,700 acres that have been reclaimed, 45,500 acres in active mining areas, and 75,000 acres occupied by facilities, stockpiles, ponds, haul roads, and other long-term structures.

There is developing interest in leasing coal lands for *in situ* coal gasification. This is a process that consumes coal in place underground and converts that coal by a physical process to hydrocarbons that can be recovered using wellbores. This process has not been implemented commercially in the PRB; however, it has been implemented internationally. To have a project of this type on federal coal lands, a coal lease would be required.

It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons would increase during the planning period, and such interest would likely focus on coal outside of the areas identified as acceptable for further coal leasing consideration. If a coal leasing action was proposed outside those areas, the four coal planning screens will be applied to those lands, and prior to leasing an amendment to this RMP will be required.

Under this alternative, the BLM would implement a policy or mechanism designed to authorize CH₄ farming on federal coal lands, regardless of the ownership of the oil and gas estate. The authorization could be an agreement, contract, or lease that would provide for compensation to the public for the use, production and/or reduced value of the federal coal or for the royalty value of the manufactured hydrocarbons produced. In addition, under this alternative, these authorizations would be stipulated to provide a requirement to CH₄ farm operators to cease their operations when the coal is leased for conventional mining. This policy would have a major beneficial effect on coal resource management by establishing a mechanism to manage conflicts between CH₄ farming and mining, by ensuring some return to the public for use of the coal resource, and by establishing an authorization process requiring appropriate NEPA analyses and mitigation measures.

Physical Resources

Soil and Water Resources

Alternative C provides for surface-disturbing activities on sensitive soils and near water resources with adequate consideration of all resources. These management actions would not effect active coal mines but would regulate the location of exploration and non-conventional conversion operations. Project proponents can likely avoid sensitive soils and water resources, but would not necessarily be required to, when planning their projects therefore the effect of these management actions would be negligible adverse.

Mineral Resources

Leasable Minerals – Fluids

Under Alternative C, coal development would experience a major beneficial effect from lease stipulations on oil and gas leases for coal lands that are permitted for mining. Oil and gas operations that interfere with permitted mining would not adversely affect coal production as a result of these lease stipulations. Furthermore, this alternative provides for similar stipulations on oil and gas leases in areas not yet leased for coal development but that have high potential for coal leasing. This has a beneficial effect on the coal resource by increasing the bonus value of the coal resource through reductions in future mining costs that would be required as compensation to operators that had established oil and gas operations. Under this alternative, the BLM policy established for the PRB that provides for a CAZ would remain in effect.

Biological Resources

Vegetation Resources – Riparian/Wetlands

Alternative C provides for surface-disturbing activities within and near riparian and wetland habitats with adequate consideration of all resources. These management actions would not effect active coal mines but would regulate the location of exploration and non-conventional conversion operations. Project proponents can likely avoid riparian and wetland communities, but would not necessarily be required to, when planning their projects therefore the effect of these management actions would be negligible adverse.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative C allows surface-disturbing activities near important wildlife sites (WGFD WHMA, grouse breeding sites, raptor nests, bald eagle nest and communal roost sites) and within sensitive habitats (big-game crucial winter range and calving areas, raptor nests, grouse nesting habitat,

bald eagle nest and communal roost sites) when all resources are adequately considered. Greater Sage-Grouse leks are present within both areas identified as acceptable for further coal leasing consideration and bald eagle nest and roost sites are present within the Sheridan County area identified as acceptable for further coal leasing consideration. The presence of sensitive wildlife habitats is unlikely to effect coal mine siting. These management actions would regulate the location of exploration and non-conventional conversion operations. Project proponents may not be able to avoid all wildlife protection areas when planning their projects but wildlife can be considered and mitigated in project designs, and no projects would likely be prohibited, so that the effect of these management actions on coal activities would be minor adverse.

Heritage and Visual Resources

Cultural Resources

Alternative C allows surface-disturbing activities near historic sites that retain their historic setting. Coal mine siting would not be effected by this management action. Exploration and non-conventional coal conversion operations would be mitigated on a project specific basis. Cultural sites can typically be avoided or mitigated so that the effect on coal operations would be negligible.

Visual Resources

The Sheridan County area identified as acceptable for further coal leasing consideration contains VRM Classes III, and IV; the Campbell County area identified as acceptable for further coal leasing consideration is entirely VRM Class IV. VRM Class III provides for moderate landscape change, activities may attract attention but should not dominate the view. Management activities may dominate the view in VRM Class IV. Coal exploration and development activities particularly within VRM Class III would be affected as projects would be required to include design features to comply with the VRM objectives. This could include limiting the size and placement of pits and infrastructure. The level of impact would be negligible as there is no VRM Class III in the Campbell County area identified as acceptable for further coal leasing consideration. Although VRM Class III makes up approximately one-fourth of the Sheridan County area identified as acceptable for further coal leasing consideration, activities can be seen but they should not dominate the view. Rough topography can also be used to screen coal activities. It is anticipated that all proposals could be modified to meet VRM objectives.

Land Resources

Lands and Realty

Alternative C would seek to dispose of all lands identified for disposal, realty actions would also seek to dispose of the mineral estate. Additional federal acreage, surface or mineral, would not be acquired. Disposing of federal coal without the acquisition of additional federal coal lands would have a major adverse effect on the coal program.

Recreation

Welch Ranch in northern Sheridan County is the only SRMA completely within an area identified as acceptable for further coal leasing consideration. Burnt Hollow is adjacent to, and Weston Hills lies in close proximity to, the Campbell County area identified as acceptable for further coal leasing consideration. Mineral activities would be managed within, and adjacent to, SRMAs in consideration of other resource values. Such management would be unlikely to prohibit any

coal activities. Because a coal proposal is unlikely at Welch Ranch, the effect of recreation management on coal activities would be negligible adverse.

Special Designations

Areas of Critical Environmental Concern

The Welch Ranch ACEC evaluation area is within the northern Sheridan County area identified as acceptable for further coal leasing consideration and the Burnt Hollow ACEC evaluation area is adjacent to the Campbell County area identified as acceptable for further coal leasing consideration. No ACECs would be designated under Alternative C therefore ACEC management would not affect the coal resource.

4.2.2.6. Alternative D

Leasable Minerals – Coal

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the Proposed RMP.

This alternative would allow for coal exploration on all federal coal lands, subject to license stipulations necessary to protect other resource values. Coal exploration involves the use of truck-mounted drill rigs and support vehicles to drill shallow core holes. Historically, exploration has been active, averaging six licenses open (active) at any time, with three new licenses approved annually. This trend is expected to continue during the planning period. Restrictions on coal exploration are consistent with resource protection requirements for other short-term surface-disturbing activities. It is estimated that 65 exploration licenses would be issued during the planning period. The average license is assumed to authorize 20 exploration locations (wells), each disturbing 0.5 acre, and each reclaimed within 1 year of drilling. Sixty licenses are expected in the two areas identified as acceptable for further coal leasing consideration, with 600 acres disturbed and reclaimed during the planning period.

New exploration on unleased lands outside the high-potential areas is possible, but unlikely, during the planning period. It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons would increase during the planning period. Therefore, 5 exploration licenses during the planning period would be on coal lands outside the areas identified as acceptable for further coal leasing consideration. These licenses would likely cover a larger area, due to the relative scarcity of coal data outside the areas identified as acceptable for further coal leasing consideration with 100 acres disturbed and reclaimed during the planning period.

Leasing in the two areas identified as acceptable for further coal leasing consideration is expected to continue. Leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study. From 2020 to 2030, the rate of production increase is conservatively forecast at one percent per year, approximately half the rate of the present electric power demand forecast. The reduced rate of coal demand is predicated on an increased emphasis on non-fossil fuels and a corresponding reduction of coal participation as a generation fuel, and conservation of electricity as a result of electricity costs.

Under Alternative D, it is estimated that 28 new leases would be issued to existing operators during the planning period. It is assumed that initiation of surface-disturbing activities would lag

coal lease issuance by five years to allow for Wyoming DEQ and OSM permitting timeframes. Surface disturbance estimates assume roughly contemporaneous reclamation at existing mines, with reclamation assumptions accounting for long-term mine facilities, and a ten percent increase in mine disturbance footprints to account for larger laybacks as coal depth increases.

Table 4.33, “Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives” (p. 843) lists estimates of disturbance and reclamation during the planning period. Under this alternative, by 2030 it is expected that mining in the two high-potential areas would have disturbed a total of 195,700 acres. These 195,700 acres comprise 120,700 acres that have been reclaimed, 45,500 acres in active mining areas and not yet recontoured or reseeded, and 75,000 acres occupied by facilities, stockpiles, ponds, haul roads, and other long-term structures.

There is developing interest in leasing coal lands for *in situ* coal gasification. This is a process that consumes coal in place underground and converts that coal by a physical process to hydrocarbons that can be recovered using wellbores. This process has not been implemented commercially in the PRB; however, it has been implemented internationally. To have a project of this type on federal coal lands, a coal lease would be required.

It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons would increase during the planning period, and such interest would likely focus on coal outside of the areas identified as acceptable for further coal leasing consideration. If a coal leasing action was proposed outside the established high-potential areas, the four coal planning screens will be applied to those lands, and prior to leasing an amendment to this RMP will be required.

At present, there is no management or specific policy guidance for managing CH₄ farming. Under Alternative D, until such specific management or policy guidance becomes available, the BLM would implement an authorization requirement when federal coal lands are requested for CH₄ farming. This coal use authorization would likely not be an exclusive use of the coal resource, but would allow for concurrent coal leasing with a condition in the authorization that would provide a mechanism for CH₄ farming cessation when necessary for coal mining operations. The authorization also would provide public compensation for the reduction in coal value resulting from CH₄ farming, especially on those lands where the coal and oil and gas mineral estate have been severed. If specific management or policy guidance becomes available that requires a coal lease for CH₄ farming, and a coal leasing action for CH₄ farming was proposed outside the established high-potential areas, the four coal planning screens will be applied to those lands, and prior to leasing an amendment to this RMP will be required.

Physical Resources

Soil and Water Resources

Alternative D provides for surface-disturbing activities on sensitive soils and near water resources when these resources are adequately protected. These management actions would likely not effect coal mine siting but would regulate the location of exploration and non-conventional conversion operations. Project proponents can avoid or mitigate sensitive soils and water resources when planning their projects therefore the effect of these management actions would be minor adverse.

Mineral Resources

Leasable Minerals – Fluids

Under Alternative D, during the planning period, new fluid mineral leases in areas identified as highly likely to be considered for LBAs would stipulate that oil and gas operations defer to coal development. The stipulation would serve to regulate fluid mineral operations that would interfere with potential coal mining. Lease stipulations in oil and gas leases in effect on leased, permitted coal lands would have a major beneficial effect on coal development. Oil and gas operations that interfere with permitted mining would not adversely affect coal production as a result of these lease stipulations. This provides a further beneficial effect on the coal resource by increasing the bonus value of the coal resource through reductions in future mining costs that would be required as compensation to operators that had established oil and gas operations. Under this alternative, the BLM policy established for the PRB that provides for a CAZ would remain in effect.

Biological Resources

Vegetation Resources – Riparian/Wetlands

Alternative D provides for surface-disturbing activities near riparian and wetland areas when these resources are adequately protected. These management actions would likely not effect coal mine siting but would regulate the location of exploration and non-conventional conversion operations. Project proponents can avoid or mitigate riparian and wetland communities when planning their projects therefore the effect of these management actions would be minor adverse.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative C allows surface-disturbing activities near important wildlife sites (WGFD WHMA, grouse breeding sites, raptor nests, bald eagle nest and communal roost sites) and within sensitive habitats (big-game crucial winter range and calving areas, raptor nests, grouse nesting habitat, bald eagle nest and communal roost sites) when the wildlife resources are adequately protected. A portion of one Greater Sage-Grouse Core Population Area is within the Campbell County area identified as acceptable for further coal leasing consideration and bald eagle nest and roost sites are present within the Sheridan County area identified as acceptable for further coal leasing consideration. The presence of sensitive wildlife habitats is unlikely to effect coal mine siting as the areas identified as acceptable for further coal leasing consideration have already been screened accounting for these wildlife resources. These management actions would regulate the location of exploration and non-conventional conversion operations. Project proponents may not be able to avoid all wildlife protection areas when planning their projects therefore the effect of these management actions would be moderate adverse.

Heritage and Visual Resources

Cultural Resources

Alternative D allows surface-disturbing activities within three miles of identified historic sites that retain their historic setting with adequate mitigation. Coal mine siting would likely not be affected by this management action. Exploration and non-conventional coal conversion operations would be mitigated and potentially prohibited for the protection of historic sites. Because few coal proposals are likely to be prohibited, most can be adequately mitigated, the effect on coal operations would be minor adverse.

Visual Resources

The Sheridan County area identified as acceptable for further coal leasing consideration contains VRM Classes II, III, and IV; the Campbell County area identified as acceptable for further coal leasing consideration is largely comprised of VRM class IV with some VRM Class III. The objective of VRM Class II is to retain the existing character of the landscape, management activities may be seen but should not attract attention. VRM Class III provides for moderate landscape change, activities may attract attention but should not dominate the view. Management activities may dominate the view in VRM Class IV. Coal exploration and development activities particularly within VRM Classes II and III would be affected as projects would be required to include design features to comply with the appropriate VRM objectives. This could include limiting the size and placement of mine pits and infrastructure. The level of impact would be minor as there is no VRM Class II in the Campbell County area identified as acceptable for further coal leasing consideration. Although VRM Class II makes up approximately one-third of the Sheridan County area identified as acceptable for further coal leasing consideration, little development is forecasted and the rough topography could be used to screen coal activities.

Land Resources

Lands and Realty

Alternative D would pursue land acquisitions and disposals for the public benefit. There are parcels identified for disposal within both areas identified as acceptable for further coal leasing consideration and parcels identified for acquisition in the Campbell County area identified as acceptable for further coal leasing consideration. Realty actions would seek to include the mineral estate in order to simplify management, prevent the creation of split estate. An active program to consolidate federal estate and dispose of small difficult to manage parcels would be a moderate benefit to the coal program.

Recreation

Welch Ranch in northern Sheridan County is the only SRMA completely within an area identified as acceptable for further coal leasing consideration. Three SRMAs lie partially within (Cabin Canyon), adjacent to (Burnt Hollow), or in close proximity to (Weston Hills) the Campbell County area identified as acceptable for further coal leasing consideration. Mineral leasing and exploration activities would be prohibited within, but not adjacent to, Burnt Hollow and Welch Ranch. Mineral leasing and activities would be allowed but managed to protect the recreation resources at Cabin Canyon and Weston Hills. The effect of the prohibition would be negligible as mineral activities would not be regulated outside of the SRMAs, Cabin Canyon would be available for coal leasing, and coal activities are unlikely to be proposed at Welch Ranch.

Special Designations

Areas of Critical Environmental Concern

The Welch Ranch ACEC lies within the northern Sheridan County area identified as acceptable for further coal leasing consideration. Burnt Hollow, located adjacent to the Campbell County area identified as acceptable for further coal leasing consideration, would not be designated. Mineral activities would be managed under ACEC specific management plans which could include a prohibition on mineral exploration and development. Coal activity is not likely at the Welch Ranch therefore the prohibition effect would be negligible.

4.2.2.7. Cumulative Impacts

During the planning period, under any of the alternatives, it is expected that approximately 9 to 12 billion tons of coal will be produced by existing mines. This production will be in response to a national demand and a national preference for PRB coal due to lower mining costs, more environmentally compliant use, and demonstrated successful reclamation. The BLM preliminary work on the 2030 forecast for the PRB Coal Review indicates a slower rate of increase in PRB coal demand than occurred from 1990 through 2010, primarily due to new natural gas discoveries, a greater national priority on nuclear and renewable-energy generation, and potential effects on coal-fired electric generation as a result of possible regulation of GHGs. A more realistic annual growth rate in PRB coal production through 2030 is between 0.25 percent and two percent. This forecast is consistent with the Energy Information Administration's 2010 Energy Outlook Report (Energy Information Administration 2010). Therefore, by 2030, the BLM would expect PRB coal production to be between 500 and 700 million tons annually.

Coal produced is expected to be used almost entirely as steam coal for electric generation and other industrial applications. This coal will be used across the entire United States and internationally as demand and prices dictate.

Table 4.33, "Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives" (p. 843) lists cumulative disturbance and reclamation as a result of continuing production at existing mines under all alternatives. Approximately five percent of this cumulative disturbance and reclamation is estimated to occur on non-federal coal lands. Because the fee and state lands are scattered, it is not likely that these lands would be disturbed if the federal coal lands are not leased and permitted.

Table 4.33. Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives

Year	Total Cumulative Disturbance	=	Total Cumulative Reclamation	+	Area Available to Reclaim ¹	+	Area Unavailable to Reclaim ²
2010	102,500		46,800		30,000		25,700
2020	148,800		86,200		34,400		28,200
2030	195,700		120,700		45,500		75,000

Source: ENSR 2005b

¹Includes active mining area

²Includes facilities, stockpiles, ponds, haul roads, etc.

A small amount of acreage would be disturbed by exploration activity each year under all alternatives (600 acres), with slightly more exploration (100 acres) allowed under Alternative D in response to expected interest in *in situ* gasification of deeper PRB coals. All exploration disturbances would be reclaimed immediately following exploration. Because the United States retained most of coal lands in the PRB, an insignificant amount (up to 100 acres) of exploration could occur off of federal coal lands.

Coal leasing in advance of existing mining is expected under all alternatives. The BLM will manage the pace of leasing to ensure a fair return to the public, through bonus bids, for those coal reserves leased. The BLM paces individual lease offerings to coincide with leased reserve depletion. This avoids potential private speculation in federal coal reserves, while providing existing coal mines with adequate reserves to compete for coal sales. If a lease

application is received for areas outside of those areas currently acceptable for further coal leasing consideration, a RMP amendment will be required.

Under Alternative D, the BLM expects that interest in *in situ* coal gasification would result in coal leasing in the deeper PRB coals outside of the areas identified as acceptable for further coal leasing consideration. If a lease application is received for areas outside of those areas currently acceptable for further coal leasing consideration, a RMP amendment will be required.

Under Alternative D, the BLM expects to manage CH₄ farming on federal coal lands. The activity will occur on lands already disturbed for conventional CBNG recovery. CH₄ farming, while it would not cause new disturbance, would result in a delay in reclaiming these disturbed lands.

4.2.2.8. Conclusion

Federal coal resources will be managed under all alternatives consistent with the specific coal planning criteria as required at 43 CFR 3420.1 and 43 CFR 3460. These requirements include identifying federal coal lands as unsuitable for coal leasing that fall under any of the coal unsuitability criteria, managing multiple use conflicts, and not leasing federal coal lands where there is a qualified surface owner that denies consent to lease.

All alternatives provide for replacing reserves depleted by existing mines. Leasing would be for production maintenance. Production at existing mines is in response to demand, and leasing would be in response to production. All exploration activities under any alternative are subject to development restrictions in place under that alternative.

Alternative B would restrict coal exploration and development to the two designated high-potential areas, potentially restricting *in situ* gasification, underground mining, and long-term future surface coal mining. This would remove an extensive portion of the national coal resource from non-conventional conversion. However, the commercial feasibility of these technologies in the PRB is uncertain. All other alternatives would allow coal exploration throughout the planning area, with leasing subject to a land use plan amendment during which all of the coal planning requirements would be applied.

CH₄ farming is seen to be a beneficial use of federal coal resources when properly managed. CH₄ farming would provide for a possible use of coals at depths where coal mining is cost prohibitive. However, many unanswered operational and legal questions persist. Pilot projects to test this process will be considered on a case-by-case basis; however, the operational and legal questions must be answered before CH₄ farming projects can proceed to commercial development in the BFO area.

4.2.3. Leasable Minerals – Fluids

Management actions to protect other resource values could directly and indirectly impact new oil and gas leases, exploration, and development. A direct impact is one that specifically prohibits or allows oil and gas leasing, exploration, or development. An example of a direct impact is the decision to identify areas as closed to new oil and gas leasing. Management actions that do not explicitly allow or prohibit oil and gas exploration and development activity, but could influence a company's decision whether to proceed with a given project, are considered an indirect impact on oil and gas leasing, exploration, or development. Indirect impacts are the result of management actions that place restrictions on oil and gas exploration and development. An example of an

indirect impact is a CSU stipulation restricting certain activities to protect a wildlife habitat area. Short-term impacts have a duration of fewer than five years. For example, a Timing Limitation Stipulation (TLS) or other seasonal restriction could result in short-term impacts. Long-term impacts have a duration of at least five years and perhaps for the duration of the planning period. Decisions to identify areas as closed to oil and gas leasing result in long-term impacts when the decision covers more than five years. Refer to Maps 13 through 16 for leasable fluid minerals alternatives.

4.2.3.1. Methods and Assumptions

Impacts analysis and conclusions are based on interdisciplinary team knowledge of resources and the project area, review of existing literature, and information provided by other agencies. Impacts are quantified where possible. Spatial analysis was performed using the ESRI ArcGIS computer software. In the absence of quantitative data, best professional judgment was used. Impacts are sometimes described using ranges or are described in qualitative terms, if appropriate. Reductions in the number of well locations (and potential surface disturbance) from the baseline RFD scenario for each alternative are a result of proposed management actions, mitigation measures, and BMPs presented in Chapter 2 and various appendices. Those measures can affect oil and gas development activities by not allowing leasing, restricting surface occupancy, controlling surface use, or adding restrictive mitigation to Conditions of Approval (COAs) on federal Applications for Permit to Drill (APDs). After the acres of federal oil and gas resources were calculated for each classification by alternative, the percent reduction in well numbers for each classification by alternative was estimated. This estimate is a percentage of the well numbers and surface disturbance that may not occur under each alternative. The impacts of the various restrictions are shown using the change in oil and gas production that results from all management actions.

The number of wells projected to be drilled under each alternative is used to estimate potential effects on other resources. These well numbers provide an easy, but incomplete, basis for estimating effects because multiple wells can be drilled from the same surface location. Well locations (as opposed to well numbers) are an indicator of human presence or disruptive activities and related impacts. The other major component of the fluid minerals RFD scenario is surface disturbance related to the construction of exploration and development wells and associated infrastructure. Surface disturbance associated with oil and gas development activity is the primary indicator of effects on other resources. Surface disturbance varies by type of well (conventional versus CBNG) because well pad size can vary and multiple wells can be drilled from one surface location. The estimate of surface disturbance by alternative is included in the BFO final RFD report; these estimates are included in Appendix G (p. 1937). Many variables may increase or decrease the level of drilling activity and associated surface disturbance acreage during the planning period. If the projections in the RFD prove to be inaccurate, the BLM will evaluate the RMP when the well numbers or surface disturbances in the RFD are approached to determine if a plan amendment or revision is warranted. Every subsequent action must be consistent with the RMP, and that consistency is checked in every NEPA document the BLM completes.

In addition to the number of oil and gas wells and the surface disturbance estimated for each alternative, the locations of the oil and gas activity are important to the analysis of effects on other resources. Most of the oil and gas exploration and development is projected to occur in areas currently experiencing oil and gas development, based on high and moderate oil and gas potential (Map 23). Map 23 identifies the areas in the Buffalo planning area most likely to experience future oil and gas development activity.

Oil and gas leasing, exploration, and development can occur throughout the entire Buffalo planning area, except where it is restricted.

The RFD and RFA tables can be found in Appendix G (p. 1937).

Assumptions

- The analysis began with the baseline total unconstrained oil and gas development potential taken from the RFD scenario for oil and gas (Stilwell et al. 2012) as summarized in Chapter 3, and applied the constraints from the other resource programs in Chapter 2. Constraints under each resource may affect oil and gas development.
- Most of the planning area has a high potential for the occurrence of oil and gas (Stilwell et al. 2012).
- There will be low or no potential interest in developing geothermal resources during the planning period.
- The RFD was updated in 2012 to reflect the increased interest in horizontal drilling.
- The CBNG potential is 51.8 percent federal fluid minerals.
- The conventional potential is 51.5 percent federal fluid minerals.
- Constraints greater than 160 acres are not reachable by CBNG technologies.
- Constraints greater than 1,300 acres are not reachable by conventional technologies.

The following terms are used to define the extent of environmental consequences:

- Negligible – The impact on the resource is barely detectable; less than 1 percent of the resource is affected. This level of impact is not considered to be significant to the fluid mineral resource.
- Minor – The impact on the resource is slight but detectable; there is a small change in the resource. This includes impacts on 1 percent to 5 percent of the resource. This level of impact is not considered to be significant to the fluid mineral resource.
- Moderate – The impact on the resource is readily apparent; there is a measurable change in the resource. This includes impacts to between 5 and 10 percent of the resource.
- Major – The impact on the resource is great; there is a highly noticeable, long-term, or permanent measurable change in the resource. This includes impacts on more than 10 percent of the resource.
- In this section impact is used instead of effect for describing what may happen to the fluid mineral resource. The reason for this is that impact describes an action that has an adverse effect on the fluid minerals resource. The impact can be described as anything that would cause the fluid minerals resource to not be developed or would add time and cost to the project.

Significance Criteria

Impacts on leasable fluid minerals are considered significant if management actions affects 250 or more CBNG wells and 50 or more conventional wells.

4.2.3.2. Impacts Common to All Alternatives

Leasable Minerals – Fluids

Geothermal leasing and geophysical exploration would be allowed in the same areas as oil and gas leasing under all alternatives; this action would treat all fluid mineral activities equally. The deferral of fluid mineral leasing in areas with leased coal would impact the availability of fluid mineral resources. This would be a minor impact as the fluid mineral

resources would still be present but their availability would be delayed until the coal operation is completed. The remaining management actions common to all alternatives are incorporated into policy or Oil and Gas Onshore Order #1.

Physical Resources

Air Quality

The air quality management actions common to all alternatives have no impact on the fluid minerals resource.

Soil

Authorized surface-disturbing activities will include plans for reclamation; site-specific reclamation actions should reflect the complexity of the project, environmental concerns, and the reclamation potential of the site. This management action is already a requirement of Oil and Gas Onshore Order #1. Therefore, it has no additional impact to the fluid minerals resource.

Water Resources

The water management actions common to all alternatives have no impact on the fluid minerals resource.

Cave and Karst Resources

The cave and karst management actions common to all alternatives have no impact on the fluid minerals resource.

Mineral (other than Fluid Mineral) Resources

Under all alternatives, the development of other mineral resources may have a negligible impact on fluid mineral resources. In these situations, conflicts between fluid minerals development and other minerals development would generally be addressed on a case-by-case basis. Regulations preclude the waste of any public resource, and in most situations compromises are reached that affirm the ability of minerals developers to produce the mineral resources.

Fire and Fuels Management

Fire and fuels management prioritizes fire suppression in areas with high resource values and high values to humans, including oil and gas development areas and infrastructure. Wildland fires generally have little impact on the development and production of oil and gas resources, but they can be devastating when they occur. Health and safety impacts for oil and gas personnel can be significant. Fuel treatments designed to reduce fuels and meet other multiple-use resource objectives may benefit oil and gas production by reducing the sizes and intensities of wildland fires, thereby reducing the threat of loss of oil and gas facilities to wildland fire. The individual alternatives have no impact on the federal minerals resource and are therefore not discussed further in the fluid minerals section.

Biological Resources

Vegetation – Forest and Woodlands

There are no impacts common to all alternatives for forest and woodlands management actions.

There are no impacts to the oil and gas resource from forest and woodlands and are therefore not discussed further in the *Leasable Minerals–Fluids* section.

Vegetation – Grassland and Shrubland Communities

Grassland and shrubland communities management may influence the location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. These are the only impacts to the oil and gas resource from grassland and shrubland communities and are therefore not discussed further in the *Leasable Minerals–Fluids* section.

Vegetation – Riparian/Wetland Resources

Riparian/wetland resources management actions common to all alternatives may influence the location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Invasive Species and Pest Management

There are no impacts common to all alternatives for invasive species and pest management actions. There are no impacts to the oil and gas resource from invasive species and pest management and are therefore not discussed further in the *Leasable Minerals–Fluids* section.

Fish and Wildlife Resources – Fish

Fish resource management actions common to all alternatives may influence the timing, location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Fish and Wildlife Resources – Wildlife

Wildlife resource management actions common to all alternatives may influence the timing, location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Special Status Species – Plants

SSS plants resource management actions common to all alternatives may influence the location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Special Status Species – Fish

SSS fish resource management actions common to all alternatives may influence the timing, location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Special Status Species – Wildlife (including Greater Sage-Grouse)

SSS wildlife resource management actions common to all alternatives may influence the timing, location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Upland game birds management actions common to all alternatives may influence the timing, location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Raptors resource management actions common to all alternatives may influence the timing, location and size of oil and gas facilities. Surface disturbance is prohibited within 0.5 mile for known active bald eagle nests, and would have a negligible impact because this affects 7,710 acres or 0.22 percent of the fluid mineral resource. This impact may affect 32 CBNG wells and may preclude them from being drilled. In some cases the surface disturbance prohibition and the addition of the 1 mile CSU from February 1 to August 15 could lead to the fluid minerals resource not being developed.

Heritage Resources

Cultural Resources

The cultural resources management actions common to all alternatives have no impact on the fluid minerals resource.

Paleontological Resource

The paleontological resources management actions common to all alternatives have no impact on the fluid minerals resource.

Visual Resources

Visual resources manage WSAs under VRM Class I objectives. Any facilities or structures proposed in WSAs will be designed so as not to impair wilderness suitability. As fluid mineral development would be largely precluded within a WSA, there would be no effect from VRM Class I management. Elsewhere, visual resources management would require non-temporary facilities and structures to be screened, painted, and designed to blend with the surrounding landscape except where safety indicates otherwise. These management actions may influence the timing, location, size, and coloration of oil and gas facilities, but rarely preclude the development or completion of oil and gas activities. Visual resources management may have a minor to moderate impact on the fluid minerals resource depending on the location and intensity of the oil and gas activity.

Land Resources

Forest Products

There are no impacts to the fluid minerals resource from common to all alternatives for forest products management actions. There are no impacts from each alternative to the fluid minerals resource from forest products management and are therefore not discussed further in *Leasable Minerals–Fluids* section.

Lands and Realty

There are no impacts to the fluid minerals resource common to all alternatives for lands and realty management actions. There are no impacts from each alternative to the fluid minerals resource from lands and realty management and are therefore not discussed further in *Leasable Minerals–Fluids* section.

Renewable Energy

There are no impacts to the fluid minerals resource common to all alternatives for renewable energy management actions. There are no impacts from each alternative to the fluid minerals resource from renewable energy management and are therefore not discussed further in the *Leasable Minerals–Fluids* section.

Rights-of-Way and Corridors

There are no impacts to the fluid minerals resource common to all alternatives for ROW and corridors management actions. There are no impacts from each alternative to the fluid minerals resource from ROW and corridors management and are therefore not discussed further in *Leasable Minerals–Fluids* section.

Travel and Transportation Management

TTM actions for maintenance of the public land transportation system would provide for public safety and adequate access for minerals development tasks. In most cases, developers would use the existing state, county, or BLM transportation network for initial access to potential oil and gas exploration sites, access for geophysical exploration, and similar activities. Once the BLM approves oil and gas exploration and development activities, developers may be required to improve and maintain existing BLM roads or develop new roads and remove them when they are no longer needed. There are no impacts to the fluid minerals resource common to all alternatives for TTM actions. There are no impacts from each alternative to the fluid minerals resource from transportation access management and are therefore not discussed further in the *Leasable Minerals–Fluids* section.

Recreation

Recreation management actions may utilize the best available technology to minimize noise and light pollution potentially affecting recreation facilities and sites, and may have a negligible impact on the fluid minerals resource. This management action would not preclude the development or completion of oil and gas activities but it could influence the size, color and equipment of oil and gas facilities.

Lands with Wilderness Characteristics

There is no development forecasted for CBNG or conventional development within the southern Big Horn Mountains, the region of the planning area that includes the area possessing wilderness characteristics. Therefore there will be no impact on fluid minerals management and wilderness characteristics will not be discussed further in the *Leasable Minerals–Fluids* section.

Livestock Grazing Management

There are no impacts to the fluid minerals resource common to all alternatives for livestock grazing management actions. There are no impacts from each alternative to the fluid minerals resource from livestock grazing management and are therefore not discussed further in the *Leasable Minerals–Fluids* section.

Special Designations**Areas of Critical Environmental Concern**

ACEC management actions common to all alternatives will have no impact on the fluid minerals resource. However, the management actions within each alternative may have varying degrees of impact on the fluid minerals resource.

Scenic or Back Country Byways

There are no impacts to the fluid minerals resource common to all alternatives for scenic or national BCBs management actions. There are no impacts from each alternative to the fluid minerals resource from scenic or national BCBs management and are therefore not discussed further in the *Leasable Minerals–Fluids* section.

Wild and Scenic Rivers

There are no impacts to the fluid minerals resource common to all alternatives for WSRs management actions. There are no impacts from each alternative to the fluid minerals resource from WSRs management and are therefore not discussed further in the *Leasable Minerals–Fluids* section.

Wilderness Study Areas

If Congress acts on the WSAs (Fortification Creek, Gardner Mountain, and North Fork) (Map 75), the RMP will be amended. BLM Manual 6330 – Management of Wilderness Study Areas guidelines would continue to be followed during the RMP amendment. The BLM manages WSAs for the preservation of natural conditions and processes, and to provide opportunities for solitude or a primitive and unconfined type of recreation. Under the guidance of BLM Manual 6330 – Management of Wilderness Study Areas, the BLM manages WSAs to emphasize primitive, nonmotorized activities to maintain the current natural values. These actions may have a minor impact on fluid minerals development, because the total area of the WSAs is small compared to the area of potential oil and gas development.

Socioeconomic Resources

Social and Economic Conditions

There are no impacts to the fluid minerals resource common to all alternatives for socioeconomics management actions. There are no impacts from each alternative to the fluid minerals resource from socioeconomics management and are therefore not discussed further in the *Leasable Minerals–Fluids* section.

Health and Safety

There are no impacts to the fluid minerals resource common to all alternatives for health and safety management actions. There are no impacts from each alternative to the fluid minerals resource from health and safety management and are therefore not discussed further in the *Leasable Minerals–Fluids* section.

4.2.3.3. Alternative A

Leasable Minerals – Fluids

Stipulating fluid mineral leases in areas with leased coal would impact the availability of fluid mineral resources. This would be a minor impact as it affects 1.3 percent of the fluid minerals resource which would still be present but the availability would be delayed until the coal operation is completed.

Physical Resources

Air Quality

The air management action, modeling on a project specific basis, will have no effect on the fluid minerals resource.

Soil

Alternative A applies an NSO stipulation for minerals leases on slopes equal to or greater than 25 percent. This covers 412,145 acres and may have a major impact because it affects 12 percent of the fluid minerals resource and may affect 416 CBNG wells and 23 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells.

Surface-disturbing activities are restricted on soils with poor reclamation suitability. This covers 1,514,445 acres and may have a major impact because it affects 45 percent of the fluid minerals resource and may affect 3,598 CBNG wells and 599 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying an NSO stipulation for minerals leases in areas with severe erosion hazard covers 669,739 acres. This may have a major impact because it affects 20 percent of the fluid minerals resource and may affect 3,780 CBNG wells and 383 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Under Alternative A, surface-disturbing activities on badlands, rock outcrops, and slopes susceptible to mass movement are restricted on a project-specific basis. This management action has been inconsistently applied. This management approach may have a moderate impact on the fluid minerals resource, depending on how much area may be affected and how prevalent the action may be.

Overall the management actions for soil for Alternative A would have a major impact on the fluid minerals resource.

Water Resources

Alternative A prohibits surface-disturbing activities within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams. This applies to 95,172 acres and may have a minor impact because it affects 2.8 percent of the fluid minerals resource and may affect 777 CBNG wells and 59 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Cave and Karst Resources

The cave and karst management action will have no effect on the fluid minerals resource.

Mineral Resources**Leasable Minerals – Coal**

On coal leases for which mining and reclamation plans have been approved, oil and gas leases under Alternative A would stipulate that oil and gas operations not interfere with approved coal mining. There are 45,500 acres closed to leasing due to coal mining activity. This may have a minor impact because it affects 1.3 percent of the fluid minerals resource.

Biological Resources

Vegetation – Riparian/Wetland Resources

Alternative A prohibits surface-disturbing activities within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams. This applies to 144,045 acres and may have a minor impact because it affects 4.2 percent of the fluid minerals resource and may affect 777 CBNG wells and 59 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Fish and Wildlife Resources – Fish

Under Alternative A, mineral leasing activities near fish-bearing waters may be considered on a case-by-case basis. This management action has been inconsistently applied. This may have a minor impact on the fluid minerals resource, depending on how much area may be affected and how prevalent the action may be.

Fish and Wildlife Resources – Wildlife

Under Alternative A, surface disturbance and occupancy are prohibited unless waived by the authorized officer within Ed O. Taylor, Kerns, Bud Love and Amsden Creek big game winter ranges. This applies to 14,216 acres and may have a negligible impact because it affects 0.4 percent of the fluid minerals resource and may affect one CBNG well and one conventional well.

Alternative A prohibits surface disturbance and disruptive activities in crucial elk winter range between November 15 and April 30 and in elk calving areas from May 1 to June 30, when necessary, a total of 173,512 acres). This may have a minor impact on fluid minerals development because activities would be allowed during other periods.

Alternative A prohibits surface disturbance and occupancy within 750 feet of sharp-tailed grouse leks at any time. This applies to 2,200 acres and may have a negligible impact because it affects less than 0.1 percent of the fluid minerals resource and may affect one CBNG well and one conventional well.

Alternative A prohibits surface disturbance within an additional 0.64-mile radius of sharp-tailed grouse leks from April 1 through May 30 unless the authorized officer waives the prohibition (35,736 acres). This may have minor impacts on fluid minerals development because the duration of the constraint is less than six months.

Alternative A prohibits surface disturbance or occupancy within a biologic buffer zone around active nests of raptor species of high federal interest unless the authorized officer waives the prohibition. This applies to 1,195,815 acres and may have a major impact because it would affect 35 percent of the fluid minerals resource and may affect 5,040 CBNG wells and 1,327 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative A precludes new surface-disturbing activities within 0.5 mile of raptor nests during critical periods from February 1 to July 31 (2,298,687 acres). This may have a major impact on fluid minerals development due to the size and duration of the timing stipulation.

Overall the management actions for Fish and Wildlife Resources – Wildlife would have a major impact on the fluid minerals resource.

Special Status Species – Plants

Under Alternative A, minerals leasing in habitat for special status plant species is

considered on a case-by-case basis. This management action has been inconsistently applied. This may have a minor impact on fluid minerals development, depending on how much area may be affected and how prevalent the action may be.

Special Status Species – Fish

Under Alternative A, surface-disturbing activities near waters with special status fish are considered on a case-by-case basis. This management action has been inconsistently applied. This may have a minor impact on fluid minerals development, depending on how much area would be affected and how prevalent the action may be.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative A manages SSS wildlife on a case-by-case basis. This management action has been inconsistently applied. This management may have a minor impact on oil and gas development, depending on how much area is affected and how prevalent the action may be.

Alternative A prohibits or restricts surface-disturbing activities or surface occupancy within a 0.25-mile radius of the perimeter of occupied Greater Sage-Grouse leks. This covers 22,777 acres and may have a negligible impact on fluid minerals development because it affects 0.7 percent of the fluid minerals resource and may affect 8 CBNG wells and 1 conventional well.

This alternative prohibits surface disturbance within Greater Sage-Grouse nesting habitat from March 1 to June 15, unless the authorized officer waives the prohibition, and affects 1,685,563 acres of the fluid minerals resource. This may have a moderate impact due to the size and duration of the timing stipulation.

Alternative A requires a 0.5-mile year-round disturbance free buffer zone for known active bald eagle nests and bald eagle winter roosts. This applies to 7,710 acres, and may have a negligible impact because it affects 0.23 percent of the fluid minerals resource and may affect 32 CBNG wells and 1 conventional well.

Applying a TLS within 1 mile of known active bald eagle nests and bald eagle winter roosts covers 24,171 acres and may have a negligible impact because it affects 0.5 percent of the fluid minerals resource.

Alternative A prohibits surface disturbance or occupancy within a biological buffer zone around active nests of special status raptor species unless waived by the authorized officer. This covers 433,635 acres, and may have a major impact because it affects 13 percent of the fluid minerals resource and may affect 5,040 CBNG wells and 1,327 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative A manages SSS amphibians, reptiles, and bats on a case-by-case basis. This management action has been inconsistently applied. This management may have a minor impact on oil and gas development, depending on how much area is affected and how prevalent the action may be.

Overall the management actions for SSS – Wildlife would have a major impact on the fluid minerals resource.

Heritage and Visual Resources

Cultural Resources

Alternative A applies NSO stipulations on mineral leases for the Crazy Woman Battle Site and potentially eligible or significant segments of the Bozeman Trail (0.25 mile or the visual horizon, whichever is closer). This applies to 27,233 acres, and may have a negligible impact because it affects 0.6 percent of the fluid minerals resource, and may affect 61 CBNG wells and 20 conventional wells.

Minerals activities in areas with sensitive or sacred sites are considered on a case-by-case basis. This management action has been inconsistently applied. This management action may have a minor impact on oil and gas development, depending on how much area is affected and how prevalent the action may be.

Overall the management actions for cultural resources would have a minor impact on the fluid minerals resource.

Paleontological Resources

Minerals activities in areas with paleontological sites are considered on a case-by-case basis. This management action has been inconsistently applied. This management action may have a negligible impact on oil and gas development, depending on how much area is affected and how prevalent the action may be.

Visual Resources

Visual resources are managed in accordance with objectives for VRM classes that have been assigned to the planning area. This may have a negligible impact on the fluid minerals resource as it influences the timing, location, size, and coloration of oil and gas facilities, but rarely precludes the development or completion of oil and gas activities.

Land Resources

Recreation

Under Alternative A, oil and gas leasing and development are not allowed in the Mosier Gulch Recreation Area and surface disturbance or occupancy is prohibited within 0.5 mile of the site unless waived by the authorized officer. This action may have a negligible impact because it affects less than 0.01 percent of the fluid minerals resource and may not affect oil and gas development since it is outside the RFD scenario.

Prohibiting surface disturbance or occupancy within 0.5 mile of Dry Creek Petrified Tree **EEA**, unless waived by the authorized officer, may have a negligible impact because it affects less than 0.01 percent of the fluid minerals resource and may affect 6 CBNG wells and 1 conventional well.

Overall the management actions for Recreation would have a negligible impact on the fluid minerals resource.

Special Designations

Areas of Critical Environmental Concern

There are presently no ACECs within the planning area; ACEC management actions will have no impact on the fluid minerals resource.

Wilderness Study Areas

Under Alternative A WSAs will continue to be unavailable for fluid mineral leasing and development. The Fortification Creek WSA has high potential for CBNG resources and as high as moderate potential for conventional resources. Gardner Mountain and North Fork WSAs have no fluid mineral potential. WSA management may have a negligible adverse impact on oil and gas development.

4.2.3.4. Alternative B**Leasable Minerals – Fluids**

Suspending fluid mineral leases in areas with leased coal would impact the availability of fluid mineral resources. This would be a minor impact as it affects 1.3 percent of the fluid minerals resource which would still be present but the availability would be delayed until the coal operation is completed.

Physical Resources**Air Quality**

Alternative B's requirement for air quality modeling may have a negligible impact on the fluid minerals resource as it would increase operator costs.

Soil

Under Alternative B, NSO stipulations for mineral leases in areas with severe erosion hazard covers 669,739 acres. This may have a major impact because it affects 20 percent of the fluid minerals resource and may affect 1,958 CBNG wells and 168 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying an NSO stipulation for mineral leases on slopes equal to or greater than 25 percent covers 412,145 acres. This may have a major impact because it affects 12 percent of the fluid minerals resource and may affect 280 CBNG wells and 15 conventional wells.

Applying an NSO stipulation on surface-disturbing activities on soils with poor reclamation suitability covers 1,514,445 acres. This may have a major impact because it affects 45 percent of the fluid minerals resource and may affect 3,598 CBNG wells and 600 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying an NSO stipulation on badlands, rock outcrops, biological crusts, and slopes susceptible to mass movement covers 685,950 acres and may have a major impact because it affects 20 percent of the fluid minerals resource and may affect 1,280 CBNG wells and 108 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for soil would have a major impact on the fluid minerals resource.

Water Resources

Alternative B prohibits surface-disturbing activities within 500 feet of springs, reservoirs, water wells, perennial streams, and associated riparian habitat to prevent stream bank and soil erosion. The 500-foot buffer covers 95,172 acres of the soils in the planning area, which may

have a minor impact because it affects 2.8 percent of the fluid minerals resource and may affect 778 CBNG wells and 59 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Prohibiting on-channel reservoirs covers 397,753 acres, and may have a negligible impact because it may not preclude oil and gas development, rather it limits one option of water disposal.

Overall the management actions for water resources would have a minor impact on the fluid minerals resource.

Cave and Karst Resources

Alternative B prohibits all surface- and subsurface-disturbing activities in cave and karst areas. This covers 212,626 acres and may have a negligible impact because the cave and karst resources do not overlap the RFD for CBNG or conventional wells, but it may affect whether or not a lease for fluid minerals is leased and what the bid for that lease might be.

Mineral Resources

Leasable Minerals – Coal

Under Alternative B, when a coal lease-by-application is filed over existing oil and gas leases, the coal lease applicant will be required to develop a mitigation plan acceptable to the oil and gas lessee allowing maximum recovery of both resources. Implementation of this mitigation plan must be accepted by any successful lease-by-application bidder and will become a stipulation on the coal lease. If a mitigation plan cannot be agreed upon prior to offering the coal lease sale, then BLM will delineate coal tracts to avoid oil and gas operations or will delay leasing of the coal tract. This may have a moderate beneficial effect on the fluid mineral estate.

Biological Resources

Vegetation – Riparian/Wetland Resources

Alternative B applies an NSO stipulation and prohibits surface-disturbing activities for mineral leasing within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains. This covers 144,045 acres and may have a moderate impact because it affects 4.2 percent of the fluid minerals resource and may affect 1,218 CBNG wells and 233 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Fish and Wildlife Resources – Fish

Alternative B applies an NSO stipulation to fluid minerals leases within 0.25 mile of naturally occurring waterbodies containing native and desirable non-native fish species. This covers 261,869 acres and may have a moderate impact because it affects 7.7 percent of the fluid minerals resource and may affect 1,263 CBNG wells and 308 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Fish and Wildlife Resources – Wildlife

Under Alternative B, surface disturbance and occupancy are prohibited within Ed O. Taylor, Kerns, Bud Love and Amsden Creek winter ranges for big game. This applies to 14,216 acres and

may have a negligible impact because it affects 0.4 percent of the fluid minerals resource and may affect one CBNG well and one conventional well.

Alternative B applies a CSU stipulation to leases in elk crucial winter range and calving areas. This may have a minor impact because the CSU is more than 40 acres.

Requiring fluid minerals production and by-products to be piped out of crucial elk winter range and calving areas may have a minor impact because it may add cost to the oil and gas project.

Prohibiting surface-disturbing and disruptive activities within 0.5 mile of big-game migration and travel corridors covers 85,462 acres. This may have a minor impact because it affects 2.5 percent of the fluid minerals resource and may affect 102 CBNG wells and 20 conventional wells.

Applying an NSO stipulation to mineral leases within 0.25 mile of sharp-tailed grouse leks covers 3,601 acres. This may have a negligible impact because it affects 0.05 percent of the fluid minerals resource and may affect 14 CBNG wells and one conventional well.

Applying a TLS to mineral leases within an additional 2-mile radius of sharp-tailed grouse leks from April 1 through July 15 may have a minor impact due to the size and duration of the timing restriction.

Applying an NSO stipulation to mineral leases within a biologic buffer zone around active nests of raptor species of high federal interest covers 1,195,815 acres. This may have a major impact because it affects 35 percent of the fluid minerals resource and may affect 5,040 CBNG wells and 1,327 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying a TLS to mineral leases with 1.5 miles of active raptor nests may have a moderate impact due to the size and duration of the timing restriction.

Overall the management actions for Fish and Wildlife Resources – Wildlife would have a major impact on the fluid minerals resource.

Special Status Species – Plants

Alternative B applies an NSO stipulation on mineral leases in habitat for special status plant species. This covers 243,929 acres and may have a minor impact because the plant habitat is mostly outside the area of the RFD, even though it affects five percent of the fluid minerals resource and may affect 5 CBNG wells and 5 conventional wells.

Special Status Species – Fish

Alternative B applies an NSO stipulation on mineral leases within 0.25 mile of any waters containing special status fish species. This covers 2,481 acres and may have a negligible impact on the fluid minerals resource because it affects less than 0.01 percent of the fluid minerals resource and is outside the area of the RFD.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative B locates and manages facilities to minimize noise impacts on SSS. This rarely precludes the development or completion of oil and gas activities and may have a minor impact to the fluid minerals resource.

Managing surface-disturbing and disruptive activities to minimize impacts on special status wildlife species and their habitats rarely precludes the development or completion of oil and gas activities and may have a minor impact to the fluid minerals resource.

Applying an NSO stipulation to mineral leases containing prairie dog habitat covers 47,702 acres and may have a minor impact because it affects 1.4 percent of the fluid minerals resource and may affect 142 CBNG wells and 16 conventional wells.

Alternative B leases minerals in Greater Sage-Grouse habitat dependent upon Greater Sage-Grouse habitat suitability, population density, and development density. Leasing is closed within 4.0 miles of Greater Sage-Grouse leks and winter concentration areas and covers 2,248,685 acres. This may have a major impact because it affects 66 percent of the fluid minerals resource and may eliminate 4,468 CBNG wells and 1,294 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying an NSO prohibiting surface disturbing activities, disruptive activities, and occupancy within 4 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks covers 2,248,685 acres. This may have a major impact because it affects 66 percent of the fluid minerals resource and may affect 4,468 CBNG wells and 1,294 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying a TLS prohibiting surface disturbance and disruptive activities within nesting and early brood-rearing habitat greater than 4 miles of an occupied or undetermined Greater Sage-Grouse lek, from March 1 to July 15, may have a major impact due to the size and duration of the timing stipulation.

Applying a TLS prohibiting surface disturbance and disruptive activities, from November 15 to March 14, for Greater Sage-Grouse winter concentration areas may have a major impact due to the size and duration of the timing stipulation.

Applying a CSU that allows no more than one disturbance and three percent total surface disturbance per 640 acres within the DDCT analysis area covers 3,117,708 acres or 92 percent of the fluid minerals resource. This may have a major impact on CBNG because the restrictions effectively eliminate CBNG development since CBNG is developed on 80 acre spacing and is shallow enough geologically that directional drilling techniques may not allow full development of this resource. This same CSU may also have a major impact on conventional development because of the size of the pads and access roads along with the existing disturbance that would exceed the 3 percent disturbance cap which may severely restrict conventional development on federal minerals.

Alternative B applies an NSO stipulation to mineral leases within 0.5 mile of the following riparian corridors consistently used by bald eagles: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. This covers 58,902 acres and may have a minor impact because it affects 1.6 percent of the fluid minerals resource and may affect 536 CBNG wells and 69 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells. This buffer may be adjusted to 1.0 mile or greater based on topographic features, visibility, disturbance and human activity levels, and other factors, which covers 147,321 acres. This may have a minor impact because it affects 4.3 percent of the fluid minerals resource and may

affect 1,447 CBNG wells and 186 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Prohibiting surface-disturbing and disruptive activities within 1.5 miles of a SSS raptor nest may be a major impact because of the size and duration of the management action.

Applying an NSO stipulation to mineral leases within a biologic buffer zone around active nests of special status raptor species covers 433,635 acres. This may have a major impact because it affects 13 percent of the fluid minerals resource and may affect 1,580 CBNG wells and 687 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative B prohibits surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats in the following areas: identified 100-year floodplains, areas within 1,640 feet (500 meters) of perennial waters, springs, playas, wells, and wetlands, areas within 100 feet of ephemeral channels, and areas within 1,640 feet (500 meters) of south-facing rock outcrops. This covers 1,217,959 acres and may have a major impact because it affects 36 percent of the fluid minerals resource and may affect 3,956 CBNG wells and 1,265 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for SSS – Wildlife would have a major impact on the fluid minerals resource.

Heritage and Visual Resources

Cultural Resources

Alternative B recommends withdrawals from minerals leasing and closes fluid minerals leasing in areas with historic properties that retain their historic settings. This covers 759,449 acres and may have a major impact because it affects 22 percent of the federal mineral estate and may eliminate 1,440 CBNG wells and 519 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Prohibiting surface disturbance in areas containing historic properties, within 5 miles or the visual horizon (whichever is closer) of historic properties that retain their integrity of setting covers 1,854,954 acres and may have a major impact because it affects 55 percent of the fluid minerals resource and may affect 2,246 CBNG wells and 888 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Recommending withdrawals and closing mineral leasing in areas with sensitive sites such as TCPs and sacred sites to protect their settings covers 4,642 acres. This may have a negligible impact because it affects only 0.14 percent of the federal mineral estate and may affect 30 CBNG wells and 4 conventional wells.

Overall the management actions for cultural resources would have a major impact on the fluid minerals resource.

Paleontological Resources

Alternative B closes mineral leasing in areas containing paleontological resources of high importance and affects 860 acres. This may have a negligible impact because it would affect 0.02 percent of the fluid minerals resource and may eliminate six CBNG wells and one conventional well.

Visual Resources

Visual resources manages all VRI Class II areas and special emphasis areas as VRM Class II. All VRI Class III areas outside special emphasis areas are managed as VRM Class III. This may have a minor impact on the fluid minerals resource as it influences the timing, location, size, and coloration of oil and gas facilities, but rarely precludes the development or completion of oil and gas activities.

Land Resources**Recreation**

Under Alternative B, closing areas to leasing and prohibiting surface disturbance in SRMAs and within a 0.5-mile buffer around SRMAs covers 55,529 acres. This may have a minor impact because it affects 1.6 percent of the fluid minerals resource and may eliminate 17 CBNG wells and 11 conventional wells.

Special Designations**Areas of Critical Environmental Concern**

Closures to mineral leasing in the Cantonment Reno, Burnt Hollow, Dry Creek Petrified Tree, Fortification Creek, Hole-in-the-Wall, Pumpkin Buttes, and Welch Ranch ACECs covers 511,000 acres. This may have a minor impact because it affects 1.9 percent of the fluid minerals resource and may eliminate 193 CBNG wells and 29 conventional wells.

Wilderness Study Areas

Alternative B prohibits all motorized and mechanized equipment in WSAs. WSAs are closed to oil and gas leasing under Manual 6330. The Fortification Creek WSA has high potential for CBNG resources and low to moderate potential for conventional resources. Gardner Mountain and North Fork WSAs have no fluid mineral potential. This covers 28,931 acres, and may have a negligible impact because it affects 0.6 percent of the fluid minerals resource.

4.2.3.5. Alternative C**Leasable Minerals – Fluids**

Stipulating coal leases in areas with leased fluids would benefit the fluid mineral resources, as the fluid mineral development would take preference over the coal lease on 1.3 percent of the fluid minerals resource.

Physical Resources**Air Quality**

Air quality monitoring is not required, the air management action will have no effect on the fluid minerals resource.

Soil

The soils management actions will have no effect on the fluid minerals resource.

Water Resources

The water management action will have no effect on the fluid minerals resource.

Cave and Karst Resources

Under Alternative C, cave and karst management actions may have a negligible impact on the fluid minerals resource. A CSU stipulation in cave and karst areas covers 11 acres and affects less than 0.01 percent of the fluid minerals resource and may not affect any wells.

Mineral Resources

Leasable Minerals – Coal

Under Alternative C, stipulate fluid mineral leases when nominated within the areas identified acceptable for further consideration for coal leasing (BLM 2001a) to require a mitigation plan allowing for maximization of both coal and oil and gas resources. Since oil and gas leasing would still be possible in these areas and the oil and gas resources would not be destroyed, the acreage is irrelevant and any additional constraint on the lease may be a minor impact.

Biological Resources

Vegetation – Riparian/Wetland Resources

The riparian and wetland communities management action will have no effect on the fluid minerals resource.

Fish and Wildlife Resources – Fish

The fish management actions will have no effect on the fluid minerals resource.

Fish and Wildlife Resources – Wildlife

The big game and upland game birds management actions will have no effect on the fluid minerals resource.

Under Alternative C, a TLS is applied within 0.5 mile of active raptor nest. This affects 757,733 acres and may have a moderate impact due to the size of the timing stipulation.

Special Status Species – Plants

Alternative C applies an NSO stipulation to mineral leases in areas with known populations of special status plant species. This may have no effect on the fluid minerals resource since there are no special status plant species that currently overlay the RFD.

Special Status Species – Fish

Alternative C applies an NSO stipulation within 500 feet of any waters containing special status fish species. This covers 821 acres, and may have a negligible impact because it affects 0.02 percent of the fluid minerals resource and may affect 11 CBNG wells and 1 conventional well.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative C manages as follows within occupied Greater Sage-Grouse habitat:

- CSU prohibiting surface-disturbing and disruptive activities and occupancy within 0.25 mile of the perimeter of occupied or undetermined Greater Sage-Grouse leks. This affects 22,777 acres

and may have a negligible impact because it affects 0.7 percent of the fluid minerals resource and may affect 7 CBNG wells and one conventional well.

- Prohibit surface-disturbing and disruptive activities in all areas within 2 miles of occupied leks from March 1 to July 15. This may have a moderate impact due to the size and duration of the timing stipulation.
- Prohibit surface-disturbing and disruptive activities and occupancy within Greater Sage-Grouse winter concentration areas from November 15 to March 14. This may have a moderate impact due to the size and duration of the timing stipulation.

Alternative C requires a 0.5 mile year round disturbance free buffer zone for known bald eagle winter roosts. This applies to 7,710 acres, and may have a negligible impact because it affects 0.22 percent of the fluid minerals resource and may affect 32 CBNG wells and 1 conventional well.

Applying a TLS within 1 mile of known bald eagle winter roosts covers 24,171 acres and may have a negligible impact because it affects 0.5 percent of the fluid minerals resource.

Applying a TLS within 0.25 mile of a special status raptor nest affects 75,276 acres. This may have a minor impact due to the size and duration of the timing stipulation.

Applying a CSU stipulation to mineral leases within a biologic buffer around active nests of special status raptor species year-round covers 433,635 acres. This may have a major impact because it affects 13 percent of the fluid minerals resource and may affect 1580 CBNG wells and 687 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative C special status amphibians, reptiles, and bats species management actions will have no effect on the fluid minerals resource.

Overall the management actions for SSS – Wildlife would have a major impact on the fluid minerals resource.

Heritage and Visual Resources

Cultural Resources

Alternative C allows mineral leasing in areas containing historic properties that retain their historic setting, when appropriate mitigation is accomplished. Mitigate through appropriate stipulations such as NSO or CSU to protect the setting. This covers 759,449 acres and may have a major impact because it affects 22 percent of the fluid minerals resource and may affect 1,440 CBNG wells and 519 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative C allows mineral leasing in areas with sensitive sites such as TCPs and sacred sites, and may apply mitigation through appropriate stipulations such as NSO or CSU to protect the settings of such sites. This covers 92,494 acres, and may have a minor impact because it affects 2.7 percent of the fluid minerals resource and may affect 641 CBNG wells and 214 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for Cultural Resources would have a major impact on the fluid minerals resource.

Paleontological Resources

Alternative C paleontologic resource management actions will have no effect on the fluid minerals resource.

Visual Resources

Alternative C visual resources manage all VRI Class II areas as VRM Class III. All VRI Class III areas are managed as VRM Class IV. This may have a negligible impact on the fluid minerals resource as it influences the timing, location, size, and coloration of oil and gas facilities, but rarely precludes the development or completion of oil and gas activities.

Land Resources**Recreation**

Alternative C allows leasing in the Burnt Hollow, Petrified Tree, Middle Fork, Mosier Gulch, Welch Ranch, and Weston Hills SRMAs in accordance with the surrounding management, which covers 30,896 acres. This may have a negligible impact because it affects only 0.6 percent of the fluid minerals resource.

Special Designations**Areas of Critical Environmental Concern**

The ACEC management action will have no effect on the fluid minerals resource.

Wilderness Study Areas

Alternative C prohibits all motorized equipment in WSAs. This covers 28,931 acres, and may have a negligible impact because it affects 0.6 percent of the fluid minerals resource. The Fortification Creek WSA has high potential for CBNG resources and as high as moderate potential for conventional resources. Gardner Mountain and North Fork WSAs have no fluid mineral potential.

4.2.3.6. Alternative D**Leasable Minerals – Fluids**

Suspending fluid mineral leases in areas with leased coal would impact the availability of fluid mineral resources. This would be a minor impact as it affects 1.3 percent of the fluid minerals resource which would still be present but the availability would be delayed until the coal operation is completed.

Physical Resources**Air Quality**

The air quality management actions will have no effect on the fluid minerals resource.

Soil

Alternative D applies a CSU stipulation on soils with a severe erosion hazard with an approved reclamation and stabilization plan. This covers 669,739 acres and may have a major impact because it affects 20 percent of the fluid minerals resource and may affect 1,959 CBNG wells and 168 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying a CSU on all slopes 25 percent or greater covers 412,145 acres. This may have a major impact because it affects 12 percent of the fluid minerals resource and may affect 280 CBNG wells and 15 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells.

Applying a CSU stipulation on LRP areas such as badlands, rock outcrops, biological crusts, and slopes susceptible to mass movement covers 685,950 acres. This may have a major impact because it affects 20 percent of the fluid minerals resource and may affect 1,280 CBNG wells and 108 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for soil would have a major impact on the fluid minerals resource.

Water Resources

Alternative D applies a CSU stipulation to any fluid mineral lease within 500 feet of any spring, non-CBNG reservoir, water well, or perennial stream based on other resource values, including, but not limited to soil, slope, and vegetation. This covers 95,172 acres and may have a minor impact because it affects 2.8 percent of the fluid minerals resource and may affect 778 CBNG wells and 59 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Cave and Karst Resources

Alternative D applies a CSU stipulation within cave and karst areas. This covers 212,626 acres (4.4%) and may have a negligible impact because the cave and karst resources do not overlap the RFD for CBNG or conventional wells.

Mineral Resources

Leasable Minerals – Coal

Stipulate fluid mineral leases when nominated over existing coal leases to allow maximum recover of the coal resources. When an oil and gas parcel is nominated over a coal lease application or coal lease modification application, the parcel will be pulled from the oil and gas sale list and deferred until such time a coal lease is issued. Once a coal leased is issued or the sale cancelled and the case closed, the deferred parcel nomination may be added to the oil and gas lease sale list with stipulations. This may have a moderate impact on the fluid minerals resource and could affect the resources throughout the planning period.

Biological Resources

Vegetation – Riparian/Wetland Resources

Alternative D applies a CSU stipulation to any fluid mineral lease within 500 feet of riparian/wetlands systems, and aquatic habitats. This covers 144,045 acres and may have a moderate impact because it affects 4.2 percent of the fluid minerals resource and may affect 1,216 CBNG wells and 233 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Fish and Wildlife Resources – Fish

Alternative D applies a CSU stipulation within 0.25 mile of naturally occurring waterbodies

containing native and desirable non-native fish species. This covers 261,870 acres and may have a moderate impact because it affects 5.5 percent of the fluid minerals resource and may affect 1,263 CBNG wells and 308 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Fish and Wildlife Resources – Wildlife

Alternative D prohibits surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges for big game. This covers 14,216 acres and may have a negligible impact because it affects 0.3 percent of the fluid minerals resource and no CBNG wells or conventional wells as these area are located outside the RFD.

Applying a CSU and TLS stipulation to leases within big game crucial winter range and elk calving areas covers 334,366 acres. This may have a minor impact because it affects 9.8 percent of the fluid minerals resource and may affect 253 CBNG wells and 43 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells.

Requiring fluid mineral production and byproducts to be piped out of crucial elk winter range and calving areas unless operator proposes and acceptable alternative may have a minor to moderate effect based on the type of production and the additional equipment required to pipe the fluids. This requirement does not grant approval for off-lease measurement and/or commingling.

Applying a CSU stipulation to mineral leases within 0.25 mile of sharp-tailed grouse leks covers 3,601 acres. This may have a negligible impact because it affects 0.05 percent of the fluid minerals resource and may affect 14 CBNG wells and 1 conventional well.

Applying a TLS to minerals leases within an additional 2-mile radius of sharp-tailed grouse leks from April 1 through July 15 may have a minor impact due to the size and duration of the timing restriction.

Alternative D applies a CSU stipulation to fluid mineral leases within the USFWS recommended biologic buffer zone around active nests of raptor species of conservation concern. This covers 1,195,815 acres and may have a major impact because it affects 35 percent of the fluid minerals resource and may affect 5,040 CBNG wells and 1,327 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative D applies a TLS to fluid mineral leases within USFWS recommended spatial buffer of an active raptor nest for the following time periods:

- February 1 to July 15 for golden eagles, barn owls, and great horned owls. This covers 111,962 acres and affects 3.3 percent of the fluid minerals resource.
- April 1 to July 31 for ospreys, merlins, sharp-shinned hawks, kestrels, prairie falcons, northern harriers, Swainson's hawks, and Cooper's hawks. This covers 19,708 acres and affects 0.6 percent of the fluid minerals resource.
- March 1 to July 31 for red tailed hawks, short eared owls, long eared owls, and screech owls. This covers 79,644 acres and affects 2.4 percent of the fluid minerals resource.
- Overall the TLS may have a moderate impact due to the size and durations of the stipulations.

Overall the management actions for Fish and Wildlife Species – Wildlife would have a major impact on the fluid minerals resource.

Special Status Species – Plants

Alternative D applies a CSU stipulation to mineral leases in habitat for special status plant species. This covers 243,929 acres and may have a minor impact because it affects 7.2 percent of the fluid minerals resource and may affect 15 CBNG wells 5 conventional wells.

Applying an NSO stipulation to fluid mineral leases within known special status plant populations may have a negligible impact because the current populations are outside the RFD.

Special Status Species – Fish

Alternative D prohibits surface-disturbing activities within 0.25 mile of fish-bearing waters when special status fish species are present. This covers 2,481 acres, and may have a negligible impact because it affects 0.1 percent of the fluid minerals resource and may affect 15 CBNG wells and 2 conventional wells.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative D locates and manages facilities to mitigate noise impacts on special status wildlife species. This rarely precludes the development or completion of oil and gas activities and may have a minor impact on the fluid minerals resource.

Managing surface-disturbing and disruptive activities to minimize impacts on special status wildlife species and their habitats rarely precludes the development or completion of oil and gas activities and may have a minor impact on the fluid minerals resource.

Applying a CSU stipulation to mineral leases in areas with active prairie dog colonies to provide suitable habitat to SSS that depend on prairie dog colonies covers 47,702 acres. This may have a minor impact because it affects 1.4 percent of the fluid minerals resource and may affect 143 CBNG wells and 16 conventional wells.

Greater Sage-Grouse Core Population Area

Alternative D applies an NSO prohibiting surface-disturbing activities, disruptive activities, and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks. This covers 30,754 acres and may have a negligible impact because it affects 0.9 percent of the fluid minerals resource and may affect 84 CBNG wells and 1 conventional well.

Applying a CSU that allows on average no more than one disturbance and no more than five percent total disturbance per 640 acres within the DDCT analysis area and, where technologically feasible, prohibits facilities with motion, light sources, noise (10 decibels above ambient), and heights greater than 4.5 feet covers 519,945 acres. This may have a major impact because it affects 15.3 percent of the fluid minerals resource and may eliminate 803 CBNG wells and affect 150 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells. CBNG resources need to be developed on 80 acre spacing which cannot be accomplished with only 1 disturbance per 640 acres and current technology. Due to directional and horizontal technologies, the conventional oil and gas resource may be accessed up to 1 mile under the Core Population Area boundary without the surface location being within Core Population Area. This may cause an increased density of conventional wells on the boundary of the Core Population Area.

Applying a TLS prohibiting surface-disturbing and disruptive activities within Core Population Area from March 15 to June 30, covers 440,114 acres. This may have a major impact due to the size and duration of the stipulation.

Applying a TLS prohibiting surface-disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas, from December 1 to March 14, may have a minor to moderate impact due to the size and duration of the stipulation.

Greater Sage-Grouse Core Population Connectivity Corridor

Alternative D applies an NSO prohibiting surface-disturbing activities, disruptive activities, and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks. This covers 7,359 acres and may have a negligible impact because it affects 0.2 percent of the fluid minerals resource and may affect 45 CBNG wells and 15 conventional wells.

Applying a CSU stipulation that allows no more than five percent total surface disturbance per 640 acres within the DDCT analysis area and avoids facilities with motion, light sources, noise (10 decibels above ambient), and height greater than 4.5 feet covers 150,006 acres. This may have a moderate impact because it affects 4.4 percent of the fluid minerals resource and may affect 763 CBNG wells and 70 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells. The management for Core Population Connectivity Corridors (Connectivity Corridors) is significantly different from the management of Core Population Areas. Within Connectivity Corridors the disturbance is not limited to 1 per 640 acres. This allows for the possibility of CBNG and conventional oil and gas development within Connectivity Corridors dependant on existing surface disturbance. While it is more likely that development will occur in Connectivity Corridors than in Core Population Areas, because of the restrictions, CBNG development will probably not happen within Connectivity Corridors.

Applying a TLS prohibiting surface-disturbing and disruptive activities within 4 miles of an occupied Greater Sage-Grouse lek, from March 15 to June 30, covers 131,849 acres. This may have a minor impact due to the size and duration of the timing stipulation.

Applying a TLS prohibiting surface-disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas, from December 1 to March 14, may have a minor to moderate impact due to the size and duration of the stipulation.

Greater Sage-Grouse Habitat Outside Core Population Areas and Core Population Connectivity Corridors

Alternative D applies an NSO prohibiting surface-disturbing activities, disruptive activities, and occupancy within 0.25 mile of the perimeter of occupied Greater Sage-Grouse leks. This covers 16,103 acres and may have a negligible impact because it affects 0.5 percent of the fluid minerals resource and may affect 8 CBNG wells and 1 conventional well.

Applying a TLS prohibiting surface-disturbing and disruptive activities within 2 miles of occupied Greater Sage-Grouse leks, from March 15 to July 30, covers 779,734 acres. This may have a major impact due to the size and duration of the timing stipulation.

Applying a TLS prohibiting surface-disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas, from December 1 to March 14, may have a minor to moderate impact due to the size and duration of the stipulation.

Alternative D requires a 0.5 mile year round disturbance free buffer zone for known active bald eagle winter roosts. This applies to 11,848 acres, and may have a negligible impact because

it affects 0.28 percent of the fluid minerals resource and may affect 32 CBNG wells and 1 conventional well.

Alternative D applies a CSU stipulation to mineral leases within 0.5 mile of the following riparian corridors consistently used by bald eagles: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. This covers 58,902 acres and may have a minor impact because it affects 1.6 percent of the fluid minerals resource and may affect 536 CBNG wells and 69 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells. This buffer may be adjusted to 1 mile or greater based on topographic features, visibility, disturbance and human activity levels, and other factors, which covers 147,321 acres. This may have a moderate impact because it affects 4.3 percent of the fluid minerals resource and may affect 1,447 CBNG wells and 186 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative D applies a TLS to mineral leases within a species specific spatial buffer using USFWS recommendations containing nests for an active SSS raptor nest for the following time periods:

- March 1 to July 31 for ferruginous hawks and peregrine falcons. This covers 670,652 acres and may have a major impact due to the size and duration of the timing stipulation.
- April 15 to September 15 for burrowing owls. This covers 11,316 acres and may have a minor impact due to the size and duration of the timing stipulation.
- April 1 to August 31 for northern goshawk. Currently there are no mapped nests for this species though they would likely be found in the area. Therefore, the impact may be none.

Applying an NSO stipulation to mineral leases within a biologic buffer zone using USFWS recommendations around active nests of special status raptor species covers 433,635 acres. This may have a major impact because it affects 12.8 percent of the fluid minerals resource and may affect 1,606 CBNG wells and 626 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Under Alternative D, a CSU stipulation is applied to mineral leases for the protection of special status amphibian, reptile, and bat species and their habitats where SSS occur in areas within 1,640 feet (500 meters) of perennial waters, vernal pools, playas, and wetlands, and within 1,640 feet of south-facing rock outcrops. This covers 1,217,959 acres, and may have a major impact because it affects 36 percent of the fluid minerals resource and may affect 3,956 CBNG wells and 1,265 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for SSS – Wildlife would have a major impact on the fluid minerals resource.

Heritage and Visual Resources

Cultural Resources

Alternative D applies an NSO stipulation to fluid mineral leases for Pumpkin Buttes, Cantonment Reno, Dull Knife Battle Site, Crazy Woman Battle Site, contributing and unevaluated segments of the Bozeman Trail, all rock art sites, all rock shelter sites, and all Native American burial sites.

This covers 24,461 acres, and may have a negligible impact because it affects 0.7 percent of the fluid minerals resource and may affect 58 CBNG wells and 15 conventional wells.

Applying a CSU stipulation to protect the setting within three miles of the above sites covers 613,601 acres. This may have a major impact on the fluid minerals resource because it affects 16 percent of the fluid minerals resource and may affect 1,440 CBNG wells and 519 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for Cultural Resources would have a major impact on the fluid minerals resource.

Paleontological Resources

Alternative D applies an NSO stipulation to mineral leases in areas containing paleontological resources of high quality or importance. This covers 860 acres and may have a negligible impact because it affects 0.02 percent of the fluid minerals resource and may affect 6 CBNG wells and 1 conventional well.

Visual Resources

Visual resources manage all VRI Class II areas (except Powder River Breaks and Fortification Creek) and special emphasis areas as VRM Class II. All VRI Class III areas, plus Powder River Breaks and Fortification Creek, outside special emphasis areas are managed as VRM Class III. This may have a minor impact on the fluid minerals resource as it influences the timing, location, size, and coloration of oil and gas facilities, but rarely precludes the development or completion of oil and gas activities.

Land Resources

Recreation

Alternative D does not allow fluid mineral leasing within the boundary of Burnt Hollow, Dry Creek Petrified Tree, Middle Fork Powder River, Mosier Gulch, Hole in the Wall, and Welch Ranch SRMAs. This may have a minor impact because it affects 1.5 percent of the fluid mineral resource and may eliminate 22 CBNG wells and 10 conventional wells.

Applying a CSU stipulation to Weston Hills SRMA covers 9,504 acres. This may have a negligible impact because it affects 0.3 percent of the fluid minerals resource and may affect six CBNG wells and nine conventional wells.

Overall the recreation management actions for recreation would have a minor impact on the fluid minerals resource.

Special Designations

Areas of Critical Environmental Concern

Alternative D designates two ACECs (2,849 acres) and manages them under site specific management plans. This may have a negligible impact because it affects less than 0.1 percent of the fluid minerals resource and may affect 18 CBNG wells and 5 conventional wells.

Wilderness Study Areas

Alternative D prohibits all motorized and mechanized equipment in WSAs. This

covers 28,931 acres, and may have a negligible impact because it affects 0.6 percent of the fluid minerals resource.

4.2.3.7. Cumulative Impacts

Oil and gas leasing, exploration and production continue under all alternatives in this RMP. The extent of the activity will be limited by each of the alternatives, with Alternative B imposing the most restrictions and Alternative C imposing the least, the prices of oil and gas commodities and the available technology for extraction of the fluid minerals. However, restrictions imposed on the resource can preclude the resource from being developed regardless of how valuable the oil and gas may be. For instance, where overlapping timing stipulations are present the operation window for drilling for oil and gas may be 3 months. Typically CBNG wells are drilled, completed and producing within 45 days. For the deeper conventional wells the drilling alone may take 30-60 days with another 30 days for completion and production activities. If anything occurs to extend these timeframes the operator may have to postpone the activities until the following year thereby increasing the cost of the well. Other restrictions, such as VRM, may not prohibit the project but may add to the cost of the project. These costs may cause a marginally economic project to be tabled until the future or may cause it to be dropped altogether.

4.2.4. Leasable Minerals – Other

The likelihood of other leasable minerals (i.e., leasable minerals other than coal, crude oil, natural gas, and geothermal energy) being explored for, or developed, in the planning areas is remote (see Chapter 3, *Other Leasable Minerals* section). Therefore, these minerals are not discussed further, and potential effects on other leasable minerals due to management actions for other resources are not analyzed. To date, the BFO has not received applications to lease a leasable mineral other than coal, oil, or gas in the planning area. If the office receives a lease application for leasing of another leasable mineral, the BLM solid minerals team in the High Plains District Office likely would process the application.

4.2.5. Salable Minerals

The BLM manages salable minerals to make them available for the mineral consumption needs of the nation. Salable minerals are the most common varieties of minerals, and include aggregate (such as sand and gravel), clinker (locally called “scoria”), common clay, stone, decorative rock, rip rap, and boulders; other minerals may also fall under this category. Clinker and sand and gravel comprise nearly all salable minerals disposals in the planning area. This section describes potential effects on the salable minerals resource from management actions for other resources and other management programs. The *Salable Minerals* section of Chapter 3 describes existing salable minerals resource conditions and likely trends during the planning period.

The Chapter 3 *Mineral Resources* section presents a discussion regarding the various mineral estate types and which mineral classifications (Leasable, Locatable, and/or Salable) BLM administers for each major mineral estate type present in the planning area. That section also discusses how split estate lands, which are lands with different surface estate and mineral estate ownership, are administered by the BLM, and for which mineral classifications. The total federal salable minerals resource in the planning area is comprised of all lands in which the federal government owns all minerals (on the Master Title Plats this is shown as “All Mins”) for all surface ownership types. The only exception is lands under the administration of USFS, which

may or may not have USFS surface. The total federal locatable minerals resource is quite large, approximately 3,357,586 acres. It is this acreage that is analyzed below, as these are the acres of the total federal salable minerals resource in the planning area that the BLM administers (see the *Mineral Resources* section of Chapter 3).

4.2.5.1. Methods and Assumptions

This section describes the methods and assumptions used in the effects analysis for the salable minerals resource. The *Salable Minerals* section of Chapter 3 describes existing salable minerals resource conditions. In general, the greater the number of acres affected, the greater the effect on the resource. Actions that limit, or impose restrictions upon, the acres of salable minerals resource open to mineral entry are considered adverse. Other actions may affect the accessibility to the salable minerals resource, and these will likely lead to increased project costs by delaying operations or production, or making operations inaccessible during certain times of the year. However, these actions would not affect the salable minerals resource itself, and are not discussed in detail. Even in the extreme example that a number of such limitations would result in such high costs that a given project became uneconomic, those acres of salable minerals resource would still be considered available or open to mineral materials disposals. Actions that increase the acres of salable minerals resource (those open or available) are considered beneficial. Also considered beneficial would be actions that would lead to a reduction in the number of acres currently under restrictions, reduced salable minerals activities costs, increased opportunities for salable minerals activities, and/or increased health and safety of workers and/or the general public in/near areas where these activities are occurring.

Assumptions

The assumptions may include, but are not limited to:

- The occurrence of a salable mineral does not imply that the mineral can be economically developed.
- Mineral occurrence potential includes both exploitable and potentially exploitable occurrences.
- The potential for occurrence of salable minerals exists across almost the entire planning area.
- A number of common variety minerals, such as sand, gravel, decorative stone, common clay, shale, borrow material, and clinker, occur in the planning area. Some varieties (such as sand, gravel, and clinker) have a high potential for development.
- The potential for development of sand, gravel, and clinker is expected to continue to be high throughout the planning period.
- Current demand for and production of decorative stone (e.g., building stone and moss rock) is low and expected to remain low throughout the planning period.
- The administration of salable minerals and related surface-disturbing activities would involve BLM cooperation with the Wyoming DEQ, as outlined in the current BLM/Wyoming DEQ MOU for salable minerals. The latest version of this MOU was signed on September 11, 2013, and is titled “Supplement to MOU No. WY-19 between the US DOI, BLM, Wyoming State Office, and the State of Wyoming DEQ, LQD, for Management of Surface Mining and Exploration for Mineral Materials (Salable Minerals) on Public Lands” (DOI and State of Wyoming 2013).
- The salable minerals resource discussed and analyzed in this document consists of only those acres of mineral ownership type “All Mins” with BLM, private, or State of Wyoming surface ownership (not USFS surface; see Chapter 3). Not included are lands in the Bighorn National Forest and the Thunder Basin National Grasslands, as the USFS administers the salable minerals

resource on those lands, even those without USFS surface. Also not included are lands under Department of Defense jurisdiction (e.g., the lands attached to the Veteran's Hospital northwest of Sheridan), as the mineral estate of those lands was transferred to the Department of Defense.

- Any alternative that limits salable minerals activities or acres would have an adverse effect on the potential exploration and development of salable minerals.
- Restrictions on salable minerals activities apply for the duration of the planning period. However, there could be changes through RMP amendments or changes in regulations.
- The disposal of salable mineral resources is discretionary.

Significance Criteria

In addition to the scale of effects identified at the beginning of Chapter 4, an adverse effect on the salable minerals resource as a result of management actions would be considered potentially significant if any of the following were to occur:

- An action would violate objectives associated with salable minerals resource management (including the *Materials Act of 1947*, as amended), and its magnitude would be such that special mitigation would be warranted.
- An action would violate the decisions, resolutions, and goals outlined in the BLM/Wyoming DEQ MOU for salable minerals activities, and its magnitude would be such that special mitigation would be warranted.
- An approved salable minerals project (exploration or development) became restricted to the point it would not be feasible to continue operations.
- An approved salable minerals project (exploration or development) became restricted to the point it would not be feasible to begin operations.
- New opportunities for salable minerals exploration and/or development on BLM-administered lands would be substantially reduced.

4.2.5.2. Impacts Common to All Alternatives

This section summarizes management actions common to all alternatives and the likely resulting effects on the federal salable minerals resource during the planning period due to their implementation. The acres of salable minerals resource that could be effected, and the percent of the salable minerals resource those acres represent, indicate the likely possible maximum number of acres that would be affected by the given management actions; the actual acres effected could be fewer.

Salable Minerals

All lands in the planning area not restricted (prohibited or closed) from salable minerals activities are open for the exploration and development of salable minerals. Currently, there are three areas in the planning area where salable minerals activities are restricted while under Congressional review: the WSAs, totaling 28,931 acres. This leaves 3,348,121 acres open to salable minerals activities, which is the entire resource (100%).

Physical Resources

Air Quality

Air quality management actions include implementing mitigation measures, such as dust suppression and cooperative efforts, to reduce dust emissions. These actions could require

ongoing monitoring for compliance, which would have a negligible adverse effect on salable minerals projects through increased costs.

Soil

Soils management actions include an onsite evaluation of proposed projects, mitigation of possible adverse effects on soils, and site-specific reclamation plans. These actions would have a negligible adverse effect on salable minerals projects through increased costs for additional soil-handling and reclamation steps and/or amending project site areas or access routes.

Water Resources

Water management actions include managing surface-disturbing activities to prevent degradation of water quality, managing water to meet Wyoming Standards for Healthy Rangelands, and reducing channel and bank erosion. Similar types of mitigation measures are already required for Wyoming DEQ Mine Permits, which are required for nearly all salable minerals development projects. The very occasional project that needs all these measures added, plus any additional measures the BLM would require for other Wyoming DEQ approved projects, would increase those projects costs; an overall negligible adverse effect.

Cave and Karst Resources

The cave and karst resources management actions common to all alternatives will not affect the salable minerals resource or activities.

Mineral Resources

Nearly the entire planning area is available for exploration and development of locatable, leasable, and salable minerals. Existing and future mining of other minerals in areas currently open and to become open to those activities could affect the salable minerals resource by increasing the acres where conflicts with other minerals projects might occur. In addition, multiple mineral resource uses in the same area are not always physically incompatible. Most potential incompatibility issues would likely result from differences in timing between the projects. This would likely result in increased project costs for one or both projects, due to delays in approval as timing issues are worked out between proponents. If timing cannot be worked out satisfactorily, it is likely one or more proponents would pursue similar projects in another or nearby area, depending on the particular projects they are pursuing.

Locatable Minerals

All lands except those formally withdrawn are open to locatable minerals projects. A total of 11,373 acres were withdrawn, leaving 777,310 acres of BLM-administered surface/all federally owned mineral lands open. Conflicts with locatable minerals projects could affect up to that entire acreage of the salable minerals resource (3,348,121 acres, 23%). The two main areas where locatable minerals projects are currently developed also contain potentially exploitable salable minerals. However, it is unlikely salable minerals will be developed in these areas during the planning period, as they are plentiful elsewhere. Therefore, the potential effect is likely to be much smaller; minor adverse.

Leasable Minerals - Coal

Federal coal lands identified as acceptable for further coal leasing consideration, via the April 2001 RMP Revision (BLM 2001a), are available for LBAs, lease modifications, emergency leases, and exchanges; the potential effect is minor adverse (115,372 acres, 3.45%). Some of these acres contain potentially exploitable occurrences of salable minerals. However,

such projects would likely not be pursued by proponents other than the nearby coal mines due to the related timing and safety issues. In addition, although coal mining does not close areas to salable minerals activities, if the exploitable salable deposits in these areas are not used by the coal mines, they will likely become unusable as coal mining proceeds through a given area. Unused salable minerals (typically surficial or near-surface) will become part of the overburden removed and stockpiled prior to coal mining, and placed back in the open pit after coal mining. This would tend to essentially destroy the value of such deposits, as their quality would most likely be compromised during the overburden removal, stockpiling, and replacing activities. This would result in some potentially exploitable salable minerals deposits in the areas of coal mines becoming unusable, though perhaps not many. This impact, plus possibly increased projects costs due to delays and temporary inaccessibility to some sites, would likely result in up to a minor adverse effect.

Leasable Minerals - Fluids

Effects to the salable minerals resource could be minor adverse (90,261 acres, 2.7%) by opening all unleased federal fluid mineral estate to leasing, but this does not close these areas to salable minerals activities; and the various projects might or might not be incompatible. In addition, some salable mineral deposits at well sites may be affected in quality, thickness, and areal extent as the oil/gas operators would move surficial materials around to attain a flat well site. When a well site is reclaimed, it will be recontoured to blend with surrounding topography; this may result in further loss of the quality of some potentially exploitable salable minerals deposits. The overall effect is likely minor adverse. Geothermal energy development potential in the planning area is low; therefore, conflicts with this resource are not likely during the planning period.

Fire and Fuels Management

Fire and fuels management actions could result in increased costs for some salable minerals projects by temporarily limiting access to certain areas. However, these effects will likely be of short duration, small in areal extent, occur only occasionally, and impact very few projects.

Biological Resources

Vegetation – Forests and Woodlands

There are no management actions common to all alternatives for forests and woodlands.

Vegetation – Grassland and Shrubland Communities

To reduce effects on grasslands and shrublands, which cover most of the planning area, salable minerals projects and access roads may need to be sited or redesigned to reduce adverse effects to vegetation. This would increase project costs and cause a negligible adverse effect.

Vegetation – Riparian/Wetland Resources

To reduce effects on riparian and wetlands areas, which are not uncommon in the planning area, salable minerals projects and access roads may need to be sited or redesigned to prevent the degradation, loss, or reduction of these resources. Similar types of mitigation measures are already required for Wyoming DEQ Mine Permits, which are required for nearly all salable minerals development projects. The very occasional project that needs all these measures added, plus any additional measures the BLM would require, would increase those projects' costs and likely result in an overall negligible adverse effect.

Invasive Species and Pest Management

Salable minerals projects would be required to limit surface disturbance to prevent weed spread, use certified weed seed-free products during reclamation, and treat reclaimed areas for invasive species, which are all likely to increase project costs. However, as these treatments should limit the spread of undesirable species and assist in achieving more successful reclamation, proponents may more likely see decreased overall project costs through avoidance of some planned or additional expenses. An overall negligible beneficial effect is expected.

Fish and Wildlife – Fish

Barriers to fish passage and activities potentially affecting native and desirable non-native fish species are to be managed with the WGFD and other stakeholders. These actions would possibly increase project costs through redesign of water crossings and result in a negligible adverse effect.

Fish and Wildlife – Wildlife

A number of management actions may lead to temporary or permanent inaccessibility to, and/or increase project costs in, certain areas and include: maintain or improve important wildlife habitats through various treatments and methods; consult with the WGFD when applying mitigation, and before allowing exceptions to, or modifying wildlife-related land use restrictions; provide suitable habitat to support WGFD wildlife population objectives; manage access to protect crucial habitats; construct new fences to avoid adverse effects to wildlife; and promote maintenance and improvement of habitat for migratory birds of conservation concern consistent with national, regional, and statewide conservation priorities. Overall a negligible adverse effect is anticipated.

Special Status Species – Plants

Management actions common to all alternatives include the following: implement actions in recovery plans, conservation measures, terms and conditions, BMPs, and reasonable and prudent measures within biological opinions for T&E plant species; and allow treatments within habitat and known populations proven to benefit the species. These management actions may temporarily or permanently affect access to, and/or increase project costs in, certain areas. Overall the likely effect is negligible adverse as SSS plants are typically rare and their populations are small and can therefore be easily avoided.

Special Status Species – Fish

A number of management actions may lead to temporary or permanent inaccessibility to, and/or increase project costs in, certain areas: require modification of projects that may affect SSS fish; require the BLM to assist in the restoration, reintroduction, augmentation, or reestablishment of SSS fish populations and habitats; and implement actions in recovery plans, conservation measures, terms and conditions, BMPs, and reasonable and prudent measures within biological opinions for special status fish species. Overall, these actions would likely result in a negligible adverse effect.

Special Status Species – Wildlife (including Greater Sage-Grouse)

A number of management actions may lead to temporary or permanent inaccessibility to, and/or increase project costs in, certain areas: utilize current research, management, and conservation plans and similar related documents to guide SSS wildlife habitat management; implement actions in recovery plans, conservation measures, terms and conditions, protection measures, and appropriate BMPs, and reasonable and prudent measures within biological opinions for T&E wildlife species; maintain seeps, springs, wet meadows, and riparian vegetation in a functional

condition; restore Greater Sage-Grouse brood-rearing habitats; manage vegetation composition, diversity, and structure to achieve Greater Sage-Grouse habitat management objectives; minimize disturbance that would alter springs and riparian Greater Sage-Grouse habitat, and develop water sources to replace affected or destroyed natural sources; and design water facilities and fences to reduce effects to Greater Sage-Grouse and habitat. Year-round disturbance-free buffer of at least 0.5 mile of known active bald eagle nests (329 acres, less than 0.01%), and seasonal limited access buffer of known active nests (1,366 acres, 0.2%). Some of these areas fall within areas likely to be developed for salable minerals, but are not expected to prohibit development. Overall the effect is likely negligible adverse.

Heritage and Visual Resources

Cultural Resources

Management actions common to all alternatives include: maintain and develop relationships with tribes to identify important sites, incorporate this information in planning documents, and manage these sites to minimize disturbance. A negligible adverse effect to salable minerals activities is likely from increased costs for some projects due to needing to adjust project areas, and also some temporary inaccessibility to some project areas.

Paleontological Resources

Retaining public lands with significant paleontological resources would also mean retention of salable minerals acres. However, as these lands would likely be restricted from salable minerals activities to conserve the paleontological resources, this would decrease the acres available for these activities. These actions would likely be a negligible adverse effect.

Visual Resources

Salable minerals activities in areas with established VRM classifications would be required to conform to the facility siting and design criteria for that classification, such as blending with the surrounding landscape. Areas with no previously-established VRI rating would be managed to match surrounding VRM classification. Mitigation for adverse effects on visual resources would increase costs for some salable minerals projects in areas of certain VRM classifications (mostly II, and sometimes III) and result in a likely negligible adverse effect.

Land Resources

Forest Products and Renewable Energy

There are no management actions common to all alternatives for forest products or renewable energy that would effect the salable minerals resource or activities.

Lands and Realty

Management actions include the prohibiting of subsequent uses of R&PP lands if not compatible with that authorization, withdrawals or segregations of surface and/or mineral lands, disposing of lands meeting certain criteria, and modifying, revoking, or terminating certain withdrawals and segregations. Any of these actions could result in decreasing or increasing the acres of, or restrictions on certain acres of the salable minerals resource. It is difficult to predict precisely what cumulative effects all these actions will have on the salable minerals resource, as many of the aspects of such projects are unknown at this time. However, it is likely that more lands will become unavailable or restricted from salable minerals activities due to such actions, which would result in a likely minor adverse effect.

Rights-of-Way and Corridors

Management actions include the siting of new ROWs adjacent to existing disturbances to minimize surface disturbance, which may necessitate modifying the siting of some roads and access routes. ROWs for salable minerals projects are uncommon: most salable minerals project-related uses of many areas of BLM surface in/near areas being explored or mined would qualify as legitimate occupancy of these lands under 43 CFR 3600 and 3715, making the need for a ROW for those projects unnecessary. ROWs would likely have a negligible adverse effect, due to possible increased costs for very few projects.

Travel and Transportation Management

Management actions include minimizing surface disturbance and erosion, closing roads temporarily or permanently where resource damage is occurring, reclaiming roads if they are heavily eroded, and prohibiting motorized travel if soils would be damaged. These actions may require redesigning and/or reconstructing all or certain portions of roads, and restricting use of certain roads during certain time periods. All these actions would result in increased costs for certain projects; as this likely would not be common, an overall negligible adverse effect is likely.

Recreation

Recreation management actions include allowing dispersed recreation and casual use of public lands throughout the planning area and minimizing noise and light pollution potentially affecting recreation facilities and sites. More dispersed recreation will result in more vehicles and people travelling across and/or temporarily occupying public lands. Approximately 20 percent of current authorized salable minerals projects are on BLM surface, and several other operators must cross BLM surface to access their project sites. This potential increased traffic at some project sites may lead to increased soil compaction, erosion, and/or trash and waste, also leading to increased operational and reclamation costs for these project proponents. Requiring minimization of noise and light pollution near recreation facilities will likely lead to increased costs for some salable minerals projects; this is not likely to affect more than a few projects, however. The overall effect is likely to be minor adverse.

Lands with Wilderness Characteristics

Evaluating newly acquired lands and other parcels meeting size and naturalness requirements for wilderness characteristics would temporarily restrict these lands from experiencing salable minerals activities. However, as all lands in the planning area have already been evaluated (see Alternative B), and the low likelihood of BLM acquiring any lands that might meet such characteristics, a negligible adverse effect is likely.

Livestock Grazing Management

Temporarily fencing off areas being explored and/or mined might be needed to protect livestock, possibly resulting in a short-term loss of grazing resources in relatively small areas. This loss will likely be very small and will be reversed upon completion of reclamation. Costs for some salable minerals projects will increase due to fencing costs, resulting in an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern

Currently, there are no designated ACECs in the planning area. However, should any ACECs be designated with the implementation of this RMP revision, management actions common to all include evaluating BLM-authorized activities and developing mitigation to protect the integrity of

the characteristics for which the ACECs were designated. As approximately 25 percent of salable minerals projects occur in/near potential ACECs, this management will likely increase costs for certain projects. However, until the particular ACECs are designated, it is difficult to accurately predict the likely impact. These actions would potentially result in a major adverse effect.

Scenic or Back Country Byways

Currently, there are no designated byways in the planning area. However, should any byways be designated after this RMP revision is approved, management actions common to all include managing byways with the objective of protecting the resource values of the area. Such designation likely will not involve instituting any restrictions to size, frequency, or timing of large truck traffic or the institution of a viewshed buffer along the byway within which few or very select disturbances may occur. Although approximately 40 percent of current salable minerals projects utilize and/or are near the roads that have been identified as potentially being designated as byways, there will likely be no effect.

Wild and Scenic Rivers

Currently, there are no designated WSRs in the planning area. Management actions common to all include continuing to implement Manual 6400 - *Wild and Scenic Rivers* for the one proposed WSR (2,664 acres, 0.08%), which involves restricting surface disturbance within that area until Congress acts on the designation. This area is unlikely to be explored or developed for salable minerals due to its' rugged terrain and long distance to points of use. Congress is not expected to act during the planning period; this restriction results in a negligible adverse impact to the salable minerals resource.

Wilderness Study Areas

Currently, there are three WSAs (28,931 acres, 0.86%) in the planning area. Management actions common to all include continuing to implement the BLM Manual 6330 - *Management of Wilderness Study Areas* for these WSAs, which includes restriction on salable minerals activities in these areas until Congress acts on these proposals. As Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas, these areas will remain restricted from salable minerals activities. The effect on the salable minerals resource is likely negligible adverse.

Socioeconomic Resources

Social and Economic Conditions

The BLM will utilize local and state socioeconomic plans, quantify socioeconomic effects where possible, and manage in consideration of the fact that BLM actions are integrally connected with the socioeconomic and cultural health of the planning area. The effect on salable minerals projects would likely be increased costs, and would be negligible adverse.

Health and Safety

Health and safety management actions seek primarily to ensure proper health and safety measures are included in mine plans, including proper procedures for handling spills and releases of hazardous substances, and mitigation for coal seam fires. The PRB is well-known for coal seam fires, and one salable minerals project occurs adjacent to such an area; risks were minimized to the operator and his personnel through education and discussions of risks and safety prior to approval. Waste minimization practices are encouraged, including reusing, recycling, and substituting when appropriate. Effects to salable minerals projects would likely be increased costs; however, many of these measures are already included in their Wyoming DEQ Mine

Permits. The resulting increases to the health and safety of the public, and a very few operators, is incalculable, though. Overall these actions would likely result in a negligible beneficial effect.

4.2.5.3. Alternative A

This section summarizes management actions under Alternative A, which is the continuation of current management, and the likely resulting effects on the federal salable minerals resource during the planning period due to their implementation.

Salable Minerals

Currently, there are three areas in the planning area where salable minerals activities are restricted while under Congressional review: the WSAs, totaling 28,931 acres. This leaves 3,348,121 acres open to salable minerals activities; these are the total acres of this federal resource analyzed below for all alternatives. As Congress is not expected to act during the planning period, and the BLM recommends to not officially designate these areas, these areas will remain restricted from salable minerals activities. Since these areas have already been prohibited from development, there is no effect on the salable minerals resource.

Physical Resources

Air Quality

The requirement for analysis of anticipated effects of proposed activities on air quality, and modeling on a project-specific basis, would likely increase salable minerals project costs and result in a negligible adverse effect.

Soil

Soils management actions include prohibitions on surface-disturbing activities on slopes equal to or greater than 25 percent (170,590 acres, 5.09%), in areas with poor reclamation suitability (455,090 acres 14%), and seasonally in areas of severe erosion hazard (215,496 acres, 6.44%); all these prohibitions have provisions for waivers, however. Prohibitions also on surface-disturbing activities have been applied on a project-specific basis for areas of LRP, such as badlands, rock outcrops, biologic crusts, and slopes susceptible to mass wasting (218,928 acres, 6.54%). Topsoil is to be salvaged during project activities and reapplied during reclamation. Less than 10 percent of salable minerals projects are currently authorized in such areas with BLM surface; that percentage is not likely to increase, as such areas tend to be avoided due to their inherent problems. However, some salable minerals sites are selected specifically because they have little topsoil or overburden covering the deposit, which leads to lower removal and replacement costs; mineral materials are typically low-price and have highly variable mining and transport costs. Although the RFA for salable minerals is that 532 acres are expected to be disturbed during the planning period (0.02%), and the effect to the resource from these types of restrictions will likely be higher; resulting in a minor adverse effect.

Water Resources

Prohibition on surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams may affect the salable minerals resource (19,861 acres, 0.59%). However, some mitigation measures regarding these features are already required for Wyoming DEQ Mine Permits, which are required for nearly all salable minerals projects. In addition, as these areas are usually undesirable for salable minerals projects due to such areas' inherent issues, and other considerations, much of this restriction is actually already taken into account when sites are selected. These actions would likely result in a negligible adverse effect.

Cave and Karst Resources

Prohibitions on surface disturbance within a buffer around significant cave entrances could be applied on a project-specific basis (11 acres, less than 0.01%); however, none have affected salable minerals projects so far. No salable minerals projects exist in these areas, and the likelihood of any being proposed here is quite low; the terrain is generally rugged, and these areas tend to be some distance from where the materials might be used. These factors would increase mining and transportation costs beyond economic feasibility, and these minerals are plentiful in other areas. The likely effect is negligible adverse.

Mineral Resources

Locatable Minerals

All lands except those formally withdrawn are open to locatable minerals projects. A total of 11,373 acres were withdrawn, leaving 777,310 acres of BLM surface open (100% of that resource). The two main areas where locatable minerals projects are currently developed also contain potentially exploitable salable minerals. It is unlikely though that salable minerals will be developed in these areas during the planning period, as they are plentiful elsewhere. The RFA for locatable minerals projects is that 554 acres will be developed, and 530 acres for salable minerals. Even if these two resources conflicted over all 530 acres, none of these lands would be closed to salable mineral activities; the likely effect is negligible adverse.

Leasable Minerals - Coal

The RFA for coal projects is 195,700 acres, and 532 acres for salable. If these two resources conflicted over all 532 acres, which is unlikely as salable minerals are plentiful elsewhere in the planning area, none of these lands would be closed to salable minerals activities; the effect is likely negligible adverse.

Leasable Minerals - Fluids

Although fluid mineral development could conflict with nearly the entire salable minerals resource, exploration and development for oil and gas would occur mostly in areas with high and moderate potential for those minerals. The maximum RFA for oil and gas projects is that 10,575 acres will be developed; 532 acres for salable minerals projects. Even if there were conflicts between the two resources over those entire 532 acres, none of these lands are closed to salable minerals activities. This amount of conflict is unlikely, as salable minerals are plentiful elsewhere, and some fluid and salable minerals projects in close proximity may not be incompatible; the effect is likely negligible adverse. Geothermal energy development potential in the planning area is low, therefore, conflicts with this resource are not likely during the planning period.

Fire and Fuels Resources

Inadvertent damage to property and facilities or temporary access limitations to salable minerals project sites could occur during fire suppression or prescribed fire activities. Such effects likely would be of short duration, small in areal extent, and occur only occasionally. These limitations may increase project costs for only a relatively few projects, at most resulting in a negligible adverse effect.

Biological Resources

Vegetation – Forests and Woodlands

Timber harvest and other vegetative treatments may temporarily limit access to certain salable minerals project sites. However, such limitations would likely be of relatively short duration, small in areal extent, and occur only occasionally, and relatively few salable mineral projects occur in or near wooded areas. Project costs would likely increase, but for relatively few projects; the effect would be negligible adverse.

Vegetation – Grassland and Shrubland Communities

Use of non-native species in reclamation seed mixtures has been approved on a project-specific basis. BLM reclamation policy allows the use of non-native species; a primary goal of reclamation is soil stabilization, and vegetation species are chosen towards that end. Changes in seed mix may increase project costs; however, more successful reclamation would likely lead to minimization of reclamation time and costs. Overall, the effect would be negligible beneficial.

Vegetation – Riparian/Wetland Resources

Prohibitions on surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams may effect up to 23,831 acres (0.71%); however, this prohibition can be waived. In addition, some mitigation and avoidance measures for such areas are already required for Wyoming DEQ Mine Permits, which are required for nearly all salable minerals projects. In addition, many of these areas are already avoided, due to their inherent issues. Prohibiting such activities in these areas essentially closes these areas to salable minerals activities; the effect would be negligible adverse.

Invasive Species and Pest Management

Invasive species and pest management actions could include area- and/or species-specific treatment strategies, applied on a project-specific basis to public lands. These treatments may increase salable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species from project sites, resulting in likely lower planned project expenses or avoidance of additional project costs, which would result in a negligible beneficial effect.

Fish and Wildlife Resources – Fish

Project-specific prohibitions on surface-disturbing and disruptive activities within 0.25 mile of naturally occurring water bodies containing acceptable fish species could result in an adverse effect to the salable minerals resource (51,745 acres, 1.55%). Project- and/or site-specific maintenance of reservoirs and riparian areas to improve potential fisheries could have a negligible adverse effect (13,102 acres, 0.39%). Other restrictions may also apply which will likely increase project costs. However, these areas will likely be avoided for salable minerals development; Wyoming DEQ Mine Permits should already include mitigation to avoid some of these areas. However, prohibiting such activities essentially closes these areas to salable minerals activities. The effect would be up to minor adverse.

Fish and Wildlife Resources – Wildlife

Wildlife management actions include a number of project- and non-project-specific distance and/or timing limitations or prohibitions on surface disturbance and occupancy in certain areas and habitats, and all will have adverse effects: year-round within the three big game WHMAs (4,583 acres, 0.14%); within 0.5 mile of big game migration corridors (9,587 acres, 0.46%), within 750 feet of sharp-tailed grouse leks (940 acres, 0.03%), and within a biologic buffer of active raptor nests (255,129 acres, 7.62%); seasonally within elk crucial winter range and calving areas (75,175 acres, 2.25%), and within 0.64 mile of sharp-tailed grouse leks (7,607 acres, 0.23%). Other

restrictions may also apply which will likely increase project costs, such as no removal of elk security habitat (132,148 acres, 3.95%). Approximately 25 percent of salable minerals projects occur in/near these areas. However, as year-round prohibitions and restrictions essentially close these areas to salable minerals activities, the likely effect will be up to moderate adverse.

Special Status Species – Plants

Year-round project-specific restrictions to protect SSS plants would have an adverse effect on the salable minerals resource (126,811 acres of suitable habitat on BLM surface, 3.79%). Surface-disturbing activities would avoid SSS plant populations, leading to adjustments of some project sites and/or access roads, or temporary inaccessibility to sites. SSS plants have very specific habitat requirements and therefore tend to occur in small areas, and the salable minerals RFA is 530 acres. The effect is up to minor adverse.

Special Status Species – Fish

Year-round project-specific restrictions to protect SSS fish (within 0.25 mile of any waters containing SSS fish) may have a negligible adverse effect (818 acres, 0.02%). Other restrictions may also apply which will likely increase project costs.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Measures to protect SSS wildlife include a number of distance and/or timing restrictions or prohibitions within certain areas and habitats, and all will have an adverse effect on the salable minerals resource: within prairie dog colonies (6,156 acres, 0.18%); within Greater Sage-Grouse strutting grounds (year-round restricted – 3,594 acres, 0.11%, seasonally prohibited – 203,724 acres, 6.08%); near bald eagle nests, winter roosts, hunting, and concentration areas (year-round – 402 acres, 0.01%; seasonally – 3,013, 0.09%); near raptor nesting areas (17,345 acres, 0.52%); and within habitats of SSS amphibians and reptiles (176,636 acres, 5.28%). Other restrictions may also apply that will likely increase project costs. Approximately 25 percent of salable minerals projects occur in/near these areas, and their RFA is 530 acres. The likely effect is up to moderate adverse.

Heritage and Visual Resources

Cultural Resources

Prohibitions of surface-disturbing activities within 0.25 mile or visual horizon of portions of the Bozeman Trail and Crazy Woman Battle Site could affect the salable minerals resource (3,588 acres, 0.11%). Project-specific prohibitions on surface-disturbing activities in or near certain areas containing historic properties or sensitive or sacred sites (such as TCPs, including the Pumpkin Buttes TCP) have an adverse effect to the salable minerals resource. Other project-specific requirements (such as archeological and/or Native American monitors) would likely increase salable minerals project costs. Many of these areas are already protected to a certain degree by other means; however, many will only be discovered through surface-disturbing activities. Also, salable mineral deposits are plentiful in other areas, and some projects can be mitigated or redesigned to reduce impacts. The likely up to minor beneficial effect to Cultural Resources (due to new discoveries of Cultural Resources) will mostly offset the minor adverse effect to the salable minerals resource and such activities (due to prohibitions at these sites, both currently known and future discoveries); the effect would likely be minor adverse.

Paleontological Resources

Project-specific prohibitions in areas identified as containing paleontological resources of high quality or importance may have a negligible adverse effect (860 acres, 0.03%).

Other project-specific requirements (such as paleontological field surveys) would likely increase salable minerals project costs. Similar to Cultural Resources, the up to negligible beneficial effect to Paleontological Resources (due to new discoveries through surface-disturbing activities), will be mostly offset by the negligible adverse effect to the Salable Minerals Resource (due to prohibitions); the effect would likely be negligible adverse effect.

Visual Resources

Salable minerals activities in areas with established VRM classifications would be required to conform to the objectives and characteristics of that classification, especially regarding the siting and design of facilities. Areas with BLM surface not rated will be managed to conform to the surrounding classification. Other project-specific requirements (such as visual simulation and mitigation design) may be applied. These limitations and requirements would likely increase project costs, with a negligible adverse effect.

Land Resources

Forest Products

Management actions include the sale of minor forest products from woodlands and noncommercial forestlands on BLM surface throughout the planning area, and fencing of regeneration areas. These activities may temporarily limit access to certain salable minerals projects; such limitations would likely be temporary, small, and occasional. As relatively few salable minerals projects occur in/near wooded areas, and with an RFA of 530 acres, the likely effect would be negligible adverse.

Lands and Realty

Land tenure adjustments may occur often on behalf of other resources and even other agencies, and these could increase or decrease BLM surface and/or federal mineral estate. Increasing or decreasing federal mineral acres would affect the salable minerals resource, depending on the type of mineral ownership of the lands involved. Neither increasing or decreasing acres of BLM surface would affect the salable minerals resource. Lands identified for acquisition are those adjacent to large blocks of BLM surface and in areas of high recreational potential (118,254 acres, 3.53%), while lands identified for disposal include those with agricultural potential or water (76,223 acres, 2.28%), and small isolated parcels (totaling 120,722 acres, 3.61%). It is extremely difficult to predict exactly which land tenure adjustments will occur during the planning period: exchanges and sales are usually initiated by those parties interested in obtaining those lands; donations are typically initiated by the donors; and acquisitions are often initiated by the sellers, or by the BLM in response to an eminent need. In addition, such land tenure adjustments can take a number of years to complete. The identified acquisitions and disposals, should they all occur during the planning period, would lead to an overall decrease in the salable minerals resource (78,691 acres, 2.35%). As discussed, it is much more likely that much fewer acres will be affected, however.

Renewable Energy

Approved renewable-energy projects on public lands would result in segregations of those acres from mineral entry, removing those acres from the salable minerals resource. Some renewable-energy projects will be long-lived, and others not as long lived, and some may not be incompatible with certain salable minerals activities. Those lands segregated would be made open again after the renewable-energy site is released from the segregation. Although no renewable-energy projects on public lands in the planning area have been received to date, it is predicted that 20,000 acres (2.57%) of BLM surface will be disturbed during the planning period.

for these projects. Only approximately 15–25 percent of the acres currently identified as most likely to be developed for renewable energy projects are in areas likely to be developed for salable minerals projects, in/near the Southern Big Horn Mountains. Renewable energy projects are not likely to be approved in these areas, however (see Chapter 3, *Renewable Energy* section). Although the salable minerals RFA is just 532 acres (0.02%), the level of impact from renewable energy could be up to that total amount (20,000 acres, 0.60%). However, it is more likely that fewer acres will be affected, and the effect would be up to minor adverse.

Rights-of-Way and Corridors

Some proposed ROWs (for roads, access routes, and/or facilities) may need to be modified to be placed within existing ROWs, and away from major transportation routes. The RFA for ROWs is 38,762 acres, and that for salable minerals is 532 acres, and conflict over all 532 acres would be negligible adverse impact (0.02%). In addition, ROWs for salable minerals projects are relatively rare (see Impacts Common to All Alternatives), so any ROWs issued for such use would likely be very few and likely only to increase costs for very few projects. No CCS projects have been received for public lands in the planning area to date. It is likely that some will be, as the current political climate appears to favor this type of action for managing GHGs, and much of the planning area contains geological formations currently believed to be amenable to these projects. Current management direction is to approve these as Land Use Applications/Permits (see the *Geological Resources* section of Chapter 3). Impacts from these types of Permits could be up to the total amount of BLM surface lands (777,310 acres, 23%). However, these projects will likely take some time to approve due to their complexity and the current financial climate. It is much more likely that the overall effect will be minor adverse.

Travel and Transportation Management

A number of area-specific restrictions to motor vehicle and OHV use, seasonally or year-round, may increase salable minerals project costs for certain project proponents. However, these areas might not be completely inaccessible as a number of exploration activities can be performed without motorized vehicles; mining and transportation of product would be challenging, though, at best. If a project proceeds, motorized vehicle access might be granted; but for designated Recreation Areas, WHMA, or other special management areas, motorized access likely would not be granted. These actions may require redesigning and/or reconstructing certain roads, and restricting use of certain roads during certain time periods, increasing project costs. Projects in these areas are not likely to be common as salable minerals are plentiful elsewhere, and given an RFA of 530 acres for salable minerals (0.02%), a negligible adverse effect is likely.

Recreation

No SRMAs are proposed under Alternative A, although surface disturbance would be prohibited within 0.5 mile of the Dry Creek Petrified Tree EEA. However, there are no known commercial deposits of salable minerals within the EEA, but are plentiful outside developed recreation areas. Also, given an RFA of 532 acres (0.02%) for salable minerals, an overall negligible adverse effect is expected.

Lands with Wilderness Characteristics

Acquired lands would be evaluated for wilderness characteristics. It is unlikely any acquisitions would contain wilderness characteristics; the effect is likely negligible adverse.

Livestock Grazing Management

Temporarily fencing off areas being explored and/or mined might be needed to protect livestock. Salable minerals project costs may increase; the overall effect would be negligible adverse.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways

There are presently no ACECs or Byways are designated, and none are proposed under Alternative A; therefore, there would be no effect.

Wild and Scenic Rivers

There are no Alternative A management actions for WSR that would result in an effect.

Wilderness Study Areas

Currently, there are three areas in the planning area where salable minerals activities are restricted while under Congressional review: the WSAs, totaling 28,931 acres (0.86%). Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas. These areas will remain restricted from salable minerals activities until Congress acts; whether these areas are designated or not, they will remain restricted from salable minerals activities, and there would be no effect.

Socioeconomic Resources

Social and Economic Conditions

The BLM will recognize and consider local and regional economic development and land use plans. The BLM management could further restrict or limit certain lands, or not limit or restrict others, as a result of the implementation of this action. The effect is difficult to predict, but may result in slightly more area being restricted; the effect would be negligible adverse.

4.2.5.4. Alternative B

This section summarizes management actions under Alternative B, which emphasizes resource conservation, and the likely resulting effects on the federal salable minerals resource during the planning period due to their implementation.

Salable Minerals

The three WSAs (totalling 28,931 acres) are already restricted from salable minerals activities. Conservation measures implemented for other resources under Alternative B would result in a total of 1,684,699 acres (50%) being closed to or restricted from salable minerals activities. This would leave 1,663,422 acres (50% of the resource) open to salable mineral activities.

Physical Resources

Air Quality

Quantitative air quality modeling, and mitigation to ensure project emissions would approach or exceed emissions standards, are required. This would likely increase project costs, and the effect would be negligible adverse.

Soil

Management actions for soils include prohibitions on surface-disturbing activities in areas with severe erosion hazard (215,496 acres, 6.44%), on slopes equal to or greater than 25 percent (170,590 acres, 5.10%), in areas with poor reclamation suitability (455,090 acres 14%), and on areas with LRP (218,928 acres, 6.54%). Less than 10 percent of salable minerals projects are

currently authorized in such areas on BLM surface. Salable minerals RFA is 114 acres, less than 0.01 percent. The effect on the salable minerals resource will likely be major adverse, as these prohibitions essentially remove those acres from potential use.

Water Resources

Surface disturbance is prohibited within 500 feet of springs, water wells, and perennial streams (19,861 acres, 0.59%). These areas are typically avoided due to their related inherent problems, and other considerations. The effect on the salable minerals resource will likely be negligible adverse, as these acres are essentially removed from potential use.

Cave and Karst Resources

Prohibited is surface disturbance within cave and karst areas (101,455 acres, 3.03%). Salable minerals projects proposed in these areas are not likely, due to the rugged terrain and long distance to where the materials would likely be used. The effect to salable minerals projects is likely to be minor adverse, as these acres are essentially removed from potential use.

Mineral Resources

Locatable Minerals

A total of 11,373 acres were withdrawn for three WHMAs, and this acreage remains withdrawn. A total of 717,741 acres (this total includes the three WSAs) are recommended for withdrawal under various management actions for other resources. Should all these acres be withdrawn from mineral entry (these are Congressional actions), this would leave 59,569 acres open to locatable minerals activities. Conflict with locatable minerals projects could potentially occur over up to all 59,569 acres of the salable minerals resource. However, the RFA for locatable minerals is 277 acres and 114 for salable minerals. Even if there are conflicts between these two resources over all 114 acres, that is less than 0.01 percent of the salable minerals resource. Conflict in those areas is unlikely, as salable minerals are plentiful on lands outside the areas likely to be developed for locatable minerals; some projects may be delayed, however. The likely effect would be negligible adverse from potentially increased project costs for few projects, due to delays or changing project sites.

Leasable Minerals - Coal

The RFA for coal projects is 186,600 acres and 114 for salable minerals. Even if there are conflicts between these two resources over all 114 acres, that is less than 0.01 percent of the salable minerals resource. Conflict in those areas is unlikely though, as salable minerals are plentiful outside areas most likely to be developed for coal. No lands are prohibited from use, but may be temporarily restricted from use; the effect would be negligible adverse.

Leasable Minerals - Fluids

A total of 2,612,920 acres will be closed to fluid mineral leasing, leaving 773,610 acres open to oil and gas projects. Conflict with oil and gas projects could potentially affect up to that number of acres of the salable minerals resource. However, the RFA for oil and gas projects is 286 acres and 114 acres for salable mineral. Even if there are conflicts between these two resources over all 114 acres, that is less than 0.01 percent of the salable minerals resource. Conflict in those areas is unlikely, though, as salable minerals are plentiful outside the areas likely to be developed for oil and gas projects. And, no lands are prohibited from salable minerals activities, but may be temporarily restricted from such uses.

Fire and Fuels Resources

Not all fires will be suppressed, likely resulting in types and extents of effects similar overall to those under Alternative A. Most affected salable minerals projects, which is likely to be not many, may experience adverse effects if in an area experiences a larger burn due to non-suppression. Overall the effect would be negligible adverse.

Biological Resources

Vegetation – Forests and Woodlands

Types of effects are similar to, but likely of lesser extent than, those under Alternative A, as silviculture and pest control treatments, techniques, and methods will be less extensively used (negligible adverse).

Vegetation – Grassland and Shrubland Communities

Requiring use of only native species for all reclamation activities may lead to increased project costs due to higher costs for some native seed species. Overall, the effect would likely be negligible adverse.

Vegetation – Riparian/Wetland Resources

Prohibitions on surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams may affect up to 23,831 acres (0.71%). Salable minerals RFA is 114 acres (less than 0.01%), and little of this development would be likely within riparian or wetland areas. The effect would be negligible adverse.

Invasive Species and Pest Management

Invasive species and pest management actions could include area- and/or species-specific treatment strategies, applied on a project-specific basis to public lands. These treatments may increase salable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species, resulting in likely lower planned project expenses or avoidance of additional project costs; a negligible beneficial effect would be likely.

Fish and Wildlife Resources – Fish

Prohibited are surface-disturbing and disruptive activities within 0.25 mile of naturally occurring water bodies containing acceptable fish species (51,745 acres, 1.1%). Reservoirs and riparian areas are managed to improve potential fisheries. Other actions will likely increase project costs. These areas are already mostly avoided due to mitigation on Wyoming DEQ Mine Permits; the salable minerals RFA is 114 acres. It is unlikely a project would be proposed in the restricted areas. A minor adverse effect would be likely, as these acres are essentially closed to salable minerals activities.

Fish and Wildlife Resources – Wildlife

Timing limitations and prohibitions required in Alternative B will adversely affect the salable minerals resource, including: the three WHMAs (4,583 acres, 0.14%); 0.5 mile of big game migration corridors (9,587 acres, 0.46%); elk crucial winter range and calving areas (75,175 acres, 2.25%); 750 feet year-round of sharp-tailed grouse leks (940 acres, 0.03%) and 0.64 mile seasonally (7,607 acres, 0.23%); and the biologic buffer of active raptor nests (255,129 acres, 7.62%). In addition, removal of elk security habitat is prohibited (132,148 acres, 3.95%), and an WHMA is recommended to be designated for the Fortification Creek elk herd's crucial and yearlong ranges (12,419 acres, 0.37%). Other restrictions also apply which will likely increase projects costs, including applying seasonal restrictions on existing projects (approximately 530

acres, 0.02%). With approximately 25 percent of salable minerals projects occurring in/near these areas, and an RFA of 114 acres, the likely effect would be moderate adverse. Some projects may experience increased costs, due to needing to amend project designs and/or areas, and delays. The year-round prohibitions essentially remove those acres from salable minerals activities.

Special Status Species – Plants

Surface-disturbing activities are required to avoid SSS plant habitat (126,811 acres, 3.79%), necessitating possible modifications of some project sites and/or access roads. These habitat areas are quite small, and given the salables RFA of 114 acres, the likely effect is minor adverse; these prohibited acres are essentially removed from potential use.

Special Status Species – Fish

Surface-disturbing and disruptive activities are prohibited are within 0.25 mile of any waters containing SSS fish (818 acres, 0.02%). Other prohibitions and requirements also apply which increase project costs. However, due to the small area where SSS fish are found the overall effect will be negligible adverse.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Surface-disturbing, disruptive, and/or occupancy activities are restricted or prohibited to conserve SSS wildlife within the following areas: prairie dog colonies (6,156 acres, 0.18%); Greater Sage-Grouse habitat (4.0-mile perimeter around occupied and undetermined leks and winter concentration areas, regardless of habitat suitability - 467,897 acres, 14%; greater than 4.0 miles of occupied and undetermined leks in nesting and brood-rearing habitat seasonally - 91,528 acres, 2.73%); seasonally within 1.5 miles of SSS raptor nests (113,784 acres, 3.40%); biologic buffer of SSS raptors (28,437 acres, 0.85%); and habitats of SSS amphibians and reptiles (176,636 acres, 5.28%). Other requirements also apply which will likely increase project costs: restoration of disturbed sagebrush communities on BLM surface; increasing visibility of existing fencing in Greater Sage-Grouse habitat; and anti-perching devices on powerlines in occupied Greater Sage-Grouse habitat. Some projects may not be approved if they would result in more than one disturbance or 3 percent of total surface disturbance per 640 acres. Approximately 50 percent of salable minerals projects occur in these areas, and their RFA is 114 acres. The likely effect would be major adverse, as year-round prohibitions essentially close those acres to salable minerals activities.

Heritage and Visual Resources

Cultural Resources

Surface-disturbing activities are prohibited within five miles or visual horizon of historic properties that retain their integrity of setting (330,592 acres, 9.88%). Salable minerals activities would be prohibited in areas containing historic properties that retain their historic setting (totaling 128,338 acres, 3.83%). Other requirements will likely increase salable minerals project costs: archeological monitors for all surface-disturbing activities, and Native American monitors when requested by tribes. The likely effect is major adverse, as these prohibitions essentially close these acres to salable minerals activities.

Paleontological Resources

Salable mineral activity would be prohibited within areas containing paleontological resources of high quality or importance (860 acres, 0.03%); these areas would be designated for special management, as they are identified. Salable minerals activities would be prohibited in certain areas containing paleontological resources of high quality or importance (40 acres,

less than 0.01%), which essentially removes these acres from salable uses; the effect would be negligible adverse. Other requirements would likely increase salable minerals project costs: paleontological field surveys for all PFYC Class 3, 4, and 5 formations; monitoring of surface-disturbing activities on all PFYC Class 4 and 5 formations, and Class 3 as needed.

Visual Resources

Areas will be managed according to their VRM classes. Visual simulation and mitigation design are required within or viewable from areas of VRM Classes I to III; this will increase project costs. The effect would likely be negligible adverse.

Land Resources

Forest Products

Required fencing of regeneration areas may temporarily limit access to certain salable minerals projects, although relatively few salable minerals projects occur in/near wooded areas. The likely effect is negligible adverse due to increased costs from temporary inaccessibility to certain sites.

Lands and Realty

Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate (see Alternative A). Lands having resource value will be retained (76,223 acres, 2.28%). Lands identified for disposal (120,722 acres, 3.61%) will be disposed of, with longest retention of those with higher resource values. Lands will be acquired as willing sellers make them available, with no priority to those adjacent to large blocks of BLM surface or areas of high recreational potential. Although it is difficult to predict which land tenure adjustments will occur during the planning period, if all those currently identified were to occur, the salable minerals resource would decrease (44,449 acres, 1.33%). It is more likely that much fewer acres will be disposed of; overall, the effect would likely be up to negligible adverse.

Renewable Energy

Approved renewable-energy projects on public lands would result in segregations of those acres from mineral entry, closing those acres to salable minerals activities until they are released from those segregations. Some renewable-energy projects may not be incompatible with certain salable minerals activities; see Alternative A. It is predicted that 5,000 acres of BLM surface (0.15% of BLM-administered salable minerals resource) will be disturbed during the planning period for these projects. The effect could potentially be up to that total amount, and would be negligible adverse.

Rights-of-Way and Corridors

ROWs will need to be placed within identified corridors, and away from major transportation routes. The RFA for ROWs is 18,011 acres of BLM surface (0.54% of BLM-administered salable minerals resource), and that for salable minerals is 532 acres; conflict over all 532 acres would be negligible adverse impacts (0.02%). In addition, ROWs for salable minerals projects are relatively rare (see *Impacts Common to All Alternatives*). CCS research and projects would be prohibited.

Travel and Transportation Management

A number of area-specific restrictions to motor vehicle use may increase salable minerals project costs for certain project proponents. However, these areas might not be completely inaccessible as a number of exploration activities can be performed without motorized vehicle. Projects in

these areas are not likely to be common as salable minerals are plentiful elsewhere; the effect would likely be negligible adverse, from increased costs for relatively few projects.

Recreation

A total of two ERMAs (totaling 726,573 acres, 22%) and eight SRMAs (totaling 55,529 acres, 1.66%) are proposed for designation, with closure to salable minerals activities in all SRMAs designated via this RMP (except for administrative use only). This could result in up to a minor adverse effect, as the acres in all designated SRMAs will be closed to salable minerals activities. Some of these potential SRMAs are already under some restrictions, and some are in areas not likely to be sought for salable mineral activities due to ruggedness of terrain and distance to likely markets, however.

Lands with Wilderness Characteristics

One area of lands with wilderness characteristics (12,237 acres, 0.37%) is recommended to be managed to emphasize primitive recreational opportunities and natural values, which includes closing to salable minerals activities. Much of this area is not likely to be sought for salable minerals activities, however, due to rugged terrain and long distances to markets.

Livestock Grazing Management

Temporarily fencing off areas being explored and/or mined might be needed to protect livestock. Salable minerals project costs may increase; the overall effect would be negligible adverse.

Special Designations

Areas of Critical Environmental Concern

A total of eight ACECs are proposed for designation (totaling 511,000 acres, 16%). Designation of any ACEC would close it to salable minerals activities; up to a major adverse impact. One of these eight ACECs, the Sagebrush Ecosystem ACEC, was proposed to help protect sagebrush habitat, which would help protect the Greater Sage-Grouse (467,897 acres, 14%). However, some of these potential ACECs are already under some restrictions, and some are in areas not likely to be sought for salable mineral activities due to ruggedness of terrain and distances to markets.

Scenic or Back Country Byways

A number of roads will be evaluated during the planning period for their eligibility to be proposed as National BCBs or Scenic Byways; possibly up to 89 miles of road or more. No effect is anticipated, as expected, as designation would not preclude salable minerals activities.

Wild and Scenic Rivers

One WSR (2,664 acres, 0.08%) is under Congressional review, and is managed according to Manual 6400 - *Wild and Scenic Rivers*, which includes surface disturbance restrictions. If Congress does not designate this WSR, the present restrictions would likely continue until Congress acts on the designation. Although Congress is not expected to act during the planning period, these restrictions result in a negligible adverse effect to the salable minerals resource. This area is not a likely target for salable minerals activities, however, given its remote location and rugged terrain.

Wilderness Study Areas

Currently, there are three areas in the planning area where salable minerals activities are restricted while under Congressional review: the WSAs, (totaling 28,931 acres, 0.86%). Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas. Whether Congress designates these areas or not, they will

remain restricted from salable minerals activities to retain these areas' characteristics. There would be no effect.

Socioeconomic Resources

Social and Economic Conditions

The BLM will consider local and regional economic development and land use plans. BLM management could further restrict or limit certain lands, or not limit or restrict others, as a result of the implementation of this action. In addition, mitigation strategies will be developed as needed to resolve conflicts that have detrimental effects to multiple resources. The effect is difficult to predict, but may result in slightly more area being restricted; the effect would be negligible adverse.

4.2.5.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource utilization, and the likely resulting effects on the federal salable minerals resource during the planning period due to their implementation.

Salable Minerals

The three WSAs (totalling 28,931 acres) are already restricted to salable minerals activities. Conservation measures implemented for other resources under Alternative C would result in a total of 57,213 acres being closed to or restricted from salable minerals activities (1.71%). This would leave 3,290,908 acres open to salable mineral activities, 98 percent of the resource.

Physical Resources

Air Quality

Quantitative air quality modeling is not required. There would be no effect.

Soil

Surface-disturbing activities are allowed, as consistent with other resource values. These include areas with severe erosion hazard, poor reclamation suitability, LRP, and on slopes equal to or greater than 25 percent; no effect to the salable minerals resource.

Water Resources

Allowed is surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams; there would be no effect to the salable minerals resource.

Cave and Karst Resources

A buffer is required around significant cave entrances (11 acres, less than 0.01%), although salable minerals projects in/near these areas is unlikely (see Alternative A); negligible adverse effect, as these acres would essentially be closed to mineral materials activities.

Mineral Resources

Locatable Minerals

A total of 11,373 acres were withdrawn for three big-game WHMAs, and this acreage remains withdrawn. A total of 28,931 acres (comprising the three WSAs) are restricted to prevent wilderness impairment. There are no additional areas recommended for withdrawal. This leaves

777,310 acres open for locatable minerals activities and therefore could potentially effect that number of acres of the salable minerals resource. However, the RFA for locatable minerals is 1,460 acres and 2,098 for salable minerals. Even if there are conflicts between these two resources over all 1,460 acres, that is 0.04 percent of the salable minerals resource. Conflict in those areas is unlikely, as salable minerals are plentiful on lands outside the areas likely to be developed for locatable minerals. Also, these lands would be not be closed to salable minerals activities, but some areas could potentially be temporarily inaccessible, increasing project costs; the effect would be negligible adverse.

Leasable Minerals - Coal

The RFA for coal projects is 195,700 acres and 2,098 for salable minerals. Even if there are conflicts between these two resources over all 2,098 acres, that is 0.06 percent of the salable minerals resource. Conflict in those areas is unlikely though, as known deposits of salable minerals are plentiful outside areas most likely to be developed for coal. Also coal projects do not close those areas to salable minerals. Negligible adverse effects are anticipated due to increased project costs from delays due to possible conflicts.

Leasable Minerals - Fluids

A total of 30,520 acres will be closed to fluid mineral leasing, leaving 3,356,010 acres open to oil and gas projects. Conflict with oil and gas projects could potentially affect up to the entire salable minerals resource. However, the RFA for oil and gas projects is 22,255 acres, 2,098 for salable minerals. Even if there are conflicts between these two resources over all 2,098 acres, that is 0.06 percent of the salable minerals resource. Conflict in those areas is unlikely, as salable minerals are plentiful outside the areas likely to be developed for oil and gas projects. Impacts would likely be increased costs for some projects; the effect would be negligible adverse.

Fire and Fuels Resources

Full protection strategies and tactics will be used across the entire planning area, likely resulting in types and extents of effects similar, although greater, overall to those under Alternative A. There is not likely to be many salable minerals projects affected due to temporary inaccessibility to project areas, and those effects would be negligible adverse from increased project costs.

Biological Resources

Vegetation – Forests and Woodlands

Types of effects are similar to, but likely of greater extent than those under Alternative A, as silviculture and pest control treatments, techniques, and methods will be more extensively used. There would be a negligible adverse effect to salable minerals activities due to potentially increased costs.

Vegetation – Grassland and Shrubland Communities

Desirable non-native species will be allowed for reclamation activities, likely leading to decreased project costs (see Alternative A); a negligible beneficial effect would be likely.

Vegetation – Riparian/Wetland Resources

Surface-disturbing activities are allowed within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains, as consistent with other resource values. The required Wyoming DEQ LQD Mine Permits already include avoidance or minimization/mitigation for such areas,

although most of these types of areas would be avoided due to problems inherent to them. There would be no effect.

Invasive Species and Pest Management

Invasive species and pest management actions could include area- and/or species-specific treatment strategies. These treatments may increase salable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species, resulting in potentially lower project expenses or avoidance of additional project costs; a negligible beneficial effect would be likely.

Fish and Wildlife Resources – Fish

Surface-disturbing activities are allowed within 0.25 mile of naturally occurring water bodies containing acceptable fish species. Reservoirs and riparian areas are managed to improve other resources first and potential fisheries second. Other actions may lead to increased project costs; a negligible adverse effect would be likely.

Fish and Wildlife Resources – Wildlife

Two seasonal restrictions occur under Alternative C: a WHMA is proposed to be designated for the Fortification Creek elk herd's crucial range (12,419 acres, 0.37%), which includes year-round restrictions; and a seasonal prohibition within 0.5 mile of active raptor nests (4,855 acres, 0.15%). Few salable minerals projects occur in/near these areas, and these restrictions would likely lead to increased project costs for few projects; the likely effect would be negligible adverse.

Special Status Species – Plants

Surface-disturbing activities that could adversely affect SSS plant habitat are allowed, but not within known populations. These habitat areas are quite small, leading to a relatively small amount of lands unavailable for mineral materials activities; the likely effect would be negligible adverse.

Special Status Species – Fish

Surface-disturbing and disruptive activities are prohibited within 500 feet of any waters containing SSS fish, when their effects cannot be mitigated (308 acres, less than 0.01%). With salable minerals plentiful, most or all SSS fish areas can be avoided. As these acres are essentially closed to salable minerals activities, the effect would be negligible adverse.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Restrictions occur under Alternative C include: maintain current habitat utilized by SSS; manage traditional wildlife migration and travel corridors consistent with other resources; manage surface-disturbing and disruptive activities consistent with other resources; require anti-perching devices on new powerlines within occupied Greater Sage-Grouse habitat; restrictions on surface-disturbing and disruptive activities within 0.25 mile of the perimeter of leks (3,594 acres, 0.11%); seasonal prohibitions within 2 miles of occupied leks (203,724 acres, 6.08%) and within Greater Sage-Grouse winter concentration areas; a year-round disturbance-free buffer of at least 0.5 mile around known bald eagle nests and winter roosts (402 acres, 0.01%); a seasonal limited activity zone within one mile of known nests and eagle roosts (3,013 acres, 0.09%); and seasonal species-specific prohibitions within 0.25 mile of SSS raptor nests (75,276 acres, 2.25%). Approximately 50 percent of salable minerals projects occur in/near these areas, so a fair number of such projects might need to be modified. As year-round prohibitions/restrictions essentially close those areas to salable minerals activities, this decreases the acres available; there would be a minor adverse effect.

Heritage and Visual Resources

Cultural Resources

Surface disturbances are allowed in areas containing historic properties when appropriate mitigation is accomplished. Archeological monitors are required on a project-specific basis, increasing project costs; Native American monitors are not required. Overall there would be a negligible adverse effect.

Paleontological Resources

Paleontological field surveys are required for all projects potentially affecting PFYC Class 4 and 5 formations, adding some cost to certain salable mineral projects. Identification and designation of casual collection areas for common invertebrate, plant, and petrified wood fossils. There would likely be a negligible adverse effect.

Visual Resources

Visual simulation may be utilized on a project-specific basis which would increase project costs. Salable minerals are plentiful and able to be accommodated even with any VRM Class II restrictions. Overall the effect is likely negligible adverse.

Land Resources

Forest Products

An array of forest products will be available from across the entire planning area; a negligible adverse effect is likely due to slightly increased likelihood of temporary lack of access to certain few projects.

Lands and Realty

Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate. Lands having agricultural potential or water will be disposed of (76,223 acres, 2.28%). Other lands identified for disposal (120,722 acres, 3.61%) will be disposed of, with the longest retention of those with higher resource values. It is difficult to predict which land tenure adjustments will occur during the planning period (see Alternative A). If all these lands are disposed of (totaling 196,945 acres, 5.88%), the salable minerals resource will decrease by up to that amount, depending on the mineral estate ownerships of the various lands. It's more likely that much fewer acres will be disposed of (see Alternative A); there would likely be up to a minor adverse effect.

Renewable Energy

Not all renewable-energy projects are incompatible with salable minerals activities; see Alternative A. Although no renewable energy projects have been received to date, it is predicted that 40,000 acres of BLM surface will be disturbed during the planning period (1.19%). Although renewable-energy projects are not necessarily incompatible with salable minerals activities, these lands will be segregated from mineral entry (see Alternative A), thus decreasing the salable minerals resource by up to that amount; there would be likely up to a minor adverse impact, though.

Rights-of-Way and Corridors

Above-ground facilities such as powerlines are to be placed along major transportation routes; however, no current or historic salable minerals projects utilize powerlines. Any future projects requiring new powerlines would have increased projects costs. ROWs for salable minerals projects are rare (see *Impacts Common to All Alternatives*). The RFA for ROWs for

other uses (such as for oil/gas roads and equipment) is 57,083 acres (7.34%). However, ROWs are not necessarily incompatible with salable minerals projects (see *Impacts Common to All Alternatives*). It is more likely that fewer acres will be affected; overall the effect would likely be up to minor adverse. CCS research and projects are allowed, where consistent with other resource values; this could occur over up to the entire acreage of BLM surface (777,310 acres, 23%). CCS projects are not necessarily incompatible with salable minerals projects.

Travel and Transportation Management

Some areas are restricted or closed to motorized travel. These areas are not completely inaccessible to salable minerals activities, but these restrictions would make exploration and development activities more challenging and increase costs; there would likely be a negligible adverse effect.

Recreation

A total of six SRMAs are recommended for designation, totaling 33,261 acres (0.99%), although designation of these areas would not close them to salable mineral development if those activities are consistent with other resource values. There would be no effect.

Lands with Wilderness Characteristics

No lands would be managed for wilderness characteristics; there would be no effect.

Livestock Grazing Management

Temporarily fencing off areas being explored and/or mined might be needed to protect livestock, thereby increasing some salable minerals project costs; there would be a negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern

No ACECs are recommended for designation; there would be no effect.

Scenic or Back Country Byways

No roads will be evaluated during the planning period for their eligibility to be proposed as National BCBs or Scenic Byways; there would be no effect.

Wild and Scenic Rivers

One WSR is under Congressional review, and is managed according to Manual 6400 – *Management of Wild and Scenic Rivers*, which includes surface disturbance restrictions. If Congress does not designate the WSR, and Congress is not expected to act during the planning period, these restrictions will be lifted. This area is not a likely target for salable minerals activities, however, given its remote location and rugged terrain. There would be no effect.

Wilderness Study Areas

Currently, there are three areas in the planning area where salable minerals activities are already prohibited while under Congressional review: the WSAs, totalling 28,931 acres. Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas. However, any WSAs released by Congress would be subject to considerations for lands with wilderness characteristics; therefore, the current surface disturbance restrictions will continue to apply until a plan amendment is completed.

Socioeconomic Resources

Social and Economic Conditions

The BLM is to develop management strategies to recognize and point out conflicts expected to affect multiple resource use, and to incorporate to the extent possible local and regional economic development and land use plans. The effect is difficult to predict, but may result in slightly more area being restricted; there would be a negligible adverse effect.

4.2.5.6. Alternative D

This section describes management actions under Alternative D, the Proposed RMP which strikes a balance between resource use and resource conservation, and the likely resulting effects on the federal salable minerals resource during the planning period due to their implementation.

Salable Minerals

The three WSAs (totalling 28,931 acres) are already restricted to salable minerals activities. Conservation measures implemented for other resources under Alternative D would result in a total of 623,061 acres (12%) being closed to or restricted from salable minerals activities, leaving 2,725,060 acres (88% of the current resource) open to salable mineral activities. There would be no effect.

Physical Resources

Air Quality

Quantitative air quality modeling and mitigation to ensure project emissions would approach or exceed emissions standards are required for projects that could exceed standards. This would increase project costs; the effect would be negligible adverse.

Soil

Surface-disturbing activities in areas with severe erosion hazard, poor reclamation suitability, LRP, and on slopes equal to or greater than 25 percent are not prohibited unless the soil resource cannot be conserved. Less than 10 percent of current salable minerals projects are in such areas on BLM surface, and soils are conserved during operations. The effect would likely be negligible adverse.

Water Resources

Surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams is allowed where resource objectives are met. These areas are already avoided due to their inherent problems, and other salable minerals projects can avoid water resources. A negligible adverse effect is likely due to increased project costs.

Cave and Karst Resources

Surface-disturbing activities are prohibited within a site-specific buffer around significant cave entrances (11 acres, less than 0.01%). Salable minerals projects are not likely in these areas due to the rugged terrain and long distance to likely areas of use. There would be a negligible adverse effect, due to these acres essentially being closed to salable minerals activities.

Mineral Resources

Locatable Minerals

A total of 11,373 acres were withdrawn for three big game WHMAs, and this acreage remains withdrawn. A total of 61,818 acres are recommended for withdrawal under various management

actions for other resources (the three WSAs are not recommended for withdrawal; this leaves 715,492 acres open to locatable minerals activities. The RFA for locatable minerals is 1,256 acres and 1,198 for salable minerals. Even if there are conflicts over all 1,198 acres, that is 0.04 percent of the salable minerals resource. Conflict is unlikely, as salable minerals are plentiful outside the areas likely to be developed for locatable minerals. Overall the effect would be negligible adverse, due to increased costs for some projects due to delays or needing their sites altered.

Leasable Minerals - Coal

The RFA for coal projects is 195,700 acres and 1,198 for salable minerals. Even if there are conflicts over all 1,198 acres, that is 0.04 percent of the salable minerals resource. Conflicts in areas of likely coal development are unlikely though, as salable minerals are plentiful outside these areas. Some projects might experience higher project costs, due to delays and/or changing sites.

Leasable Minerals - Fluids

A total of 72,276 acres will be closed to fluid mineral leasing, leaving 3,314,254 acres open to oil and gas projects. Conflict with oil and gas projects could potentially affect up to that number of acres of the salable minerals resource. However, the RFA for oil and gas projects is 14,869 acres; 1,198 for salable minerals. Even if there are conflicts over all 1,198 acres, that is 0.04 percent of the salable minerals resource. Conflict in those areas is unlikely, as salable minerals are plentiful outside the areas likely to be developed for oil and gas projects; overall the effect is likely negligible adverse, due to delays and increased costs for certain projects.

Fire and Fuels Resources

Fire response and treatment will vary to meet other resource objectives. Relatively few salable minerals projects might be affected through temporary restriction of access to sites; there would be a negligible adverse effect.

Biological Resources

Vegetation – Forests and Woodlands

Types of effects are similar to, but likely of slightly lesser extent than, those under Alternative A; some silviculture and pest control treatments, techniques, and methods will be less extensively used and some more. Few salable mineral projects occur in/near forests and woodlands; a negligible adverse effect is likely due to increased costs for few projects.

Vegetation – Grassland and Shrubland Communities

Desirable non-native species allowed for short-term reclamation activities, but only with native species during final reclamation. This would increase project costs due to the use of native seed species; there would be a negligible adverse effect.

Vegetation – Riparian/Wetland Resources

Surface-disturbing activities are allowed within 500 feet of riparian/wetland systems and aquatic habitats where other resource objectives are met. These areas are usually avoided for salable minerals development; there would likely be a negligible adverse effect.

Invasive Species and Pest Management

Planning and actions would be required to manage invasive species, these would increase project costs but decrease the spread and of invasive species; there would be a negligible beneficial effect.

Fish and Wildlife Resources – Fish

Surface-disturbing activities are allowed within 0.25 mile of naturally occurring water bodies containing acceptable fish species where fish resource objectives can be met (51,745 acres, 1.55%). Fisheries enhancement in reservoir design is utilized consistent with other resources. Other actions will likely increase project costs. These areas are already mostly avoided due to mitigation on Wyoming DEQ Mine Permits; a negligible adverse effect is likely due to increased costs for few projects.

Fish and Wildlife Resources – Wildlife

Distance and/or timing limitations or prohibitions will adversely affect the salable minerals resource. These are within: the three WHMAs (totaling 4,583 acres, 0.14%); 0.5 mile of big game priority travel corridors (9,587 acres, 0.46%); big game crucial winter range and elk calving areas (98,411 acres, 2.94%); 0.25 mile year-round of occupied sharp-tailed grouse leks (940 acres, 0.03%), and seasonally within 2 miles of occupied leks in potential nesting and early brood-rearing habitat (48,127 acres, 1.44%); and within USFWS Wyoming Ecological Services' recommended spatial buffers for breeding raptors (255,129 acres, 7.62%). In addition, retention of 85 percent of existing elk security habitat is required (existing acreage 132,148 acres, 3.95%). A WHMA is not recommended to be designated for the Fortification elk herd; instead, the current management (BLM 2011c) is to be retained. Other restrictions also apply which will likely increase project costs, including applying seasonal restrictions on existing projects when wildlife resources are not met (approximately 530 acres, 0.02%). With approximately 25 percent of salable minerals projects occurring in/near these areas, the likely effect will be moderate adverse, due to many of these acres essentially being closed to salable minerals activities.

Special Status Species – Plants

Surface-disturbing activities are prohibited within SSS plant habitat (237,279 acres, 7.09%) when the populations would not be conserved. Also, predisturbance flowering season surveys are required prior to project approval. These habitat areas are typically quite small, and few salable minerals projects are likely in these areas. The likely effect is moderate adverse, as these acres will essentially be closed to salable minerals activities.

Special Status Species – Fish

Surface-disturbing activities are prohibited within 0.25 mile of any waters containing SSS fish species, unless it benefits the species (818 acres, 0.02%). Other prohibitions and requirements apply, likely increasing project costs. Overall there would be a negligible adverse effect, as these acres will essentially be closed to salable minerals activities.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Surface-disturbing, disruptive, and/or occupancy activities are prohibited or restricted to conserve SSS wildlife within the following areas: prairie dog colonies, unless suitable habitat for SSS dependent upon prairie dogs is not affected (6,156 acres, 0.18%); year-round within at least 0.5 mile of bald eagle riparian corridors (12,937 acres, 0.38%); seasonally within the USFWS recommended buffer and year-round within species-specific biologic buffer of active SSS raptor nests (17,417 acres, 0.52%); and habitats of SSS amphibians, reptiles, and bats, unless populations and habitat can be conserved (176,636 acres, 5.28%). Powerlines are to be designed to minimize wildlife-related impacts, are to avoid certain areas of high avian use, and are prohibited within certain distances of Greater Sage-Grouse leks, areas, or habitat; this will likely lead to increased project costs.

Alternative D would apply the following surface-disturbing activities to the extent necessary to prevent unnecessary or undue degradation in:

- Greater Sage-Grouse Core Population Areas:

Prohibit surface disturbing activities, disruptive activities, and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability). Allow no more than one oil and gas or mining location and no more than 5 percent disturbance per 640 acres within the DDCT analysis area (4 mile buffer of occupied leks within 4 miles of proposed surface disturbance restricted to Core Population Area and Connectivity Corridor). Design and manage facilities to prevent WNV transmission. Avoid overhead electric transmission lines and bury electrical distribution lines where possible; if not possible, then locate overhead lines at least 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards. Prohibit electric overhead transmission lines unless within one-half mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than one mile. Limit noise sources to 10 dBA above ambient noise measured at the perimeter of occupied Greater Sage-Grouse leks from March 1 to May 15, 6 PM to 8 AM, unless scientific findings indicate a different noise level is appropriate. In addition, limit noise sources in other important Greater Sage-Grouse habitats if research and/or policy indicate the need. Locate new roads, used to transport products or waste, greater than 1.9 miles and other new roads, such as roads for site access, greater than 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks. Construct roads to minimum design standards needed. Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. Prohibit surface disturbing and disruptive activities from March 15 to June 30 (independent of habitat suitability). Prohibit surface disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas from December 1 to March 14.

- Greater Sage-Grouse Core Population Connectivity Corridors:

Prohibit surface-disturbing activities, disruptive activities and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability). Allow no more than 5 percent total surface disturbance per 640 acres within the DDCT analysis area (4 mile buffer of occupied leks within 4 miles of proposed surface disturbance, restricted to Core Population and Core Population Connectivity Corridors). Design and manage facilities to prevent WNV transmission. Avoid overhead electric transmission lines and bury electric distribution lines where possible; if not possible, locate overhead lines at least 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards. Locate new roads, used to transport products or waste, greater than 1.9 miles and other, new such as site access, greater than 0.6 mile from the perimeter of the occupied Greater Sage-Grouse leks. Construct roads to minimum design standards needed, and facilities with motion, light sources, noise (10 decibels above ambient), with a height greater than 4.5 feet. Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been

in place for at least two years. Prohibit surface disturbing and disruptive activities within 4 miles of occupied Greater Sage-Grouse leks from March 15 to June 30 (independent of habitat suitability, restricted to within Core Population Connectivity Corridors). Prohibit surface disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas, from December 1 to March 14.

- Occupied Greater Sage-Grouse habitat outside of Core Population Areas and Core Population Connectivity Corridors:

Prohibit or restrict surface-disturbing and disruptive activities within 0.25 mile of the perimeter of occupied Greater Sage-Grouse leks. Reduce surface disturbance for authorizations within 0.25 mile of occupied Greater Sage-Grouse leks. Design and manage facilities to prevent WNV transmission. Bury electric distribution lines where possible; if not possible, then locate overhead lines at least 0.5 mile from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards. Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. Recommend for all surface-disturbing activities on BLM surface adjacent to priority habitat, within or adjacent to lands involved in Greater Sage-Grouse conservation projects, or support an 85 percent Greater Sage-Grouse population density. BLM parcels less than 640 acres that only meet the population density factor may be excluded. Prohibit surface disturbing and disruptive activities within 2.0 miles of occupied Greater Sage-Grouse leks, from March 15 to June 30 (independent of habitat suitability), and within Greater Sage-Grouse winter concentration areas from December 1 to March 14.

Approximately 50 percent of salable minerals projects occur in or near SSS habitat; the likely effect will be moderate adverse.

Heritage and Visual Resources

Cultural Resources

Surface disturbance is prohibited within Pumpkin Buttes, Cantonment Reno, Dull Knife Battlefield, Crazy Woman Battlefield, Contributing and unevaluated segments of the Bozeman Trail, all rock art sites, rock shelter sites, and Native American burials (15,382 acres, 0.46%). Surface disturbance is allowed within 3 miles of those areas, if the development is not visible or will result in a weak contrast rating to the setting (188,488 acres, 5.63%). Prohibitions and other measures will be used to mitigate adverse effects to sensitive sites such as TCPs and or sacred sites. Other requirements include: requiring archeological monitors for projects according to established strategy, establishing agreements to provide tribal access to Pumpkin Buttes, other TCPs, and sacred sites on BLM surface, and requiring Native American monitoring for surface-disturbing projects in accordance with agreements or on a project-specific basis. CRPPs will be developed for Pumpkin Buttes, sites associated with Red Cloud's War and the Great Sioux War (including Dull Knife Battle, Cantonment Reno, Crazy Woman Battle, and Bozeman Trail), and the South Big Horn Mountains; it is uncertain at this time what restrictions or requirements might be included in these CRPPs. Many of such areas are already protected to a certain degree by other means, and salable minerals are plentiful elsewhere; the effect will be up to moderate adverse due to those acres prohibited being essentially closed to salable minerals activities.

Paleontological Resources

Areas containing paleontological resources of high quality or importance would be designated for special management as they are identified (860 acres, 0.03%); these areas are to be avoided by salable minerals activities. Requiring paleontological field surveys for all PFYC Class 4 and 5 formations, and Class 3 as needed, with monitoring of surface-disturbing activities in such areas as based on the survey results, would increase project costs. Overall, there would be a negligible adverse effect due to certain areas becoming essentially closed to salable minerals activities.

Visual Resources

Areas will be managed according to their VRM classes, except certain areas (such as SRMAs, ACECs, lands with wilderness characteristics, Powder River Breaks, Fortification Creek); some of these areas will be managed according to more scenic management. Required within VRM Class II areas is completion of visual simulation and mitigation design; these may be required on a project-specific basis within VRM Class III areas with high visual sensitivity. These will likely increase project costs; the effect is likely negligible adverse.

Land Resources

Forest Products

Temporarily fencing off of regeneration or treatment areas may be needed, and may temporarily limit access to certain salable minerals projects. Relatively few salable minerals projects occur in/near wooded areas; there would likely be a negligible adverse effect.

Lands and Realty

Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate (see Alternative A). Lands will be acquired and disposed of based on resource values, including but not limited to, disposals of lands with agricultural potential and water (potentially 76,223 acres, 2.28%). Other management actions include: disposal of BLM surface lands identified for disposal (120,722 acres, 3.61%), and other lands not identified but meeting appropriate disposal criteria, would be available for disposal. Acquisition of lands from willing sellers would occur consistent with other resource values, with priority given to those lands adjacent to large blocks of BLM surface (before those in other areas). It is difficult to predict which land tenure adjustments will occur during the planning period, although currently identified disposals total 196,945 acres (5.88%). It is much more likely that fewer acres will be affected (see Alternative A); overall would more likely be up to a minor adverse effect.

Renewable Energy

Although no renewable-energy projects for public lands in the planning area have been received to date, it is predicted that 75,240 acres of BLM surface will be disturbed during the planning period (2.25%). Although not all renewable-energy projects are incompatible with salable minerals activities, these lands would be segregated from mineral entry (see Alternative A), thereby reducing the salable minerals resource up to that total amount. It is much more likely that fewer acres will be affected, however (see Alternative A); the effect is likely to be up to minor adverse.

Rights-of-Way and Corridors

Transmission lines and above-ground facilities will be placed within existing ROWs and other disturbed areas. ROWs for salable minerals projects are uncommon (see *Impacts Common to All Alternatives*), and these actions would likely have an overall negligible adverse effect, due to possible increased costs for extremely few projects. The predicted disturbance from

other ROWs is 38,762 acres of BLM surface (1.16%). However, ROWs are not necessarily incompatible with salable minerals projects (see Alternative A). It is more likely that fewer acres will be affected. CCS proposals will be evaluated; assessing the likely level of effect on the salable minerals resource from these opportunities is difficult, as no projects for public lands in the planning area have been received to date. However, up to the entire acreage of BLM surface (777,310 acres, 23%) could be affected (see Alternative A); however, CCS projects are not necessarily incompatible with salable minerals activities.

Travel and Transportation Management

A number of area-specific restrictions to motor vehicle use may increase salable minerals project costs for certain project proponents, but these areas might not be completely inaccessible as a number of salable minerals activities can be performed without motorized vehicles. These actions may require redesigning and/or reconstructing certain roads, and restricting use of certain roads during certain time periods, increasing project costs. Projects in these areas are not likely to be common as salable minerals are plentiful elsewhere, but will have increased costs; there would likely be a negligible adverse effect.

Recreation

The planning area is proposed to be divided into eight ERMA (349,663 acres, 10.44%) and seven SRMA (54,160 acres, 1.62%). Designation of ERMA would not close those areas to locatable mineral activities, but would likely add some requirements for analysis and/or mitigation, increasing project costs. Designation of SRMA would close them to salable mineral development, except for administrative use only. A minor adverse effect is likely, as closure of the designated SRMA acres decreases the acres of salable minerals resource.

Lands with Wilderness Characteristics

One area of lands with wilderness characteristics (6,864 acres, 0.21%) is recommended to be closed to salable minerals activities. Although this area is not likely to be sought for salable minerals activities, due to rugged terrain and long distance to where these minerals would likely be used, these acres would be closed, decreasing the resource. There would be a negligible adverse effect.

Livestock Grazing Management

Temporarily fencing off areas being explored and/or mined might be needed to protect livestock. Salable minerals project costs may increase; there would be an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern

A total of two ACECs are recommended for designation, totalling 2,849 acres (0.09%). These areas would be managed under site-specific management plans, which include closing them to salable minerals activities. Parts of these potential ACECs are already under some restrictions, and parts are in areas not likely to be sought for salable mineral activities due to ruggedness of terrain and distance to likely places of use. There would be a negligible adverse effect.

Scenic or Back Country Byways

A number of roads will be evaluated during the planning period for their eligibility to be proposed as National BCBs or Scenic Byways. There would be no effect.

Wild and Scenic Rivers

One WSR is under Congressional review, and is managed according to Manual

6400 - *Wild and Scenic Rivers*, which includes surface disturbance restrictions. If Congress denies its designation, these restrictions will continue to retain the areas' characteristics; Congress is not expected to act during the planning period, however. These restrictions result in negligible adverse effect to the salable minerals resource (2,664 acres, 0.08%). This area is not a likely target for salable minerals activities, however, given its remote location and rugged terrain.

Wilderness Study Areas

Currently, there are three areas in the planning area where salable minerals activities are restricted while under Congressional review: the WSAs (totaling 28,931 acres). In addition, all motorized and mechanized equipment will be prohibited in these areas. Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas. These areas will remain restricted from salable minerals activities (see Alternative A); there would be no effect.

Socioeconomic Resources

Social and Economic Conditions

The BLM is to work with other entities (local, state, federal, private) to develop mitigation strategies for promoting a healthy and sustainable social and economic environment. The BLM is to work with all stakeholders to identify socioeconomic impacts of BLM actions and develop strategies to mitigate those impacts where possible to promote sustainability in a multiple resource use environment. The effect is difficult to predict, but may result in slightly more area being restricted, or more requirements that would increase project costs; negligible adverse.

4.2.5.7. Cumulative Impacts

The current total available BLM-administered federal salable minerals resource amounts to 3,348,121 acres. The current total available salable minerals resource that BLM does not administer comprises the remainder of the planning area, 3,979,322 acres (7,356,374 total acres in the planning area, less 3,348,121 acres of BLM-administered salable mineral, and less the 28,931 acres that are already closed to salable minerals activities). The existence of federal mineral estate does not imply the presence of salable minerals of sufficient quality and/or quantity to make them economically viable to develop in those lands (see Chapter 3). Alternative A forecasts that approximately 532 acres of federal mineral estate will be disturbed during federally-authorized exploration and development activities (BLM), and approximately 4,768 acres of non-federal mineral estate during similar activities not involving federal authorization (non-BLM); see Appendix G (p. 1937). Under the other alternatives, these acres are: Alternative B – 114 acres BLM, 14,304 acres non-BLM; Alternative C – 2,098 acres BLM, 7,152 acres non-BLM; Alternative D – 1,198 acres BLM, 11,178 acres non-BLM. The actual current acres (Alternative A) and projected potential acres (alternatives B through D) of the BLM-administered portion of the federal salable minerals resource explored and/or developed are all less than 1 percent of this resource; the equivalent non-BLM acres (given above, and in Appendix G (p. 1937)) are less than 1 percent of that resource.

The current acres under exploration/development were obtained from BLM's LR2000 database (BLM acres) and Wyoming DEQ LQD's files (non-BLM acres). The projected acres under alternatives B through D were obtained by approximating how much salable minerals mining might occur under each of those scenarios: Alternative B is the most restrictive for BLM-administered lands, while Alternative C is the least restrictive, and Alternative D is

anticipated to lie between those two extremes. Alternative B's BLM acres were approximated to be 25 percent of that for Alternative A — this approximation takes into account the actual number of BLM-administered acres that are already authorized to continue to be mined and yet to be mined, as well as those actual and approximated acres that will be reclaimed during the planning period. Alternative B Non-BLM acres were approximated to be quite large, taking two important factors into account: (1) as BLM-administered lands are greatly restricted under Alternative B, this likely will result in more non-BLM acres being mined to make up for the decrease in BLM-administered lands available for mining, and (2) the additional very likely potential for mining to increase in the planning area overall. Alternatives B through D, for both types of acres, take into account the very real likelihood that mining will continue to increase in the planning area due to the nation's and world's continually increasing populations and technological advances: our needs for minerals are likely to increase, and continue increasing, into the future. In addition, for the salable minerals currently mined in the planning area (sand, gravel, clinker), there are several other materials with similar qualities also available that may substitute for them. Alternative C's BLM acres were approximated to be roughly 400 percent of that for Alternative A (an increase of roughly 300% over what is currently occurring) — this approximation takes into account the likelihood that more BLM-administered acres will be mined, given the lesser restrictions on these lands; non-BLM acres are also projected to increase, though not as greatly as under Alternative B. Alternative D's BLM and non-BLM acres were both approximated to be roughly 225 percent of that for Alternative A (an increase of roughly 125% over what is currently occurring) — this approximation takes into account the likelihood that all lands will likely experience more mining into the future, and that fewer acres are proposed to be closed or restricted from salable minerals activities.

In general, BLM-authorized salable minerals activities disturb far fewer acres in the planning area than do BLM-authorized oil and gas or coal activities (see Appendix G (p. 1937)), and that such BLM-authorized activities disturb fewer acres in the planning area than do non-BLM activities. Salable minerals demand and production has decreased somewhat over the last several years. This is mainly due to the sharp decrease in CBNG-related activities as the natural gas price fell several years ago. CBNG is still being developed, however, as the natural gas price has been rebounding. Activities related to deeper oil/gas development have increased dramatically, however, off-setting the decreased CBNG activity to a fair degree. The crude oil price remains high, and many more oil/gas wells are being developed. Advances in long horizontal well completions, as well as successfully completing multiple horizontal wells on single pads, has allowed oil/gas operators to drill more wells and increase the production per well dramatically. Although the pads needed for horizontal wells tend to be much larger than for CBNG or vertical oil/gas wells, there are far fewer of them, leading to a decrease in road-building as well. Stricter air quality standards have resulted in a continued decreasing overall demand for scoria for road maintenance, as it tends to create more dust than sand/gravel; increasingly more sand/gravel is used for road maintenance. The coal mines still use large quantities of scoria, however, as it is much more abundant than sand/gravel in the areas where the coal mines are located. An overall increasing population means roads are travelled more, which increases road building and maintenance demands. Portions of several county roads have been improved over the last couple of years, and aggregate use in those projects also off-set some of the falling off of demand due to the decreased CBNG activity. Although the demand for salable minerals in the planning area has decreased somewhat over the last several years, the forecast is that demand for these minerals has experienced its' potentially lowest level and will rise again during the planning period. However, it will likely rise at a much slower rate, and to not as great a height, as seen in the period of roughly 2003–2010.

4.2.5.8. Conclusion

The alternatives listed in ascending order from least to most adverse in terms of effects on the salable minerals resource are: A, C, D, B.

Alternative A is the continuation of current management. Alternative B emphasizes resource conservation, and therefore generally places the most constraints on, and is the most restrictive to, development. Alternative C emphasizes resource use, and therefore places the least constraints on, and is the least restrictive to, development. Alternative D is the Proposed RMP, which strikes a middle ground between resource conservation and resource use, and therefore places a more moderate amount of constraints on development.

4.3. Fire and Fuels Management

The goals of fire and fuels management are to protect life and property; protect or enhance natural resources; maintain or restore landscape-level fire regimes; and vegetation characteristics. Fire and fuels management strategies focus on these goals and encourage the use of vegetative treatments to accomplish the goals. This chapter describes the potential effects of BLM actions on fire and fuels management, and ability to meet the goals.

4.3.1. Unplanned Fire (Wildfire)

The BFO will manage wildfires based on ecological, social, and legal consequences, and the circumstances under which wildfires occur. Firefighter and public safety is the first priority in every fire management activity. Where geographically allowed within an RMP planning area, unplanned ignitions may be managed for both protection and resource benefit (multiple objectives). Unplanned ignitions not managed to meet resource & protection objectives would be managed solely to meet protection objectives.

4.3.1.1. Methods and Assumptions

Actions that affect wildfire management are those that facilitate or constrain suppression activities; alter the complexity or costs of wildfire management; increase or allow fuel loading to increase; or change the potential for human-caused wildfires. Actions that require inventory, analysis, or added decision levels to emergency response would increase the complexity of wildfire management.

Actions which contribute to the health of plant communities and the landscape are beneficial to unplanned fire management because they support the goals of fire and fuels management. In plant communities/systems with the highest departures from natural or historical disturbance regimes (fire regimes condition class [FRCC2] and FRCC3), inaction or reduced actions could exacerbate or expand acres of undesirable conditions and increase the potential for atypical fire behavior and high-severity fire effects. In Wildland-urban Interface (WUI) areas high fuel loads would increase the complexity of suppression operations, so actions that constrain fuels treatments in these areas would consequently affect management of wildfires and would increase costs.

Wyoming BLM standardized surface use definitions specify that fire could be a surface-disturbing activity. This means both fire suppression activities and the fires themselves could be considered surface disturbances, which may in turn produce conflicting direction or guidance especially where wildfire might be used to meet multiple objectives. In most cases wildfire will not

alter the vegetation beyond natural site conditions, but suppression actions generally will. Therefore for simplicity and clarity of analysis in this section, suppression actions are considered surface-disturbing activities whereas wildfire is not.

Impact analyses and conclusions are qualitatively based on the constraints versus facilitative management actions of other resources, while considering fire history, current vegetation, expected fire behavior, and previous management experience responding to unplanned ignitions in the planning area.

4.3.1.2. Impacts Common to All Alternatives

For unplanned fire, some fire suppression activities are broadly constrained in certain areas to protect sensitive resources. For example, fire retardant is restricted or prohibited in specific areas to protect water sources and rock art, and heavy equipment is constrained in cultural sites, WSAs, and other sensitive areas. There is further description in the specific resources.

Fire and Fuels Management

In general fire and fuels management actions common to all are beneficial to unplanned fire because they focus on coordinated and collaborative pre-planning, which adds safety and facilitates or simplifies emergency decisions. There are two restrictions to fire suppression tactics which have minor adverse effects to wildfire management: retardant or foam is prohibited within 300 feet of surface water sources; and fire retardant is restricted or prohibited as appropriate to protect rock art. These restrictions affect about one percent of BLM-administered lands and have a minor adverse effect on fire management. Other suppression restrictions, such as use of heavy equipment, are discussed within the alternatives.

Prescribed fire and other fuels treatments would affect wildfire management in the following ways:

- Mitigate high-intensity fire behavior and undesirable effects on resources
- Support fire suppression activities by adding safety and options to operations
- Decrease adverse effects on resources from suppression actions
- Restore or maintain appropriate fire regimes and improve FRCC classes
- Reduce costs of wildfire suppression activities.

Fuels and other vegetation projects which reduce hazardous fuels are especially helpful in conifer settings and in developed areas. Treatment acres vary across alternatives and are discussed for each alternative, but overall, fire and fuels management common to all alternatives would have a minor beneficial effect on management of unplanned fires.

Physical Resources

Air Quality

Wyoming DEQ can require ambient air quality monitoring on a case-by-case basis for unplanned fires. On fires in which the BLM has jurisdictional authority, the AQD requires visual monitoring and reporting for fires that exceed 50 acres. Depending on air quality conditions during a wildfire, potential restrictions could constrain or prevent the use of fire for resource benefit. Air quality management common to all alternatives would have a negligible adverse effect on management of unplanned fires. This does not vary across the alternatives and is not discussed further within this section.

Soil and Water Resources

Rehabilitating all surface-disturbing activities (firelines) would ultimately benefit fire management even though the short-term workload would be increased. Costs of wildfire suppression includes rehabilitation of fire suppression damages and this should be incorporated as much as possible into the fire operations. This has negligible effects on fire management.

For unplanned ignitions that might be managed for multiple objectives, the pre-identified area would require an authorization which includes site-specific reclamation plans. The extra planning step would have a negligible adverse effect on fire management. Soils and water management common to all alternatives would have a negligible adverse effect on management of unplanned fires.

Cave and Karst Resources

Management of cave and karst resources has little effect on wildfire management.

A resource advisor would be consulted during wildfire events to determine constraints, especially where fires might be managed for multiple objectives. This has negligible adverse effects on wildfire management and is not discussed further in Unplanned Fire (Wildfire).

Mineral Resources

Minerals exploration and development would increase the complexity of fire management actions. The potential for human-caused fires increases during minerals exploration and development activities, as does the need to protect industrial interface areas. The proliferation of roads in remote areas could increase fire occurrence by introducing additional human-caused ignition sources, although the associated road network and new water impoundments would improve emergency vehicle access and enable an earlier response to fires. Roads could be used as control lines during suppression actions.

Although mineral resources development would vary across the alternatives, the trade-offs described above would apply to all the alternatives. In this respect, effects would not be highly variable among the alternatives, and are therefore not discussed for each alternative. The effects on fire management and emergency response depend very much on sites and circumstances, and should be considered during activity-level planning.

Overall, mineral resources management common to all alternatives would have a minor adverse effect on management of unplanned fires.

Biological Resources

Vegetation

Using an integrated approach for managing and maintaining plant communities for a diversity of native species, habitats, seral stages, and distribution; and managing forests and woodlands in desired ecological conditions would have a minor beneficial effect on wildfire management by maintaining or restoring natural fire regimes or other disturbance regimes. Specific management actions for the vegetation communities are discussed in the alternatives.

Invasive Species and Pest Management

Cooperative IPM programs with non-BLM partners would benefit wildfire management by using landscape level-plans and actions to control annual bromes. Managing invasive plant species by utilizing best available science could increase local understanding of wildfire as a management

tool, whether it is used for resource objectives where annual bromes are present, or used as an integrated process to control annual bromes. Requiring disturbed areas (firelines) to be treated for invasive species should be part of the wildfire response and has negligible effects on fire management. Overall, management of invasive species and pest management actions common to all alternatives would have a negligible beneficial effect on management of unplanned fires. There is further discussion in alternatives B, C, and D.

Fish and Wildlife Resources

Specific vegetation goals for habitat management would be considered during decisions to implement limited versus full suppression strategies for unplanned fire. Depending on circumstances, limited suppression strategies that allow more acres to be burned might be less obtrusive than aggressive actions that minimize acreage burned; however, in some cases such as protection of Greater Sage-Grouse habitat, aggressive suppression actions may be required to protect the habitat from fire.

Constraints on surface-disturbing and disruptive activities would typically increase incident complexity by adding decisions to emergency actions, although constraints might be waived as necessary to accommodate appropriate suppression tactics that would protect the habitat or site. Timing restrictions that extend to July 31 would affect management of unplanned ignitions for resource objectives, though these restrictions generally occur in sagebrush settings where protection of the habitat would be prioritized over other resource benefits. Overall, fish and wildlife resources management actions common to all alternatives would have a negligible adverse effect on management of unplanned fires. There is further discussion in each alternative.

Special Status Species (including Greater Sage-Grouse)

Specific goals for habitat protection or enhancement would be considered during decisions to implement limited versus full suppression strategies for unplanned fire in SSS habitats. Where policy and pre-planning is in place, incident complexity could be reduced.

Management of sensitive plant species is discussed within the alternatives.

For Greater Sage-Grouse **Priority Habitat** Core Population Area and Connectivity Corridor, suppression response would follow current BLM management guidelines and fire management BMPs to protect the habitat. Suppression actions could include all tactics necessary to maximize protection of sagebrush communities and suitable habitat. This protection strategy simplifies emergency decisions but may increase costs. This does not vary across the alternatives and is not discussed further in this section. Specific surface-disturbing and timing restrictions vary across the alternatives and are discussed further in alternatives B and D, where unplanned ignitions may be managed for resource benefit.

Year-round restrictions would apply to bald eagle roosts or winter use areas, and the buffer could be extended depending on site circumstances and human activities. For nesting raptors, surface-disturbing activities would be prohibited within a buffer through spring and summer. Suppression strategies would strive to protect the habitat and nests while minimizing disruption, though the variable buffers add complexity to wildfire response especially where unplanned fire could be managed to meet other resource objectives.

Overall common management of SSS has a negligible adverse effect on fire management.

Heritage and Visual Resources

Cultural Resources

Management or protection plans for special areas or historic properties would provide preplanned direction for the Wyoming High Plains District (WHPD) Fire Management Plan (FMP) and reduce the complexity of wildfire response. Overall, cultural resources management actions common to all alternatives would have a negligible beneficial effect on management of unplanned fires. See further discussion for alternatives B through D.

Paleontological Resources

Field surveys of paleontological resources would indicate where heavy equipment would be constrained. In addition, a resource advisor would be consulted during wildfire events. This would have negligible effects on wildfire management and is not discussed further in Unplanned Fire.

Visual Resources

Management of visual resources would not affect emergency management of unplanned fires. When considering the use of wildfire to meet resource goals and objectives, VRM would not likely constrain this activity. This would not effect wildfire management. This does not vary across the alternatives and is not discussed further in Unplanned Fire.

Land Resources**Forest Products**

See the discussion under each alternative below.

Lands and Realty

Exchanging lands to consolidate blocks of BLM-administered lands, disposing of isolated public lands, and pursuing easements to access public lands would improve wildfire management options and safety. Alternatives A, B, and D consider or prioritize these types of actions. See Alternative C for further discussion. Lands and realty actions common to all alternatives would have a minor beneficial effect on management of unplanned fires.

Renewable Energy

As with mineral resources, renewable-energy development could increase the complexity of wildfire management actions. The potential for human-caused fires would increase, as would the need to protect industrial interface areas. The proliferation of roads in remote areas could increase wildfire occurrence by introducing additional human-caused ignition sources, although the associated road network would improve emergency vehicle access and enable an earlier response to wildfires. Roads could be used as control lines during suppression actions.

Although renewable-energy development would vary across by alternative, the trade-offs described above would apply to all alternatives. In this respect, the effects are not highly variable among the alternatives so are not discussed further in this section. The effects on wildfire management and emergency response depend very much on sites and circumstances, and would be considered during activity-level planning.

Overall, renewable-energy management actions common to all alternatives would have a negligible adverse effect on management of unplanned fires.

Rights-of-Way and Corridors

Management of ROWs and corridors does not effect wildfire management and is not discussed further in Unplanned Fire.

Travel and Transportation Management

Closed areas, or limiting motorized vehicle travel to designated routes would help prevent accidental fires. However when considering the use of wildfire to meet resource goals and objectives, closed areas could increase the complexity of wildfire management decisions. With consideration of these trade-offs, TTM common to all alternatives would have a negligible adverse effect on management of unplanned fires. Restrictions and closed areas vary across the alternatives and are discussed further in each alternative.

Recreation

SRMA designations and associated recreation values could constrain management of unplanned fires for resource benefit. Full protection strategies would be required where new facilities are developed. Increased human activities associated with facilities could contribute to accidental fires, although improved access to the sites could enable an earlier response to wildfire. Although SRMA designations vary across the alternatives, these trade-offs apply to all alternatives and are not further discussed in this section. Recreation management common to all alternatives would have a minor adverse effect on management of unplanned fires.

Lands with Wilderness Characteristics

Management of wilderness characteristics is discussed in alternatives B and D, but otherwise has no effect on wildfire management.

Livestock Grazing Management

The allocation of resource reserve allotments would benefit fire management by providing temporary grazing opportunities when rest or deferment is required after wildfires. This varies across the alternatives and is assessed within the alternatives.

Livestock grazing strategies generally would include rest periods after vegetative treatments, including treatments through unplanned fires. Under some circumstances, such as adaptive management of annual bromes, this could unnecessarily postpone or constrain activities that benefit range, fire, and fuels management. See the alternatives for further impacts and discussion about rest periods. Vermeire et al. (2011) found that annual grasses were reduced in the Northern Great Plains following summer fire.

Special Designations**Areas of Critical Environmental Concern**

Management of ACECs and effects on wildfire management is discussed in alternatives B and D, but otherwise does not affect wildfire management.

Scenic or Back Country Byways and Wild and Scenic Rivers

Management of these special designations does not effect wildfire management and is not discussed further in Unplanned Fire.

Wilderness Study Areas

Wildfire management activities, strategies, and tactics would follow the policy and guidelines in BLM Manual 6330 – Management of Wilderness Study Areas to preserve or enhance the natural character of WSAs and avoid unnecessary impairment of a WSA's suitability for preservation as wilderness. Approximately four percent of BLM-administered lands in the planning area are under wilderness review and affect wildfire management decisions. Appendix Q (p. 2511) provides more information from BLM Manual 6330 – Management of Wilderness

Study Areas. Additional restrictions for motorized and mechanized equipment is discussed further in alternatives B through D.

Socioeconomic Resources

Social and Economic Conditions and Health and Safety

Ensuring that local and regional economic development and local land use plans are considered in BLM actions, and working with local agencies to foster public awareness benefits fire and fuels management. Reducing or eliminating physical hazards through appropriate mitigations benefits fire and fuels management by adding safety to fire operations. This does not vary across the alternatives and is not discussed further in this section.

4.3.1.3. Alternative A

Fire and Fuels Management

Fuels treatments under Alternative A are allowed to treat about two percent of BLM-administered lands (approximately 14,000 acres) during the planning period. This could accomplish fuels reduction objectives in developed interface areas, which would improve wildfire suppression options and decrease costs. Treatments in other areas could achieve project-level objectives, but likely would not achieve landscape objectives. Fire and fuels management under Alternative A would have a minor beneficial effect on wildlife management. In this alternative wildfire suppression costs would be commensurate with the values to be protected. See further discussion under *Impacts Common to All Alternatives*.

Alternative A would continue management in accordance with the 1985 RMP as amended in 2001. Under this alternative, variable suppression strategies are balanced with resource values. There are no geographically identified areas in this alternative to manage unplanned ignitions for both protection and resource benefit (multiple objectives), so the overall objective of wildfire management is to suppress the fire.

Physical Resources

Soil and Water Resources

Alternative A would restrict surface-disturbing activities in areas of high erosion hazard, on slopes equal to or greater than 25 percent, and on soils with poor reclamation suitability, and within 500 feet of water sources. The authorized officer could waive the restrictions, but in whole these restrictions increase the complexity of immediate suppression decisions. Alternative A management of soils and water would have a minor adverse effect on wildfire management.

Biological Resources

Vegetation – Forests and Woodlands and Vegetation – Grassland and Shrubland Communities

Managing vegetation to meet forest and rangeland health objectives would influence hazardous fuel loads, and would likely reduce the potential for large-scale high-severity wildfire effects. For example, forest management actions that reduce conifer encroachment in aspen communities would influence fire behavior by restoring barriers to the spread of fire. At the

landscape-level, where vegetation has been managed to create mosaics of diverse structural/seral stages, the size and intensity of wildfires would likely be reduced. Alternative A management of forests and woodlands and grasslands and shrublands would have a negligible beneficial effect on wildfire management.

Vegetation – Riparian/Wetland Resources

See Soil and Water. The restrictions within 500 feet of water sources also apply to this resource.

Invasive Species and Pest Management

See *Impacts Common to All Alternatives*.

Fish and Wildlife Resources

In addition to effects described under *Impacts Common to All Alternatives*, Alternative A seasonal restrictions on surface disturbances near sharp-tailed grouse leks and active raptor nests would affect suppression strategies. Although the affected area for sharp-tailed grouse would be small, year-round restrictions for raptor nests apply to approximately 33 percent of BLM-administered lands in the planning area. Depending on raptor species, the timing restriction could apply until mid summer and would influence suppression strategies during the height of the fire season. Alternative A management of wildlife resources would have a minor adverse effect on wildfire management.

Special Status Species (including Greater Sage-Grouse)

See *Impacts Common to All Alternatives*.

Where fires occur in limber pine settings, fire management activities would follow current Wyoming BLM guidelines.

For Greater Sage-Grouse habitat *Impacts Common to All Alternatives* discusses fire management guidelines and BMPs. Because unplanned ignitions are managed in this alternative for suppression objectives only, specific surface disturbing and timing restrictions in this alternative have negligible additional affects on fire management.

Heritage and Visual Resources

Cultural Resources

See *Impacts Common to All Alternatives*.

Land Resources

Forest Products

Under Alternative A, the commercial harvest of wood products, diseased old growth, and over-stocked forests would reduce fuel loading, improve defensible space in WUI areas, and contribute to safer and less costly suppression operations. There would be more ignition sources during management activities, but the risk would be mitigated by fire restrictions during severe fire seasons.

Timber harvest methods such as clear-cuts, which create fuel breaks and mimic fire regimes, could reduce the size of wildfires. However limiting clear-cut methods to fewer than 20 acres would not support landscape-scale fire regime objectives in lodgepole pine settings and other stand-replacement disturbance regimes.

During and after the planning period, pre-commercial thinning would provide cost-effective benefits for forest health and associated reductions in fuel loads.

Overall, Alternative A management of forest products would have a minor beneficial effect on wildfire management.

Lands and Realty

See Impacts Common to All Alternatives.

Travel and Transportation Management

In addition to the effects common to all alternatives, under Alternative A there would be very few BLM-administered acres closed year-round to motorized vehicles. This would simplify fire suppression activities. Approximately 16 percent of BLM-administered lands in the planning area would be closed during winter, which would not typically affect wildfire management. Alternative A management of travel and transportation would have a negligible adverse effect on wildfire management.

Livestock Grazing Management

Resource reserve allotments would be considered on a project specific basis, which would not likely facilitate wildfire management actions by providing temporary grazing opportunities where rest or deferment is required after wildfires. This would have a negligible adverse effect on management of unplanned fires.

In addition to effects common to all alternatives, under Alternative A, livestock rest periods after wildfire could include the first year and deferred grazing the following growing season. Under some circumstances, such as adaptive management of annual bromes, this could unnecessarily postpone or constrain activities that benefit range, fire, and fuels management.

4.3.1.4. Alternative B

Alternative B would emphasize resource conservation and natural processes where appropriate, while protecting sensitive resources. Response to wildfires would vary from full protection where fire would be undesirable, to monitoring fire behavior in areas where fire can be used to meet multiple objectives. This alternative would use a full range of fire management actions and makes the whole planning area available to consider areas where wildfire could be managed for resource benefit (multiple objectives).

Fire and Fuels Management

Under Alternative B, hazardous fuels reduction treatments would be allowed on 0.4 percent of BLM-administered land (approximately 3,500 acres) during the planning period. Treatments would focus on developed interface areas, but would not be allowed at levels necessary to meet Community Wildfire Protection Plan objectives during the planning period. Treatments outside developed interface areas would likely be rare, but unplanned ignitions could be managed to meet resource objectives in those areas and to meet desired fire regime characteristics. Alternative B fire and fuels management actions would have a negligible beneficial effect on wildfire management. By using unplanned ignitions for multiple objectives costs of fire suppression might be reduced, but constraints from other resources would likely complicate this strategy and effect costs.

Physical Resources

Soil and Water Resources

Alternative B effects on wildfire management would be similar to effects under Alternative A, except that the authorized officer could not waive prohibited surface disturbances. This adds risk to wildfire management, and adds complexity in managing fires for multiple objectives. Because surface-disturbing activities are prohibited within 500 feet of water sources, Alternative B could deny the use of water for suppression operations, which does not effectively address firefighter and public safety. In terms of acres affected, Alternative B soils and water management would have a minor adverse effect on wildfire management.

Biological Resources**Vegetation – Forests and Woodlands and Vegetation – Grassland and Shrubland Communities**

Under Alternative B, managing forests and woodlands with an emphasis on natural processes would allow insect and disease, wildfire, and other natural disturbances to run their natural courses. This could be beneficial in areas where historical or desirable vegetative characteristics could be maintained by natural processes.

However, in recent decades, natural and human-caused disturbances have been prevented or eliminated in many forested areas, and other management practices have altered vegetation and fuel characteristics. These activities have created a departure from historical conditions where heavy fuel loads, ladder fuels, and high stand densities occur in contiguous areas across the forested landscape. Wildfire behavior in these areas would likely be high intensity and could produce undesirable, high-severity fire effects and large fires. Under this alternative, natural fuel breaks such as moist aspen communities could eventually be replaced by drier, more flammable conifer vegetation, and conifer expansion into grassland communities would contribute to large fires.

Vegetation treatments under this alternative would not be allowed at levels that could compliment the use of fire for resource benefit. Using silviculture treatments only when catastrophic events threaten the public and surrounding lands would not effectively address firefighter and public safety, or the priorities of Community Wildfire Protection Plans.

Overall, Alternative B management of forests and woodlands and grassland and shrubland communities would have a negligible beneficial effect on wildfire management.

Vegetation – Riparian/Wetland Resources

These effects are the same as described above in Physical Resources, Soil and Water. Alternative B effects on wildfire management would be similar to effects under Alternative A, except that the authorized officer could not waive prohibited surface disturbances. This adds risk to wildfire management, and adds complexity in managing fires for multiple objectives. Because surface-disturbing activities are prohibited within 500 feet of water sources, Alternative B could deny the use of water for suppression operations, which does not effectively address firefighter and public safety. In terms of acres affected, Alternative B Riparian/Wetland Resources management would have a minor adverse effect on wildfire management.

Invasive Species and Pest Management

In addition to effects common to all alternatives, under Alternative B, developing pest management areas would generally facilitate fire management planning. This would have a minor beneficial effect on wildfire management.

Fish and Wildlife Resources – Fish and Fish and Wildlife Resources – Wildlife

In addition to effects common to all alternatives, the following specific restrictions under Alternative B would increase incident complexity by adding decisions to emergency actions; and would complicate managing fires for multiple objectives:

- Surface-disturbing and disruptive activities would be prohibited within 0.25 mile (1,320 feet) of naturally occurring waterbodies that contain desirable fish. Though only about 1 percent of BLM-administered lands are affected, this could complicate the use of water for suppression operations.
- Surface-disturbing and disruptive activities would be prohibited in elk winter range and calving areas until June 30, which affects about 10 percent of BLM-administered lands. Though natural ignitions would be rare it is possible they would occur in late June, a time of year when weather and fuel parameters would allow wildfires to be managed for resource benefit.
- Seasonal restrictions for sharp-tailed grouse leks would be the same as under Alternative A.
- Buffers for active raptor nests during critical times would affect about 55 percent of BLM-administered lands.

At a minimum, these restrictions could affect 55 percent of BLM-administered lands in the planning area and have a major adverse effect on wildfire management, whether the strategy is suppression or multiple objectives.

Special Status Species (including Greater Sage-Grouse)

In addition to impacts common to all alternatives, the following specific restrictions under Alternative B would increase incident complexity by adding decisions to emergency actions; and would complicate managing fires for multiple objectives:

- Surface-disturbing activities that could adversely affect special status plant habitats would be prohibited, including the use of suppression chemicals and motorized fire suppression vehicles. This management action adversely affects about 16 percent of BLM-administered lands and would not effectively address firefighter and public safety. In limber pine settings, fire management activities would follow the Wyoming BLM guidelines for five-needle pines.
- Buffers for active raptor nests would be extended during critical times and could affect about 14 percent of BLM-administered lands.
- Surface disturbance would be prohibited in special status reptile and amphibian habitats, including floodplains, wetlands, ephemeral channels, and south-facing rock outcrops. Although these areas could be mapped and incorporated into the WHPD FMP, they are intricate and complex across the landscape, occupy approximately 23 percent of BLM-administered lands in the planning area, and would increase the complexity of incident management.
- Within occupied Greater Sage-Grouse habitat surface disturbance restrictions would affect about three percent of BLM-administered lands. Seasonal restrictions would affect about 60 percent of BLM-administered lands until mid-June, which would add complexity and cost to suppression operations. Because sagebrush preservation would be a priority, unplanned ignitions would likely not be managed for resource benefit in these areas.

These restrictions could affect fire management on 23 percent of BLM-administered lands in the planning area. These restrictions would result in increased fuel loading and therefore fire size due to decreased ability to control damaging fires and have a major adverse effect on wildfire management, whether the strategy is suppression or multiple objectives.

Heritage and Visual Resources

Cultural Resources

In addition to effects common to all alternatives, Alternative B would prohibit surface disturbances in areas with historic properties or within 5 miles of the visual horizon of historic properties. This would have a major adverse effect on decisions and suppression strategies for wildfires.

Land Resources

Forest Products

Under Alternative B, offering only sawtimber from forest treatments, limiting timber harvest areas to five acres, and not utilizing pre-commercial thinning would not efficiently meet hazardous fuels objectives. This would have a minor adverse effect on wildfire management.

Lands and Realty

See *Impacts Common to All Alternatives*.

Travel and Transportation Management

In addition to effects common to all alternatives, Alternative B would close motorized vehicle use year-round on approximately 80 percent of BLM-administered lands in the planning area. When deciding to use wildfire to meet resource goals and objectives, this would have a major adverse effect on wildfire management actions and incident decisions.

Lands with Wilderness Characteristics

Managing lands with wilderness characteristics to emphasize ecosystem health and natural values could provide opportunities to manage unplanned ignitions for resource benefit. For conifer communities in particular, this would help to maintain or improve diverse structural/seral stages at the landscape-level, which would improve forest health and fuel loads. This would have a minor beneficial effect on wildfire management. However in Alternative B, management actions would restrict access or constrain surface disturbances which could limit the use of wildfire for resource benefit. This would have a negligible adverse effect on wildfire management.

Livestock Grazing Management

The creation and maintenance of reserve common allotments would facilitate wildfire management actions by providing temporary grazing opportunities where rest or deferment is required after wildfires. This would have a negligible beneficial effect on management of unplanned fires.

A minimum of two years rest from livestock grazing would be required after managing wildfire for resource benefit. Where there are no alternative pastures, this potential hardship to lessees could eliminate the use of unplanned ignitions to meet multiple objectives. This is a concern for fire management in this alternative since fuels treatments are also limited and desired vegetation goals may be difficult to achieve. Minimum two years rest could also postpone or constrain other activities, such as adaptive grazing management to control annual bromes. This would have a minor adverse effect on managing wildfire to meet resource goals and objectives.

Special Designations

Areas of Critical Environmental Concern

Alternative B effects on wildfire management from ACEC management actions would be the same as described under *Impacts Common to All Alternatives*, except that Alternative B would

not allow surface disturbance on approximately 511,000 acres of BLM-administered lands in the planning area. This would have a moderate adverse effect on fire management decisions.

Wilderness Study Areas

Motorized and mechanized equipment would be prohibited in WSAs in this alternative, which affects about four percent of BLM-administered lands. This has a minor adverse effect on wildfire management, whether the objectives are for resource benefit or for suppression.

4.3.1.5. Alternative C

Alternative C would emphasize resource use. Fire management under this alternative would place more emphasis on full protection strategies, with fewer constraints on the use of heavy equipment. There are no geographically identified areas in this alternative to manage unplanned ignitions for both protection and resource benefit (multiple objectives), so the overall objective of wildfire management is to suppress the fire.

Fire and Fuels Management

The scale of fuels treatments under Alternative C would allow about five percent of BLM-administered lands (approximately 42,000 acres) to be treated during the planning period. Hazardous fuels reduction objectives could be accomplished in developed interface areas. Throughout the planning period, treatments in other areas could improve landscape-level fire regime conditions in portions of the planning area, and could compensate for the adverse effects of full suppression strategies for wildfires. Based on acres, this would have a moderate beneficial effect on wildfire management. With the emphasis on resource protection strategies and wildfire suppression objectives costs of suppression would be higher in this alternative, though the allowed levels of fuels treatments might offset this especially in areas of concern such as WUI.

Physical Resources

Soil and Water Resources

Alternative C soils management would not restrict surface-disturbing activities in areas of high erosion hazard, on slopes equal to or greater than 25 percent, and on soils with poor reclamation suitability. Alternative C water management would allow surface-disturbing and disruptive activities within 500 feet of riparian and wetland systems, aquatic habitats, and floodplains. Alternative C soils and water management actions would simplify fire management decisions and activities.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative C, actively managing forests and woodlands to maximize forest health and to prevent expansion into other plant communities also would meet fuels management objectives. This would have a minor beneficial effect on wildfire management.

Vegetation – Riparian/Wetland Resources

Alternative C would allow surface-disturbing and disruptive activities within 500 feet of riparian and wetland systems, aquatic habitats, and floodplains. This would simplify fire management decisions and activities and has a minor beneficial effect on fire management.

Invasive Species and Pest Management

Alternative C invasive species and pest management actions would be the same as described under *Impacts Common to All Alternatives*, except that management under Alternative C would be reactive. This could complicate management of unplanned ignitions for resource benefit, which would have a negligible adverse effect on wildfire management.

Fish and Wildlife Resources

In general, Alternative C would allow surface-disturbing and disruptive activities in wildlife habitat. This would simplify fire management decisions, and could allow a full range of options to manage unplanned ignitions for multiple objectives, although this alternative would emphasize full protection strategies. This management would have a negligible beneficial effect on wildfire management.

Special Status Species (including Greater Sage-Grouse)

Alternative C management would allow surface-disturbing activities in plant habitats, but not in areas with known special status plant populations. This includes the use of fire suppression vehicles and suppression chemicals. This management would simplify fire management decisions, depending on the location of special status plant populations and the status of inventories. In limber pine settings, fire management activities would follow the Wyoming BLM guidelines for five-needle pines.

For Greater Sage-Grouse habitat, *Impacts Common to All Alternatives* discusses fire management guidelines and BMPs. Because unplanned ignitions are managed in this alternative for suppression objectives only, specific surface disturbing and timing restrictions in this alternative have negligible additional effects on fire management.

Alternative C management would not prohibit surface disturbance in special status reptile and amphibian habitats. This would simplify fire management decisions, and could allow a full range of options to manage unplanned ignitions for multiple objectives, although this alternative emphasizes full protection strategies.

Overall, Alternative C management of SSS would have a negligible beneficial effect on wildfire management.

Heritage and Visual Resources

Cultural Resources

Under Alternative C, management or protection plans for special areas or historic properties would not be developed, which would mean some management decisions would be made during incident response. This management would have a negligible adverse effect on wildfire management.

Land Resources

Forest Products

Alternative C forest products management would affect wildfire management similar to Alternative A, except that Alternative C would limited the size of harvest areas by terrain and forest BMPs, rather than for predetermined acreages. This would efficiently meet wildfire and fuels management objectives for hazardous fuels reduction, and have a moderate beneficial effect on wildfire management.

Lands and Realty

Under Alternative C, public lands could be disposed of, but exchanges and access easements would not be considered or pursued. Because there would not be opportunities to consolidate public lands, fire management strategies and complexity would not change from current conditions. This would have a negligible beneficial effect on wildfire management.

Travel and Transportation Management

Alternative C effects from TTM would be similar to effects under Alternative A, except that Alternative C would allow travel up to 300 feet off designated routes. This would increase the potential for human-caused fires and have a negligible adverse effect on wildfire management.

Livestock Grazing Management

Alternative C effects on wildfire management from livestock grazing management would be similar to effects under Alternative A, but Alternative C would allow deferment within the first year rather than total rest. This could provide more opportunities to manage unplanned ignitions for resource benefit.

Special Designations**Wilderness Study Areas**

Motorized equipment would be prohibited in WSAs in this alternative, which affects about four percent of BLM-administered lands. This has a minor adverse effect on the protection strategies of wildfire management.

4.3.1.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Under this alternative, fire management would balance suppression strategies with resource values and desired conditions. Protection strategies would be used in developed areas such as WUI and industrial interface areas. In other areas wildfires might be managed for multiple objectives, to enhance other resources, such as wildlife habitat and forest health. This alternative would use a full range of fire management actions and makes the whole planning area available to consider areas where wildfire could be managed for multiple objectives.

Fire and Fuels Management

In Alternative D heavy equipment is generally limited to existing roads and trails, and is prohibited in sensitive areas unless there are safety issues or the expected fire effects would cause more resource damage than the suppression actions. These sensitive areas include the more obvious resources such as cultural, soils, and wetlands, but also include restrictions in Greater Sage-Grouse habitat and in lands with wilderness characteristics. In lands with wilderness characteristics, efficient use of heavy equipment would likely be difficult in any case. In Greater Sage-Grouse habitat where protection of sagebrush is a priority and burning out should be avoided, additional restrictions on suppression tactics would complicate fire management decisions. This would have an adverse effect to wildfire response, though the effects on fire management as a whole is based on acres of fuels treatments (next paragraph).

Similar to Alternative A, fuels treatments in this alternative would be allowed on about two percent of BLM-administered lands (approximately 14,000 acres) during the planning period. Treatments could accomplish fuels reduction objectives in developed interface areas which would improve fire suppression options, safety, and costs. Treatments in other areas could achieve project-level objectives but would likely not achieve landscape objectives. In addition to the allowed treatments, managing wildfires for multiple objectives could contribute to fuels reduction and improve FRCC. This would have a minor beneficial effect on fire management.

Physical Resources

Air Quality

The Wyoming DEQ can require ambient air quality monitoring on a case-by-case basis for unplanned fires. On fires in which the BLM has jurisdictional authority, the AQD requires visual monitoring and reporting for fires that exceed 50 acres. Depending on air quality conditions during a wildfire, potential restrictions could constrain or prevent the use of fire for resource benefit. Air quality management common to all alternatives would have a negligible adverse effect on management of unplanned fires.

Soil and Water Resources

Subject to evaluation, Alternative D would allow surface-disturbing activities on highly erosive soils, on slopes equal to or greater than 25 percent, and on soils with poor reclamation suitability. This would provide flexibility to manage unplanned ignitions for multiple objectives or other sensitive resources, and would have a negligible beneficial effect on wildfire management.

Based on management decisions for other resource values, allowing surface disturbance within 500 feet of water sources would provide more options to safely manage unplanned ignitions or to meet objectives for other sensitive resources. Managing riparian and uplands to restore perennial flows or standing water would benefit wildfire management objectives by creating natural fire breaks.

Overall, Alternative D soils and water management would have a negligible beneficial effect on wildfire management.

Mineral Resources

See *Impacts Common to All Alternatives*. Minerals exploration and development would increase the complexity of wildfire management actions. The potential for human-caused fires would increase with minerals exploration and development, as would the need to protect industrial interface areas. The proliferation of roads in remote areas could increase fire occurrence by introducing additional human-caused ignition sources, although the associated road network and new water impoundments would improve emergency vehicle access and enable an earlier response to wildfire. Roads could be used as control lines during suppression actions. Alternative D management of leasable coal and fluid minerals would have a negligible adverse and a minor adverse effect on wildfire management, respectively.

Biological Resources

Vegetation – Forests and Woodlands and Grassland and Shrublands

Under Alternative D, managing forests and woodlands to maximize forest health and to emphasize

multiple resource values would benefit wildfire management activities by reducing fuel loads, creating defensible space and operational options, and enhancing firefighter and public safety. This management would have a minor beneficial effect on wildfire management.

Vegetation – Riparian/Wetland Resources

These effects are the same as those for Water Resources, above. Based on management decisions for other resource values, allowing surface disturbance within 500 feet of water sources would provide more options to safely manage unplanned ignitions or to meet objectives for other sensitive resources. Managing riparian and uplands to restore perennial flows or standing water would benefit wildfire management objectives by creating natural fire breaks. Alternative D Riparian/Wetland Resources management would have a negligible beneficial effect on wildfire management.

Overall, Alternative D soils and water management would have a negligible beneficial effect on wildfire management.

Invasive Species and Pest Management

Alternative D effects on wildfire management from invasive species and pest management would be the same as described under *Impacts Common to All Alternatives*. In addition, long-range pest management plans with treatment areas prioritized could benefit wildfire management planning by providing guidance for activities, as would designating and prioritizing areas for the treatment of annual bromes. This management would have a minor beneficial effect on wildfire management.

Fish and Wildlife Resources – Fish and Fish and Wildlife Resources – Wildlife

In general, Alternative D would provide opportunities to evaluate surface-disturbing and disruptive activities, and allow those activities if specific criteria could be met. This would provide opportunities to designate areas and manage unplanned ignitions for multiple objectives and for other sensitive resources. Wildlife management actions such as burying powerlines would also benefit wildfire and fuels management by enhancing safety during operations.

There would be two exceptions, as follows:

- Surface-disturbing and disruptive activities would be prohibited in elk calving areas and in crucial big-game winter range during WGFD-specified dates, which would include about 13 percent of BLM-administered lands during winter and spring when limited suppression strategies could be most viable. Although natural ignitions would be rare in spring, they are still possible and would affect the decision to manage unplanned ignitions for resource benefit.
- Surface-disturbing activities would be prohibited within specific buffers when those activities could disrupt nesting raptors. For most species, the seasonal restriction would be implemented from early spring until mid summer, which would include about eight percent of BLM-administered lands until July 15 and four percent of BLM-administered lands until July 31. This would affect wildfire complexity and suppression options, as well as the decision to manage unplanned ignitions for resource benefit.

These two restrictions would affect at least four percent of BLM-administered lands and would have a moderate adverse effect on fire management. Consultation with a resource advisor would be necessary to provide direction for suppression strategies in these two situations. However, weighing the allowed actions in this alternative with the constraints, the overall affect to fire management would be minor adverse.

Special Status Species (including Greater Sage-Grouse)

Similar to management of fish and wildlife resources, Alternative D SSS management would

provide opportunities to evaluate surface-disturbing and disruptive activities, and allow them if specific criteria could be met. Depending on circumstances, this would simplify wildfire incident management.

The following actions are specific to this alternative and would affect incident management decisions and complexity:

- For known populations of special status plants, Alternative D management would be similar to management under Alternative C, but Alternative D would allow the use of suppression chemicals within known populations if that use would be consistent with the biology of the plant. In limber pine settings, fire management activities would follow the Wyoming BLM guidelines for five-needle pines.
- Within Greater Sage-Grouse Priority Habitat, surface disturbance restrictions would affect about 20 percent of BLM-administered lands from March until late June. Because sagebrush protection would be a priority, these restrictions would add cost and complexity to suppression operations. Unplanned ignitions would likely not be managed for resource benefit in these Core Population Areas and Connectivity Corridors. In occupied habitat outside Priority Habitat, about 46 percent of BLM-administered lands would be affected by these same seasonal restrictions, adding cost and complexity to suppression operations. Although natural ignitions would be rare before June 15, they are still possible in late June when weather and fuel conditions might allow unplanned ignitions to be managed for resource benefit. Restrictions outside of Greater Sage-Grouse Priority Habitat would reduce large portions of the landscape that might otherwise be available to manage unplanned ignitions for resource benefit. This could have major adverse effects to wildfire management.
- Buffers for active raptor nests would follow USFWS recommendations for distance and timing restrictions, and would affect about four percent of BLM-administered lands.
- Depending on surveys and circumstances, surface disturbance would be allowed in special status reptile, amphibian, and bat habitats.

Weighing the allowed actions in this alternative with the constraints, the overall effects to fire management would be minor adverse.

Heritage and Visual Resources

Cultural Resources

Alternative D would prohibit surface disturbance within identified sites. Management plans described under *Impacts Common to All Alternatives* would provide preplanned guidance that would typically reduce decision timelines, thereby reducing complexity during wildfire incident management. Alternative D management of cultural resources would have a negligible adverse effect on wildfire management.

Land Resources

Forest Products

Under Alternative D, offering forest products throughout the planning area could enhance local markets and encourage cost-effective alternatives to slash disposal, which would benefit fuels management activities. Pre-commercial thinning and other practices that create healthy forest stands would benefit wildfire and fuels management by efficiently reducing fuel loads and ladder fuels. Rather than being restricted by predetermined acreages, treatment areas could

follow topographic features and could be planned to mitigate wildfire spread and behavior. This management would have a minor beneficial effect on wildfire management.

Lands and Realty

Under Alternative D, exchanging lands to consolidate blocks of BLM-administered lands and pursuing easements to access public lands would improve wildfire management and safety on public lands. Limited suppression actions would be more feasible, which would reduce firefighter exposure and would likely decrease suppression costs. Alternative D lands and realty management would have a minor beneficial effect on wildfire management.

Travel and Transportation Management

Alternative D effects from management of travel and transportation would be similar to effects under Alternative C. Travel would be allowed up to 300 feet off designated routes. This would increase the potential for human-caused wildfires and have a negligible adverse effect on wildfire management.

Lands with Wilderness Characteristics

Managing lands with wilderness characteristics to emphasize ecosystem health and natural values could provide opportunities to manage unplanned ignitions for resource benefit. For conifer communities in particular, this would help to maintain or improve diverse structural/seral stages at the landscape-level, which would improve forest health and fuel loads. This would have a negligible beneficial effect on wildfire management.

Livestock Grazing Management

Under Alternative D, designating future resource reserve allotments would provide options for adaptive management for temporary grazing when rest or deferment is required in other areas after managing fire for resource benefit. Livestock grazing rest or deferment could be required as necessary after fire events or other vegetative treatments, which would allow flexibility to manage for multiple resources and objectives. Alternative D livestock grazing management would have a minor beneficial effect on wildfire management.

Special Designations

Areas of Critical Environmental Concern

Alternative D effects on wildfire management from ACEC management would affect surface disturbance on less than one percent of BLM-administered lands in the planning area, which would have a negligible adverse effect on wildfire management decisions.

Wilderness Study Areas

Motorized and mechanized equipment would be prohibited in WSAs in this alternative, which affects about four percent of BLM-administered lands. This has a minor adverse effect on wildfire management, whether the objectives are for resource benefit and/or for suppression.

4.3.1.7. Cumulative Impacts

Cumulative impacts relevant to unplanned fire include the interaction of planned fire treatments and the allowed levels of those treatments. Management of unplanned and planned fire both contribute to human safety, suppression costs, and vegetation conditions on the landscape. The

Conclusion section below and the *Cumulative Impacts* for Planned Fire section discuss these interactions and long-term effects on the landscape.

4.3.1.8. Conclusion

The alternatives are compared here by considering fire management strategies and costs, and the contributed benefits of the allowed levels of fuels treatments. One of the goals of fire and fuels management is to restore natural (historically characteristic) fire regimes, vegetation structures, and plant communities on the landscape during the planning period. The alternatives are weighed against this goal.

Alternative A is based on current fire management in which variable suppression strategies are balanced with resource values and protection needs. In this alternative unplanned ignitions are not managed for resource benefit (multiple objectives), but limited or conditional suppression strategies would be used where resource values do not require full protection. Costs of suppression actions would be commensurate with the values to be protected. When combined with allowed acres of prescribed fire treatments, there would be an opportunity to reduce fuel loading and improve landscape-level fire regime conditions in portions of the planning area. This in turn could potentially reduce the costs of suppression actions. Through variable suppression strategies and workable resource constraints, this alternative would provide a reasonable framework for wildfire management to partially meet the goals of fire and fuels management at costs which would likely be less than alternatives B and C, but higher than Alternative D. Those alternatives provide further explanation.

Under Alternative B, there would be an opportunity to use a full range of fire management strategies to meet multiple objectives. This would provide options, where appropriate, to reintroduce fire into fire-dependent ecosystems and to reduce undesirable effects from suppression actions. However, in this alternative managing unplanned ignitions for resource benefit would likely be rare because of human developments, specific resource issues, and combinations of constraints from sensitive resources. An emphasis on sagebrush protection would further reduce opportunities to use wildfire to meet other resource objectives. In theory suppression costs should be lowest in this alternative because a full range of strategies could be used, but constraints, resource conditions, reduced levels of vegetation treatments, and resource protection needs could elevate costs to the highest of all the alternatives. Planned vegetative treatments (prescribed fire) under this alternative would not be of an adequate scale (0.4% of BLM-administered lands) to affect fire regime conditions and fuel loading at the landscape level, and therefore would not provide potential reduced costs to suppression actions. In this alternative, The goal of reintroducing fire into fire-dependent ecosystems could be pursued via unplanned ignitions, but the overall effects of wildfire might not meet desired conditions. Costs of this alternative are addressed further in the Emergency Stabilization and Rehabilitation (ES&R) section.

Alternative C emphasizes full suppression strategies to protect resources. Other than immediate protection of resources, this alternative would not pursue the goals of fire management, and suppression costs would be higher than the other alternatives. Only planned ignitions (prescribed fire) under this alternative could influence landscape conditions during the planning period and could offset the effects of full suppression strategies for wildfires.

Alternative D combines wildfire management strategies from Alternative B with allowed acres of prescribed fire treatments from Alternative A, where suppression strategies could be balanced with resource values and desired conditions; unplanned ignitions could be managed for resource

benefit; and vegetation treatments could reduce fuel loading and improve landscape-level fire regime conditions in portions of the planning area. With the combination of prescribed fire and the allowed use of fire for resource benefit, suppression costs would likely be the lowest of all alternatives. This combination of fire management strategies, reasonable resource constraints, and allowed levels of vegetative treatments would provide the best opportunity to accomplish fire management goals.

Whether considering fire and fuels management as a whole, or unplanned ignitions alone, Alternative D would provide the best balance to meet the fire management goal in a multiple-use environment.

4.3.2. Planned Fire (Prescribed Fire)

The goal of prescribed fire is to accomplish hazardous fuel objectives and protect or enhance natural resources by restoring natural fire regimes to the landscape.

4.3.2.1. Methods and Assumptions

Natural or historical fire frequency and severity maintains characteristic vegetation structure, health, fuel loads, and fire effects in all but the most severe weather and drought conditions. Prescribed fire and other vegetative treatments could improve or maintain healthy disturbance regimes on the landscape, improve vegetative health, and decrease hazardous fuel loadings.

Vegetative treatments in conifer settings alter fire behavior and severity by reducing ladder fuels and decreasing canopy cover, thereby inhibiting the vertical spread of fire and reducing the risk of crowning, spotting, and high-intensity fires. These treatments are especially helpful in urban interface, rural intermix, or other developed areas. Treatments affect resources and fire management in the following ways:

- Mitigate high-intensity fire behavior and undesirable effects to resources
- Support fire suppression activities by adding safety and options to operations
- Decrease adverse effects to resources from suppression actions
- Restore or maintain appropriate fire regimes and improve FRCC classes
- Reduce costs of wildfire suppression activities.

In areas with the highest departures from natural or historical disturbance regimes, inaction or reduced actions could exacerbate or expand acres of undesirable conditions.

Areas identified by Community Wildfire Protection Plans receive priority for vegetative treatments under any alternative. As possible, treatments would be implemented in other areas for resource benefit and to restore natural fire regimes. Treatment acres addressed for fire and fuels management include prescribed fire, but touch on the mechanical treatments addressed for forests and woodlands, and forest products. In some areas, mechanical treatments would be followed with prescribed fire. Some mechanical treatments, such as mowing, grinding, or hand thinning, would be used in grass or shrub communities to meet desired conditions or to protect resource values. Specific treatment sites have not been identified for parts of the planning area not covered by Community Wildfire Protection Plans, but undesirable vegetation conditions would be targeted.

Impact analyses and conclusions are qualitatively based on the constraints or facilitative actions from other resources, and how those actions could affect the implementation of vegetation treatments to meet fire regime or fuel loading conditions. Analysis is based on interdisciplinary

team knowledge of resources and past treatments in the planning area, and best professional judgement of the effects of other management actions on vegetation treatment projects.

4.3.2.2. Impacts Common to All Alternatives

Resource issues under any alternative could require location and timing restrictions for vegetative treatments. However, for most activities, interdisciplinary planning would consider constraints versus beneficial effects, and would identify mitigation measures or restrictions necessary for successful implementation.

Fire and Fuels Management

Where limited suppression or resource-benefit strategies could be used on unplanned ignitions, hazardous fuels reduction objectives could be met. Depending on scale and fire effects, fire regime conditions could be improved on the landscape to achieve desired plant communities (DPCs) and seral mixes. Fire and fuels management common to all alternatives would have a minor beneficial effect on prescribed fire as a management tool.

Physical Resources

Air Quality

Prescribed fire is managed to comply with Wyoming DEQ-AQD smoke-management rules and regulations. Ambient air quality issues have rarely limited implementation of prescribed fires. Air quality management actions common to all alternatives would have a negligible adverse effect on prescribed fire as a management tool. This does not vary across the alternatives and is not discussed further in this section.

Soil, Water Resources, and Cave and Karst Resources

These impacts are variable and discussed below under each alternative.

Mineral Resources

Management actions for mineral resources does not effect prescribed fire management and is not discussed further in this section.

Biological Resources

Vegetation

Managing plant communities for a diversity of native species, habitats, seral stages, and distribution, and managing forests and woodlands and grasslands and shrublands in desired ecological conditions would benefit fire and fuels management by maintaining or restoring natural fire regimes. Management of these vegetative communities common to all alternatives would have a minor beneficial effect on prescribed fire as a management tool. Specific vegetation management actions vary across the alternatives and are discussed further in each alternative.

Invasive Species and Pest Management

Cooperative IPM programs with non-BLM partners would benefit fire and fuels management by controlling weeds at the landscape level.

Managing annual bromes by utilizing best available science could increase understanding of fire as a management tool and allow continued use of prescribed fire to meet other resource objectives or even control annual bromes. Depending on scale and success of annual brome management, natural fire regimes and fire behavior and effects could be maintained or improved.

Invasive species and pest management actions common to all alternatives would have a negligible beneficial effect on prescribed fire as a management tool.

Fish and Wildlife Resources

Long-term benefits and short-term adverse effects for habitat enhancement projects would provide a foundation for analysis of vegetative treatments. In general, timing restrictions or prohibiting surface disturbance from fall through spring would reduce opportunities to implement prescribed fire treatments. In some situations, especially in forested settings, prescribed fire might not be available as a treatment option because weather and fuel prescriptions could not be satisfied during summer and early fall.

For most of the alternatives, timing restrictions and prohibiting surface disturbance in elk calving areas would affect approximately four percent of BLM-administered lands in the planning area during spring. Timing restrictions also would apply to elk winter range during fall and winter, although those constraints would affect only about one percent of BLM-administered lands in the planning area. See Alternative D for further discussion.

Year-round restrictions on surface disturbance near sharp-tailed grouse leks and active raptor nests could constrain treatments on about 33 percent of BLM-administered lands in the planning area. Seasonal restrictions for active raptor nests could affect treatments on about 50 percent of BLM-administered lands in the planning area, particularly during early spring when weather and fuel parameters are often most favorable for prescribed fire. See Alternative B for further discussion.

Discussions for individual alternatives address year-round restrictions for big-game travel corridors, and seasonal restrictions and surface disturbances near sharp-tailed grouse leks, active raptor nests, and near natural waterbodies that contain desirable fish species.

Fish and wildlife resources management actions common to all alternatives would have a major adverse effect on prescribed fire as a management tool.

Special Status Species (including Greater Sage-Grouse)

Goals and policies for SSS management would guide decisions to implement vegetative treatments in SSS habitats. Long-term benefits and short-term adverse effects would provide a foundation for analysis of treatments.

Where treatments occur in limber pine settings, current Wyoming BLM guidelines and prescriptions would be followed to enhance or maintain limber pine stands. This has negligible to minor adverse effects on fuels treatments.

For Greater Sage-Grouse habitats, fuels treatments would follow current BLM management guidelines and fuels management BMPs to protect or enhance the habitat. The emphasis on sagebrush preservation would reduce opportunities to implement prescribed fire or other vegetative treatments to achieve other resource objectives. However in unoccupied habitat, there could be site-specific opportunities to improve or restore fire regimes and associated fire behavior

and severity. For example, reducing conifer encroachment in Greater Sage-Grouse habitat would remove uncharacteristic conditions and restore suitable habitat.

In general, year-round restrictions would apply to bald eagle roosts or winter use areas, which would affect less than two percent of BLM-administered lands in the planning area. For other nesting raptors, year-round and seasonal restrictions would affect approximately four percent of BLM-administered lands in the planning area. As further described for each alternative, these effects vary somewhat by alternative.

Heritage and Visual Resources

Cultural Resources

Management or protection plans for special areas or historic properties would provide direction for vegetative treatments. See Alternative C for further discussion. Cultural resources management actions common to all alternatives would have a minor beneficial effect on prescribed fire as a management tool.

Paleontological Resources

Field surveys would indicate where mitigation measures must be developed for vegetative treatments. This would have a negligible adverse effect on prescribed fire management and does not vary across the alternatives.

Visual Resources

VRM Class I and II management objectives require that visual resources be maintained, or that changes to the visual resource be unnoticeable to the casual observer. Depending on the project site, constraints could restrict the size or shape of vegetative treatment areas. About four percent of BLM-administered lands are in Class I areas in WSAs, which does not vary across the alternatives. This scale could have a minor adverse effect on prescribed fire and fuels management, but mitigation measures would likely be developed for successful design and implementation of projects. Impacts common to all alternatives would have a negligible adverse effect on prescribed fire as a management tool. Other than WSAs, VRM is variable and is discussed further in each alternative.

Land Resources

Forest Products

Management of forest products varies across the alternatives and is discussed below under each alternative.

Lands and Realty

Exchanging lands to consolidate blocks of BLM-administered lands, disposing of isolated public lands, and pursuing easements to access public lands would facilitate fuels management actions at the project and landscape levels. Alternatives A, B, and D consider or prioritize these types of actions which has a minor beneficial effect on prescribed fire management. See Alternative C for further discussion.

Renewable Energy

Management of renewable energy resources does not effect prescribed fire management and is not discussed further in this section.

Rights-of-Way and Corridors

Management of ROW and corridors does not effect prescribed fire management and is not discussed further.

Travel and Transportation Management

Closing areas seasonally or year-round would reduce opportunities to implement vegetative treatments. Closures would vary across the alternatives and are further discussed by alternative. TTM actions common to all alternatives would have a negligible adverse effect on prescribed fire as a management tool.

Recreation

SRMA designations and associated recreation values could constrain vegetative treatments, especially prescribed fire. However, in some cases treatments might be needed to reduce hazardous fuel loads near recreation facilities. Recreation management actions common to all alternatives would have a negligible adverse effect on prescribed fire as a management tool.

Lands with Wilderness Characteristics

Managing lands with wilderness characteristics to emphasize ecosystem health and natural values is compatible with prescribed fire and other vegetative treatments. For conifer communities in particular, this would help to maintain or improve diverse structural/seral stages at the landscape-level, which would improve forest health and fuel loads. This would have a negligible beneficial effect on prescribed fire management. See Alternative B for further discussion.

Livestock Grazing Management

The creation and maintenance of reserve **common** allotments varies across the alternatives, but where allowed, could provide temporary grazing opportunities where rest or deferment is required after vegetative treatments. Resting treatment areas as necessary prior to prescribed fire would facilitate implementation by extending burn windows. Livestock grazing management actions common to all alternatives would have a minor beneficial effect on prescribed fire as a management tool.

Livestock grazing strategies generally would include rest periods after vegetative treatments. Under some circumstances, such as adaptive management of annual bromes, this could unnecessarily postpone or constrain grazing strategies that benefit range, fire, and fuels management. Vermeire et al. (2011) found that annual grasses were reduced in the Northern Great Plains following summer fire. See the alternatives for further discussion about rest periods. In management common to all, this negligible adverse effect is less important than the minor beneficial effects from creating reserve **common** allotments.

Special Designations**Areas of Critical Environmental Concern**

ACECs are not designated in alternatives A and C, but are discussed further in alternatives B and D.

Scenic or Back Country Byways and Wild and Scenic Rivers

See the discussion in alternatives B and D, but these special designations otherwise have no effect on prescribed fire management.

Wilderness Study Areas

Fuels management activities must follow the policy and guidelines of BLM Manual

6330 – Management of Wilderness Study Areas to preserve or enhance the natural character of WSAs and avoid unnecessary impairment of a WSA's suitability for preservation as wilderness. Appendix Q (p. 2511) provides more information from BLM Manual 6330 – Management of Wilderness Study Areas. This does not vary across the alternatives and is not discussed further in this section, however further restrictions on motorized and mechanized equipment is discussed within the alternatives.

Socioeconomic Resources

Social and Economic Conditions and Health and Safety

Ensuring that local and regional economic development and local land use plans are considered in BLM actions, and working with local agencies to foster public awareness benefits fire and fuels management. Reducing or eliminating physical hazards through appropriate mitigations benefits fire and fuels management by adding safety to fire operations. This does not vary across the alternatives and is not discussed further in this section.

4.3.2.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended in 2001. Under this alternative, the BLM would treat approximately 14,000 acres with prescribed fire and other fuels treatments. Mechanical treatments are discussed in the *Forests and Woodlands* section.

Fire and Fuels Management

Under Alternative A, unplanned ignitions could be managed with limited suppression strategies, which would help meet fuels and fire ecology objectives at the project level. This would have a minor beneficial effect on fuels management.

Physical Resources

Soil

Under Alternative A, there would be restrictions and prohibitions on surface-disturbing activities in areas of high erosion hazard, on slopes equal to or greater than 25 percent, and on soils with poor reclamation suitability. The authorized officer could waive these restrictions and prohibitions, so hazardous fuels projects could be considered in areas covered by County Wildfire Protection Plans or where high fuel loads threaten other resource values. Alternative A soils management would have a minor adverse effect on the use of prescribed fire as a management tool.

Water Resources

Alternative A would prohibit surface disturbance within 500 feet of water sources, which could increase the complexity of implementing prescribed fire. However, the authorized officer could waive the prohibition as appropriate for successful implementation. Alternative A water management would have a minor adverse effect on the use of prescribed fire as a management tool.

Cave and Karst Resources

In Alternative A there are no constraints on surface use for vegetative treatments, which would have a negligible beneficial effect on prescribed fire management.

Biological Resources

Vegetation – Forests and Woodlands and Grassland and Shrubland Communities

Under Alternative A, managing vegetation to meet forest and rangeland health standards also would meet fuels management objectives. Reducing hazardous fuel accumulations would likely improve fire regime conditions. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Vegetation – Riparian/Wetland Resources

Alternative A would prohibit surface disturbance within 500 feet of water sources, which could increase the complexity of implementing prescribed fire. However, the authorized officer could waive the prohibition as appropriate for successful implementation. Alternative A riparian management would have a minor adverse effect on the use of prescribed fire as a management tool.

Invasive Species and Pest Management

See Impacts Common to All Alternatives.

Fish and Wildlife Resources

See Impacts Common to All Alternatives.

Special Status Species (including Greater Sage-Grouse)

See Impacts Common to All Alternatives.

Heritage and Visual Resources

Cultural Resources

See Impacts Common to All Alternatives.

Visual Resources

Under Alternative A, the approximately four percent of BLM-administered lands in the planning area are managed as VRM Class I, which could affect the sizes, shapes, or placement of vegetative treatments. This scale could have a minor adverse effect on prescribed fire and fuels management, but mitigation measures would likely be developed for successful design and implementation of projects. There would be few constraints for Class II areas. This management would have a negligible adverse effect on the use of prescribed fire as a management tool.

Land Resources

Forest Products

Under Alternative A, the commercial harvest of wood products, diseased old growth, and overstocked forests would reduce fuel loading, improve defensible space in WUI areas, and contribute to safer and less expensive suppression operations.

Timber harvest methods (e.g., clear-cuts) that create fuel breaks could reduce the size of wildfires. However, limiting clear-cut methods to fewer than 20 acres would not support landscape-scale fire regime objectives in lodgepole pine settings.

Pre-commercial thinning would provide cost-effective benefits for forest health and associated reductions in fuel loads during and after the planning period.

Overall, Alternative A management of forest products would have a minor beneficial effect on the use of prescribed fire as a management tool.

Lands and Realty

See Impacts Common to All Alternatives.

Travel and Transportation Management

Under Alternative A, seasonally closed roads would affect approximately 16 percent of BLM-administered lands in the planning area, and would reduce opportunities to implement prescribed fire treatments during times when weather and fuel parameters can be most viable.

Recreation

See Impacts Common to All Alternatives.

Livestock Grazing Management

Also see *Impacts Common to All Alternatives*. Resource common allotments would not be designated in this alternative, so would not benefit fire and fuels management by providing temporary grazing opportunities where rest or deferment is required after vegetation treatments.

Livestock grazing rest periods after vegetative treatments could include the first full year and deferment the following season. In some cases, such as adaptive management of annual bromes, this could unnecessarily postpone or constrain grazing strategies that benefit range, fire, and fuels management. This would have a negligible adverse effect on the use of prescribed fire as a management tool.

Special Designations

See Impacts Common to All Alternatives.

4.3.2.4. Alternative B

Alternative B would emphasize resource conservation. Under this alternative, the BLM would treat approximately 3,500 acres with prescribed fire and other fuels treatments. Mechanical treatments are discussed in the *Forests and Woodlands* section.

Fire and Fuels Management

Under Alternative B, managing wildfires for resource benefit could help meet fuels and fire ecology objectives, and compensate for constraints on allowable acres for prescribed fire treatments. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Physical Resources

Soil

Alternative B effects on the use of prescribed fire as a management tool would be similar to effects under Alternative A, except that under Alternative B, the authorized officer could not waive prohibitions on surface disturbances. Specifically, prescribed fire projects would be prohibited on highly erosive soils, which accounts for approximately 28 percent of BLM-administered lands in the planning area. Hazardous fuels projects could not be considered in areas where high fuel loads

threaten structures or other resource values. Alternative B soils management would have a major adverse effect on the use of prescribed fire as a management tool.

Water Resources

Alternative B effects on the use of prescribed fire as a management tool would be similar to effects under Alternative A, except that the authorized officer could not waive prohibitions on surface disturbances within 500 feet of water sources. As for soils management, hazardous fuels projects could not be considered in these areas. In addition, this restriction could deny the use of water for prescribed fire operations in nearby areas. Alternative B water management actions would have a minor adverse effect on the use of prescribed fire as a management tool.

Cave and Karst Resources

Cave and karst management in Alternative B would prohibit timber harvest activities on approximately 13 percent of the BLM-administered lands. This would have a major adverse effect on mechanical treatments done by machine. However, hand thinning and prescribed fire would likely be allowed with mitigation measures in place. This would have a negligible adverse effect on prescribed fire management.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative B, managing forests and woodlands with an emphasis on natural processes would allow insects and disease, wildfire, and other natural disturbances to run their natural courses. This could be beneficial in areas where historical or desirable vegetation characteristics are healthy and could be maintained by natural processes.

However, in recent decades, natural and man-made disturbances have been prevented or eliminated in many forested areas. This has created a departure from historical conditions, with high stand densities, ladder fuels, and heavy fuel loads in contiguous areas across the forested landscape. Wildfire behavior in these areas would likely be intense and could produce undesirable, high-severity fire effects. Under Alternative B, natural fuel breaks such as moist aspen communities would eventually be replaced by drier, more flammable conifer vegetation, and conifer expansion into grassland communities would contribute to larger fires.

Using silviculture treatments only when catastrophic events threaten the public and surrounding lands would not effectively address firefighter and public safety, or the priorities of Community Wildfire Protection Plans.

Overall, Alternative B forests and woodlands management actions would have a minor beneficial effect on the use of prescribed fire as a management tool.

Vegetation – Riparian/Wetland Resources

Alternative B effects on the use of prescribed fire as a management tool would be similar to effects under Alternative A, except that the authorized officer could not waive prohibitions on surface disturbances within 500 feet of water sources. Alternative B riparian management actions would have a minor adverse effect on the use of prescribed fire as a management tool.

Invasive Species and Pest Management

In addition to the effects described under *Impacts Common to All Alternatives*, under Alternative B, identifying pest management areas would generally facilitate fuels management planning. This would have a minor beneficial effect on the use of prescribed fire as a management tool.

Fish and Wildlife Resources

Specific to Alternative B, the following restrictions would affect implementation of fuels projects and other vegetative treatments:

- Surface-disturbing and disruptive activities would be prohibited within 0.25 mile of naturally occurring waterbodies that contain desirable fish. This would affect approximately seven percent of BLM-administered lands in the planning area.
- Prohibiting surface-disturbing and disruptive activities in crucial elk winter range, in big-game migration corridors, and in elk calving areas would reduce opportunities to implement prescribed fire treatments on approximately seven percent of BLM-administered lands in the planning area. In some cases, especially in forested settings where much of this habitat occurs, prescribed fire might not be available as a treatment option because weather and fuel prescriptions could not be satisfied during summer and early fall. Designating elk crucial and year-round ranges for the Fortification Creek elk herd could exclude prescribed fire treatments from an additional four percent of BLM-administered lands.
- Seasonal restrictions for active raptor nests would constrain treatments as far away as 1.5 miles, which could affect approximately 55 percent of BLM-administered lands in the planning area. This would especially affect treatments near red-tailed hawk nests and several species of owl, whose timing restrictions cover early spring when fire prescriptions often are most feasible.

Overall, Alternative B management of fish and wildlife resources would have a major adverse effect on the use of prescribed fire as a management tool.

Special Status Species (including Greater Sage-Grouse)

Specific to Alternative B, the following restrictions would affect implementation of fuels projects and other vegetative treatments and would have major adverse effects to prescribed fire management:

- Surface-disturbing activities that could adversely affect special status plant habitats would be prohibited, including the use of suppression chemicals in motorized fire suppression vehicles. These constraints could affect the implementation of some vegetative treatments on approximately 16 percent of BLM-administered lands in the planning area, although project planning could provide options to accommodate the restrictions. Where treatments occur in limber pine settings, current Wyoming BLM guidelines and prescriptions would be followed to enhance or maintain limber pine stands.
- Seasonal restrictions for active raptor nests would constrain treatments as far away as 1.5 miles. This would affect treatments on approximately 14 percent of BLM-administered lands in the planning area when prescribed fire often is most feasible.
- Prohibiting surface-disturbing and disruptive activities in special status reptile and amphibian habitats, regardless of species presence, would greatly constrain vegetative treatments in and near ephemeral channels, 100-year floodplains, and south-facing rock outcrops. These sites occupy approximately 23 percent of BLM-administered lands in the planning area.
- Within occupied Greater Sage-Grouse habitat, surface disturbance restrictions would affect about three percent of BLM-administered lands, and seasonal restrictions would affect about 60 percent of BLM-administered lands until mid-June. Because sagebrush preservation would be a priority, much of the landscape could be unavailable to meet other vegetation goals.

Heritage and Visual Resources

Cultural Resources

Under Alternative B, surface disturbance in areas with historic properties or within 5 miles of

the visual horizon of historic properties would be prohibited. Hazardous fuels projects or other vegetative treatments could not be considered in those areas. This would have a major adverse effect on the use of prescribed fire as a management tool.

Visual Resources

Under Alternative B, approximately 32 percent of BLM-administered lands in the planning area would be managed as VRM Class I or Class II, which could affect the sizes, shapes, or placement of vegetative treatments. In addition, visual simulation and mitigation designs would be performed for all vegetative treatments in VRM Classes I to III areas. This management would have a major adverse effect on the use of prescribed fire as a management tool.

Land Resources

Forest Products

Under Alternative B, offering only sawtimber from forest treatments, limiting harvest areas to 5 acres, and not utilizing pre-commercial thinning would not efficiently meet hazardous fuels objectives. This management would have a negligible adverse effect on the use of prescribed fire as a management tool.

Lands and Realty

See Impacts Common to All Alternatives.

Travel and Transportation Management

Alternative B effects from TTM would be the same as described under *Impacts Common to All Alternatives*, except that approximately 80 percent of BLM-administered lands in the planning area would be closed year-round to motorized vehicles, and another 2 percent would be closed during winter. These restrictions would seriously limit the implementation of vegetative treatments and would have a major adverse effect on the use of prescribed fire as a management tool.

Recreation

Under Alternative B, vegetative treatments could be constrained by restrictions on surface-disturbing activities in SRMAs, which would affect approximately seven percent of BLM-administered lands in the planning area. However in some sites, treatments might be needed to reduce hazardous fuel loads around recreation facilities. Because of the restrictions on surface-disturbing activities, Alternative B recreation management would have a moderate adverse effect on the use of prescribed fire as a management tool.

Lands with Wilderness Characteristics

Managing lands with wilderness characteristics to emphasize ecosystem health and natural values could provide opportunities to implement prescribed fire to accomplish multiple objectives. For conifer communities in particular, this would help to maintain or improve diverse structural/seral stages at the landscape-level, which would improve forest health and fuel loads. This would have a minor beneficial effect on prescribed fire management. However in Alternative B, associated management actions would restrict access or constrain surface disturbances which would limit vegetative treatments. Overall, this would have a minor adverse effect on prescribed fire.

Livestock Grazing Management

Under Alternative B, resource reserve common allotments would be designated in this alternative, which would benefit fire and fuels management by providing temporary grazing opportunities where rest or deferment is required after vegetation treatments, however, a minimum of two years

rest from livestock grazing would be required after prescribed fire treatments. Where there are no alternative pastures, this potential hardship to lessees could restrict or prevent prescribed fire projects. Under some circumstances, such as adaptive management of annual bromes, this could postpone or constrain other grazing strategies that would benefit range, fire, and fuels management. This management would have a negligible adverse effect on the use of prescribed fire as a management tool.

Special Designations

Areas of Critical Environmental Concern

Depending on site characteristics, values, and protection measures, newly designated ACECs could either encourage or discourage the use of prescribed fire to maintain ecological conditions. Site-specific management plans would be developed for each area to provide guidance for vegetation management activities. In Alternative B, 511,000 acres of BLM-administered lands in the planning area would have restrictions on surface disturbance, and prescribed fire would be subject to the terms of site-specific plans. This would have a moderate adverse effect on the use of prescribed fire as a management tool.

Scenic or Back Country Byways and Wild and Scenic Rivers

Such designations could influence the application of vegetative treatments, depending on values or constraints described for other resources. Constraints would have an adverse effect on prescribed fire management. Conversely, these types of designations can provide educational opportunities for interpretive displays about disturbance ecology, fire, and vegetative treatments, which would have a beneficial effect on prescribed fire management. Overall, these designations would likely have a negligible adverse effect on prescribed fire management.

Wilderness Study Areas

All motorized and mechanized equipment would be prohibited in WSAs, which would preclude prescribed fire and many other vegetation treatments on about four percent of BLM-administered lands. This would have a minor adverse effect on fuels management.

4.3.2.5. Alternative C

Alternative C would emphasize resource use. During the planning period, approximately 42,000 acres would be treated with prescribed fire and other fuels treatments. Mechanical treatments are discussed in the *Forests and Woodlands* section.

Fire and Fuels Management

Under Alternative C, full protection strategies for wildfires would not meet fuels and fire ecology objectives, but the allowed levels of prescribed fire treatments under this alternative would compensate to meet landscape-level objectives in some areas. This management would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Physical Resources

Soil and Water Resources

Under Alternative C, there would be no restrictions or prohibitions on surface-disturbing activities in areas of high erosion hazard, on slopes equal to or greater than 25 percent,

and on soils with poor reclamation suitability. Surface-disturbing and disruptive activities would be allowed within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains. This would facilitate implementation of fuels treatment projects. Overall, Alternative C management of soils and water would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Cave and Karst Resources

Surface disturbance restrictions and buffers from cave and karst management would affect very few acres and would have negligible adverse effects for prescribed fire management.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative C, actively managing forests and woodlands to maximize forest health and to prevent expansion into other plant communities also would meet fuels management objectives. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Vegetation – Riparian/Wetland Resources

Also see Soil and Water, above. Under Alternative C, surface-disturbing and disruptive activities would be allowed within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains. This would facilitate implementation of fuels treatment projects. Management riparian and wetland resources would have a negligible adverse effect on the use of prescribed fire as a management tool.

Invasive Species and Pest Management

Alternative C effects from invasive species and pest management would be the same as described under *Impacts Common to All Alternatives*, except that management would be reactive and could complicate prescribed fire management. This management would have a negligible adverse effect on the use of prescribed fire as a management tool.

Fish and Wildlife Resources

In general, Alternative C would allow surface-disturbing and disruptive activities in wildlife habitat. This would facilitate implementation of fuels treatment projects.

Special Status Species (including Greater Sage-Grouse)

Except for effects described in *Impacts Common to All Alternatives*, the following actions in Alternative C would facilitate implementation of fuels treatment projects and would have a negligible beneficial effect on prescribed fire management:

- Surface-disturbing activities would be allowed in special status plant habitats but not within known populations of such plants. This includes the use of fire suppression vehicles and suppression chemicals. Where treatments occur in limber pine settings, current Wyoming BLM guidelines and prescriptions would be followed to enhance or maintain limber pine stands.
- Surface disturbance would not be prohibited in special status reptile and amphibian habitats.

Restrictions for Greater Sage-Grouse habitat management would be similar to *Impacts Common to All Alternatives* with a minor adverse effect on Planned Fire, however this is not included in the assessment for this alternative.

Heritage and Visual Resources

Cultural Resources

Under Alternative C, required cultural resources surveys would be performed in vegetative treatment units to identify sites and mitigation measures before treatment. Otherwise, this alternative would allow surface-disturbing activities near cultural sites. Alternative C management would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Visual Resources

Under Alternative C, approximately four percent of BLM-administered lands in the planning area would be managed as VRM Class I. However, all Class II areas would be managed as Class III, which would remove most restrictions on vegetative treatments. Alternative C management of visual resources would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Land Resources

Forest Products

Under Alternative C, offering an array of forest products to facilitate management of forests and woodlands would also meet fuels management objectives. In time, new local markets may be created which could lower costs for vegetation treatments. Alternative C management of forest products would have a moderate beneficial effect on the use of prescribed fire as a management tool.

Lands and Realty

Under Alternative C, there would be disposals of public lands, but exchanges and access easements would not be considered or pursued. With no opportunity to consolidate public lands, fuels management planning and vegetative treatments would remain complex in many areas. This management would have a negligible adverse effect on the use of prescribed fire as a management tool.

Travel and Transportation Management

In Alternative C, the effects of TTM on fuels management would be the same as described under *Impacts Common to All Alternatives*, although under this alternative, very few BLM-administered acres would be closed year-round to motorized vehicles. However, seasonally closing roads would affect approximately 16 percent of BLM-administered lands in the planning area and would reduce opportunities to implement prescribed fire treatments during times when weather and fuel parameters would be most viable. This management would have a major adverse effect on the use of prescribed fire as a management tool.

Recreation

See *Impacts Common to All Alternatives*.

Livestock Grazing Management

Alternative C effects would be similar to effects under Alternative A, but Alternative C would allow deferment within the first year after treatment, rather than total rest. This could open more opportunities to implement prescribed fire treatments, and have a negligible beneficial effect on the use of prescribed fire as a management tool, especially because reserve **common** allotments would not be designated in this alternative.

Special Designations

Wilderness Study Areas

All motorized equipment would be prohibited in WSAs, which would preclude prescribed fire and many other vegetation treatments on about four percent of BLM-administered lands. This would have a minor adverse effect on fuels management.

4.3.2.6. Alternative D

Alternative D would generally allow resource use if the activity benefits resource values, can be done in a manner that conserves resource values, or provides adequate mitigation to reduce adverse effects on sensitive resources. During the planning period, approximately 14,000 acres could be treated with prescribed fire and other fuels treatments. Mechanical treatments are discussed in the *Forests and Woodlands* section. Alternative D is the **Proposed RMP**.

Fire and Fuels Management

Under Alternative D, unplanned ignitions could be managed for resource benefit or with limited suppression strategies. Either strategy could meet fuels and fire ecology objectives and therefore have a minor beneficial effect on the prescribed fire management.

Physical Resources

Soil

Subject to evaluation, Alternative D would allow surface-disturbing activities on highly erosive soils, on slopes equal to or greater than 25 percent, and on soils with poor reclamation suitability. This would provide flexibility to manage prescribed fire and other vegetative treatments for multiple objectives or for other priorities such as fuels reduction in WUI areas. Alternative D soils management actions would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Water Resources

Based on management decisions for resource values, allowing surface disturbance within 500 feet of water sources would provide flexibility to manage prescribed fire efficiently and safely and to meet other resource objectives. Managing riparian and uplands to restore perennial flows or standing water would benefit fuels management objectives by creating natural fuel breaks and restoring vegetative communities. These management actions would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Cave and Karst Resources

Surface disturbance restrictions and buffers from cave and karst management would affect few acres and have negligible adverse effects for prescribed fire management.

Biological Resources

Vegetation – Forests and Woodlands and Grassland and Shrubland Communities

Under Alternative D, managing forests and woodlands to maximize forest health and to emphasize multiple resource values would benefit fire and fuels management by reducing fuel loads and

restoring characteristic fire regimes and plant communities. This would have a minor beneficial effect on the use of prescribed fire as a management tool.

Vegetation – Riparian/Wetland Resources

See *Water*, above.

Invasive Species and Pest Management

In addition to the effects described under *Impacts Common to All Alternatives*, Alternative D would include long-range pest management plans with treatment areas prioritized. This could benefit fuels management by providing guidance for activities, as would designating and prioritizing areas for the treatment of annual brome grasses. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Fish and Wildlife Resources

In general, Alternative D would provide opportunities to evaluate surface-disturbing and disruptive activities, and allow those activities if specific criteria could be met. Prescribed fire and other vegetative treatments could be implemented for multiple objectives or for other priorities, such as fuels reduction in developed interface areas. The exceptions are:

- Surface-disturbing and disruptive activities would be prohibited in crucial big-game winter range and in calving areas. Under Alternative D, approximately 12 percent of BLM-administered lands in the planning area would be affected, much of it in conifer settings. In some situations, especially in forested settings, prescribed fire might not be available as a treatment option because weather and fuel prescriptions could not be satisfied during summer and early fall.
- Surface-disturbing activities would be prohibited within specific buffers when those activities could disturb nesting raptors. For most species, the seasonal restriction would be in place from early spring until mid summer, and would affect approximately 7 percent of BLM-administered lands in the planning area. This restriction could reduce opportunities to implement vegetative treatments, although for many projects, site-specific evaluations would identify mitigation measures necessary for successful implementation.

Alternative D wildlife management actions include burying powerlines. This would enhance the safety of fire and fuels operations.

Overall, because of surface-disturbing constraints for big game and nesting raptors Alternative D fish and wildlife management actions would have a moderate adverse effect on the use of prescribed fire as a management tool.

Special Status Species (including Greater Sage-Grouse)

Alternative D effects from SSS management would be similar to effects described under *Impacts Common to All Alternatives*. However, Alternative D would provide opportunities to manage special status plant habitats or implement treatments in habitats if treatments are known to enhance the species' distribution or if projects would not be within known populations of such plants. Where treatments occur in limber pine settings, current Wyoming BLM guidelines and prescriptions would be followed to enhance or maintain limber pine stands.

Alternative D, surface-disturbing and disruptive activities would be allowed where amphibian, reptile, and bat species occur if specific criteria could be met. This would provide opportunities to manage prescribed fire and other vegetative treatments for multiple objectives, other sensitive species, or for other priorities, such as fuels reduction in WUI areas.

For Greater Sage-Grouse Core Population Areas and Connectivity Corridors, fuels treatments would follow current BLM management guidelines and fuels management BMPs to protect or enhance the habitat. About two percent of BLM-administered lands would have year-round surface-disturbing restrictions in Core Population Areas and Connectivity Corridors, and at least 20 percent of BLM-administered lands would have seasonal restrictions from March through late June.

Not considering restrictions in Greater Sage-Grouse habitat, Alternative D management of SSS would have negligible beneficial effects on prescribed fire management.

Heritage and Visual Resources

Cultural Resources

Alternative D would prohibit surface disturbance within identified sites, although the total BLM-administered area affected would be less than one percent. This would have a negligible adverse effect on the use of prescribed fire as a management tool.

Visual Resources

Under Alternative D, managing SRMAs, ACECs, and lands with wilderness characteristics as VRM Class II could restrict surface disturbance on approximately 63 percent of BLM-administered lands in the planning area. Depending on visual values, vegetative treatments could be constrained. However some treatments would mimic natural processes and restore characteristic plant communities, thereby contributing to the visual appeal. Because of these trade-offs, Alternative D management of visual resources would have a minor adverse effect rather than a major adverse effect on the use of prescribed fire as a management tool.

Land Resources

Forest Products

Under Alternative D, offering forest products throughout the planning area could enhance local markets and encourage cost-effective alternatives to slash disposal, which would benefit fuels management activities. Pre-commercial thinning and other practices that create healthy forest stands would benefit fire and fuels management by efficiently reducing fuel loads and ladder fuels. Rather than being restricted by predetermined acreages, treatment areas could follow topographic features and could be planned to mitigate fire spread and behavior. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Lands and Realty

Under Alternative D, exchanging lands to consolidate blocks of BLM-administered lands, disposing of isolated public lands, and pursuing easements to access public lands would facilitate fuels management actions at the project and landscape levels. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Travel and Transportation Management

Alternative D effects would be similar to effects under Alternative C because approximately five percent of BLM-administered lands in the planning area would be closed year-round to motorized travel. However, under Alternative D, seasonal closures would include approximately 10 percent of public lands in big-game crucial winter range. In some situations, especially in forested settings, prescribed fire might not be available as a treatment option because weather and fuel prescriptions could not be satisfied during summer and early fall. Alternative D management of

transportation and access would have a moderate adverse effect on the use of prescribed fire as a management tool.

Recreation (minor adverse)

Alternative D effects would be similar to those described under *Impacts Common to All Alternatives*. In addition, vegetative treatments could be constrained under Alternative D by restrictions for surface-disturbing activities in SRMAs, although in some cases treatments might be needed to reduce hazardous fuel loads. This management would have a minor adverse effect on the use of prescribed fire as a management tool.

Lands with Wilderness Characteristics

Managing lands with wilderness characteristics to emphasize ecosystem health and natural values could provide opportunities to implement prescribed fire to accomplish multiple objectives. For conifer communities in particular, this would help to maintain or improve diverse structural/seral stages at the landscape-level, which would improve forest health and fuel loads. This would have a negligible beneficial effect on prescribed fire management.

Livestock Grazing Management

Under Alternative D, designating future reserve common allotments would provide adaptive management options for temporary grazing when rest or deferment is required in other areas after prescribed fire treatments. Livestock grazing rest or deferment might be required as necessary after fires or other vegetative treatments, which would allow flexibility to manage for multiple resources and objectives. Alternative D livestock grazing management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Special Designations

Areas of Critical Environmental Concern

Depending on site characteristics, values, and protection measures, newly designated ACECs could either encourage or discourage the use of prescribed fire to maintain ecological conditions. Site-specific management plans would be developed for each area to provide guidance for vegetation management activities. Alternative D would restrict surface disturbance on less than one percent of BLM-administered lands in the planning area, which would have a negligible adverse effect on prescribed fire management and other vegetative treatments.

Scenic or Back Country Byways and Wild and Scenic Rivers

Such designations would influence the application of vegetative treatments, depending on values or constraints described for other resources. Constraints would have an adverse effect on prescribed fire management and other vegetative treatments. Conversely, these types of designations can provide educational opportunities for interpretive displays about disturbance ecology and fire, and vegetative treatments, which would have a beneficial effect on prescribed fire management. Overall, these designations would likely have a negligible adverse effect on prescribed fire management.

Wilderness Study Areas

All motorized and mechanized equipment would be prohibited in WSAs, which would preclude prescribed fire and many other vegetation treatments on about four percent of BLM-administered lands. This would have a minor adverse effect on fuels management.

4.3.2.7. Cumulative Impacts

WUI areas would receive priority for vegetative treatments. Under any alternative, non-BLM partners would mechanically treat approximately 3,200 acres of WUI on other public and private lands during the planning period. Non-BLM partners also would use prescribed fire on approximately 2,000 acres near such WUI areas as subdivisions and campgrounds. When combined with BLM treatments (except under Alternative B), developed areas such as urban interface or rural intermix would likely have received hazardous fuels reduction treatments at least once during the planning period. Some areas might have been treated twice, or would be due for reentry. This would create favorable conditions for fire suppression actions, which would increase the likelihood of early success at fire containment, or would lower the risk to structures.

As possible, BLM prescribed fire treatments would be implemented in remote areas for resource benefit and to restore characteristic fire regimes. Treatments in these areas would contribute to the goal of improving fire regime conditions and vegetative structure on the landscape.

Under alternatives A and D, prescribed fire could be implemented on approximately 14,000 acres of BLM-administered lands in the planning area during the planning period, which is approximately 700 acres per year. Hazardous fuels objectives in WUI areas would likely be accomplished. Vegetative treatments in other areas could achieve project-level objectives, but there is little opportunity to use prescribed fire to improve landscape-level fire regime conditions. Some resource constraints or restrictions in these alternatives could be waived or mitigated, especially in Alternative D, which would help to accomplish the treatments.

In Alternative D, unplanned ignitions could be managed using a full range of strategies, including resource benefit objectives, which would contribute to fuels reduction objectives on those sites.

Alternative B would allow prescribed fire on only approximately 3,500 acres during the planning period, which is approximately 175 acres per year. Hazardous fuels objectives in developed interface areas would be partially accomplished, but might not keep pace with interface growth. Vegetative treatments in other areas would be minimal or none because of other resource constraints or restrictions. There would not be opportunities to use prescribed fire to improve fire regime conditions at any scale. Unplanned ignitions could be managed to restore fire to the landscape, but restrictions from other resources could constrain its use in most cases.

Under Alternative C, prescribed fire could be implemented on approximately 42,000 acres during the planning period, which is approximately 2,100 acres per year. Hazardous fuels objectives in developed interface areas could be fully accomplished. In addition, the scale of vegetative treatments in other areas could improve landscape-level fire regime conditions in portions of the planning area. Treatments would be necessary to maintain fire on the landscape and to offset the effects of full protection of unplanned ignitions.

4.3.2.8. Conclusion

For planned ignitions (prescribed fire), Alternative C would allow the greatest opportunity and fewest constraints to meet landscape-level fire regime and fuel objectives. This alternative would provide flexibility to plan and implement vegetative treatments as necessary to meet desired vegetation conditions in the planning area. At approximately 2,100 acres per year, there would be an excellent opportunity to implement prescribed fire projects and other treatments in developed interface and other areas.

Conversely, Alternative C would emphasize full protection strategies for unplanned ignitions, which would impede progress toward meeting desired fire regime conditions and other vegetation objectives. Because of this discrepancy, Alternative C does not best meet the overall goals and objectives of fire and fuels management, whereas Alternative D would allow a reasonable mix of planned and unplanned ignitions to meet multiple objectives.

4.3.3. Stabilization and Rehabilitation

At present, there is no programmatic plan for the BFO to address ES&R activities. Projects would be implemented on a case-by-case basis following the guidance in BLM Handbook H-1742-1, Burned Area Emergency Stabilization and Rehabilitation. Regardless of alternative, interdisciplinary planning would consider constraints and long-term effects, and would identify mitigation measures or restrictions necessary for successful implementation of ES&R projects. Appendix Q (p. 2511) provides more information about ES&R planning, funding, and implementation.

4.3.3.1. Methods and Assumptions

ES&R treatments are planned actions for emergency stabilization and repair of damages or anticipated damages from the undesirable effects of fire. Rehabilitation of fire lines and other suppression damage is an incident response action and should be performed by suppression resources shortly after the fire is contained. For example if heavy equipment is used to create fire lines, it will generally be needed to rehabilitate the lines and should be used if possible before being demobilized from the incident.

Impact analyses and conclusions are qualitatively based on expected fire effects versus the level of fire management strategies across the alternatives.

4.3.3.2. Impacts Common to All Alternatives

ES&R projects must follow management guidance from the approved RMP, and must have activity plans and decisions in place before they may be implemented.

4.3.3.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended in 2001 and maintained. Suppression strategies under this alternative would balance conservation of resource values with protection of developed areas. Although high-severity fire effects are possible, appropriate response to unplanned ignitions would likely minimize the need for ES&R treatments.

4.3.3.4. Alternative B

With an emphasis on natural processes under Alternative B, conservative levels of vegetation treatments, and current fuel load conditions, large-scale high-severity fire effects would be likely in some areas, especially conifer settings. More ES&R projects would be needed than have historically been implemented in the planning area. Motorized and mechanized equipment would be prohibited in WSAs except in emergency situations, which would make Burned Area Rehabilitation (BAR) projects difficult or impossible to implement.

4.3.3.5. Alternative C

Under Alternative C, suppressing fires at smallest size could minimize total acres of wildfire, thereby reducing the need for emergency stabilization treatments. In addition, prescribed fire treatments would help offset undesirable vegetation conditions that would develop from lack of fire disturbance. However, aggressive protection actions in this alternative could create excessive damages from fireline construction and rehabilitation, and contribute to other resource concerns such as damaged soils and spread of invasive plants. Motorized equipment would be prohibited in WSAs except in emergency situations, which would make BAR projects difficult to implement.

4.3.3.6. Alternative D

Alternative D suppression strategies balance conservation or enhancement of resource values with protection of developed areas. Although high-severity fire effects would be possible, appropriate response to unplanned ignitions should minimize the need for ES&R treatments. In addition, allowing a full range of suppression actions would generally reduce surface disturbance from suppression actions and minimize the need for fire line rehabilitation. However, motorized and mechanized equipment would be prohibited in WSAs except in emergency situations, which would make BAR projects difficult or impossible to implement.

4.3.3.7. Cumulative Impacts

In any alternative, implementing ES&R projects on fire-damaged lands would create immediate and cumulative beneficial effects. This is especially applicable to important watersheds in developed areas, or to restoration of sensitive resources and wildlife habitats.

4.3.3.8. Conclusion

Stabilization and rehabilitation projects would be implemented under any alternative as necessary to repair or mitigate damage or undesirable fire effects. Alternatives A and D would provide practical management of unplanned fires so that effects from suppression actions versus fire effects could be balanced. However, undesirable fire effects would be possible under any alternative and will require ES&R activities.

4.4. Biological Resources

4.4.1. Vegetation – Forests and Woodlands

This section describes potential effects on the forest and woodland communities in the planning area from BLM management of resources and resource uses under the alternatives. The *Vegetation – Forests and Woodlands* section of Chapter 3 describes existing conditions of these vegetative communities. Healthy forests and woodlands support other resources (e.g., physical and biological resources) and resource uses (e.g., forest products and recreation). Actions that remove forest or woodland vegetation for purposes other than promoting forest health and sustainability are considered adverse (e.g., minerals development or road construction). Conversely, actions that promote healthy forest and woodland communities are considered beneficial, including those that might reduce vegetative cover over the short term (e.g., prescribed fire or pest management).

4.4.1.1. Methods and Assumptions

Indicators of forest and woodland health are the amount, diversity, and age-class structure of the forest and woodland communities. The goal is to sustain healthy forest and woodland communities in their desired ecological conditions. Forest and woodland communities should be sustainable, resilient, diverse, and able to recover from natural and human disturbances. The types of projected effects under the alternatives are similar; however, the potential amount of acres disturbed would vary by specific allowable uses and management actions associated with individual alternatives, as described below. Appendix G (p. 1937) identifies the projected amount of surface disturbance in the planning area.

Short-term effects would result during initial surface disturbance (vegetation removal) before revegetation is completed, or from decreases in forest health that do not result in a change of the vegetative community. Long-term adverse effects would be changes in vegetative community type that would restrict reestablishment of the desired vegetative community. The scale of effects would be the same as identified in the Introduction of Chapter 4.

Assumptions

Assumptions and methods used in this analysis include, but are not limited to the following:

- This impact analysis and its conclusions are based on interdisciplinary team knowledge of resources in the planning area, reviews of existing literature, and information from other agencies.
- Spatial analysis was performed using the ESRI ArcGIS 10.0 computer software.
- Effects are quantified where possible. Effects are based on the acreage of forest (51,225 acres) and woodland (26,147 acres) communities on BLM surface in the planning area.
- In the absence of quantitative data, best professional judgment was used. Effects are sometimes described using ranges of potential effects or in qualitative terms, if appropriate.
- Forest inventory data was collected on the larger BLM forest management area in 2005.

4.4.1.2. Impacts Common to All Alternatives

Vegetation – Forests and Woodlands

The BLM goal is to sustain healthy forest and woodland communities in their desired ecological conditions. Forest management techniques, which include silvicultural operations such as thinning, timber stand improvement, and planting, can contribute to forest health by removing dead and dying trees, reducing the number of diseased trees and the spread of insects, and reducing the likelihood of uncharacteristic wildland fires.

Physical Resources

Air Quality

Restrictions on vegetative treatments to mitigate adverse effects on air quality would vary depending on air quality conditions in the immediate area at the time of proposed treatments. Potential short-term adverse effects on vegetative treatments include planning and timing restrictions to minimize emissions associated with fugitive dust or smoke. This effect would be minor.

Soil

A reclamation plan is required for all surface-disturbing activities. Forest health projects could be restricted in areas with unstable soils or particularly steep terrain where reclamation is challenging. This would have a minor adverse effect on forests and woodlands management.

Water Resources

In areas with high-value water resources, management practices could be limited to prevent water quality degradation. Modification of forest health projects would be necessary in these areas in accordance with the Wyoming State Forestry BMPs. There are 3,895 acres (7.6%) of BLM-administered forest lands and 243 acres (0.9%) of woodlands within 500 feet of water resources. Water management actions would have a minor adverse effect on forest and woodland communities.

Cave and Karst Resources

Caves and karst management actions common to all alternatives are procedural and would not effect forest and woodland communities.

Mineral Resources**Locatable Minerals**

Public lands not formally withdrawn from minerals entry would be available for locatable minerals development. At present, locatable minerals operations affect 0.3 percent of BLM-administered forest and woodlands communities (138 and 92 acres, respectively). The trend in locatable minerals development in the planning area is predicted to be similar throughout the planning period. The effect on forest and woodland resources would be negligible adverse.

Leasable Minerals – Coal

The potential acreage available for coal leasing is extensive, but the foreseeable activity would be confined to central Campbell County and north-central Sheridan County. Coal leasing and development would not affect BLM-administered forest and woodland resources, and is not further addressed in this section.

Leasable Minerals – Fluids

Federal fluid mineral estate in the planning area would be available to fluid minerals leasing unless it is identified as **closed**. Based on the predicted activity from oil and gas operators surveyed as part of the reasonably foreseeable development forecast, conventional oil and gas development (potential of low to moderate could occur on 3,468 acres (13%) of BLM-administered woodlands. CBNG development could occur on 5,737 acres (22% of BLM-administered woodlands). Physical disturbance and loss of vegetation would be much less than the acreage where fluid mineral activities occur, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Salable Minerals

There are 205 acres (1.2%) of sand and gravel deposits in forest management areas (Billy Creek and the Horn). With the typically small size of salable minerals development, small acreages would be removed. The foreseeable development scenarios for all alternatives predict less than one percent of BLM surface would be disturbed through salable minerals development. Although sand and gravel deposits are present in slightly more than one percent of the forested areas, it is not likely the entire limited amount of predicted salable minerals development would occur in forested areas. Therefore, salable minerals development would have a negligible adverse effect

on forest and woodland communities. The effects would be the same scale under all alternatives. Therefore, salable minerals development is not further addressed in this section.

Fire and Fuels Management

Fire management can affect forest and woodland community health. Fuels treatment projects can promote forest and woodland health by reducing the potential for catastrophic wildfire. Large wildland fires could change the seral state of the forest or woodland. Wildland fire use for resource benefit promotes forest and woodland health. Fire and fuels management common to all alternatives would have a major beneficial effect on forests and woodlands.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Grassland and shrubland communities overlap forest and woodland communities and play an important role in creating vegetative mosaics and diversity for both vegetation types. The overlap benefits forest and woodland health. When forest management activities are performed, the soil is scarified for the introduction of seeds and openings for the grasses and shrubs, diversity in vegetation is produced. The grasses and shrubs protect the soil and water resources and provide cover and browse. Grassland and shrubland management actions common to all alternatives would have a major beneficial effect on forests and woodlands.

Vegetation – Riparian/Wetland Resources

The Wyoming Forestry BMPs require streamside management buffers. These buffers are located with consideration of slope, aspect, stream type, and stream life. This could reduce the acres available for forest health treatments, and have a moderate adverse effect on forests and woodlands.

Invasive Species and Pest Management

The requirements to control invasive species and revegetate disturbed areas would increase the cost of forest health projects. Requirements to flush equipment and reseed only with approved seed are examples of the restrictions that would increase operation costs. However, the ability to control invasive species and pests plays a vital role in sustaining forest and woodland health. Overall management to control invasive species and pests would have a moderate beneficial effect on forests and woodlands.

Fish and Wildlife Resources – Wildlife and Special Status Species – Plants and Wildlife (including Greater Sage-Grouse)

The management of fish and wildlife including sensitive, Threatened, and Endangered species and their habitats would affect forest and woodland health. Fish and wildlife management actions could preclude or seasonally restrict forest health treatments in areas with habitat for these species, such as during the nesting season near raptor nests. Vegetative manipulations such as the removal of conifers to improve sagebrush habitat for Greater Sage-Grouse would decrease the area of forests and woodlands. Management of special status plant species and communities could preclude forest management projects in places where such species are present. Many wildlife species are dependent upon healthy forest and woodland communities; habitat enhancements for these species would benefit forest and woodland communities. In all, these management actions would have a negligible adverse effect on forest and woodland communities.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Management of cultural and paleontological resources could indirectly affect forest and woodland health through increased costs to stabilize and protect significant sites. The likelihood of significant sites within forest and woodland health treatments is low; therefore, these management actions would have a negligible adverse effect on forests and woodland communities.

Visual Resources

Management of VRM Class II areas would control the size, shape and amount of acres included in a forest health project or could limit or prohibit certain types of disturbances. Management of VRM Class III and IV areas would include minor limitations.

Land Resources**Forests Products**

Providing for personal use forest products in an ecologically sustainable manner would have a major beneficial effect on the management of forests and woodland resources.

Lands and Realty

Lands and realty management actions common to all alternatives would not effect forest and woodland health.

Renewable Energy

Portions of the planning area including the southern Big Horn Mountains and the southern PRB have good potential for renewable-energy development, primarily wind energy. Effects on forest and woodland communities from renewable-energy development could include the removal of forest cover. These areas would be taken out of production for the life of the renewable-energy project. The areas where renewable energy potential overlaps with forests and woodlands is limited; therefore, the impact would be minor adverse.

Rights-of-Way and Corridors

The extension of new access roads into forest and woodland communities could allow for better access to conduct forest health treatments. Common to all management actions limit the amount of surface disturbance and vegetation removal. These management actions will have a minor effect on forest and woodland communities as they are not expected to be widespread.

Travel and Transportation Management

The extension of new access roads into forest and woodland areas could allow for better access to conduct forest health treatments. Common to all management actions regulate route construction and transportation use limiting vegetation removal and resource damage which is a major benefit to the forest and woodland communities.

Recreation (minor adverse)

Management actions common to all alternatives promote dispersed recreation use of a casual nature. Dispersed casual use activities can lead to impacts such as trampling of regeneration, or carving on trees but overall the level of impact should be minor.

Lands with Wilderness Characteristics

The likelihood of any newly acquired lands meeting size and naturalness requirements for wilderness characteristics is so low that it is considered to be no effect.

Livestock Grazing Management

Livestock are to be managed to achieve healthy rangeland standards; therefore the regeneration of aspen and other deciduous trees and shrubs in forested, wooded, and riparian areas should only be negligibly affected by livestock grazing.

Special Designations**Areas of Critical Environmental Concern**

A management plan would be prepared for any designated ACECs. Management prescriptions would likely limit surface disturbing activities and vegetation loss that would benefit forest and woodland communities. The acreage to be included in ACECs would likely be small and therefore the overall benefit minor.

Scenic or Back Country Byways

Management actions common to all alternatives have no measurable effect on the forests and woodlands resource, nor would those management actions that vary by alternative; therefore, byways will not be discussed further in this section.

Wild and Scenic Rivers

The portion of the Middle Fork Powder River that is suitable and eligible for WSR designation contains minimal forest or woodland vegetation. Management of WSRs would not affect the forests and woodlands resource and will not be discussed further in this section.

Wilderness Study Areas

WSAs are managed to preserve natural conditions and processes including forest and woodland communities. Intensive management to promote forest health would be restricted, however less intrusive options such as prescribed fire are available. The overall result should be a negligible adverse effect.

Socioeconomic Resources**Social and Economic Conditions and Health and Safety**

The socioeconomic management actions common to all alternatives and the management actions that vary by alternative have no measurable effect on forest and woodland communities and will not be not discussed further in this section.

4.4.1.3. Alternative A

This section describes management actions and potential effects under Alternative A, which would continue management in accordance with the 1985 RMP as amended and maintained.

Vegetation – Forests and Woodlands

Under Alternative A designing forest management treatments, including timber harvesting, to meet overall resource management objectives to protect or improve biodiversity and water quality would have a beneficial effect on forest and woodlands and create healthy ecosystems. With the number of treatments and acreage (4,000 to 6,000 acres) anticipated to be treated including diseased old growth or overstocked forests, the benefit is moderate (7.7% of forest and woodland communities).

Physical Resources

Air Quality

Under Alternative A, analysis of activities and air quality modeling may be performed on a project-specific basis. Large-scale treatments involving thousands of acres, such as planned (prescribed) fires or pest management treatments, would likely be the only activities for which air quality modeling and impacts mitigation would be necessary. Forest and woodland treatments of this scale are not common, the adverse effect on implementing forest and woodland health treatments would be negligible.

Soil

Alternative A would prohibit or control surface-disturbing activities on sensitive soils, subject to management approval, on a project-specific basis. Forest and woodland communities commonly occur on sensitive soils. There are 30,819 acres (60%) of BLM-administered forest communities on slopes equal to or greater than of 25 percent, and 2,741 acres (54%) in areas with poor reclamation suitability. Woodland figures are similar; 9,213 acres (35%) of BLM-administered woodlands are on slopes equal to or greater than of 25 percent, and 19,282 acres (74%) in areas with poor reclamation suitability. Preventing surface-disturbing activities and vegetation removal generally benefits forest and woodland communities. However, under Alternative A, the authorized officer could waive the prohibitions resulting in loss of forest and woodland communities. The management actions could also prevent or control treatments to benefit forest and woodland health. Overall, the effect of these management actions on forest and woodland communities is moderate beneficial.

Water Resources

The only water management action under Alternative A that would directly effect forest and woodland vegetation is a 500-foot restriction on surface-disturbing activities around springs, reservoirs, water wells, and perennial streams. Like many management actions under Alternative A, the authorized officer can waive the prohibition, and there are no defined waiver criteria. This has resulted in inconsistent management. There are 3,895 acres (7.6%) of BLM-administered forest lands and 243 acres (0.9%) (243 acres) of woodlands within 500 feet of water resources. Alternative A water management actions would have only a minor beneficial effect on forest and woodland communities because management actions could be inconsistently applied.

Cave and Karst Resources

Alternative A does not include management actions for cave and karst resources, and actions in those areas would be considered on a project-specific basis. Management would likely focus on entrances to significant caves. There are no documented significant caves in BLM-administered woodland communities, and three in forest communities. Caves are generally located in rock formations and not in the forest or woodland communities. Therefore, management of cave and karst resources would have a negligible effect on forest and woodland communities.

Mineral Resources

Locatable Minerals

Under Alternative A, existing withdrawals from locatable minerals entry would continue. At present, locatable minerals operations affect 0.3 percent of BLM-administered forest and woodlands communities (138 acres and 92 acres, respectively). The trend in locatable minerals development is predicted to be similar throughout the planning period. The effect to forest and woodland resources would be negligible adverse.

Leasable Minerals – Fluids

Based on the predicted leasable fluid minerals activity under Alternative A, conventional activity (potential of moderate or above) could occur on 1,209 acres (2.7%) of BLM-administered forest lands and 1,942 acres (7.4%) of woodlands. CBNG activity would occur on 2,148 acres (4.7%) of BLM-administered forest lands and 5,779 acres (22%) of woodlands. Physical disturbance and the loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Fire and Fuels Management

Under Alternative A, applying different levels of suppression efforts and restricting the use of some types of suppression equipment would have a direct beneficial effect on forest and woodland vegetation. Short-term effects from the fire itself would be direct and beneficial to some tree species, ecosystems, and natural regeneration. Prescribed fire also would have a direct beneficial effect on forests and woodlands over the short and long terms, because the burn conditions are typically less severe than for wildfires. However, short-term effects would be the destruction of any litter on the surface and the current year's growth.

Biological Resources**Vegetation – Grassland and Shrubland Communities**

There is no previous decision under this alternative.

Vegetation – Riparian/Wetland Resources

Alternative A would prohibit surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams which protects forest and woodland communities. However, the management action would also prohibit treatments designed to promote forest and woodland health. This would affect approximately 23,831 acres, unless the authorized officer waives the prohibition. Aspen, cottonwood, ash, and willow often grow in these moist areas; prescribed management would limit surface-disturbing activities and ensure the reproduction and maintenance of these species. Overall, the management actions balance to a negligible beneficial effect on forests and woodlands.

Invasive Species and Pest Management

Approximately 50 to 100 acres are treated annually in the Big Horn Mountains to manage invasive species. At present, no pesticide applications are employed; however, if a pesticide is produced to control species such as the mountain pine beetle, aerial applications would be beneficial. Invasive species treatments have a negligible effect on forest and woodlands.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Alternative A has few decisions to guide management of fish. At present, the practice is to cooperate with the WGFD in introducing or reintroducing native and desirable non-native fish in the planning area where there is potential habitat; to design reservoirs to enhance fisheries where there is a potential; and to maintain reservoirs and riparian areas to improve or enhance potential fisheries. Improving habitat should be a direct benefit. However, the effect would be adverse if anglers and other recreationists attracted to these areas develop foot and motorized vehicle trails and unintentionally introduce invasive species. Special status fish species are presently limited to the Tongue River drainage. Overall, Alternative A fish management would have a negligible beneficial effect on forests and woodlands.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

The reintroduction or augmentation of acceptable wildlife species in suitable habitats could have a long-term effect on forest and woodland management. Considering surface-disturbing activities on a project-specific basis could benefit forest and woodland management by providing management flexibility. Under Alternative A, there would be prohibitions on surface-disturbing and disruptive activities in crucial elk winter range (50,586 acres) and elk calving areas (27,851 acres). Alternative A management for upland game birds would have a negligible adverse effect on forests and woodlands management as there are only woodland communities near sharp-tailed grouse leks. Alternative A would prohibit surface disturbance or occupancy within a biologic buffer around active raptor nests. Seasonally restricting surface-disturbing activities within 0.5 mile of raptor nests would affect approximately 385,148 acres. This could limit the timing for forest health operations. Waivers to allow surface-disturbing activities or occupancy could have a beneficial effect on forest and woodland management.

Under Alternative A, providing and managing habitat for T&E and special status wildlife species on all public lands in compliance with the ESA, approved recovery plans, and BLM policy associated with management of habitat could have beneficial or adverse effects on forest and woodland communities. Focusing on single species often can adversely effect other species and resources. Under this alternative, prohibiting surface disturbance and occupancy within a 0.25-mile radius of the center of Greater Sage-Grouse leks, would affect approximately 3,594 acres, and seasonally prohibiting surface disturbance within an additional 1.75-mile radius would affect approximately 203,724 acres. Establishing a year-round disturbance-free buffer for eagle winter roosts would affect approximately 402 acres, and adding a 1-mile limited activity zone for roosts (November 1 to April 1) would affect approximately 3,013 acres. This would have a minor adverse effect on forest and woodland management because most of these nests occur in riparian forests, but would have a greater effect around northern goshawk nests which tend to nest in coniferous upland forests.

These management actions regulate surface-disturbing activities which promote wildlife habitat conservation and therefore forest and woodland conservation. However, the management actions could also limit treatments designed to promote forest and woodland health. Overall, Alternative A wildlife management actions would benefit forest and woodlands communities to a moderate degree.

Special Status Species – Plants

Alternative A does not include management for special status plant species, which are therefore considered on a project-specific basis. Forest and woodland projects would consider special status plants. Most special status plants are typically rare and have small populations; it is not likely they would adversely effect forest and woodland management. Limber pine is present on approximately 13,927 acres of the planning area. Single-species management specifically for limber pine could have a minor adverse effect on overall forest and woodland management.

Heritage and Visual Resources

Cultural Resources

Alternative A would apply NSO stipulations to mineral leases along potentially eligible and significant segments of the Bozeman Trail and within the Crazy Woman Battle Site. Alternative A would protect these two sites, which are in shrubland communities, from surface-disturbing mineral activities. This management action would not prevent treatments designed to promote

woodland health. These management actions effects on forest and woodland management would be negligible beneficial.

Paleontological Resources

Alternative A does not include management actions for the protection of paleontological resources and it is unlikely that management of significant paleontological sites would effect forest and woodland communities.

Visual Resources

VRM Class II management objectives require that the visual resources in these areas be maintained or that changes to visual resources not be noticeable to the casual observer. VRM management could restrict the type, size, and shape of surface-disturbing activities, including forest health activities, in these areas. Other forested areas in the planning area would be managed under VRM Class III and IV, which impose fewer restrictions on surface-disturbing actions. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented. Overall, Alternative A management of visual resources would have a moderate beneficial effect on forest and woodlands management.

Land Resources

Forests Products

The ability to offer an array of products and one Million Board Feet (MMbf) for a 10-year period with regeneration would benefit the health and sustainability of forest communities. Limiting clear-cuts to 20 acres could hinder management activities in instances of treatments for insect and disease or other natural forces. However, timber stand improvement activities, such as precommercial thinning would be beneficial to forest and woodland health.

Lands and Realty

Alternative A management of lands and realty would not effect forests and woodlands.

Renewable Energy

Alternative A does not address the development of renewable energy resources. Portions of the Big Horn Mountains and southern PRB have potential for renewable-energy development, especially wind energy. Effects on forest and woodland communities from renewable-energy development could include the removal of forest cover. Renewable energy projects within forest communities are not anticipated to be common, in part due to the necessary removal of the forest vegetation. Projects within woodland communities are more likely. Overall, renewable energy management would have a minor adverse effect on forest and woodlands communities.

Rights-of-Way and Corridors

Under Alternative A, ROW disturbances from BLM actions are estimated to affect approximately 38,762 acres (Appendix G (p. 1937)). Surface disturbance and occupancy will not be allowed on slopes equal to or greater than 25 percent, which would affect approximately 215,496 acres and directly benefit all plant communities over the long term. ROW management actions do not restrict forest and woodland health management treatments. Overall, Alternative A management of ROWs and corridors would have a moderate beneficial effect on forests and woodlands.

Travel and Transportation Management

Alternative A would limit motorized vehicle use to existing roads and routes. Under this

alternative, closing areas with saturated soils or steep slopes (approximately 170,590 acres) to motorized vehicles would have a direct beneficial effect on vegetation. Closing certain areas to vehicular travel (approximately 3,650 acres), limiting travel to designated routes (737,166 acres), and seasonal route closures (37,646 acres) would reduce vehicle damage to woodland vegetation and forest regeneration. These management actions combine to have a moderate beneficial effect on forest and woodland communities.

Recreation

Under Alternative A, recreation site development is anticipated to disturb approximately five acres. Most recreation use is dispersed casual use which has little long-term effect to forest and woodland communities.

Lands with Wilderness Characteristics

Alternative A would continue to manage forest and woodland areas for multiple resource values and not manage any lands for wilderness characteristics. There would be no effect on the forests and woodlands resource.

Livestock Grazing Management

Under Alternative A, livestock grazing would not be authorized on approximately 4,000 acres of public land in the canyons and slopes of the southern Big Horn Mountains because of rough terrain and steep slopes and approximately 6,000 acres (1%) where grazing has been determined to be incompatible with other resource uses or values. Livestock grazing tends to be a compatible resource use with forest and woodland communities, except in areas of aspen or other deciduous regeneration. Alternative A would provide for a minimum of two years rest from livestock grazing following prescribed burns and other vegetative treatments, and allow additional rest where necessary to achieve resource goals and objectives.

Special Designations

Areas of Critical Environmental Concern

There are presently no ACECs within the planning area; therefore, there would be no anticipated impacts to forest and woodland communities.

Wilderness Study Areas

WSAs are managed to preserve natural conditions and processes including forest and woodland communities. Intensive management to promote forest health would be restricted, however less intrusive options such as prescribed fire are available. The overall result would be a negligible adverse effect.

4.4.1.4. Alternative B

This section describes management actions under Alternative B, which would emphasize resource conservation, and the likely resulting effects on forest and woodland communities.

Vegetation – Forests and Woodlands

Alternative B would minimize treatments in forests and woodlands, allowing insects, disease, and other forces to run their course. Management would not be proactive in addressing forest and woodland health. Forests and woodlands could become more susceptible to insects and disease. This management strategy would allow accumulation of fuels which sustain wildfires. The expansion of forests and woodlands into meadows would reduce species and landscape diversity.

Physical Resources

Air Quality

Alternative B would require air quality modeling and mitigation for adverse effects on air quality for proposed industrial activities with the potential to approach or exceed emission standards. Few large-acreage vegetative treatments to promote forest and woodland health are predicted. Therefore, the effect on forest and woodland resources would be negligible.

Soil

Alternative B would prohibit surface-disturbing activities on sensitive soils. Forest and woodland communities commonly occur on sensitive soils. There are 30,819 acres (60%) of forest communities on BLM surface on slopes equal to or greater than 25 percent and 2,741 acres (54%) in areas with poor reclamation suitability. Woodland figures are similar; 9,213 acres (35%) of BLM-administered woodlands on slopes equal to or greater than 25 percent and 19,282 acres (74%) in areas with poor reclamation suitability. Alternative B soils protections would be absolute and would prevent disturbance in the forest and woodland communities. The absolute protections could prevent treatments to promote forest or woodland health. The acreage of forests and woodlands protected from surface-disturbing activities would be much greater than the acres of forest and woodland health treatments prevented; therefore, overall a major beneficial effect on forest and woodland communities is anticipated.

Water Resources

Alternative B would prohibit surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams. There are 3,895 acres (7.6%) of BLM-administered forest lands and 243 acres (0.9%) of woodlands within 500 feet of water resources. The absolute protections could prevent treatments to promote forest or woodland health. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented; therefore, overall a moderate beneficial effect on forest and woodland communities is anticipated.

Cave and Karst Resources

Alternative B would prohibit surface-disturbing activities in cave and karst areas. There are 33,942 acres (66%) of BLM-administered forest and 4,729 acres (18%) of woodland communities on karst formations. The absolute protections could prevent treatments to promote forest or woodland health. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented; therefore, overall a major beneficial effect on forest and woodland communities is anticipated.

Mineral Resources

Locatable Minerals

Alternative B would recommend withdrawal from minerals entry 15,870 acres (31%) of BLM-administered forest lands and 10,777 acres (41%) of woodlands. This would have major beneficial effect on forest and woodland resources by preventing potential surface-disturbing activities.

Leasable Minerals – Fluids

Based on the predicted fluid minerals activity under Alternative B, conventional activity (potential of moderate or above) could occur on 340 acres (1.0%) of BLM-administered forest lands and 812 acres (6.9%) of woodlands. CBNG activity could occur on 900 acres (2.7%)

of BLM-administered forest lands and 2,820 acres (24%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Fire and Fuels Management

Alternative B fire and fuels management activities would have a major beneficial effect on forest and woodland resources. Fuel treatment projects would be performed in forested areas to reduce the potential hazard of wildfire. These projects can reduce the amount of woody material on the ground and alter the structure of both the understory and overstory of trees, changing the composition and structure of the stand, and allow for regeneration.

Unplanned ignitions achieving resource benefit also would benefit forest and woodland communities. In areas where this practice is allowed, wildland fire could alter stand composition and be a beneficial occurrence for regeneration, creating age-class diversity and sustainability.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Regenerating native plant species and performing reclamation activities would contribute to ecosystem health by conserving soils, water, and creating diversity.

Vegetation – Riparian/Wetland Resources

Surface-disturbing activities would be prohibited within 500 feet of waterbodies. The Wyoming Forestry BMPs require streamside management zones (MZs), which benefit forest and woodland resources. These actions would have a moderate beneficial effect on forest and woodland communities.

Invasive Species and Pest Management

Alternative B would allow aerial applications of insecticides. However, this has not been the preferred treatment on the forest and woodland landscapes with the types of insects encountered and the current insecticides used. Invasive species and pest management does not concentrate in forest and woodland areas, but those areas would benefit from inclusion into a plan of treatment, which would result in healthier forests and woodlands. Sanitation harvest and biological treatments are the most common treatments in forest and woodland areas. Alternative B invasive species and pest management actions would have a major beneficial effect on forests and woodlands.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Alternative B would prohibit surface-disturbing activities within 0.25 mile of fish-bearing waterbodies which could include projects designed to promote forest health. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented; therefore, overall a minor beneficial effect on forest and woodland communities is anticipated due to the limited BLM surface near fish-bearing waters. Special status fish species are presently limited to the Tongue River drainage, limiting the benefit to forest and woodland communities to negligible.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Under Alternative B, applying prohibitions and seasonal restrictions to surface-disturbing activities for big game and other wildlife species would benefit wildlife habitat including forest and woodland communities. However, they could also limit treatments designed for forest or woodland health. The management of Sensitive, Threatened, and Endangered species and their habitats would affect all woodland management activities on 26,000 acres. Amphibian and reptile habitat includes 36,680 acres or 47 percent of the forest and woodland communities. Alternative B management of general wildlife and special status wildlife species would have a major beneficial effect on forest and woodlands communities.

Special Status Species – Plants

Surface-disturbing activities would be prohibited within special status plant habitat. Most special status plants are rare and have specialized habitat requirements, some of which may include forest and woodland communities. Limber pine is present on approximately 13,927 acres of the planning area. Single-species management specifically for limber pine could adversely effect overall forest and woodland management. Cumulatively SSS plant management would likely have a minor adverse effect on forest and woodland communities.

Heritage and Visual Resources

Cultural Resources

Under Alternative B, establishing and identifying historic sites and creating a 5-mile buffer around those sites could have a major beneficial effect by preventing surface-disturbing activities within forest and woodland communities. The absolute protections could prevent treatments to promote forest or woodland health. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented; therefore, overall a major beneficial effect on forest and woodland communities is anticipated.

Paleontological Resources

Surface-disturbing activities, including forest health activities, would be prohibited in areas with paleontological resources of high quality or importance. However, at present, there are no high-quality paleontological areas in the forested areas, and typically the areas are small. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented. Therefore, the effect on forest and woodland communities would be negligible beneficial.

Visual Resources

Under Alternative B, VRM Class II areas would prohibit or limit surface-disturbing activities on approximately 217,021 acres. VRM Class III and IV areas encompass 276,107 and 258,866 acres respectively, and would have minor limitations that could allow surface-disturbing activities. VRM Class II management objectives require that the visual resources in these forested areas be maintained or that changes to visual resources not be noticeable to the casual observer. VRM constraints would restrict the types, sizes, and shapes of surface-disturbing activities, including forest health treatments, in these areas. Other forested areas in the planning area would be managed as VRM Class III, which would impose few restrictions on forest management actions. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented. Overall, Alternative B management of visual resources would have a moderate beneficial effect on forest and woodlands management.

Land Resources

Forests Products

Limiting timber harvest options to a five acre select group harvest and preventing precommercial stand improvement operations would limit the available prescriptions to promote sustainability and forest and woodland health, a major adverse effect.

Lands and Realty

Under Alternative B, land acquisitions, pursuit of easements, and retaining lands with resource value would improve overall management of public lands. Effects on vegetation would vary depending on the type of action and would be project specific. Effects would be negligible for individual projects, but could be major when considered together or if the BLM pursued and completed a large acquisition.

Renewable Energy

Portions of the Big Horn Mountains and PRB area have a potential for renewable-energy (e.g., wind) development, however, renewable energy development is excluded from most of these areas in Alternative B. If renewable-energy development were to occur in forest or woodland communities it would include the removal of forest cover. Alternative B management of renewable energy would have a negligible adverse effect on forest and woodlands management.

Rights-of-Way and Corridors

Under Alternative B, designating corridors for utility ROW, constructing new ROW projects adjacent to existing projects, a development plan to concentrate communications sites, approving ROWs to access private lands, and a transportation management system would reduce loss of forest and woodland communities. Concentrating sites and corridors would have a direct, major beneficial effect on vegetation over the long term.

Travel and Transportation Management

Alternative B would limit motorized vehicle use to designated routes, close 625,854 acres to motorized travel, and seasonally limit motorized travel on another 18,259 acres. These actions would reduce vehicle damage to woodland vegetation and forest regeneration. These management actions combine to have a moderate beneficial effect on forest and woodland communities.

Recreation

Under Alternative B, development of recreational facilities and opportunities would be limited to designated SRMAs (55,529 acres). SRMAs would be managed to protect natural and cultural values, including vegetation resources. Most recreation use would be dispersed casual use which has little long-term effect to forest and woodland communities. Overall, Alternative B recreation management would have a negligible beneficial effect on forest and woodland communities.

Lands with Wilderness Characteristics

Alternative B would manage 12,237 acres for wilderness characteristics. The **lands with wilderness characteristics** area is predominately forest. Commercial treatments would be prohibited while forest health treatments would be allowed. Wilderness characteristics management results in a moderate beneficial impact to the forest and woodland communities.

Livestock Grazing Management

Under Alternative B, livestock grazing would not be authorized where grazing has been determined to be incompatible with other resource uses or values. Livestock grazing tends to be a compatible resource use with forest and woodland communities, except in areas of aspen

or other deciduous regeneration. Alternative B would provide for a minimum of two years rest from livestock grazing following vegetative treatments and restore vegetation in areas to achieve resource objectives. Because livestock grazing tends to be compatible with forest and woodland communities, livestock predominantly graze on grass and forbs not woody plants, the overall beneficial effect of these management actions on forest and woodland communities would be minor.

Special Designations

Areas of Critical Environmental Concern

Eight ACECs would be designated with Alternative B. Surface-disturbing activities would be prohibited in ACECs preventing loss of forest and woodland vegetation. Treatments for forest and woodland health could be authorized. These management actions would be a major benefit to the sustainability of forest and woodland communities.

Wilderness Study Areas

WSAs are managed to preserve natural conditions and processes including forest and woodland communities. Intensive management to promote forest health would be restricted, however less intrusive options such as prescribed fire are available. The overall result should be a negligible adverse effect.

4.4.1.5. Alternative C

This section describes management actions under Alternative C, which would emphasize resource utilization, and the resulting effects on forest and woodland communities. The effects described above under *Impacts Common to All Alternatives* would be in addition to the effects described below for management actions under Alternative C.

Vegetation – Forests and Woodlands

Alternative C provides for intensive management including designing treatments specific to forests and woodlands, the health of those communities would improve and the forest would be better able to resist the effects of disease, insects, and wildfire. The old growth, tree species, age-class diversity, stand density, and other characteristics that are important objectives for healthy forests would be met. Alternative C management of forests and woodlands would have a major beneficial effect on that resource.

Physical Resources

Air Quality

Alternative C would not require air quality monitoring for industrial activities. There would be no effect on forest and woodland communities from Alternative C air quality management actions.

Soil

Alternative C soils management actions would include allowing surface-disturbing activities on slopes equal to or greater than 25 percent and on soils with a severe erosion hazard, as long as those activities would be consistent with other resource values. Forest management practices would be implemented, but methods would be designed to accommodate slopes, erosion hazard, and soil moisture content consistent with the Wyoming Forestry BMPs. Allowing proposed activities on badlands, rocky outcrops, or on slopes susceptible to mass movement would make approximately 218,928 acres available for forest and woodlands management. Alternative C

would also allow mineral development and other land uses on these same areas which could result in the loss for forest and woodland vegetation. Overall, Alternative C soils management actions would have a moderate beneficial effect on forest and woodlands management, although vegetation loss could increase healthy forest and woodland communities would be maintained.

Water Resources

Alternative C would allow surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams. There are 3,895 acres (7.6%) of BLM-administered forest lands and 243 acres (0.9%) of woodlands within 500 feet of water resources. Mitigating adverse effects on forest and woodland communities would likely not prevent vegetation removal. Therefore, Alternative C water management actions would have a moderate adverse effect on forest and woodlands resources.

Cave and Karst Resources

Surface-disturbing activities, including timber harvests, would be required to maintain a buffer (likely 100 feet) around the entrances to significant caves. There are no documented significant caves in BLM-administered woodland communities, and three in forest communities. Caves are generally located in rock formations and not in the forest or woodland communities. Therefore, management of cave and karst resources would have a negligible effect on forest and woodland communities.

Mineral Resources

Locatable Minerals

Alternative C would not recommend any additional minerals withdrawals. Under Alternative C, locatable minerals are available on 26,007 acres in the forest areas of the Big Horn Mountains. There are also woodlands included in the acres available for locatable minerals development. At present, locatable minerals operations affect 0.3 percent of BLM-administered forest and woodlands communities, 138 and 92 acres, respectively. The locatable minerals development trend is predicted to be similar throughout the planning period, and the effect on forest and woodland resources would be negligible adverse.

Leasable Minerals – Fluids

Based on the predicted fluid minerals activity under Alternative C, conventional activity (potential of moderate or above) could occur on 1,205 acres (2.7%) of BLM-administered forest lands and 1,936 acres (7.7%) of woodlands. CBNG activity could occur on 2,057 acres (4.7%) of BLM-administered forest lands and 5,512 acres (22%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Fire and Fuels Management

Under Alternative C, full suppression throughout the planning area without consideration of individual forest and woodland species, density, slopes, and other characteristics would have a moderate adverse effect on forests and woodlands. Full suppression would prevent most fires from growing into large fires. Wildfire could not be used for resource benefit including to promote forest health.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Allowing the planting of desirable non-native species would have a beneficial effect for forest and woodlands by hastening reclamation and vegetation recovery.

Vegetation – Riparian/Wetland Resources

Alternative C management would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams. This management would allow for project-specific adjustments for slope, aspect, stream type, and other conditions. Wyoming Forestry BMPs and other mitigation measures would be incorporated to reduce adverse effects to water resources. Mitigating adverse effects on forest and woodland communities would likely focus on reclamation, not preventing vegetation removal. Therefore, Alternative C management actions would have a moderate adverse effect on forest and woodlands resources.

Invasive Species and Pest Management

Alternative C would allow aerial applications of insecticides. However, this has not been the preferred treatment on the forest and woodland landscapes with the types of insects encountered and the current insecticides used. Invasive species treatment emphasis would be only on species on the Wyoming list and prioritized based on risk of spread onto private lands. Because there would likely be little invasive species and pest treatment, the benefit to forest and woodland communities would be negligible.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Alternative C would allow surface-disturbing activities within 0.25 mile of fish-bearing waterbodies consistent with other resource values. This management would affect 3,432 acres (19%) of the forested areas. Forest management activities could be subject to some regulation for the protection of other resources, but protective buffers would not be likely to extend more than 500 feet from fish-bearing waters. The effect on the forest and woodland communities would be beneficial. Special status fish species are presently limited to the Tongue River drainage, limiting the benefit to forest and woodland communities to negligible.

Fish and Wildlife Resources – Wildlife

Alternative C would not apply many restrictions on surface-disturbing and disruptive activities to protect wildlife which could result in the loss of forest and woodland communities, a major adverse effect.

Special Status Species – Plants

Surface-disturbing activities would be prohibited within special status plant populations. Most special status plants are typically rare and have small populations; it is not likely they would adversely affect forest and woodland management. Limber pine is present on approximately 13,927 acres of the planning area. Single-species management specifically for limber pine could have a minor adverse effect on overall forest and woodland management.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative C includes restrictions for the protection of Greater Sage-Grouse and special status raptors but not protection of prairie dog colonies or herptile habitat. The foreseeable loss of forest and woodland communities from Alternative C management of special status wildlife species would be a major adverse effect.

Heritage and Visual Resources

Cultural Resources

Alternative C would allow surface disturbance in areas around historic sites, which would have a long-term adverse effect on forests and woodlands. Because most cultural sites are small, the overall effect on forest and woodland communities would be minor.

Paleontological Resources

No high-quality paleontological areas would be protected; such areas are typically small. Therefore, the effect on the forest products program would be negligible adverse.

Visual Resources

Alternative C would manage all parts of the planning area outside of WSAs as VRM Class III or IV, and would require visual simulations on a project-specific basis. This would have a major adverse effect on forest and woodland communities by providing for surface-disturbing activities within forests and woodland communities.

Land Resources**Forests Products**

The ability to manage forests and woodlands to offer a diversity of products would be beneficial to forest and woodland health. However, managing to maximize economic returns without consideration of other resources and without any topographical design or harvest limits could be damaging to the resource. Regeneration would not have any protections and only minimum stocking requirements would be met. Overall the promotion of economic activity over resource protection would have a moderate adverse effect on the forest and woodland communities.

Lands and Realty

Under Alternative C, disposing of lands with resource value could have a long-term adverse effect on forest and woodlands communities if many forest and woodland areas are disposed of. Removing the option of acquiring the forest and woodlands adjacent to larger blocks also would have a long-term adverse effect by denying access opportunities and not acquiring lands that have natural values. These adverse effects would be major.

Renewable Energy

Under Alternative C, renewable-energy development must be consistent with all other resources values. All public lands in the planning area would be open to such development with limited restrictions to protect other resources. Renewable energy projects would be unlikely in forested areas due to the cost of removing the forest cover. Renewable energy projects would be more likely in woodland areas. The potential for loss of forest and woodland communities from renewable energy development would be moderate.

Rights-of-Way and Corridors

Alternative C provides few restrictions on the placement of ROWs which would result in the loss of forest and woodland vegetation. Based on the reasonably foreseeable ROW activity, the impact to forest and woodland communities would be minor.

Travel and Transportation Management

Under Alternative C, allowing motorized vehicle use on saturated soils and steep slopes would have a long-term adverse effect on forest and woodland areas and the watershed. This management would open all roads to motorized vehicle use and would allow access to management areas where regeneration could be damaged by OHV use. The adverse effect on forest and woodlands management would be major.

Recreation

Under Alternative C, 30,570 acres would be designated as SRMAs. There is little overlap between the forest and woodlands community and designated SRMAs in Alternative C. Allowing additional recreation facilities where they are supported by recreational use could affect forest and woodlands communities, depending on where future facilities are located. The overall effect of recreation management actions to the forest and woodlands resources is negligible.

Lands with Wilderness Characteristics

Alternative C does not propose any special management related to lands with wilderness characteristics, thus there would be no effect on the forests and woodlands resource.

Livestock Grazing Management

Under Alternative C, allowing livestock grazing in regeneration areas and after prescribed fire would affect the sustainability and health of forests and woodlands by limiting species and age-class diversity. This would have a major adverse effect on forest and woodlands management.

Special Designations**Areas of Critical Environmental Concern**

There would be no ACECs within the planning area under Alternative C; therefore, there would be no anticipated impacts to forest and woodland communities.

Wilderness Study Areas

WSAs are managed to preserve natural conditions and processes including forest and woodland communities. Intensive management to promote forest health would be restricted, however less intrusive options such as prescribed fire are available. The overall result should be a negligible adverse effect.

4.4.1.6. Alternative D

This section describes management actions under Alternative D, the Proposed RMP, and the likely resulting effects on forest and woodland resources due to its implementation. The effects described above under *Impacts Common to All Alternatives* would be in addition to the effects described below for management actions under Alternative D.

Vegetation – Forests and Woodlands

Alternative D would manage vegetative treatments considering the health of forests and woodlands and multiple resource needs. Projects would be designed and managed to meet all resource needs, forest health would improve, and forests would be better able to resist disease, insects, and wildfire. The old growth, tree species, age-class diversity, stand density, and other characteristics that are important objectives for healthy forests would be met. This management would provide forest products derived from vegetative treatments in forests and woodlands. Alternative D management of forests and woodlands and forest productions would have a major beneficial effect on forest and woodland resources.

Physical Resources**Air Quality**

Alternative D would require air quality modeling and mitigation for adverse effects on air quality for proposed industrial activities with the potential to approach or exceed emission standards.

Few large-acreage vegetative treatments, to which this requirement would apply, are predicted. Therefore, the effect on forest and woodland resources would be negligible adverse.

Soil

Alternative D would allow surface-disturbing activities on sensitive soils, where adequately mitigated. Forest and woodland communities commonly occur on sensitive soils. There are 30,819 acres (60%) of forest communities on BLM surface on slopes equal to or greater than 25 percent and 2,741 acres (54%) in areas with poor reclamation suitability. Woodland figures are similar; 9,213 acres (35%) of BLM-administered woodlands on slopes equal to or greater than 25 percent and 19,282 acres (74%) in areas with poor reclamation suitability. These management actions would not prevent vegetation removal, but would promote the stabilization and reclamation of soil resources. This would benefit the long-term recovery of forest and woodland resources. Because most surface-disturbing activities would still occur, the soils protections would have a moderate beneficial effect on forest and woodland communities.

Water Resources

Alternative D would allow surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams in accordance with defined criteria. There are 3,895 acres (7.6%) of BLM-administered forest lands and 243 acres (0.9%) of woodlands within 500 feet of water resources. The mitigation for adverse effects on forests and woodlands would focus on reclamation and not prevent vegetation removal. Therefore, Alternative D water management actions would likely adversely effect forest and woodland resources to a moderate degree.

Cave and Karst Resources

Surface-disturbing activities, including forest and woodland treatments, would be required to maintain a buffer around the entrances to significant caves. There are no documented significant caves in BLM-administered woodland communities, and three in forest communities. Caves are generally located in rock formations and not in the forest or woodland communities. Therefore, management of cave and karst resources would have a negligible effect on forest and woodland communities.

Mineral Resources

Locatable Minerals

Alternative D would recommend locatable minerals withdrawals on 26,007 acres in forested areas of the Big Horn Mountains, a major benefit to forest and woodland communities by preventing potential vegetation removing activities.

Leasable Minerals – Fluids

Based on the predicted fluid minerals activity under Alternative D, conventional activity (potential of moderate or above) could occur on 949 acres (2.2%) of BLM-administered forest lands and 1,576 acres (6.5%) of woodlands. CBNG activity could occur on 1,968 acres (4.6%) of BLM-administered forest lands and 5,350 acres (22%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Fire and Fuels Management

Under Alternative D, using full suppression of wildland fire in the WUI and recreation areas could have beneficial and adverse effects on forests and woodlands, depending on the species of trees, the fire intensity, and the suppression tactics required. Alternative D would provide flexibility in choosing fire management tactics. This would have a moderate beneficial effect on forest and woodland resources.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Allowing desirable non-native plant species for short-term reclamation activities prior to seeding native species would be beneficial to the forest and woodlands by promoting restoration of native communities creating biological diversity and healthy vegetative communities. Because reclamation activities are limited to disturbed areas, the benefit to forest and woodland communities would be minor.

Vegetation – Riparian/Wetland Resources

Alternative D management would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams with appropriate mitigation. Mitigation would ensure that riparian resources are protected while allowing for surface-disturbing activities. Wyoming Forestry BMPs require a 200-foot buffer and other mitigation measures incorporated into project designs. The overall result would be a minor beneficial effect (less than 5% of forest and woodlands affected).

Invasive Species and Pest Management

Alternative D would allow aerial applications of insecticides, and BLM resource specialists would be able to determine plants and areas for treatment and prioritize areas for treatment. This would have a minor beneficial effect on the forest and woodlands resource.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Alternative D would allow surface-disturbing activities within 0.25 mile of fish-bearing waterbodies where resources could be adequately protected. This management would affect 3,432 acres (19%) of forested areas. However, because surface-disturbing activities would be subject to restrictions for the protection of fish and other resources the loss of forest and woodland communities should be reclaimable and therefore a moderate effect. Special status fish species are presently limited to the Tongue River drainage, limiting the benefit to forest and woodland communities to negligible.

Fish and Wildlife Resources – Wildlife

Under Alternative D, surface-disturbing activities would be required to maintain current amounts of crucial elk habitat and hiding cover. There are timing restrictions and a few prohibitions in Alternative D for the protection of wildlife species and their habitat. These management actions would ensure the sustainability of forest and woodland communities. Surface-disturbing activities would still occur within forest and woodland communities; therefore, the overall effect is moderate beneficial.

Special Status Species – Plants

Alternative D would require that populations of special status plants be conserved. Limber pine is present on approximately 13,927 acres of the planning area. Single-species management specifically for limber pine could have a minor adverse effect on overall forest and woodland management.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Most of the forest and woodland areas include amphibian and reptile habitat. Surface-disturbing activities would have to conserve all SSS. Raptor nest sites and other SSS habitat would also limit surface-disturbing activities. The result would be a major beneficial effect to the sustainability of forest and woodland communities.

Heritage and Visual Resources**Cultural Resources and Paleontological Resources**

Forest and woodland areas contain few cultural and paleontological resources where surface disturbance would be prohibited. Most sites are small which means the protections offered forest and woodland communities are also small. Alternative D management of cultural and paleontological resources would have a minor beneficial effect on forest and woodlands management.

Visual Resources

Under Alternative D, forest and woodlands areas in the Big Horn Mountains would be managed under VRM Class II, which could restrict surface-disturbing activities. VRM constraints would restrict the types, sizes, and shapes of surface-disturbing activities. This would have a moderate beneficial effect on forest and woodlands communities, by ensuring the sustainability of forest and woodland communities, while allowing for resource uses.

Land Resources**Forests Products**

The ability to offer a variety of products for sale while designing and implementing treatments in an ecologically sound manner would be beneficial to forests and woodlands. Management for multiple resources would benefit forests and woodlands by conserving soils, waters, wildlife and other vegetative communities. Regeneration would be protected as needed and silvicultural treatments required to create and maintain forest and woodland health and sustainability consistent with other resource values, would be available.

Lands and Realty

Under Alternative D, acquiring and disposing of lands based on all resource values and acquiring lands adjacent to large blocks of BLM-administered lands would have a long-term beneficial effect on forest areas in the southern Big Horn Mountains and the scattered woodlands throughout the planning area. The scale of the benefits is minor due to the long and complex nature of land acquisitions.

Renewable Energy

Portions of the Big Horn Mountains and PRB area have a potential for renewable-energy (e.g., wind) development, however, renewable energy development is excluded from most of these areas in Alternative D. If renewable-energy development were to occur in forest or woodland communities it would include the removal of forest cover. Alternative D management of renewable energy would have a negligible adverse effect on forest and woodlands management.

Rights-of-Way and Corridors

Under Alternative D, allowing for the ROW transmission lines to be co-located, would reduce surface-disturbing activities, resulting in a minor benefit forests and woodlands.

Travel and Transportation Management

Under Alternative D, limiting motorized vehicle use to designated routes and managing roads consistent with forest and woodland resources would have a moderate beneficial effect on forest and woodlands management.

Recreation

Under Alternative D, 54,160 acres would be designated as SRMAs. SRMAs would be managed to balance recreational opportunities with protection of natural and cultural values, including vegetation resources. Most recreation use would be dispersed casual use which has little long-term effect to forest and woodland communities. Allowing additional recreation facilities where they are supported by recreational use could affect forest and woodlands communities, depending on where future facilities are located. The overall effect of recreation management actions to the forest and woodlands resources is negligible.

Lands with Wilderness Characteristics

Managing 6,864 acres for wilderness characteristics would protect forest and woodland communities. Treatments for forest health could be authorized, subject to mitigation for impacts to wilderness characteristics. Management actions for lands with wilderness characteristics would have a moderate beneficial effect on forest and woodlands resources by protecting forest and woodland communities.

Livestock Grazing Management

Alternative D would include actions and treatments to reduce potential damage to regeneration from livestock grazing to meet resource objectives, including grazing deferment after wildfires. This would have a minor beneficial effect on forest and woodlands management.

Special Designations

Areas of Critical Environmental Concern

Two ACECs would be designated with Alternative D. Surface-disturbing activities would be prohibited in ACECs preventing loss of forest and woodland vegetation. Treatments for forest and woodland health could be authorized. Due to the small acreage (2,849 acres), these management actions would be a minor benefit to the sustainability of forest and woodland communities.

Wilderness Study Areas

WSAs are managed to preserve natural conditions and processes including forest and woodland communities. Intensive management to promote forest health would be restricted, however less intrusive options such as prescribed fire are available. The overall result should be a negligible adverse effect.

4.4.1.7. Cumulative Impacts

The effects on forest and woodlands health from past actions are included in the description of the affected environment (Chapter 3). Forest and woodlands comprise 1.2 percent of the total acres in planning area, but they play an important role in supporting many resource values, including watersheds, wildlife, and recreation.

The intermingling of private, state, and USFS lands with BLM-administered lands throughout the planning area ensures that activities outside of BLM's control would continue. Surface-disturbing

activities within forest and woodland communities would continue on adjacent private, State of Wyoming, and USFS lands.

Silviculture treatments other resource management activities, and the construction of houses and other structures on private, State of Wyoming, and USFS lands would reduce forest and woodland acres and create more fragmentation and edge effects. Land fragmentation leads to declines in forest health and reduced biodiversity.

Decades of fire suppression and limited mechanical vegetation treatments have led to a decline in forest health, especially at the landscape scale. While some forests and woodlands appear to be thriving and healthy, on a landscape scale, forest health and the associated wildlife habitat are at risk to catastrophic loss. Because of human interference with the natural systems, these systems no longer function in the ways that have sustained them for millennia. The continued increases in the WUI or industrial development, continued fire suppression without adequate reintroduction of fire into these systems, and the inability to develop forest stands that are resilient to disturbance could lead to stand-replacing events.

Proposed management actions for forest and woodland management would affect less than one percent of the total watershed and forest and woodland acres on BLM-administered land in the planning area and the entire Big Horn ecosystem.

4.4.1.8. Conclusion

It is anticipated and logical that forest and woodland management would benefit the health of the ecosystem, benefit the health of forests and woodlands, and protect the watershed and the entire ecosystem. The primary difference between the alternatives is the number of acres anticipated for management actions and therefore the acres of forest and woodland communities affected. Alternative B, the most conservative alternative, would allow treatment on the fewest acres, and the Alternative C, the least conservative alternative, would allow for more management options on more acres of forest woodlands.

4.4.2. Vegetation – Grassland and Shrubland Communities

This section describes potential impacts to vegetation in the grassland and shrubland communities from management actions under other resource programs. Chapter 3 provides a general discussion and information about vegetative community types. FLPMA and the Wyoming Standards for Healthy Rangelands (Appendix P (p. 2501)) direct the BLM to manage vegetative resources toward maintenance or restoration of the physical function and biological health of vegetative ecosystems. Objectives are to maintain or improve the health and trends in plant communities that conserve soil and water, and provide forage, wildlife habitat, SSS habitat, recreation, scenic, ecological, and scientific benefits for consumptive and nonconsumptive uses.

Management actions that would contribute to the decline in abundance, distribution, or diversity would result in adverse impacts. Beneficial impacts include actions that protect, enhance, or restore these communities.

Direct impacts result from surface-disturbing and other activities that cause removal of and/or mechanical damage to plants, invertebrates, and biological soil crusts, both in terms of amount (overall biomass, density, cover) and in terms of diversity (species presence and richness). Direct

impacts may also be the deposition of invasive species individuals or propagules (e.g., seeds or spores), soil compaction and/or erosion.

Indirect impacts result from activities that alter the quality and health of grassland and shrubland communities and may include soil compaction and erosion, dust deposition from nearby disturbances, loss of biological crusts, changes in hydrology, decreases in forb production due to loss of pollinators, and encroachment of invasive plant species are considered indirect impacts.

For purposes of analysis, short-term impacts result from activities that contribute to the decline in abundance or distribution within five years after the activities; long-term impacts are those that require more than five years reclaim or restore.

4.4.2.1. Methods and Assumptions

This section describes the methods and assumptions used in the impact analysis for grasslands and shrublands communities.

Activities affect vegetative resources by altering, disturbing, or removing soil and vegetation. This impacts analysis and the conclusions are based on interdisciplinary team knowledge of resources in the planning area, review of existing literature, and information provided by other agencies. Existing literature and analyses include the Buffalo RMP (1985), the PRB EIS (BLM 2003c), USDA NRCS ESDs for Major Land Resource Area (MLRA) 58B Northern Rolling High Plains, and WGFD spatial mapping and analysis. Spatial analysis was performed using the ESRI ArcGIS Desktop 10 computer software. Effects are quantified where possible. In the absence of quantitative data, impacts are expressed qualitatively based on professional judgement and interdisciplinary team knowledge.

Assumptions

To assist and simplify analysis of alternative effects on the condition of grassland and shrubland communities and the responses to different stimuli depending on the type and the level of activity. This analysis is based on the following assumptions, although there could be fluctuations based on climatic, economics, and other conditions:

- Protection of soils from disturbances and soil health, including microbes and invertebrates, are the main factors for sustaining healthy native plant communities.
- Soil and plant ecosystem management will determine the overall health of watersheds in conjunction with climate and, topography.
- Plant and plant-community health would determine the health of habitat for wildlife, habitats for special status plant species and wildlife, and the quality and quantity of forage.
- The Standards for Healthy Rangelands & Guidelines for Livestock Grazing Management for Public Lands Administered by the BLM in the State of Wyoming (BLM 1997) (referred to hereinafter as the Wyoming Standards for Healthy Rangelands) are designed to determine the health of the grassland and shrubland plant communities.
- The factors with the greatest impact to vegetative and soil health include the introduction and expansion of invasive plants species, primarily cheatgrass, surface-disturbing activities, large grazing ungulates, and large-scale catastrophic events (wildfire and drought).
- Precipitation levels and soil characteristics, namely high-saline soils with minimal soil structure, are the dominant limiting factors affecting reclamation potential and should be a dominant factor in determining locations of developments.

- Based on the definition of surface-disturbing activity (see Glossary), energy development is identified as the primary source and generally increases the potential for accelerated erosion.
- Surface disturbances substantially increase the likelihood of the spread of invasive plant species.
- Grazing and browsing, whether by livestock or wildlife, is important for maintaining the health of grassland and shrubland communities. Improper grazing can decrease plant vigor and ground cover, lead to increased erosion, degrade soil nutrients and the ability of soil to retain water, and impact rangeland health.
- Updated plant inventories are crucial to the management of public lands.

Significance Criteria

4.4.2.2. Impacts Common to All Alternatives

The importance of having baseline vegetation information to determine management goals and objectives drives the need for a complete vegetative inventory for the entire planning area.

Vegetation – Grassland and Shrubland Communities

Managing vegetative communities in accordance with Wyoming Standards for Healthy Rangelands provides minimum standards for determining rangeland health and provides the guidelines to aid communities that do not meet the standards. Using an integrated management approach (e.g., mechanical, chemical, and biological treatments; prescribed fire; and grazing management techniques) would maintain, restore, and enhance the health and diversity of plant communities to achieve resource or multi-resource objectives, including but not limited to, improving species richness and plant structure diversity, promoting a variety of age classes, increasing plant densities, and reducing or removing undesirable plants. Most vegetative treatments would directly benefit grasslands and shrublands, and the benefits would be long term so long as appropriate follow-up management was applied. Maintaining sustainable forage levels for livestock and wildlife habitats and managing grasslands and shrublands to protect, preserve, or enhance plant communities are continuing practices that result in direct and indirect beneficial impacts to grassland and shrubland communities over the long term.

Managing the siting of facilities and related infrastructure (e.g., utility corridors and roads) and planning and developing travel routes, recreational facilities, mineral exploration and development sites, and ROW would reduce impacts. Reclamation has been difficult due to, among other things, lack of soil structure, limited precipitation, soil textures, inversion of spoil piles, unavailability of seed of preferred species, herbicide application to reclaimed sites, re-disturbance of reclaimed sites, drought, and improperly applied techniques. Vegetation, if not timely established, would facilitate soil erosion, introduction of invasive species, and changes in site biodiversity due to the introduction or departure of native species or the use of non-native species. Grasses and forbs would dominate reclaimed sites initially and forbs and shrubs would return over a longer period. Developing a contingency plan to address catastrophic natural events such as drought, wildfires, and large-scale pest infestations by incorporating strategies that best protect vegetative resources would result in direct, short-term, beneficial effects to vegetation during the event and to the long-term overall health of plant communities. Working with landowners to reestablish disturbed sites to healthy plant communities on split estate lands would directly benefit plant communities by reestablishing native vegetative species and densities, therefore improving the health of those plant communities and decreasing the opportunity for invasive species to establish and spread in the short and long term.

Physical Resources

Air Quality

Adherence to rules and regulations and enhancing cooperative processes are administrative processes that would have no direct effect on grassland and shrubland communities. Dust that covers vegetation reduces the photosynthesis process by blocking light and potentially water from reaching the plant cells. Travel on roads that are or will be surfaced with either gravel or scoria, if untreated, would force large amounts of dust into the air; this dust could settle on vegetation. Reducing dust emissions and overall air quality management throughout the planning area would have a major beneficial effect on grassland and shrubland resources.

Soil

Management actions include evaluating impacts to soil resources from proposed surface-disturbing activities using NRCS soil survey data and onsite investigation; and authorizing surface-disturbing activities that include plans for reclamation. These management actions help maintain and improve soil conditions and minimize soil erosion. Protecting soils and minimizing or mitigating impacts would result in direct, long-term, beneficial impacts to grasslands and shrublands.

Water Resources

Water management actions include managing surface-disturbing activities to prevent degradation of water quality for all waters; managing water resources to meet the Wyoming Standards for Healthy Rangelands to achieve PFC; meeting Wyoming water quality standards; and taking appropriate actions to improve the biological, chemical, and geomorphic conditions of streams. Protecting and enhancing water quality and water functions would result in indirect, long-term, beneficial impacts to grasslands and shrublands.

Cave and Karst Resources

Conducting cave inventories and significance determinations would not impact grasslands and shrublands.

Mineral Resources

Leasable Minerals – Coal , Locatable Minerals, Leasable Minerals – Fluids, and Salable Minerals

Management actions Common to All Alternatives include any lands not withdrawn [closed] to mineral entry, closed to leasing or closed to mineral material disposal are available for exploration or development for locatable, leasable, and salable minerals; areas open to oil and gas leasing would be open to geothermal development. Coal development will occur in areas identified as acceptable for further coal leasing consideration. All oil and gas mineral estate are open to leasing (Map 12) unless specifically identified as closed.

Impacts to grasslands and shrublands from the listed management actions would be direct and include long- and short-term impacts ranging from small and localized removal of vegetation to large-scale disturbances covering several hundred acres. The severity of effects would vary, depending on the amount of activity, the size of the disturbance, and the success of reclamation efforts (e.g., impacts from uranium mining would be negligible; impacts from CBNG and coal development would be minor). Surface disturbance and infrastructure from mineral development can fragment vegetative communities and alter plant community structure, diversity, and landscapes. Impacts can be short term until revegetation is successful. There would be long-term

adverse impacts associated with surface disturbance, site developments, infrastructure, roads and utility corridors, and unsuccessful or partially successful reclamation. Effects on grassland and shrubland resources from mineral resource development would be direct, long term, and adverse.

Leasable – coal mineral exploration and development could be permitted in one to five percent of all grassland and shrubland communities in the planning area; therefore management actions common to all alternatives for coal would have minor adverse effects on grassland and shrubland communities. Locatable mineral, leasable fluid mineral, and salable mineral exploration and development could each be permitted in greater than ten percent of all grassland and shrubland communities; therefore management actions common to all alternatives would all have major adverse effects on grassland and shrubland communities.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Most wildfires in the planning area are ignited by lightening in fine fuels (cured grasses), especially cheatgrass. Management actions include rehabilitating fire lines constructed by heavy equipment or on steep slopes to prevent or control erosion. Rehabilitation would include, but not be limited to, water barring and reseeding. Surface disturbance and soil compaction resulting from fire line construction, use of heavy equipment, and other fire-suppression activities would result in direct adverse effects by flattening or removing vegetation, potentially removing root systems of plants, particularly trees and shrubs, and increasing erosion, especially on steep slopes. The response to fire depends on the size, location, intensity, season, timing, and amount of post-fire precipitation, and preexisting plant community condition and the abundance of invasive plant species in the area. Large fires (100 acres or more) occur every five to seven years. Management actions also include cooperating and pursuing agreements with other agencies and landowners to perform landscape treatments to enhance fuels management and restore fire-adapted ecosystems. Prescribed fire, hazardous-fuels reduction, and WUI projects that include fire would result in direct beneficial impacts. These activities are planned on a project-specific basis, are generally applied in the cooler seasons (spring, fall, and winter), and often involve adjacent land owners. Protection from wildfire or enhancement of vegetation by applying planned ignitions would have a direct, beneficial effect on grassland and shrubland communities over the long term.

In shrubland communities, the impacts from fire usually are long term and depend on the scale and severity of the disturbance. Prescribed fires and wildland fires typically result in the complete mortality of Wyoming big sagebrush. Wyoming big sagebrush recovers very slowly from both types of burns at all sites, even those with relatively moist conditions. Full recovery to pre-burn sagebrush canopy cover would take well over 100 years (Montana Natural Heritage Program 2007).

Biological Resources

Vegetation – Forests and Woodlands

There are no management actions for forests and woodlands in the *Impacts Common to All Alternatives* section.

Vegetation – Riparian/Wetland Resources

Management actions include managing riparian and wetland systems to enhance ecosite vegetation conditions and improve water quality; preventing degradation, loss, or destruction of riparian and wetland habitat; and managing all riparian systems with sensitive species concerns

to a succession stage appropriate for that system, including vertical and horizontal vegetative structure and composition. As riparian/wetland systems occur in or near greater than ten percent of the grassland and shrubland communities in the planning area, implementation of actions to protect, enhance, and prevent degradation, loss, and destruction of these systems would result in indirect, long-term, major, beneficial effects on adjacent upland plant communities.

Invasive Species and Pest Management

Historically, chemical or biological treatments are the most common treatment methods; in the future, IPM practices will be actively applied to manage designated pests on public surface lands. IPM uses a variety of tools to accomplish control, including, but not limited to, herbicide application, mechanical treatments (mowing), biological treatments (insects, fungi), cultural treatments (prescribed burns), and any combination thereof. Use of certified weed seed-free vegetation products ensures invasive species would not be unintentionally introduced. Encouraging minimum disturbance accomplishes two purposes it reduces reclamation efforts and costs, and reduces the size of area for invasive species to establish.

Removing native vegetation and disturbing soils make sites vulnerable to invasive species; these sites must be managed to reduce opportunities for invasive species to establish and spread. Areas of primary concern are surface disturbance sites, including roads, trails, utility corridors, recreation sites, mineral development sites, gravel pits, mines, and surface water. Herbicide treatment can directly benefit native species by reducing competition for water and soil nutrients. Herbicide treatments, if broad spectrum, can result in direct, long-term, adverse effects on non-target forbs and shrubs. Invasive species management would result in direct beneficial impacts over the long term.

Requiring all disturbance areas be treated would ensure the responsible party, whether the BLM or another entity, manages for invasive species. Animal and Plant Health Inspection Service-Plant Pest Quarantine (APHIS) responds to many new introductions of plant pests to eradicate, suppress, or contain them through various programs in cooperation with state departments of agriculture and other government agencies. These can be emergency or longer-term domestic programs that target specific pests. APHIS is the lead agency for monitoring pest species and coordinating with the county weed and pest control districts and the BLM to administer control treatments on public lands.

Controlling invasive species by chemical and mechanical methods could have a direct adverse effect on other plant species. As an example, if an herbicide is nonselective for all broadleaf plants, the chemical could adversely affect forb species. If mechanical methods are used, any plant in the direct path of the application would be affected. Biological treatments are generally species specific and effects would be adverse, direct, and long-term to the pest species; removing pest species would have an indirect beneficial effect on other plants by improving the health of the vegetative community. Control measures for leafy spurge include grazing, biological agents, and herbicide. Biological agents have spread to concentrations of leafy spurge not accessible by motorized vehicle and difficult to access by foot. Management of this species would have a direct, beneficial effect over the long term.

Control treatments have not been pursued for cheatgrass because this species is currently not listed on the Wyoming Weed and Pest Control Act Designated List and a lack of funding. Cheatgrass results in direct, long-term, adverse impacts to grasslands and shrublands.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Management actions common to all alternatives for fish and SSS fish are either administrative or

do not overlap grasslands and shrublands and would have no effect on grassland and shrubland communities.

Fish and Wildlife Resources – Wildlife

Maintaining, enhancing, and protecting important wildlife habitats to ensure suitable habitat components and minimize disturbance in these areas would indirectly promote the long-term health of vegetative communities. Wildlife browsing or grazing has less effect on grassland and shrubland communities, because wildlife frequently move and tend to not re-graze forage unless they are confined. Wildlife trails, bedding areas, and other congregation areas result in direct, long-term, adverse effects on grasslands and shrublands, but the scope of these effects would be negligible.

Upland game birds, raptors, and migratory birds can depend on grassland and shrubland communities for cover (upland game birds), food sources, and protection. Actions that protect or enhance habitats for these species would result in indirect, long-term, major beneficial effects.

Special Status Species – Plants and Special Status Species – Wildlife (including Greater Sage-Grouse)

SSS are given priority consideration in planning and implementing on-the-ground activities and projects. Some species require early seral ecological conditions, such as black-tailed prairie dogs and mountain plover. Actions that maintain or enhance these habitats result in direct adverse effects on the long-term health of vegetation by promoting water and wind erosion of soil. Management action for special status plant species common to all alternatives promotes health of the habitats which would also promote improving health of the grassland and shrubland communities in which they could occur. Special status plant habitats occur in one to five percent of grassland and shrubland communities in the planning area; therefore, the beneficial effects would be minor. Management actions common to all alternatives for special status wildlife species encourage managing vegetation composition, diversity and structure in Greater Sage-Grouse habitats; thereby improving the health of grassland and shrubland communities. Habitats for special status wildlife species are within greater than ten percent of all grassland and shrubland communities in the planning area; therefore, the beneficial effects would be major.

Heritage and Visual Resources

Cultural Resources

Management actions under all alternatives would generally focus on avoiding, stabilizing, and protecting cultural sites. These actions would decrease surface-disturbing activities on or near such sites. This could result in the adjustment of a project location or design. Areas important to Native American tribes would be managed to minimize disturbances; this would benefit shrublands and grasslands. Data recovery excavations would include surface disturbance and vegetation removal, but these areas are generally small (less than one acre), and data recovery excavations would have short-term, direct, adverse effects on grassland and shrubland resources. Overall, management actions that avoid or protect cultural resources by prohibiting or limiting soil disturbance would have a negligible beneficial effect on grasslands and shrublands.

Paleontological Resources

No effects are anticipated from paleontological management actions.

Visual Resources

Management of VRM Class I and II areas could prohibit or limit some surface-disturbing

activities. Management of VRM Class III and IV areas would include minor limitations on surface disturbance; this would have an indirect minor beneficial effect on grasslands and shrublands, depending on the locations, types, and durations of approved projects.

Land Resources

Forest Products

Management actions common to all alternatives for forest products do not affect grassland and shrubland communities.

Lands and Realty

Land acquisitions, pursuit of easements, and tenure adjustments would improve management of the public lands overall. Effects on grasslands and shrublands would vary, depending on the type and extent of the action. Actions that would remove public land management from small scattered parcels and promote larger seamless tracts of public land would benefit management of grasslands and shrublands.

Vegetation on land proposed for exchange or acquisition could be indirectly affected by such action due to a change in ownership and management. Management actions that promote vegetative resources, such as habitat enhancement, would benefit grasslands and shrublands and actions that promote surface disturbance and vegetation removal would have an adverse effect; these effects would be long term.

Overall, lands and realty management actions could occur in one to five percent of grassland and shrubland communities; therefore, management actions Common to All Alternatives would have minor adverse effects on grasslands and shrublands.

Renewable Energy

Cooperating with stakeholders to coordinate renewable-energy opportunities would have no effect on grasslands and shrublands as this action is administrative.

Rights-of-Way and Corridors

Actions to minimize surface disturbance and adverse effects on other resources, and to locate new ROWs adjacent to or in existing disturbed areas would lessen adverse effects from ROWs. New ROWs and corridors could be located in greater than ten percent of all grassland and shrubland communities in the planning area; therefore, management actions common to all alternatives for ROWs and corridors would have direct, long-term, major, adverse effects on grasslands and shrublands.

Travel and Transportation Management

Roads and trails have a direct adverse effect on vegetation, but are necessary to conduct management and development on public lands. Management actions include provisions to inventory and evaluate upgrade, maintain, or close and reclaim, reduce surface water runoff and erosion and restrict motorized vehicles to designated roads and trails and temporary and permanent road and trail closures. All these management actions would reduce erosion, protect and stabilize soils and vegetation, and reduce opportunities for invasive species and weeds to establish. Overall, transportation and access would be permitted in one to five percent of all grassland and shrubland communities in the planning area; therefore the management actions common to all alternatives would have minor adverse effects on them.

Recreation

Development of recreational opportunities, trails, maintenance of established sites, facility construction, and designating trails to caves all would have the potential to directly affect native grassland and shrubland communities. Trails, roads, campgrounds, and facilities remove vegetation for the life of the development. Adjacent vegetation would be indirectly affected by trampling, dust, and erosion from vegetatively denuded sites. Erosion and decreased vegetative cover would occur from soil compaction and the channelization of surface water runoff in ruts and road ditches. Recreation management actions that involve disturbance of the soil and vegetation removal would have minor adverse effects on grasslands and shrublands by promoting soil erosion, removing plant, and providing an opportunity for invasive species to establish.

Lands with Wilderness Characteristics

Management actions common to all alternatives for wilderness characteristics include evaluation of lands only and would have no effect on grassland and shrubland communities.

Livestock Grazing Management

Livestock grazing strategies, including implementation of the Wyoming Standards for Healthy Rangelands, Allotment Management Plan (AMP) and grazing agreement implementation, proper livestock management, and installation of range improvement projects, are designed to assist in achieving appropriate levels of forage consumption by livestock and wildlife. AMPs and grazing agreements include defined rotations, deferments, periods of rest from grazing, manipulation of season of use, and grazing intensity. Over time, these actions can alter the amounts and types of vegetation present on the landscape; therefore, they can be used as tools to directly and indirectly manipulate and improve plant community composition, plant structure, plant cover, and vigor of vegetation. Construction and location of range improvements helps disperse livestock and can be used as management tools. Strategies will be developed and implemented to minimize adverse effects on vegetation during periods of drought. Prescribed-burn areas will be managed before the treatment to ensure needed fuels are available. Grazing (livestock and wildlife) has adverse and beneficial effects on grasslands and shrublands, depending on grazing intensity (utilization), timing (allowances for re-growth during active growing season), season of grazing, rangeland health, and precipitation.

Historic and current trailing of livestock on the established stock driveways can contribute to disturbed soil, trampled vegetation, deposited manure, loss of plant cover, and localized areas dominated by annuals and invasive and other weed species. The major stock driveways (The Slip, Trabing Road, and Hazelton Road) are designated county roads; therefore, effects from trailing constitute only a small portion of adverse effects. Trailing is also short term, occurring only two to three weeks in spring and fall. Trailing livestock would have a negligible adverse effect on vegetation.

Livestock grazing allotments contain greater than ten percent of all grassland and shrubland communities in the planning area; therefore, proper livestock grazing management would have a major beneficial effects on them.

Special Designations**Areas of Critical Environmental Concern, Scenic or Back Country Byways, Wild and Scenic Rivers, and Wilderness Study Areas**

Management actions associated with special designations would be to maintain or enhance their natural characteristics and emphasize primitive, nonmotorized activities to maintain current

natural values. Special designations could increase popularity with recreationists and increase use in these areas, resulting in increased potential for vegetation disturbance and removal and invasive plant and weed species establishment. Overall, management actions that prohibit disturbance of the soil or removal of native vegetation would have a negligible beneficial effect on grasslands and shrublands plant communities.

Socioeconomic Resources

Social and Economic Conditions

Multiple entities depend on public lands for their livelihoods or a portion of their livelihoods. Public land natural resources also can add to the quality of life, and benefits from these can be directly and indirectly derived from activities such as hunting, outfitting, fishing, and guided hunts and tours. Managing in a way that considers these sources of employment and income can be beneficial and adverse to vegetation and would be similar to those described for recreation.

Health and Safety

Management actions designed to prevent accidental spills of hazardous materials would benefit grassland and shrubland communities by protecting riparian and upland areas. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is a threat of accidents or spills. There would be no adverse effects on vegetation unless there was an accident or spill. If there was a spill, mitigation and cleanup would rarely succeed in recovering a riparian or upland area to its original condition over the short term; therefore, there would long-term adverse effects. Reclamation of abandoned mines would have a direct beneficial effect by reducing erosion, protecting and stabilizing soils and vegetation, and reducing opportunities for invasive species and weeds to establish on grassland and shrubland communities at the affected sites over the long term.

The following sections describe impacts by alternative. These impacts would be in addition to the impacts common to all alternatives described above.

4.4.2.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes potential impacts to grassland and shrubland communities from management of other resources under Alternative A.

Vegetation – Grassland and Shrubland Communities

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained, which did not include specific decisions for management of grasslands and shrublands. With no specific management decisions, reclamation would be guided by BLM policy, which allows use of non-native species. Use of non-native species could directly benefit grasslands and shrublands by quickly establishing vegetation on sites reducing the opportunity for erosion and invasive plant establishment. This could indirectly benefit vegetative communities by reducing erosion potential. Achieving successful reclamation would directly benefit the surrounding plant community and could help discourage invasive species.

Physical Resources

Air Quality

The types of effects to grassland and shrubland communities from Alternative A would be

the same beneficial effects as described in the *Impacts Common to All Alternatives* section for air quality (vegetation conservation). In Alternative A, though, these impacts would be analyzed on a project-specific basis. Without monitoring or oversight on a programmatic level, lack of consistency would cause the beneficial effects to likely only be negligible. Air quality resource management actions under Alternative A would have negligible beneficial effects on grassland and shrubland communities.

Soil

Soils management under Alternative A would prohibit surface-disturbing activities from March 1 through June 15, and on slopes equal to or greater than 25 percent unless the authorized officer waives the prohibition. These protective measures have a beneficial effect by not allowing soil disturbance and vegetation removal. However, waivers allow for inconsistent application of management and could allow activities when and where soils would be highly susceptible to erosion. Restricting surface-disturbing activities on soils with poor reclamation suitability on a project-specific basis does protect the soil resource in these specific areas. Soils management under Alternative A would allow for surface-disturbing activities on 22 percent of BLM-administered public land, on slopes equal to or greater than 25 percent, 58 percent of BLM-administered public land with poor reclamation suitability. Current management decisions do not address limitations and restrictions on badlands, rock outcrops, and slopes susceptible to mass movement and all current decisions can be waived. Current management decisions have soil protective measures that have a beneficial effect on the vegetation but do not adequately address and protect all soils capable of eroding and this lack of decisions has a direct adverse long-term effect. Protective measures for soils would conserve vegetation in greater than ten percent of all grassland and shrubland communities in the planning area. Without oversight on a programmatic level or allowing waivers without specified criteria, it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only moderate.

Water Resources

Alternative A prohibits surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams unless the authorized officer waives the prohibition. This management would affect approximately 19,861 acres of BLM-administered public land. This allows inconsistent management application and could allow activities at distances that could adversely affect water quality and quantity; remove or crush vegetation, thus reducing its ability to hold the soils and filter sediment; reduce or degrade habitat for numerous plant and animal species that inhabit these water systems; and reduce or degrade potential habitat for SSS. The prohibition decision is beneficial but the ability to implement waivers without identified criteria reduces that to minor. Impacts could have direct and indirect effects that could be short term (days to months) or long term (months to years).

Cave and Karst Resources

There are no current management actions for this resource.

Mineral Resources

Locatable Minerals

Under Alternative A, withdrawing the Amsden Creek, Middle Fork Canyon, and Kerns Game Ranges (4,583 acres) from mineral location, and restricting locatable minerals activities in the Fortification Creek, Gardner Mountain, and North Fork WSAs (approximately 28,931 acres) would have a direct, long-term, beneficial effect on vegetative communities at these sites because surface-disturbing activities would not be allowed or would be restricted. Under the

locatable minerals program for the planning area, it is estimated that BLM actions would disturb approximately 554 acres over the next 20 years (less than 1% of available acres). This would have a negligible adverse effect on grassland and shrubland communities.

Leasable Minerals – Coal

The effects of coal development would be long term for the life of the project and would require successful reclamation to ensure the vegetative component was reestablished to predisturbance vegetative states and to reduce the potential introduction and establishment of invasive plant species. Although significant acreage is open to study and exploration, only a portion would be developed. Under current management, approximately 195,700 acres (4%) would be disturbed; 120,700 would be reclaimed, 45,500 acres are actively mined, leaving approximately 75,000 acres disturbed over the long term (Appendix G (p. 1937)).

Leasable Minerals – Fluids

Alternative A would continue to lease and allow development of federal oil and gas and would close the WSAs (28,931 acres) to leasing. Site development, roads, and utility corridors associated with oil and gas activities would be surface-disturbing activities that would require successful reclamation. Under the leasable CBNG program for the planning area, development could be permitted in greater than ten percent of grassland and shrubland communities; therefore management actions for leasable fluid minerals under Alternative A would have a major adverse effect on them. Overall, it is estimated that BLM CBNG actions would disturb approximately 2,258 acres over the next 20 years (less than 1% of the total available acres). Reclamation will occur on 903 acres. Under the leasable oil and gas conventional program for the planning area, overall it is estimated that BLM actions would disturb approximately 8,317 acres over the next 20 years. Reclamation will occur on 5,575 acres (Appendix G (p. 1937)). This management action would promote surface-disturbing activities that would have a direct adverse effect on those grassland and shrubland plant communities. There is no anticipated disturbance from geothermal-related activities.

Salable Minerals

Salable minerals activities would be prohibited in the Fortification Creek, Gardner Mountain, and North Fork WSAs (approximately 28,931 acres). Prohibiting soil-disturbing mineral activity would have a direct beneficial effect for the long term on those protected plant communities. The estimated areas of surface disturbance from salable minerals activities over the next 20 years would be small (530 acres disturbed) (Appendix G (p. 1937)). Long-term disturbance of vegetative communities would have a direct adverse effect on grassland and shrubland communities. Salable minerals, under Alternative A could be permitted in greater than ten percent of all grassland and shrubland communities in the planning area; therefore, the effects would be minor.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Both wildland fire and prescribed fire have adverse and beneficial effects on grassland and shrubland communities. In the short term, wildland fires and prescribed-fire projects would reduce canopy and ground cover through the direct loss of vegetation, litter, and duff, thereby exposing soils to potential wind and water erosion and increasing the potential for runoff. Fires also can promote the spread of invasive species by leaving soil bare and transporting invasive plants and seeds by human activity, on tools, and on vehicles. In the long term, because of the role fire historically played in these communities, fire can increase vegetative species and seral-stage

diversity across the landscape, rejuvenate decadent plants, and improve the overall health of these communities (Thonicke et al. 2001).

Current management uses prescribed fire to achieve desired vegetative and wildlife habitat management objectives. Prescribed fire is an important vegetation management tool and fires are planned on a landscape basis, usually with multiple land owners involved. Management objectives using prescribed fire can include increasing the age and species diversity of plant communities, increasing plant vigor, and enhancing nutrient cycling. Prescribed fires reduce fuels loading and minimize the risk of catastrophic wildland fires; therefore, short-term effects associated with prescribed fire generate long-term benefits by reducing the risk of highly damaging catastrophic wildland fires. Prescribed fire can adversely affect non-targeted species in the same vegetative community. Prescribed fires usually burn at lower temperatures, enabling more rapid recovery of the surviving plant species. The change in ground-surface temperature could damage vegetation root structure, but usually would not destroy the root crown of perennial grasses, thereby enabling them to flourish after fires have removed the undesirable or competing vegetation. Prescribed fires can be controlled to times of year when fire would be less likely to damage soils through excessive heating. Prescribed fires generally are not possible in areas with oil and gas development and in WUI areas.

Biological Resources

Vegetation – Forests and Woodlands

Designing vegetative treatments, including sagebrush spraying or burning, to meet overall resource management objectives to protect or improve biodiversity and water quality would affect vegetation. Plant recipients of the treatments would be directly and adversely affected, but overall, vegetative communities would indirectly benefit through improved health over the long term (10 or more years, depending on the treatment). Forest and woodland management would impact less than one percent of grassland and shrubland communities in the planning area; therefore, management action for forests and woodlands would have negligible beneficial effects on grassland and shrubland communities.

Vegetation – Riparian/Wetlands Communities

Current management prohibits surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams. This prohibition of surface disturbance and associated vegetation removal would have direct, beneficial effects over the long term. The authorized officer may waive the prohibition which could allow surface-disturbing activities. Removing vegetation by exceptions to the prohibition would have a direct adverse effect and would increase the potential for soil erosion. This would contribute to movement of sediments into the water systems, which would affect water quality. Riparian/wetland resource health indirectly affects grassland and shrubland communities by proximity. Riparian/wetland systems occur in or near greater than ten percent of all grassland and shrubland communities in the planning area; therefore, the prohibitions would have major beneficial effects on grassland and shrubland communities. Without oversight on a programmatic level or allowing waivers without specified criteria, though, it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only moderate.

Invasive Species and Pest Management

The goal for managing invasive and pest species is to maintain weed seed-free, native communities to sustain their natural values. Under Alternative A, areas with established invasive plant patches would be treated to control unwanted species, which would protect native plant

communities from initial invasion or expansion of invasive species. Control of invasive and pest species on public lands (approximately 8,000 acres annually) in cooperation with county weed and pest control districts would have direct and indirect, short- and long-term, and beneficial and adverse effects on grasslands and shrublands. Most of the control effort would include the use of chemical, mechanical, and biological methods. Long-term disturbances over the next 20 years are estimated to affect approximately 1,000 acres from BLM actions, with 7,000 acres of reclamation.

Pest (e.g., grasshoppers) control would primarily be by chemical (insecticide) application; effects on grasslands and shrublands would be indirect, beneficial and short term.

Fish and Wildlife Resources – Fish

Alternative A would apply constraints on surface-disturbing and disruptive activities on a project-specific basis. These constraints should affect greater than ten percent of all grassland and shrubland communities over the long term; thereby having major beneficial effects. Without oversight on a programmatic level or allowing waivers without specified criteria, though, it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only moderate by not providing protection of vegetation, soils, and soil microbial activity from surface disturbing activities.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Current management actions include surface disturbance and occupancy prohibitions or restrictions in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek Game Ranges in crucial elk winter range between November 15 and April 30; in elk calving areas; within 750 feet of sharp-tailed grouse leks any time, within an additional 0.64-mile radius of sharp-tailed grouse leks from April 1 through May 30; within a 0.25-mile radius of the center of Greater Sage-Grouse leks, and within an additional 1.75-mile radius from March 1 to June 15 unless the authorized officer waives the prohibition. Prohibitions of surface disturbance is a direct, major benefit by denying plant removal and soil disturbance. Without oversight on a programmatic level or allowing waivers without specified criteria, though, it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only moderate.

Special Status Species – Plants

Limiting surface disturbing activities in habitats with known populations of special status plants species would have a direct, beneficial effect on grasslands and shrublands over the long term. Special status plants occur in less than one percent of all grassland and shrubland communities in the planning area; therefore, management actions for special status plant species, under Alternative A, would have negligible beneficial effects on them.

Special Status Species – Fish

Restricting surface-disturbing and disruptive activities near any water that contains special status fish species would affect approximately 818 acres (less than one percent of the grassland and shrubland communities in the planning area), which would have a direct, negligible, beneficial impact to grasslands and shrublands over the long term.

Heritage and Visual Resources

Cultural Resources

Current management decisions protect cultural sites near the Bozeman Trail. Prohibiting surface-disturbing activities for cultural resources, under Alternative A, would conserve

vegetation in one to five percent of the grassland and shrubland communities in the planning area. This would have direct minor beneficial effects on grassland and shrubland communities over the long term.

Paleontological Resources

No effects are anticipated from paleontological management actions.

Visual Resources

Management of VRM Class I and II areas could prohibit or limit some surface-disturbing activities. Management of VRM Class III and IV areas would include minor limitations on surface disturbance within one to five percent of the grassland and shrubland communities in the planning area. This would have an indirect minor beneficial effect on grasslands and shrublands, depending on the locations, types, and durations of approved projects.

Land Resources

Forest Products

No effects are anticipated from forest products management actions.

Lands and Realty

The types of effects from Alternative A would be the same minor adverse effects as described in the *Impacts Common to All Alternatives* section for lands and realty (vegetation loss and degradation).

Renewable Energy

Alternative A does not establish guidelines for the development of renewable-energy resources. Under the renewable-energy program for the planning area, overall it is estimated that approximately 20,000 acres would be disturbed over the next 20 years. This would have a direct, moderate, adverse effect as renewable energy actions could be permitted in, and cause removal of vegetation in five to ten percent of the grassland and shrubland communities in the planning area.

Rights-of-Way and Corridors

Current management actions under Alternative A include locating transmission lines and transportation facilities within identified corridor areas to the extent feasible. This action concentrates the surface disturbance to designated areas, thereby reducing the amount of disturbed acres overall. Also, surface disturbance and occupancy will not be allowed on slopes of 25 percent or more. ROWs and corridors could be permitted in five to ten percent of the grassland and shrubland communities in the planning area. ROW disturbances are estimated to affect approximately 38,762 acres (Appendix G (p. 1937)). This would have a direct, moderate, and adverse effect over the long term.

Travel and Transportation Management

Motorized travel removes plants and decreases plant production and species composition; this contributes to accelerated soil erosion. Limiting motorized vehicle use to existing roads and vehicle routes would concentrate adverse effects. Current decisions under Alternative A include closing areas with saturated soils and with slopes equal to or greater than 25 percent (approximately 170,590 acres) to motorized vehicles; this would have a direct beneficial effect on vegetation, soils, and water quality over the long term. In addition, closing certain areas to vehicular travel (approximately 3,650 acres), limiting vehicular travel to designated roads and trails (737,166 acres) in other areas, and seasonally closing areas from November 15 to April 30 (approximately 37,646 acres) would directly benefit grassland and shrubland communities over

the long term by protecting vegetation and soils overall and at times when erosion could occur. For a list of areas closed to motorized travel, see the *Travel and Transportation Management* section of this chapter.

Recreation

Under Alternative A, recreation-site development is anticipated to disturb approximately five acres, with successful reclamation on all five acres. Unless waived by the authorized officer, Alternative A prohibits surface disturbance or occupancy in the Red Wall/Hole-in-the-Wall area, in Middle Fork Canyon and with 0.5 mile of the canyon rims, and in the Dry Creek Petrified Tree EEA. Prohibiting surface disturbance has a direct beneficial effect on the vegetation. Waivers allowing surface-disturbing activities would likely be limited in number but would have a direct adverse effect on plant communities and would be in effect for the duration of the project or permit over the long term (usually 10 or more years). Recreational site development will remove the majority of the vegetation due to impacts from motorized vehicles and human activity, these sites would have a direct, negligible, adverse effects for the long term.

Lands with Wilderness Characteristics

Presently no areas outside the three WSAs are managed for the preservation of their wilderness characteristics.

Livestock Grazing Management

Under Alternative A, livestock grazing is not authorized on approximately 4,000 acres of public land in the canyons and slopes of the southern Big Horn Mountains because of the rough terrain and steep slopes. Livestock grazing is allowed on all public lands in the resource area except on approximately 6,000 acres (1%) where it has been determined to be incompatible with other resource uses or values. Most of these areas have fragile soil surfaces, shallow soils, and steep slopes, and produce little vegetation.

Native grasslands evolved with grazers, and many grass species respond positively to leaf removal by propagating, which increases vegetative cover (Anderson 2006). Current decisions include allocating temporary increases in available forage first to wildlife to meet the population objectives of the WGFD. Any of the increased forage not needed for wildlife would be available for livestock use. Any permanent increases in the amount of forage produced would be considered for watershed protection and wildlife habitat before authorizing additional livestock use. Management actions that protect watersheds and enhance habitats would have a direct beneficial effect on grasslands and shrublands communities.

Under Alternative A, a minimum of two years rest from livestock grazing would be provided following prescribed fire and other vegetative treatments. Additional rest might be allowed where necessary to achieve resource goals and objectives. Impacts from vegetative treatments, including prescribed fire, would include deferring planned areas from grazing to leave grasses (fine fuels) to help carry the ignition. Prescribed fire and other treatments would cause short-term losses of vegetation and changes in plant community structure. In the long term, treatments would be designed to improve the health and vigor of vegetation, increase vegetative diversity, modify vegetation types (e.g., a change from shrubs to herbaceous vegetation), and modify age class and structure. Treatments would have a beneficial effect on grasslands and shrublands.

Current management allows development of range improvements. These result in localized short-term disturbances to grassland and shrubland communities, including the flattening or loss of vegetative cover due to construction activities. Placement of water, salt, or other supplements results in trampling of vegetation and small bare areas of livestock and wildlife concentration.

Where salt and mineral supplements are not in containers, changes in soil chemistry could delay long-term recovery of vegetation. Long-term loss of vegetation would occur near pits and reservoirs and along fence lines where there are roads or animal trails. However, improved management due to additional water sources, fences, and other improvements potentially improve plant composition and vigor. Estimates for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 70 acres (80 miles), with successful reclamation on approximately 50 acres (57 miles) and approximately 20 acres disturbed over the long term. Wells are estimated to disturb 1 acre.

Special Designations

Areas of Critical Environmental Concern, Scenic or Back Country Byways, and Wild and Scenic Rivers

Alternative A does not include special designations. Areas have been identified and are being managed under interim management criteria that protects the resource. Current management may not have adequate management actions to protect the vegetative resources which has a direct, negligible adverse effect on grasslands and shrublands.

Wilderness Study Areas

If Congress decides not to designate the WSAs as wilderness, Alternative A would allow leasing for minerals. The WSAs currently encompass less than one percent of the grassland and shrubland communities in the planning area. This would have a direct adverse effect on grassland and shrubland communities due to the surface-disturbing activities of development and needed infrastructure. Adverse effects would continue for the life of the permit or lease. At present, there are no decisions addressing motorized travel in these areas. Limiting motorized travel would benefit vegetation unless it restricts the application of herbicides to control invasive species in the plant communities.

Socioeconomic Resources

Social and Economic Conditions

No effects are anticipated from social and economic management actions.

Health and Safety

No effects are anticipated from health and safety management actions.

4.4.2.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely resulting effects on grassland and shrubland resources from those management actions.

Vegetation – Grassland and Shrubland Communities

The management action includes authorizing only native plant species for all reclamation activities, eliminating the concern of cross pollination of non-native species with native species and competition for water and soil nutrients, overall, creating a more naturally healthy plant

community. However, native plants can be more difficult to establish than some non-native species that have specific plant characteristics that assist in achieving reclamation objectives.

Physical Resources

Air Quality

Under Alternative B, air quality modeling would be performed on a project-specific basis. In addition, projects expected to approach or exceed emissions standards would be evaluated for potential mitigation strategies. This would protect the health of all of the plant communities and would have a major beneficial effect on grassland and shrubland communities.

Soil

Soils management actions under Alternative B would include prohibiting surface-disturbing activities on slopes equal to or greater than 25 percent (approximately 170,590 acres or 22% of public land acres), on soils with a severe erosion hazard (approximately 215,496 public land acres or 28%), and on soils with poor reclamation potential (approximately 455,090 public land acres or 58%). Management actions would also prohibit certain proposed activities on badlands, rock outcrops, or slopes susceptible to mass movement, which would affect approximately 218,928 public land acres or 28 percent. All these actions would serve to protect the soil resource which would have direct beneficial effects on grassland and shrubland communities over the long term. In general, protecting soils directly correlates to protecting vegetation by reducing erosion potential and providing a healthy medium in which plants can grow. This would occur in greater than ten percent of the grassland and shrubland communities in the planning area; therefore the management actions for soil under Alternative B would have major beneficial effects on grassland and shrubland communities.

Water Resources

Watershed management actions to prohibit surface disturbance within 500 feet of any natural or man-made water feature (approximately 19,861 public land acres or 2.5%) would have a direct beneficial effect on vegetation and water quality in these sensitive sites. This action would prohibit removal of vegetation and disturbance of soil which would reduce potential for soil runoff into nearby water systems that could contribute to the impairment of water quality. Other management actions include prohibiting activities that would result in surface discharge of water and prohibiting construction of on-channel reservoirs that could adversely affect natural flow regimes. These actions would directly benefit grassland and shrubland communities by preventing the natural transition of plant species from dry land species to more wetland-tolerant species in grasslands and shrublands, and minimizing the opportunity for invasive plant species to establish on these sites. Managing riparian and upland areas to restore perennial flow or standing water in historically perennial systems would return these systems to their natural state and would provide habitat for numerous flora and fauna species. The removal and reclamation of unneeded CBNG reservoirs would directly benefit vegetative communities over the long term by returning these systems to their natural state and reducing the opportunity for invasion and spread of undesirable plant species. All of these actions would have a minor beneficial effect on grasslands and shrublands plant communities.

Cave and Karst Resources

Caves and karsts are generally present in rock formations. Alternative B management actions to prohibit surface-disturbing activities in cave and karst areas and implementation of cave-specific management plans would directly benefit grassland and shrubland communities by limiting soil and vegetation disturbance from minerals development or other human activities.

Approximately 101,455 public land acres or 13 percent would be protected from disturbance. Trails leading to popular cave and karst areas could trample and remove vegetation, which would have a direct adverse effect on those plants over the long term. Management actions to protect cave and karst resources would have a major beneficial effect on grasslands and shrublands.

Mineral Resources

Locatable Minerals

In addition to areas currently withdrawn or restricted from locatable minerals development, Alternative B includes new areas to protect and preserve cultural, paleontological, recreation, lands with wilderness characteristics, and other special designation resource values (ACECs, Scenic or BCBs, WSRs, and WSAs). This would result in 2,686,776 acres (13%) available. Locatable minerals development has a direct adverse effect on vegetation over the long term, and protecting these areas would benefit grassland and shrubland plant communities. Under the locatable minerals program for the planning area, it is estimated that BLM actions would disturb approximately 277 acres over the next 20 years. Reclamation would occur on 72 acres. The long-term disturbance would have a adverse effect on those plant communities directly affected. Locatable minerals could be permitted in greater than ten percent of the grassland and shrubland communities in the planning area; therefore, management actions for locatable minerals under Alternative B would have major adverse effects on them.

Leasable Minerals – Coal

Under Alternative B, where development occurs, vegetation would be directly and adversely affected over the long term for the life of the project and would require successful reclamation to ensure the native vegetative component was reestablished to predisturbance conditions and to reduce the potential establishment and spread of invasive plant species. Under this alternative, approximately 186,600 acres would be disturbed, with reclamation occurring on approximately 120,600 acres, 36,500 acres being actively mined, and approximately 66,000 acres disturbed over the long term. This long-term disturbance has a direct and adverse effect on those vegetative communities. Alternative B management of leasable coal resources would have a major adverse effect on grasslands and shrublands.

Leasable Minerals – Fluids

Under Alternative B, management to conserve other resources would make 2,612,920 acres of public land closed to fluid minerals leasing (41% of total public land acres). This large amount of protected acreage would directly benefit vegetation; however, in areas of development, the effect would be direct, adverse, and long term. The fluid mineral program is estimated to disturb approximately 286 acres over the next 20 years. Long-term disturbances have a direct and adverse effect on those vegetative communities (Appendix G (p. 1937)). Leasable fluid mineral exploration and development could occur in one to five percent of the grassland and shrubland communities in the planning area; therefore management actions for fluid minerals would have a minor adverse effect on grasslands and shrublands.

Salable Minerals

Alternative B would close leasing in accordance with management identified to conserve other resources. This would result in 3,218,690 acres of federal mineral estate (88%) closed to salable minerals development. Alternative B would result in reducing adverse effects to grassland and shrubland communities because additional acreage would not be developed over the long term and only a small portion of public land would be developed. Estimated acres of disturbance for salable minerals over the next 20 years would be negligible (114 acres) (Appendix G (p. 1937)).

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Alternative B management actions apply full suppression in areas where fire is undesirable affecting approximately 42,232 acres. Monitoring fire behavior only in areas where fire can be used as a management tool based on resource goals and objectives would directly benefit grassland and shrubland communities by enhancing/restoring the natural fire regime of these communities. Limiting suppression vehicles to existing roads and trails unless they are in identified full suppression areas would affect approximately 739,910 acres, and rehabilitating all fire-related damage would directly benefit vegetative communities over the short and long terms by reducing the potential for vegetation compaction or removal and soil erosion. Alternative B protected acres would be the same as under Alternative A. Long-term, the application of prescribed fire to improve grassland and shrubland communities (plant species diversity, production and vigor) and wildlife habitat objectives is estimated to affect approximately 3,500 acres from BLM actions. All acres would be successfully reclaimed (Appendix G (p. 1937)). This management would have minor beneficial effects.

Rehabilitating all fire-related damage would directly benefit vegetative communities over the short and long terms by reducing the potential soil erosion and limiting opportunities of invasive species establishment. Using wildland fire and other vegetative treatments to restore fire-adapted ecosystems and to reduce hazardous fuels would benefit native vegetation by returning a historic fire regime to the ecosystem; reducing hazardous fuels reduces the opportunity for wildfire and severe impacts from wildfires. Long-term, the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives is estimated to affect approximately 3,500 acres from BLM actions. All acres are expected to be successfully reclaimed (Appendix G (p. 1937)).

Under Alternative B, prescribed fire and other vegetation treatments would be used to restore fire-adapted ecosystems and reduce hazardous fuels. Wyoming big sagebrush requires 50–120 years or more recovery time after fire. Evidence suggests that particularly in Wyoming big sagebrush, a program of prescribed burning is unwarranted or inadvisable if maintaining and restoring sagebrush landscapes and sagebrush-dependent species is the goal (Baker 2006). Prescribed fire would have minor beneficial effects on grasslands and major adverse effects on shrublands. Unplanned fire would have negligible to major effects, depending on the fire size, soil type, type of vegetative community, and burn conditions.

Biological Resources

Vegetation – Forests and Woodlands

No effects are anticipated from forests and woodlands management actions.

Vegetation – Riparian/Wetland Resources

Alternative B, prohibiting surface-disturbing activities for mineral leasing within 500 feet of riparian and wetlands systems, aquatic habitats, and floodplains (approximately 23,831 acres) would directly benefit adjacent grassland and shrubland communities. Restoring vegetation on all CBNG-supported wetland and riparian systems would return those hydric systems in the upper watershed back to upland vegetation and reclaim the large numbers of systems constructed to receive CBNG produced water. These systems are very susceptible to water-tolerant invasive species such as salt cedar and Canada thistle, and reclamation would establish competitive native species. Reclamation also would include eradication of invasive species. These management

actions would occur in one to five percent of the grassland/shrubland communities in the planning area and would have a minor beneficial effect on the health of them.

Invasive Species and Pest Management

Alternative B would control invasive plant species in cooperation with county weed and pest districts. Treating plants on the Wyoming Weed and Pest Control Act Designated List, the appropriate county lists, and other species of concern as determined by BLM resource specialists would treat all species that adversely affect native plant communities. Annual bromes (cheatgrass) are present throughout the planning area; therefore, a treatment management plan addressing cheatgrass should incorporate the entire planning area. Treatment of annuals would improve the ecological condition of the vegetative communities and reduce the potential for wind and water to erode soil. Non-selective herbicides could affect other broadleaf plants (forbs, special status plant species, and shrubs) along with the target species. Aerial application of pesticides would allow for treatment of large acreages for widespread species such as cheatgrass and leafy spurge, and lower rates of herbicide so other non-target, yet susceptible, species would be less affected. All these actions would have direct beneficial effects on grasslands and shrublands over the long term. Long-term disturbances over the next 20 years are estimated to affect approximately 15,000 acres from BLM actions, with 13,000 acres of reclamation (Appendix G (p. 1937)).

Fish and Wildlife Resources – Fish

Alternative B management actions would consider fish and fish habitat in reservoir, riparian and wetland systems, and perennial water management. Alternative B would apply constraints on surface-disturbing and disruptive activities providing protection of vegetation, soils, and soil microbial activity from surface disturbing activities adjacent to or within greater than ten percent of the grassland and shrubland communities in the planning area. Management actions for fish under Alternative B would have major beneficial effects on grassland and shrubland communities.

Fish and Wildlife Resources – Wildlife

Alternative B management actions include distance and timing limitations or prohibitions on surface disturbance and occupancy in or near big-game and elk crucial winter ranges or big-game transition ranges, elk calving areas, within 750 feet of upland game bird leks at any time and an additional 0.64-mile radius from April 1 through May 30, and within a biological buffer zone around nests of conservation concern raptor species. Limitations and prohibitions protecting the soil surface for wildlife would conserve vegetation in five to ten percent of the grassland and shrubland communities in the planning area. Management actions under Alternative B for wildlife would have direct, moderate, beneficial effects on grasslands and shrublands over the long term.

Special Status Species – Plants

Alternative B management actions that prohibit surface-disturbing or disruptive activities in designated areas would affect approximately 126,811 acres (less than 1%) of grassland and shrubland communities. Limiting these activities in habitats with known populations of special status plants species would have a direct, negligible, beneficial effect on grasslands and shrublands over the long term.

Special Status Species – Fish

Alternative B management actions that prohibit surface-disturbing and disruptive activities with 0.25 mile of any water that contains special status fish species and prohibit impoundments where they could adversely affect such fish would affect approximately 818 acres (less than 1%), which would have a direct, negligible, beneficial impact to grasslands and shrublands over the long term.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Maintenance or enhancement of special status wildlife species habitat will usually directly benefit the surrounding plant community unless the SSS requires a habitat contrary to “typical” habitats, such as the prairie dog and the mountain plover, which are associated with short-grass prairie dominated by blue grama (*Bouteloua gracilis*). These species require a degraded ecological state of health to thrive. Providing these habitat requirements would have a direct adverse effect on the plant community over the long term. Prohibiting surface-disturbing and disruptive activities in all prairie dog colonies to provide suitable habitat for SSS that depend on prairie dog colonies would affect 6,156 acres.

Alternative B management actions would prohibit renewable-energy projects in Greater Sage-Grouse nesting, brood-rearing, and winter concentration areas. Actions would prohibit or avoid surface-disturbing activities within 4.0 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks year-round, would prohibit surface-disturbing activities within four miles of occupied leks from March 1 to June 30, and prohibit surface-disturbing activities within wintering habitat from November 15 to March 14, which in total would affect approximately 467,897 acres. Other areas include identified nesting and early brood-rearing habitat outside the four-mile lek buffer, which would affect approximately 135,194 acres, and Greater Sage-Grouse winter habitat, including winter concentration areas, which would affect approximately 226,595 acres. The larger the area protected from surface disturbances the greater the benefit to vegetative communities. Alternative B management actions that prohibit or avoid surface-disturbing activities would have a direct, beneficial effect on associated grassland and shrubland communities over the long term.

Alternative B management would avoid surface-disturbing and disruptive activities and occupancy in Greater Sage-Grouse winter habitat, including winter concentration areas, from November 15 to March 14 and allow no more than three percent removal of sagebrush habitats per 640-acre section. The action to allow no more than three percent removal of sagebrush habitats per 640-acre section might or might not benefit grassland and shrubland communities, depending on the ecological condition of the communities and other resource objectives. Alternative B management actions would also restore, where appropriate, all disturbed grassland and shrublands to Greater Sage-Grouse habitats. This would increase the health of these systems.

Alternative B management actions that prohibit surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats would affect approximately 176,636 acres. This would have a direct, beneficial effect on grasslands and shrublands by protecting vegetation and soils from disturbance.

Overall, the prohibitions/restrictions for special status wildlife habitats would encompass and conserve vegetation within greater than ten percent of the grassland and shrubland communities in the planning area; therefore the management actions for special status wildlife resources under Alternative B would have major beneficial effects on these communities.

Heritage and Visual Resources**Cultural Resources**

Prohibiting surface disturbance in areas with historic properties, or within five miles or the visual horizon (whichever is closer) would affect approximately 330,592 public land acres of historic properties that retain their integrity of setting. These prohibitions would conserve vegetation within greater than ten percent of the grassland and shrubland communities in the planning

area; therefore they would have a direct, major, beneficial effect on grassland and shrubland communities by keeping soils and vegetation intact.

Paleontological Resources

Requiring paleontological field surveys to determine types and locations of classes, monitoring, and then initiating protective measures, including limiting or prohibiting surface-disturbing activities, would protect vegetation from possible large-scale surface disturbance. This could affect up to 754,668 acres of public land (greater than ten percent of the grassland and shrubland communities). Protecting lands with paleontological resources could promote paleontological excavation and research activities. These small (under one acre) short-term activities would have a direct adverse effect on grasslands and shrublands by disturbing soils and removing vegetation for the life of the project through successful reclamation. It is estimated that approximately 200 acres would be disturbed, with successful reclamation anticipated on all acres (Appendix G (p. 1937)). Overall there would be a major beneficial effect.

Visual Resources

Under Alternative B, the BLM could prohibit or limit some surface-disturbing activities in VRM Class II areas on about 217,021 acres and thereby protect grassland and shrubland communities. VRM Class III and IV areas encompass approximately 276,107 and 258,866 acres respectively, on which the BLM would allow surface-disturbing activities with some limitations. Prohibiting or limiting surface-disturbing activities for management of visual resources would occur in five to ten percent of the grassland and shrubland communities and would, therefore, have a moderate beneficial effect.

Land Resources

Forest Products

No effects are anticipated from forest products management actions.

Lands and Realty

Alternative B management actions would pursue land disposals, acquisitions, easements, or land tenure adjustments for lands holding custodial grazing allotments, and sales independent of other resource values. As they pertain to the overall management of public lands if pursued and completed, these actions would improve public land management capabilities overall and would occur in five to ten percent of the grassland and shrubland communities, having an indirect, moderate, beneficial effect on grassland and shrubland communities over the long term.

Renewable Energy

Alternative B management actions would affect development in the public lands by excluding specific areas on about 730,530 acres and avoid areas from mineral leasing on about 45,441 acres. These restrictions would lessen the adverse effects to grassland and shrubland communities if the energy developments involved surface-disturbing activities. Under the renewable-energy program for the planning area, overall for the next 20 years it is estimated that BLM actions would disturb approximately 5,000 acres. Reclamation would occur on 4,500 acres (Appendix G (p. 1937)). These management actions would allow renewable-energy development within one to five percent of the grassland and shrubland communities in the planning area, therefore, having a minor adverse effect on grasslands and shrublands.

Rights-of-Way and Corridors

Management actions include prohibiting ROW on slopes equal to or greater than

25 percent and on highly erodible soils to minimize impacts to soil resources. Requiring co-location of new communication sites within designated areas, authorizing transmission lines in identified corridors, and avoid constructing facilities along major transportation routes. All these actions would reduce surface disturbance directly reducing adverse effects to vegetation over the long term by limiting removal or mechanical damage to vegetation and reduce the potential for water and wind to erode soil. ROW development on public land would be excluded on 706,556 acres and avoided on 56,857 acres of public land. ROW disturbances are estimated to affect approximately 5,750 acres for pipelines and 28 acres for communications sites during the planning period; all pipeline acres are expected to be successfully reclaimed. Roads are estimated to affect 9,275 acres, with successful reclamation on approximately 2,690 acres 6,585 acres of long-term disturbances on the public lands. Powerlines are estimated to affect approximately 2,458 acres, with successful reclamation on approximately 245 acres and 2,213 acres of long-term disturbance (Appendix G (p. 1937)). These Alternative B management actions would allow ROWs and corridors to be permitted in greater than ten percent of grassland and shrubland communities; therefore, having a major adverse effect on grasslands and shrublands.

Travel and Transportation Management

Alternative B management actions would allow motorized vehicles off designated routes with a special use permit. Management actions would close areas with saturated soils or on slopes of 25 percent or greater, in habitat for SSS, special designation areas (a total of 625,854 acres), and in big game ranges during specific timeframes; also limit travel to designated roads and trails on 137,126 acres. These actions would protect the grassland and shrubland resources during conditions when soil and plants are highly susceptible to erosion, but may affect implementation of restoration projects. Prohibiting vehicular travel on saturated soils and requiring closure and reclamation of roads if they are heavily eroded, washed out, or if other access roads in better condition are available would directly benefit vegetative resources. Transportation and access would be restricted in more than 80 percent of the grassland and shrubland communities in the planning area; therefore management actions under Alternative B for transportation and access would have a moderate beneficial effect on grasslands and shrublands.

Recreation

Alternative B management actions to designate eight areas as SRMAs, for 55,529 acres, with possible consideration of additional lands for SRMA designation, and prohibit surface disturbance in designated SRMAs unless the disturbance is for administrative purposes would generally help protect, maintain, and enhance vegetative resources. However, the BLM promotes visitor use and access in SRMAs, which would increase the areas' popularity and visitation. This would increase vegetation disturbance from trampling and increase the potential for invasive plant species introduction and spread. SRMAs under Alternative B encompass one to five percent of the grassland and shrubland communities in the planning area. Alternative B management actions would have a minor adverse effect on grasslands and shrublands over the long term.

Lands with Wilderness Characteristics

Alternative B includes management actions for lands with wilderness characteristics, which would directly benefit vegetative communities by limiting surface-disturbing activities in those areas on approximately 12,237 acres, less than one percent of the grassland and shrubland communities. This management would have a negligible beneficial effect on grasslands and shrublands.

Livestock Grazing Management

Alternative B livestock grazing management actions include: (1) prohibiting increases in livestock stocking rates as a result of vegetative treatments; (2) providing a minimum of two years rest

following prescribed fire, wildfire (in lieu of an approved plan), and other vegetative treatments, with additional rest where necessary; (3) limiting or prohibiting livestock grazing where it has been determined to be incompatible with other resource values; (4) locating livestock salt or mineral supplements a minimum of 0.5 mile from water sources, riparian areas, and aspen stands; (5) designating and managing future resource reserve common allotments as needed; and (6) authorizing permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority and to livestock grazing as the second priority. All these management actions benefit vegetative communities. Prohibiting increases in livestock stocking rates would ensure benefits to vegetation gained through treatment would not be lost to increased grazing pressure. Locating salt and mineral supplements away from water sources and other sensitive areas would discourage livestock from congregating and would alleviate long-term impacts from animals and hoof action. Reserve common allotments would enable other pastures and allotments to be rested if needed. Treatment and project-related deferment or rest allows vegetation to complete two life-cycles, or more if determined needed, before resuming livestock grazing. Increases in forage would be allocated to watershed protection and wildlife habitat to meet health standards before making it available to livestock. Construction of range improvements would have a direct adverse effect on vegetation for the life of the project. All other livestock-related actions would have an indirect beneficial effect over the long term.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and approximately 30 acres of long-term disturbance. Wells are estimated to disturb 1 acre, with successful reclamation (Appendix G (p. 1937)).

Alternative B livestock grazing management would have a moderate beneficial effect on grasslands and shrublands.

Special Designations

Areas of Critical Environmental Concern

Alternative B management actions include designating eight areas as ACECs, which would affect approximately 511,000 acres. The associated management plans for these sites would initiate specific conservation to protect soils and vegetation from surface-disturbing activities, including minerals development, vehicular travel, ROW, and any other activity not compatible with retaining or enhancing the area's values. All these restrictions would have direct, minor, beneficial effects on grasslands and shrublands over the long term.

Scenic or Back Country Byways

Evaluating the road system for potential designation could indirectly benefit vegetation because some activities (minerals and energy development) might be discouraged based on scenic values. This management would have a negligible beneficial effect on grasslands and shrublands.

Wild and Scenic Rivers

The portion of the Middle Fork Powder River portion that is suitable and eligible for WSR designation is awaiting Congressional action. Until Congress acts, or if Congress releases the corridor from WSR consideration, management would continue in accordance

with the Middle Fork Interim Management Plan to retain its free-flowing characteristics and outstanding resource values. Under the designation or continuation of interim management, upland vegetation would indirectly benefit from special management actions. This management would have a negligible beneficial effect on grasslands and shrublands.

Wilderness Study Areas

There are three WSAs in the planning area totaling 28,931 acres. There are restrictions to preserve wilderness conditions in these areas until Congress acts on their Wilderness status. Designation of these areas and interim management is based on conservation of the natural resources, which would directly benefit vegetative communities and limit vehicular travel and surface-disturbing activities. This management would have a negligible beneficial effect on grasslands and shrublands.

Socioeconomic Resources

No effects are anticipated from socioeconomic resources management actions

4.4.2.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource utilization, and the likely resulting impacts to grassland and shrubland resources.

Vegetation – Grassland and Shrubland Communities

The management action allowing non-native plant species (mostly sterile, small-grain cereal crops such as oats, triticale, and barley) for initial (one to two years) reclamation practices would provide another tool for achieving reclamation goals, but also would provide the opportunity for non-native species to be introduced. Non-native species could cross pollinate with native species, outcompete native species for water and soil nutrients, and move out of their original niche and become an invasive species. Use of non-native species could directly benefit grasslands and shrublands by quickly establishing vegetation on sites reducing the opportunity for erosion and invasive plant establishment. This could indirectly benefit vegetative communities by reducing erosion potential. Achieving successful reclamation would directly benefit the surrounding plant community and could help discourage invasive species.

Physical Resources

Air Quality

There would be no air quality modeling under Alternative C. Industrial projects would be expected to approach or exceed emissions standards, and no mitigation strategies would be examined. This would have indirect adverse impacts to grassland and shrubland communities. Vegetation is possibly more sensitive to air pollutants than humans. In particular, acid rain has left areas barren or with severely damaged vegetation. Ground-level ozone and reactive nitrogen can cause discoloration, damage, and loss of leaves, which can reduce photosynthesis by as much as fifty percent. As a result, biologically significant quantities of reactive nitrogen are now reaching the highest places. At lower elevations in the western United States, introduced grasses stoked by nitrogen are overwhelming many ecosystems. Plants also become more vulnerable to attacks by pests, disease, and environmental disasters. Consequently, the plant's ability to store food, grow, and reproduce is hindered. Adverse impacts to vegetation would be major.

Soil

There would be no constraints for surface-disturbing activities under Alternative C. Allowing surface-disturbing activities would directly remove and mechanically damage vegetation, remove soils and soil microbes, decrease forage availability, remove habitat and increase opportunities for invasive species where development occurs throughout the planning area. This action would have a direct, major, adverse effect on grasslands and shrublands communities.

Water Resources

There would be no constraints surface-disturbing activities under Alternative C. Management actions include allowing on-channel reservoirs, which locates these in the most productive vegetative sites. Surface discharge would be authorized when permitted by the State of Wyoming, which would promote upland vegetation transition to hydric species including invasive species such as tamarix and Canada thistle. All these actions would have a direct moderate adverse effect on grasslands and shrublands over the long term.

Cave and Karst Resources

Alternative C management actions include establishing project-specific buffers (100 feet, for a total of 11 acres of protection) from significant cave entrances to protect caves from surface-disturbing activities. This would have a direct, negligible, beneficial effect on grasslands and shrublands.

Mineral Resources**Locatable Minerals**

Alternative C does not include recommendations for new withdrawals or restrictions on locatable minerals development. Lands open to mineral entry (open is about 3,319,535 acres – including greater than ten percent of the grassland and shrubland communities in the planning area and withdrawn are about 11,373 acres) are consistent with other resource values. Grassland and shrubland communities would be directly and adversely affected by not protecting more areas from locatable minerals activities. Under the locatable minerals program for the planning area, overall it is estimated that BLM actions would disturb approximately 1,455 acres over the next 20 years. Reclamation would occur on 378 acres. Alternative C management of locatable minerals would have a major adverse effect on grassland and shrubland communities.

Leasable Minerals – Coal

Development is only likely to occur in those areas identified as acceptable for further coal leasing consideration. Where development does occur there is a direct and adverse impact to the vegetation through removal and mechanical damage. Effects are long term until successful reclamation is achieved. Allowing these surface-disturbing activities would have a direct, minor, adverse effect on vegetation in these areas.

Leasable Minerals – Fluids

Alternative C makes all lands administratively available for development (within greater than ten percent of the grassland and shrubland communities in the planning area). Development would include surface-disturbing activities at the production sites as well as all the necessary infrastructure. Surface-disturbing activities would have a direct and adverse effect on vegetation for the long term until required successful reclamation is achieved. Native grasses and forbs would dominate reclaimed sites initially, and forbs and shrubs would return over a longer period. Mechanical removal and injury to the vegetation would occur. Soil removal and compaction would occur and channelization of surface runoff in ruts and road ditches is

likely. Alternative C management of leasable fluid minerals would have a major adverse effect on grasslands and shrublands. Under the CBNG program for the planning area, overall it is estimated that BLM actions would disturb 13,200 acres over the next 20 years. Reclamation will occur on 5,280 acres. Under the leasable conventional oil and gas program for the planning area, overall it is estimated that BLM actions would disturb approximately 9,055 acres over the next 20 years. Reclamation will occur on 6,070 acres. There is no anticipated disturbance from geothermal activities.

Salable Minerals

Alternative C does not recommend new closures or restrictions. The existing closures and restrictions were imposed to protect and preserve other resource values. Not adding areas to be protected from these minerals activities would have a direct, adverse effect on grassland and shrubland communities. For salable minerals over the next 20 years, the estimated areas of surface disturbance would be occur in greater than ten percent of grassland and shrubland communities in the planning area; 2,090 acres disturbed, 392 acres reclaimed, and 1,698 acres long-term disturbance (Appendix G (p. 1937)).

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative C, management actions that involve full suppression regardless of other resource objectives would have a direct adverse effect on grassland and shrubland communities. The use of heavy equipment with few constraints would have a direct adverse effect on vegetative communities over the short and long terms by increasing the opportunities for water and soil erosion, soil compaction, and invasive plant species establishment. Long-term estimates for the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives is estimated to affect approximately 42,000 acres from BLM actions. All acres are expected to be successfully reclaimed.

Biological Resources

Vegetation – Forests and Woodlands

No effects are anticipated from forests and woodlands management actions.

Vegetation – Riparian/Wetland Resources

Alternative C management actions would allow surface-disturbing and disruptive activities and apply standard lease terms for mineral leasing within 500 feet of riparian and wetlands systems, aquatic habitats, and floodplains. This would have a direct adverse effect on the adjacent grassland and shrubland communities by promoting activities that would lead to soil erosion. Restoring vegetation only on direct CBNG disturbance areas (e.g., dams and reservoirs) rather than on all CBNG-supported riparian and wetland systems would benefit only a very small number of the systems overall. All systems are very susceptible to water-tolerant invasive species such as salt cedar and Canada thistle. This would have an adverse effect on the health of greater than ten percent of the adjacent grassland and shrubland communities.

Invasive Species and Pest Management

Under Alternative C, restricting aerial application to only insecticides would limit herbicide applications to motorized vehicle and hand application. This would restrict where application could occur and the size of treatments, therefore allowing vast acreages (in the case of leafy spurge, which inhabits thousands of acres across multiple landscapes, plant communities, remote

locations, and a variety of terrain) to go untreated. This would have a direct adverse effect on upland and hydric plant communities over the long term. Long-term disturbances over the next 20 years are estimated to affect approximately 10,000 acres from BLM actions; reclamation would occur on 8,500 acres (Appendix G (p. 1937)).

Annually treating only designated areas for cheatgrass would be ineffective because there would be only small, scattered treatments and most of the cheatgrass would be unaffected. This would have an adverse effect on grassland and shrubland communities.

Fish and Wildlife Resources – Fish

Alternative C management actions would consider other resources a higher priority than fish and fish habitat in reservoir, riparian and wetland systems, and perennial water management. Alternative C would not apply constraints on surface-disturbing and disruptive activities, and would apply only the standard lease terms for minerals leasing in naturally occurring waterbodies. This lack of constraints would indirectly and adversely affect these systems over the long term by not providing protection of vegetation, soils, and soil microbial activity from surface disturbing activities. Prioritizing other resources considerations above fish and fish habitat could also adversely or beneficially effect greater than ten percent of the vegetation depending on the management action.

Fish and Wildlife Resources – Wildlife

Alternative C wildlife management actions, including management for big-game species, upland game birds, migratory birds, special status plants, special status fish, and special status amphibians and reptiles, would not be implemented on a project-specific basis. Alternative C would manage special areas consistent with other resource values, rather than for wildlife species, except raptors, and would not apply constraints on locations and timing of surface disturbances. These management actions would still conserve vegetation within greater than ten percent of the grassland and shrubland communities in the planning area. Management actions for wildlife under Alternative C would have indirect and direct, major beneficial effects on vegetative communities over the long term.

Special Status Species – Plants

Alternative C management actions would allow aerial application of herbicide treatments in areas with habitat for special status plant species. The alternative would restrict treatments in areas of known special status plant populations. This would conserve vegetation in less than one percent of the grassland and shrubland communities in the planning area and would have a direct, negligible, beneficial long-term effect. Other invasive management methods would be applied in habitats of known species.

Special Status Species – Fish

Alternative C management actions would prohibit surface-disturbing and disruptive activities in less than one percent of grassland and shrubland communities, if impacts could not be mitigated. Other actions include designing impoundments and instream structures to minimize impacts on or near existing or potential sites and habitats. These actions would reduce, but not prevent, direct adverse effects such as surface-disturbing activities that could affect upland vegetation; however, the primary effect would be to the riparian habitat adjacent to the stream. All effects would be long term.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Maintenance or enhancement of SSS habitat usually benefits the plant communities. However, vegetation in the prairie dog towns is already in lower ecological state, with a large component of

cheatgrass. Alternative C management actions that would allow surface-disturbing activities in prairie dog habitat would adversely affect vegetation by direct mechanical removal or damage to plants, removal of soil medium, and increase the opportunity for resident cheatgrass to spread. Impacts to grasslands and shrublands would be direct, adverse, and long term.

Alternative C management actions would allow renewable-energy projects in Greater Sage-Grouse nesting, brood-rearing, and winter concentration areas. Management would prohibit or avoid surface-disturbing activities within a specified distance from designated leks, identified nesting and early brood-rearing habitat, and Greater Sage-Grouse winter habitat during specific periods, some areas would prohibit surface-disturbing activities yearlong. Only those areas protected from surface disturbance year-round would benefit the vegetation. Those areas, under Alternative C still conserve greater than ten percent of the grassland and shrubland communities in the planning area. All other management actions would be adverse since surface disturbance could occur. There would be no limit on the amount of sagebrush removal, so decision would be based on multiple resources rather than only on Greater Sage-Grouse habitat. Allowing surface disturbance has a adverse effect on grassland and shrubland communities.

Alternative C management actions would allow surface-disturbing and disruptive activities in known areas of special status amphibian and reptile species and their habitats. This would have a direct, adverse effect on those habitat types over the long term.

Overall, management action for special status wildlife species under Alternative C would have major beneficial effects on grassland and shrubland communities.

Heritage and Visual Resources

Cultural Resources

Alternative C management would allow surface disturbance in areas with historic properties which would have a direct adverse effect on vegetation over the long term by mechanical removal or damage to the vegetation, removal of the soil medium, increasing the opportunities for soil erosion and invasive species establishment. The areas open to disturbance encompass one to five percent of the grassland and shrubland communities in the planning area; therefore, management actions for cultural resources under Alternative C would have minor adverse effects on grassland and shrubland communities.

Paleontological Resources

Alternative C management actions that would limit the requirement for paleontological field surveys to all PFYC Class 4 and 5 formations potentially affected by proposed activities would affect 28,177 acres. Lack of protective measures, including limiting or prohibiting surface-disturbing activities, would subject vegetation to possible direct, moderate, adverse effects by removal or damage to vegetation. Under Alternative C, this could occur in one to five percent of otherwise protected grassland and shrubland communities, therefore, management action for paleontological resources would have minor adverse effects on grassland and shrubland communities.

Visual Resources

Under Alternative C, WSAs and WSRs are managed as VRM Class I (30,103 acres), manage VRI Class II as VRM Class III (167,334 acres), and manage all VRI Class III and IV areas (584,500 acres) as VRM Class IV. Management would be applied at a lower level of VRM class, therefore more surface disturbing activities would be allowed within five to ten percent

of grassland and shrubland communities. This would have a direct, moderate, adverse effect on vegetation over the long term.

Land Resources

Forest Products

No effects are anticipated from forest products management actions.

Lands and Realty

Alternative C management actions would not pursue land disposals, acquisitions, easements, or land tenure adjustments for lands holding custodial grazing allotments, and sales independent of other resource values. Lands otherwise available for these actions contain greater than ten percent of the grassland and shrubland communities in the planning area, therefore, effects to grasslands and shrublands would be indirect, major, adverse, and long term.

Renewable Energy

Alternative C would allow sites and areas for energy development, which would likely involve surface-disturbing activities within greater than ten percent of the grassland and shrubland communities in the planning area. This would have a major adverse effect on grassland and shrubland communities. Under the renewable-energy program for the planning area, overall it is estimated that BLM actions would disturb approximately 40,000 acres over the next 20 years. Reclamation will occur on 22,500 acres (Appendix G (p. 1937)).

Rights-of-Way and Corridors

Alternative C would not apply constraints on ROW and corridor placement or development. Not limiting surface disturbance and not avoiding activities on slopes equal to or greater than 25 percent would have a direct adverse effect (removal) on vegetation over the long term. ROW disturbances are estimated to affect approximately 20,000 acres for pipelines and 84 acres for communications sites during the planning period; successful (100%) reclamation is estimated to occur on all affected acres. Roads are estimated to affect 27,825 acres, with successful reclamation on approximately 12,800 acres; the remaining 15,025 acres would experience long-term disturbances on public lands. Powerlines are estimated to affect approximately 7,374 acres, with successful reclamation on approximately 737 acres and 6,637 acres of long-term disturbance (Appendix G (p. 1937)). ROWs and corridors, under Alternative C would be permitted in one to five percent of the grassland and shrubland communities in the planning area; therefore, the adverse effects would be moderate.

Travel and Transportation Management

Alternative C management actions would allow motorized vehicles within the stock driveways, on saturated soils and on slopes greater than 25 percent, and in special species habitat. These actions would have a direct, long-term, moderate adverse effect by not protecting the soil or vegetation resources within five to ten percent of the grassland and shrubland communities in the planning area.

Recreation

Alternative C management actions include designation six areas as SRMAs with no consideration to additional lands for SRMA designation, leasing minerals in accordance with management for areas surrounding SRMAs, and allowing surface disturbance and salable minerals development in the six designated SRMAs. Mineral leasing and surface disturbance would be allowed, this would have a direct adverse effect on vegetation over the long term. Visitor use

and access is promoted in SRMAs, which would increase popularity and visitation, increase vegetation disturbance from trampling, and increase the potential for invasive plant species introduction and spread. This would also have a direct and adverse effect over the long term. SRMAs encompass less than ten percent of the grassland and shrubland communities in the planning area; therefore, the management actions for recreation under Alternative C would have negligible adverse effects on them.

Lands with Wilderness Characteristics

Alternative C management actions include managing the Land with Wilderness Characteristics areas the same as the surrounding areas. There are no significant protective measures for the surrounding areas therefore the management actions. Effects on grasslands and shrublands from these actions would be indirect, minor, adverse, and long term as vegetation removal could occur in one to five percent of grassland and shrubland communities in the planning area that are present in lands with wilderness characteristics.

Livestock Grazing Management

Alternative C management actions include allowing increases in livestock stocking rates as a result of vegetative treatments and providing a maximum of two years rest following prescribed fire, wildfire (in lieu of an approved plan), and other vegetative treatments. This would compromise the health of vegetative communities. Livestock are often attracted to new vegetation following vegetative treatments and fires. If not monitored, these sites can be over utilized, and increasing stocking rates could compound the issue. Two years of rest might not be sufficient to achieve preferred ecological state and vegetation management goals. Grazing of young seedling plants would reduce their ability to compete with more aggressive plants, which often are invasive or less palatable and less nutritious species.

Estimates of surface disturbances in the planning area over the next 20 years for range improvement projects include spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately four acres, with successful reclamation on two acres and two acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and five acres as long-term disturbance. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and 30 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1937)).

Overall, Alternative C livestock grazing management allotment occur in greater than ten percent of the grassland and shrubland communities in the planning area, therefore, the management actions under this alternative would have a major adverse effect on them.

Special Designations

Areas of Critical Environmental Concern

Alternative C would not designate ACECs. Lack of designation would allow these areas that contain less than ten percent of the grassland and shrubland communities in the planning area to be eligible for surface-disturbing activities, among other actions, which would have a direct, negligible, adverse effect on vegetative communities.

Scenic or Back Country Byways

No evaluation of the road system for potential designation would occur. Activities would not

be discouraged based on scenic values. This management would have no effect on grasslands and shrublands.

Wild and Scenic Rivers

Alternative C management would be the same as management in the surrounding areas until Congress acts. Rather than developing a specific management plan for this area, these management actions would be generic. The Middle Fork Powder River area contains less than one percent of the grassland and shrubland communities in the planning area. Grassland and riparian communities would indirectly benefit over the long term from this management action, but likely not to the same degree as the more protective measures under a specific management plan.

Wilderness Study Areas

There are three WSAs in the planning area totaling 28,931 acres and encompass less than one percent of the grassland and shrubland communities in the planning area. Alternative C management would be the same as management in surrounding areas, which would be generic and might not address all resource issues. This would have an indirect, negligible, adverse effect on grassland and shrubland communities over the long term.

Socioeconomic Resources

No effects are anticipated from socioeconomic resources management actions.

4.4.2.6. Alternative D

This section describes management actions under Alternative D, which presents the **Proposed RMP**, a compromise between resource conservation and resource use, and the potential impacts to grasslands and shrublands from those management actions.

Vegetation – Grassland and Shrubland Communities

Under Alternative D, allowing non-native plant species for initial reclamation practices would provide another tool for achieving reclamation goals. These species would only be used on those sites where native species have proven not to establish or the timing of native plant seedling establishment is not conducive to establishment (months of low precipitation with higher climatic temperatures). Plant establishment is critical to prevent erosion of soil and reduce the opportunities for invasive species establishment. It is anticipated that non-native species would be used in the short term (one to three years). As stated in Chapter 2 of the Integrated Vegetation Management Handbook (H-1740-2) (BLM 2008c); it is the policy of the BLM to manage for biologically diverse, resilient and productive native plant communities to sustain the health and productivity of the public lands. This policy recognizes that, for a variety of reasons, not every acre of public land will contain native plants and that, in certain circumstances to prevent further site degradation and improve functionality, non-native plants may be used as part of post fire stabilization and rehabilitation activities as well as in restoration to achieve short-term site stabilization objectives. However, where practical, uses and activities will be conducted to favor the health and persistence of native plant communities where they currently exist and rehabilitation or restoration actions will be undertaken to improve their diversity, resiliency and productivity. The policy in BLM Manual 1745 requires that native species shall be used except under limited circumstances. Diverse, healthy, and resilient native plant communities provide the greatest opportunity to be successful in meeting multiple use objectives. Although native plants are always given first consideration, as a last resort, it may be beneficial to introduce non-native, non-invasive plant materials to break unnatural disturbance cycles or to prevent

further site degradation by noxious or invasive plants (H-1740-2) (BLM 2008c) and promote native species development by creating a favorable environment for native species success. Use of non-native species could have the direct benefit of quickly establishing vegetation on sites, stabilizing soils, and reducing the opportunity for erosion and invasive species establishment. This would directly benefit vegetative communities over the short and long terms. Non-native species could outcompete native plants for water and soil nutrients and move out of their original niche and become an invasive. These outcomes would have a direct adverse effect on grasslands and shrublands. There also would be a small potential risk of non-native species cross pollinating with native species.

Physical Resources

Air Quality

Effects to grassland and shrubland associated with air quality management actions in Alternative D would be the same as those described in Alternative B.

Soil

Surface-disturbing activities would be allowed under Alternative D when soil resource objectives can be met. Development on and disturbance of sensitive soils would have approved site-specific construction, stabilization, and reclamation plans to conserve the soil resource and meet reclamation and resource objectives. Alternative D would avoid surface disturbances on badlands, rock outcrops, and slopes susceptible to mass movement unless site-specific construction, stabilization, and reclamation plans to conserve the soil resource and meet reclamation and resource objectives are submitted and approved.

Alternative D would allow development on a total of 3,285,316 acres (within greater than ten percent of the grassland and shrubland communities in the planning area). Alternative D would have a direct, long-term, effect on grassland and shrubland communities. Under Alternative D, restrictions for construction on sensitive soils will likely be permitted and would have major adverse effects on grassland and shrublands in the planning area.

Water Resources

Alternative D would allow surface disturbances within 500 feet of springs, water wells, perennial streams, CBNG reservoirs, and non-CBNG reservoirs (within one to five percent of the grassland and shrubland communities in the planning area) in accordance with identified criteria and based on management decisions considering other resource values. This management would have a direct, long-term, beneficial effect on grasslands and shrublands. Disturbance in these areas would have a direct adverse effect on vegetation and water quality in these sensitive sites; however, meeting the stipulations and criteria would reduce the areas where development could occur and would minimize adverse effects. Allowances for on-channel reservoirs could have a direct adverse effect on vegetation.

Cave and Karst Resources

Alternative D management actions include establishing project-specific buffers (100 feet, for a total of 11 acres of protection – less than one percent of the grassland and shrubland communities in the planning area) from significant cave entrances to protect caves from timber sales and surface-disturbing activities. This would have a negligible, beneficial effect on grasslands and shrublands over the long term.

Mineral Resources

Locatable Minerals

In addition to areas currently withdrawn or restricted, Alternative D includes a number of new areas to conserve other resource values; this would leave 4,720,586 acres open to mineral entry, with 82,691 acres recommended for withdrawal from mineral entry in addition to the 11,373 acres of existing withdrawals. Grassland and shrubland communities would directly benefit over the long term from the additional withdrawn acreage. However, in the greater than ten percent of the grassland and shrubland communities in the planning area where development did occur, any related actions that disturbed the surface would have a direct and adverse effect until successful reclamation is achieved. Under the locatable minerals program for the planning area, overall it is estimated that BLM actions would disturb approximately 1,252 acres over the next 20 years. Reclamation would occur on 329 acres (Appendix G (p. 1937)). This long term disturbance would have a direct major adverse effect on the vegetative communities.

Leasable Minerals – Coal

Federal coal minerals are likely to be developed in areas identified as acceptable for further coal leasing consideration. In areas where coal development does occur, or where gasification facilities are constructed, grasslands and shrublands would be directly and adversely affected for the life of the project until reclamation goals and objectives are achieved.

Leasable Minerals – Fluids

Alternative D would make lands available for fluid minerals leasing and exploration in accordance with management identified to conserve other resources within greater than ten percent of the grassland and shrubland communities in the planning area. This management would make a total of 79,777 acres of federal land closed to minerals leasing. Overall, it is estimated that BLM's actions would disturb approximately a total of 14,869 acres over the next 20 years. Reclamation would occur on 8,127 acres (Appendix G (p. 1937)). This long-term disturbance of 6,742 acres would have a direct major adverse effect on vegetative communities.

Salable Minerals

Alternative D would open 2,725,060 acres of federal minerals to salable minerals exploration and development and would close 623,061 acres. Salable are not predicted to impact large acreage but where salable minerals are leased and developed (within greater than ten percent of the grassland and shrubland communities in the planning area), vegetation would be directly and adversely impacted by the mechanical removal or damage to the vegetation; soils also would be directly and adversely impacted until reclamation goals and objectives are met. For salable minerals development over the next 20 years, the estimated areas of surface disturbance would be 1,193 acres disturbed, 224 acres reclaimed, and 969 acres of long-term disturbance (Appendix G (p. 1937)).

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative D, response to wildland fires would vary from full suppression in areas where fire is undesirable, to monitoring fire behavior in areas where fire can be used as a management tool based on resource goals and objectives. Alternative D prohibits heavy equipment use within specifically identified areas totaling approximately 503,612 acres of public land except when human safety is at risk or if the effects of fire would cause more resource damage than the use of heavy equipment. Prohibiting heavy equipment would directly benefit vegetation over the short and long terms. Full protection strategies and tactics would be used in designated areas on approximately 38,760 acres. All protective measures have a direct, long-term, negligible,

beneficial effect on vegetation. All fires would be evaluated for rehabilitation and severity of impacts. Alternative D would use prescribed fire, wildland fire, and other vegetative treatments to meet management objectives. Effects from management actions would be direct, beneficial and long term.

Biological Resources

Vegetation – Forests and Woodlands

No effects are anticipated from forests and woodlands management actions.

Vegetation – Riparian/Wetland Resources

Alternative D would allow surface-disturbing activities when riparian/wetland and other resource objectives can be met on 23,831 acres (one to five percent of the grassland and shrubland communities in the planning area). Reclaiming vegetation on all CBNG riparian and wetland systems in accordance with ecological site protection measures would achieve returning all water-affected systems to their pre-CBNG natural state. These actions would have an indirect, minor, beneficial effect on vegetation.

Invasive Species and Pest Management

Alternative D would allow aerial application in areas where topography, extent of infestation, target species, and timing limit other application methods. Areas with annual bromes would be designated and prioritized for treatment. These actions would have a direct, moderate, beneficial effect on vegetative communities over the long term.

Fish and Wildlife Resources – Fish

Alternative D management actions would consider fish and fish habitat in reservoir, riparian/wetland systems, and perennial water management. Alternative D would apply constraints on surface-disturbing and disruptive activities providing protection of vegetation, soils, and soil microbial activity from surface-disturbing activities within greater than ten percent of the grassland and shrubland communities in the planning area; therefore, the management actions for fish under Alternative D would have major beneficial effects on grassland and shrubland resources.

Fish and Wildlife Resources – Wildlife

Alternative D would prohibit surface disturbance and occupancy in established big-game winter ranges, unless in doing so, the resource objectives are achieved. Any limitations, restrictions, or prohibitions on surface-disturbing activities and motorized travel would directly benefit greater than ten percent of the grasslands and shrublands communities over the long term. Activities that enhance habitat for wildlife would likely have a direct, major, beneficial effect on grassland and shrubland communities over the long term.

Special Status Species – Plants

Alternative D management actions would allow surface-disturbing activities, ROW, and motorized travel in habitats of special status plant species (126,811 acres, or 17%, of public land – five to ten percent of grassland and shrubland communities), but not in the area of known populations. This would have a moderate beneficial effect long term.

Special Status Species – Fish

Alternative D management actions would prohibit surface-disturbing and disruptive activities within 0.25 mile of any water that contains special status fish species (818 acres). This area of restriction also encompasses one to five percent of the grassland and shrubland

communities in the planning area. This action would have a direct, minor, beneficial effect on grasslands and shrublands over the long term.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative D would allow surface-disturbing and disruptive activities in active prairie dog colonies, within defined criteria, that do not adversely affect special status wildlife species that depend on the habitat provided by the colonies. Allowing these activities in prairie dog habitat would further impact vegetation that is already in a lower ecological state and increase the opportunity for resident cheatgrass to spread. Adverse effects to grasslands and shrublands would be direct and long-term.

Alternative D management actions would prohibit renewable-energy projects in Greater Sage-Grouse Priority Habitat Area. Actions also would prohibit or avoid surface-disturbing activities during specific periods within a specified distance from designated leks, identified nesting and early brood-rearing habitat, and Greater Sage-Grouse winter habitat. There would be no more than 5 percent removal of sagebrush habitat in Priority Habitat Area; outside these areas there would be no limitation on the amount of sagebrush removal. Decisions would also be based on management of occupied Greater Sage-Grouse habitats and Priority Habitat Area of Greater Sage-Grouse. In addition, lands that meet identified criteria would be prioritized for restoration to Greater Sage-Grouse habitat. These would have beneficial effects on vegetative communities.

Alternative D management actions would allow surface-disturbing and disruptive activities in accordance with defined criteria in known areas of special status amphibian and reptile species and their habitats. Known populations would be protected with an additional 1,640 feet (500 meter) buffer. This would affect approximately 176,636 acres, and would have a direct, beneficial effect over the long term.

Overall, protective measures for special status wildlife species would also conserve vegetation within greater than ten percent of the grassland and shrubland communities in the planning area; therefore, management actions for special status wildlife resources under Alternative D would have major beneficial effects on these vegetative communities.

Heritage and Visual Resources

Cultural Resources

Alternative D would prohibit surface disturbance in areas with historic properties, or within three miles or the visual horizon (whichever is closer) of historic properties that retain their integrity of setting (approximately 188,488 acres, less than ten percent of the grassland and shrubland communities in the planning area). This would have a direct, negligible, beneficial effect on grasslands and shrublands over the long term.

Paleontological Resources

Requiring paleontological field surveys and initiating protective measures would protect vegetation from possible large-scale surface disturbance within one to five percent of the grassland and shrubland communities in the planning area. This could affect up to 754,668 acres of public lands. This would result in a minor beneficial impact on grasslands and shrublands.

Visual Resources

Under Alternative D, VRI Class II areas and special emphasis areas (SRMAs, ACECs, etc.) would be managed as VRM Class II. All VRI Class III areas, plus the Powder River Breaks and Fortification Creek, would be managed as VRM Class III. VRM Class I and II areas could

prohibit or limit some surface-disturbing activities. VRM Class III and IV areas would have some limitations that could allow surface-disturbing activities. Overall, these management actions would occur in greater than ten percent of the grassland and shrubland communities in the planning area and, therefore, have a direct, major, beneficial effect on them over the long term.

Land Resources

Forest Products

No effects are anticipated from forest products management actions.

Lands and Realty

Alternative D management actions would pursue land disposals, acquisitions, easements, or land tenure adjustments for lands holding custodial grazing allotments, and sales in accordance with other resource values within greater than ten percent of the grassland and shrubland communities in the planning area. As they pertain to the overall management of public lands if pursued and completed, these actions would improve public land management overall and would have an indirect, long-term, major, beneficial effect on grassland and shrubland communities.

Renewable Energy

Alternative D management actions would exclude renewable-energy development in the southern Big Horn Mountains, areas closed to mineral leasing for fluids and solids, locatables, salables, ROW exclusions areas, and other areas where surface disturbance is prohibited for a total exclusion acreage of 396,995 public land acres. Renewable energy development would also be avoided on 340,912 public land acres, leaving less than 6 percent of public land available for development. (See Map 56 for specific locations.) Under the renewable-energy program for the planning area, overall it is estimated that BLM actions would disturb approximately 75,240 acres over the next 20 years. Reclamation would occur on 50,240 acres (Appendix G (p. 1937)). This management would have a minor adverse, and long term effect on the vegetation.

Rights-of-Way and Corridors

Alternative D management actions would exclude 79,777 acres from ROW development and avoid an additional 321,149 acres. Newly proposed transmission lines and ground facilities would be allowed within existing ROW and other disturbance areas. ROW activities would be avoided on slopes equal to or greater than 25 percent and on highly erodible soils. All these actions would have a direct, beneficial effect on grasslands and shrublands over the long term (Appendix G (p. 1937)). ROW disturbances are estimated to affect approximately 14,000 acres for pipelines and 56 acres for communications sites during the planning period; successful reclamation is estimated to occur on all affected acres. Powerlines are estimated to affect approximately 4,916 acres (1,900 miles), with successful reclamation on approximately 491 acres, leaving 4,425 acres of long-term disturbance (Appendix G (p. 1937)). These disturbances are allowed to occur within one to five percent of the grassland and shrubland communities in the planning area; therefore they would have minor adverse effects on those resources.

Travel and Transportation Management

Alternative D would close special designation areas to motorized vehicle use. Motorized vehicle use in stock driveways would be allowed on designated routes. Motorized vehicle use would be allowed with travel management designations in SSS habitat and on saturated soils or on slopes 25 percent or greater if resource management objectives can be met. Alternative D would limit motorized vehicle travel to designated roads and trails, consistent with management of other resources and would seasonally prohibit travel in game ranges. Alternative D management actions

would allow disturbance in less than one percent of the grassland and shrubland communities in the planning area and would have a direct, negligible adverse effect on grassland and shrubland communities over the long term.

Recreation

Alternative D management actions to designate seven specified areas as SRMAs, 54,160 acres, with possible consideration of additional lands for SRMA designation, and prohibiting surface disturbance in designated SRMAs unless for administrative use would generally help protect, maintain, and enhance vegetative resources. Alternative D allows additional recreation facilities consistent with other resource values, these would have a direct adverse effect on vegetation in and around the facilities over the long term. Visitor use and access is promoted in SRMAs, which would increase popularity and visitation and increase vegetation disturbance from trampling and increase the potential for introduction and spread of invasive plant species. SRMAs under Alternative D encompass one to five percent of the grassland and shrubland communities in the planning area. Alternative D management actions would have a minor adverse effect on grasslands and shrublands over the long term.

Lands with Wilderness Characteristics

Alternative D actions would include managing lands with wilderness characteristics to emphasize vegetative health, natural values, and primitive recreational opportunities on about 6,864 acres along the face of the Big Horn Mountains. These areas would conserve vegetation within less than one percent of the grassland and shrubland communities in the planning area. Managing these lands to those standards would have an indirect, negligible, beneficial effect over the long term.

Livestock Grazing Management

Alternative D management actions include management of Category M allotments would be to achieve multiple resource health and objectives, rather than maintaining a certain number of Category M allotments and Animal Unit Months (AUMs). Range improvements would be developed in accordance with resource needs and livestock management objectives, rather than developing range improvements and then monitoring to detect undesirable changes. AMPs would continue to be developed, but increases in vegetative production would be allocated for watershed protection first, then forage and habitat, rather than allocated for wildlife first, then livestock use. Livestock grazing would be allowed on all public lands except for areas described under Alternative A, with the addition of evaluated areas determined to be incompatible with other resource uses or values such as entrances of caves, campgrounds, and culturally significant sites. Permanent increases in forage allocations would be considered for watershed protection, livestock grazing, wildlife habitat, and other resource values. Rest and deferment following wildfires, prescribed fires, and vegetative treatments would continue until resource objectives were met, rather than based on a specific timeframe. Other management actions that do not address previous decisions include locating livestock salt and mineral supplements, designating future resource reserve common allotments, and allowing increases in livestock stocking rates as a result of vegetative treatments when resource objectives for the project are met. Construction of range improvements would have a direct adverse effect on vegetation for the life of the project but they are a tool for improving grazing management and this would benefit the vegetative communities. All other livestock-related actions would have an indirect, beneficial effect over the long term.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately four acres, with successful reclamation on two acres and two acres of long-term disturbance. Pipelines

are estimated to disturb 40 acres, with successful reclamation on 35 acres and five acres of long-term disturbances. Fences would disturb approximately 38 acres (200 miles), with successful reclamation on approximately 35 acres (140 miles) approximately three acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1937)).

Alternative D livestock grazing management would have a moderate beneficial effect on grasslands and shrublands.

Special Designations

Areas of Critical Environmental Concern

Alternative D management actions include designating two areas as ACECs, which would affect approximately 2,849 acres, including less than one percent of the grassland and shrubland communities in the planning area. The associated management plans for these sites would initiate specific conservation to protect soils and vegetation from surface-disturbing activities. This would have a direct, negligible, beneficial effects over the long term.

Scenic or Back Country Byways

The effects to grassland and shrubland communities from scenic or BCBs under Alternative D would be the same negligible beneficial effects as described in Alternative B.

Wild and Scenic Rivers

The effects to grassland and shrubland communities from WSRs under Alternative D would be the same negligible beneficial effects as described in Alternative B.

Wilderness Study Areas

There are three WSAs in the planning area totaling 28,931 acres, including less than one percent of the grassland and shrubland communities in the planning area. There are restrictions to preserve wilderness conditions in these areas until Congress acts on these WSAs. Designation of these areas and interim management is based on conservation of the natural resources, which would limit vehicular travel and surface-disturbing activities. This management would have a negligible beneficial effect on grasslands and shrublands.

Socioeconomic Resources

No effects are anticipated from socioeconomic resources management actions.

4.4.2.7. Cumulative Impacts

Chapter 4 describes effects to grassland and shrubland plant communities from past and present actions, federal and non-federal as part of the affected environment. Non-federal actions will affect vegetation similar to federal actions but mitigation for effects to vegetation resources would differ between federal and non-federal actions. The primary non-BLM authorized activities in the planning on and adjacent to public land have the potential to affect plant communities by changing species diversification within plant communities, the relative distribution of plant communities, and the relative occurrence of seral stages of those communities. The extent of non-federal activity is several times greater than BLM activities because BLM administers approximately 11 percent of the surface acreage in the planning area. These actions could improve or impair wildlife habitat, soil and water resources, and riparian and wetland habitats,

and those improvements or impairments could extend to other adjacent ownerships. The impacts from adjacent land owners would involve livestock grazing, habitat manipulation, and invasive species. Because of the intermingled ownership pattern, grazing management and the acres of livestock grazing on BLM surface versus non-federal surface does not change appreciably, and acre for acre, similar effects on vegetation would be anticipated.

4.4.3. Vegetation – Riparian/Wetland Resources

This section describes potential impacts to the vegetation in riparian/wetland systems from management actions under other resource programs. Chapter 3 provides a general discussion and information about riparian and wetland community types.

Most riparian lotic (flowing) systems in the planning area originate in the southern Big Horn Mountain watersheds and flow northeasterly to the plains. Other systems, but not all, are found along the major river and stream corridors, such as the Powder River, Crazy Woman Creek, Clear Creek, and Little Powder River. FLPMA and the Wyoming Standards for Healthy Rangelands (Appendix P (p. 2501)) direct the BLM to manage vegetative resources toward the maintenance or restoration of the physical function and biological health of vegetative ecosystems. Objectives are to maintain and improve the health and trend in plant communities that conserve soil and water, and provide forage, wildlife habitat, SSS habitat, recreation, scenic, ecological, and scientific benefits for consumptive and nonconsumptive uses.

Implementing any of the alternatives could cause direct or indirect impacts. Because riparian/wetland systems are limited and are often the most productive lands, humans, livestock, and wildlife disproportionately affect these areas compared to the same types or extent of actions in upland systems. All alternatives usually would avoid or minimize direct effects on riparian and wetland systems whenever possible. An impact to riparian and wetland systems affects the physical, chemical, or biological components of the ecosystem. Actions that contribute to the decline in abundance, distribution, or functionality of riparian and wetland systems would result in adverse effects; beneficial effects would result from activities that protect or restore these habitat types. Direct impacts to riparian and wetland systems result from surface-disturbing activities that remove or mechanically damage vegetation or the ground surface in these systems. Indirect impacts to riparian and wetland systems result from actions within a watershed that cause a change in riparian and wetland functionality (e.g., increased rates of sediment loading or changes in hydrology), a change in water chemistry, and spread of invasive plant species. For purposes of this analysis, short-term effects include actions that contribute to the decline in abundance or distribution of these systems, but can be reclaimed or restored within five years after the action; long-term effects require more than five years to repair or reclaim.

4.4.3.1. Methods and Assumptions

This section describes the methods and assumptions used in the impact analysis for riparian/wetland systems.

Activities affect vegetative resources by altering, disturbing, or removing soil and vegetation. This impacts analysis and conclusions are based on interdisciplinary team knowledge of resources in the planning area, review of existing literature, and information provided by other agencies. Existing literature and analyses include the Buffalo RMP (1985), the PRB EIS (BLM 2003c), and WGFD Spatial Mapping and Analysis. Spatial analysis was performed using the ESRI

ArcGIS Desktop 10.0 computer software. Effects are quantified where possible. In the absence of quantitative data, best professional judgement or interdisciplinary team knowledge was used. Potential impacts are sometimes described using ranges, or in qualitative terms if appropriate. Many impacts are described qualitatively because suitable data are not unavailable.

Assumptions

- Baseline inventory is needed to determine current riparian/wetland health and to develop management plans. The most recent assessment is more than 20 years old.
- Riparian and wetland systems comprise only a small portion of public lands, but offer more species and diversity than any other land type.
- Some riparian systems are evaluated during assessments for the Wyoming Standards for Healthy Rangelands (Appendix P (p. 2501)). Where assessments for healthy rangeland standards have been performed, riparian plant systems are functioning properly or are in the process of achieving PFC.
- Livestock and wildlife use typically is disproportionately higher in riparian and wetland systems than in upland systems. Improper grazing can adversely affect these systems throughout the year, but generally results in greater adverse effects in spring and early summer, when soils are wet (and therefore more vulnerable to compaction) and stream banks are more vulnerable to sloughing.
- It is assumed that the more surface disturbance in a watershed, the greater the probability that excess surface runoff and sediment will enter the stream and contribute to the loss of riparian and wetland functionality.
- Stream channels and land health can degrade quite rapidly. Recovery is often a much slower process. It is generally more efficient to prevent degradation than to recover a degraded system.
- Partnering with adjacent surface owners would allow achievement of PFC or DFC on longer reaches of qualifying streams and systems.
- Wetted systems are known to attract special status plant species, but also invasive plant species.

Significance Criteria

An adverse effect on water resources as a result of project actions would be considered potentially significant if it violates objectives associated with water quality, watershed, and soils management and its magnitude is such that special mitigation is warranted or it persists indefinitely.

Impacts on water quality, watersheds, and soils would be considered significant if any of the following were to occur:

- Unmitigated loss of wetlands or wetland function (EOs 11990 and 11988) or activities that would degrade riparian and wetland systems such that, as a minimum physical state, PFC and Wyoming Standards for Healthy Rangelands (Appendix P (p. 2501)) are not being maintained.
- Streamflow characteristics of perennial streams are altered such that established fisheries, wildlife, livestock, recreation, domestic, municipal, and industrial uses are affected.
- The alteration of stream hydraulic geometry by accelerated runoff and erosion (i.e., undue erosion, sedimentation, or mass wasting) beyond that expected through natural processes.
- The natural flow to or level of groundwater in existing springs, seeps, artesian wells, or permitted water supply wells is reduced to the point where beneficial uses cannot be maintained.
- Water quality is degraded to the level livestock and/or humans avoid it or is not fit for consumption.

4.4.3.2. Impacts Common to All Alternatives

Vegetation – Riparian/Wetland Resources

Riparian systems are some of the most productive ecosystems in the western United States, with a great diversity of plant and wildlife species. Healthy riparian systems purify water by removing sediment as it moves through vegetation. Stream bank erosion is prevented as riparian vegetation absorbs and dissipates the energy of flood waters. They also provide crucial habitat for wildlife, fish, and some SSS.

A baseline riparian inventory and information is needed to establish management goals and objectives and set priorities for these systems. Chapter 3 states the basis for this need – development and implementation of activity plans to manage riparian systems to be at or above, or continue to be improving toward, PFC while achieving Wyoming Standards for Healthy Rangelands. Management plans must be developed and implemented with continued monitoring to maintain, restore, and enhance the health and diversity of plant systems to achieve resource or multi-resource objectives, including but not limited to, improving species richness and plant structure diversity (vertical and horizontal vegetative structure and composition), promoting a variety of age classes, increasing plant densities, reducing or removing undesirable plants, addressing sensitive species concerns, and improving water quality. Riparian and wetland systems are able to recharge and rebound faster than other vegetative systems in the planning area.

For these systems to function properly, partnerships must be developed to enhance and expand these resource systems and to prevent degradation, loss, or destruction of riparian/wetland systems and habitats, regardless of land ownership.

Physical Resources

Air Quality

Adherence to rules and regulations and enhancing cooperative processes are administrative processes that would have no direct effect on riparian/wetland resources. Dust that covers vegetation reduces the photosynthesis process by blocking light and potentially water from reaching the plant cells. Travel on roads that are or will be surfaced with either gravel or scoria, if untreated, would force large amounts of dust into the air; this dust could settle on vegetation. Reducing dust emissions and overall air quality management throughout the planning area would have a major beneficial effect on riparian/wetland resources.

Soil and Water Resources

Management actions aimed at maintaining or improving soil conditions and minimizing soil erosion also would maintain or improve the health of vegetation. Management actions, including managing surface-disturbing activities; managing water resources; managing to achieve PFC, and meeting Wyoming water quality standards would benefit the associated riparian/wetland systems. All these actions would have a direct, long-term, beneficial effect on riparian and wetland systems. Also beneficial would be appropriate actions to improve the biological, chemical, and geomorphic conditions of streams adversely effected by BLM-authorized actions and permitted activities. Management actions common to all alternatives for soil occur within greater than ten percent of riparian/wetland vegetation; therefore they would have major beneficial effects on riparian/wetland resources.

Water quality, watershed, and soils management actions that allow for surface discharge of produced waters into stream channels from oil and gas activities would alter riparian vegetation

to accommodate higher quantity and persistence of flow regimes. Alteration of hydrologic conditions can affect the physical and chemical properties, such as pH, soil salinity, sediment properties, oxygen content, and nutrient availability, in wetlands (BLM 2003c). In ephemeral channels, existing vegetation would be lost through erosional processes. In more stable locations where vegetation could reestablish, composition would be dominated by salt-tolerant species. Perennial drainages would widen and have more defined channels. Where regulated flows mimic natural patterns, site stability would be maintained and vegetative cover and structure would be improved, while composition would shift to more salt-tolerant species. Management actions common to all alternatives for water occur within greater than ten percent of riparian/wetland vegetation; therefore they would have major beneficial effects on riparian/wetland resources.

Cave and Karst Resources

Cave inventories could benefit riparian/wetland resources. Riparian/wetland vegetation communities would be monitored through these inventories. Inventories would occur within greater than ten percent of riparian/wetland communities; therefore, management actions common to all alternatives would have major beneficial effects on riparian/wetland resources.

Mineral Resources

Leasable Minerals – Coal , Locatable Minerals, Leasable – Minerals – Fluids, and Salable Minerals

Coal development occurs primarily in areas identified as acceptable for further coal leasing consideration. Coal resources occur within less than one percent of riparian/wetland communities; therefore, management actions common to all alternatives for coal would have a negligible effect on riparian/wetland resources.

Any lands not withdrawn (closed) to mineral entry, closed to leasing or closed to mineral material disposal are available for exploration or development for locatable, leasable, and salable minerals. Most fluid mineral development occurs in east-central Johnson County, southern Campbell County, and northern and eastern Sheridan County. Most of the headwaters and riparian/wetland systems are a part of the southern Big Horn Mountain watersheds in southwestern Johnson County. For these major riparian and wetland systems, there is minimal conflict with fluid minerals development. For wet systems co-located in CBNG development areas, additional water and modifications (sediments, nutrients, and mineral loading or loss) could modify existing riparian and wetland systems. The largest proportion, approximately 80 percent, of the habitat disturbance would be caused by construction of linear facilities such as pipelines, roads, and powerlines. Straight-line construction of these facilities is the most cost-effective method; therefore, riparian and wetland areas would be in the path of construction. Roads and powerline and pipeline corridors are likely to cross riparian areas in particular. Well pads, compressor station pads, and many water-handling facilities would not cause loss of riparian and wetland systems because they would be located in upland sites. Some of the disturbance would be short term, such as construction of buried pipelines and overhead powerlines, while other disturbances would be long term or essentially permanent, such as construction of roads. The road system, pipelines, and utility corridors associated with minerals activities would affect soil erosion by generating excess overland flow from road surfaces and cut slopes and directing water into channels. The direct discharge of produced water that could reach local riparian and wetland areas also would affect these systems. Increases in surface water flow would have a direct adverse effect on existing riparian and wetland areas due to the large increase in water volume. These

processes can impair stream banks, alter hydrologic functions, and alter the composition and physical structure of riparian and wetland systems.

Habitat loss in riparian and wetland systems would occur directly through construction of roads, pipelines, powerlines, and some water-handling facilities. Habitat loss in riparian and wetland systems can substantially affect plant and animal species that depend on these ecosystems. Many plants grow only in seasonally flooded or saturated soils associated with riparian and wetland systems. These indirect adverse effects would degrade riparian and wetland systems. Roads, well pads, or powerlines adjacent to riparian and wetland systems cause various wetlands species to disappear from physical impacts. Decreases in the species richness can occur due to soil erosion, changes to hydrological patterns, and invasive plant species (BLM 2003c).

Locatable, fluid, and salable minerals are all available within greater than ten percent of riparian/wetland communities; therefore, management actions common to all alternatives for locatable minerals, leasable fluid minerals, and salable minerals would each have moderate adverse effects on riparian/wetland resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

The following management actions would directly benefit riparian/wetland systems: (1) prohibiting the use of retardant or foam within 300 feet of surface water sources, (2) rehabilitating fire lines constructed using heavy equipment, or on steep slopes, to prevent or control erosion, and (3) rehabilitation, including water barring and reseeding. Actions that would prevent water quality impairment and minimize erosion potential would be beneficial. These actions would reduce opportunities for soil and water erosion, thus preventing movement of sediments that could impair water quality and modify streamflow. Minimizing erosion potential would have an indirect, long-term, beneficial effect on riparian and wetland systems. Prohibitions for use of retardants or foam would occur within greater than ten percent of riparian/wetland vegetation communities; therefore, management actions common to all alternatives for unplanned and planned fire would have major beneficial effects on riparian/wetland resources.

Biological Resources

Vegetation – Forests and Woodlands

There are no management actions common to all alternatives for forest and woodland resources; therefore, there would be no effects to riparian/wetland resources.

Vegetation – Grassland and Shrubland Communities

Management actions to: (1) manage vegetative communities in accordance with Wyoming Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management; (2) use an integrated management approach to maintain, restore, and enhance the health and diversity of plant communities; (3) manage grasslands and shrublands; (4) manage planning and development of travel routes, recreational uses, mineral exploration, and development sites; and (5) the siting of facilities and related infrastructure (e.g., utility corridors and roads) and ROW to reduce impacts to vegetative resources all would benefit nearby riparian and wetland systems. Management actions that improve the health of the surrounding upland vegetative community would indirectly benefit riparian and wetland systems. Limiting surface-disturbing activities nearby would directly benefit riparian and wetland systems by reducing opportunities for soil erosion, water erosion and water quality impairment, and limiting the opportunity for invasive plant species to establish and

expand. Grassland and shrubland management actions would have major beneficial effects on riparian and wetland systems.

Invasive Species and Pest Management

Management actions include implementing and maintaining cooperative IPM programs on public lands adjoining deeded and state lands, and limiting surface disturbance to the minimum needed for safe project completion to limit the spread of invasive plant species. These actions would benefit riparian and wetland systems by controlling invasive species regardless of land status. Riparian and wetland systems commonly traverse private, state, and federal lands. Minimizing the area of surface disturbance would benefit riparian and wetland systems by reducing the area of potential invasive species establishment. Management actions also include the use of vegetation products certified to be free of weed seed on all BLM-administered projects and lands. Application of herbicides can be beneficial and adverse, depending on the species being controlled and the herbicide itself. Non-selective herbicides could affect other broadleaf plants (forbs, special status plant species, and shrubs) along with the target species. Certain herbicides are safe for water application and others require a certain buffer, depending on application method (10 feet for hand, 25 feet for boom, and 100 feet for aerial - all BLM standard buffer zones - unless the herbicide label states or recommends a wider buffer). Stricter requirements would be no aerial application within 0.25 to 0.5 mile of wetlands, riparian systems, and aquatic habitats, and no vehicle or hand application within 0.25 mile of these same habitats. The greater the buffer area around sensitive resources where chemicals are applied or mixed, the less potential for impacts to habitats within the buffer area associated with vegetation removal, soil disturbances, or chemical spills. Other implications for establishing buffers in wetlands, riparian systems, and aquatic habitats is the difficulty of treating invasive species in wetland systems. There is the possibility of invasive species spread, which could allow invasive species to out-compete native species and potentially destroy the natural, native riparian/wetland communities.

Salt cedar is a shrub and a concern in some riparian and wetland systems because it transpires large amounts of water, resulting in salinization of soil around the plant (BLM 2007m). This species is a phreatophyte, which is a deep-rooted plant that obtains water from the water table. As a result, salt cedar could outcompete native riparian shrubs and herbaceous plants, thereby radically altering and affecting system functions. Salt cedar does not depend on surface disturbances outside the riparian zone to increase its ability to invade riparian and wetland systems.

Fish and Wildlife Resources – Fish

Providing public access would have a direct adverse effect on riparian and wetland systems over the long term because this activity would promote foot or primitive vehicular trails, which would trample native species and could introduce invasive species to these systems. Providing public access to fish-bearing waters would have an adverse long-term impact. Managing harmful non-native riparian vegetation in river and stream systems important to fish species would promote increased health of riparian systems. Five to ten percent of all riparian/wetland communities within the planning area are located along fish-bearing water systems; therefore, management actions common to all alternatives for Fish and Wildlife Resources – Fish would have moderate beneficial effect on riparian/wetland resources.

Fish and Wildlife Resources – Wildlife

Elk, deer, and pronghorn are attracted to and often congregate in riparian and wetland systems. Extensive browsing of desirable shrubs in riparian habitats could affect the density, height, and vigor of such species as willows, aspen, water birch, cottonwood, dogwood, and currant. In localized areas, elk have substantially affected riparian habitats through trampling, wallowing,

and grazing. Beaver can dramatically change the nature of a stream and the riparian and wetland systems with which it is associated. In most cases, changes to riparian and wetland systems created by beaver activity are beneficial. Management actions maintain or improve important wildlife habitats through vegetative manipulations, habitat improvement projects, and livestock grazing strategies; all these would indirectly improve any associated riparian/wetland systems. Improved habitat would correlate directly to improved health for the riparian zone. If wildlife populations grazed or inhabited riparian/wetland systems to the point of overgrazing and habitat degradation, adverse effects would result. Management actions common to all alternatives for wildlife resources would have a major beneficial effect on riparian/wetland systems.

Special Status Species – Fish and Special Status Species – Plants and Wildlife (including Greater Sage-Grouse)

All measures in all SSS common to all alternatives that protect and enhance SSS habitat in riparian and wetland systems would directly benefit those systems over the long term. These include such actions as assisting authorized agencies in the restoration or reestablishment of SSS habitats; supporting the WGFD in obtaining water rights for the benefit of special status fish habitat; implementing actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate BMPs and reasonable and prudent measures in biological opinions for T&E species. It is possible that special status plant species could take precedence over other native species; protection measures such as limiting or prohibiting treatments of invasive plants and pests, could contribute to the demise of other native species. This would have an indirect, adverse effect for the long term. Special status fish habitats occur within less than one percent of all riparian/wetland vegetation communities within the planning area; therefore, management actions for special status fish species would have negligible beneficial effects on riparian/wetland resources.

Management of SSS generally involves restricting activities in the vicinity of special status plants or occupied wildlife habitat either year-round or during specific times of the year. As a result, riparian and wetland systems in the vicinity of buffer zones of SSS can benefit from less public use. Under all alternatives, no water development or salt, mineral, or forage supplements are allowed in areas inhabited by special status plant species. This restriction will prevent trampling of plants and changes to the soils that support special status plant species.

Habitats important to special status wildlife species occurs within greater than ten percent of all riparian/wetland vegetation communities within the planning area; therefore, management actions common to all alternatives for special status plant and special status wildlife species would have major beneficial effects on riparian/wetland resources.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Management actions include inventories for these resources. Lack of inventories means the locations of significant sites are not known. It is difficult to determine the extent of impacts to riparian/wetland systems from management of these resources. Cultural sites are often found close to streams, natural springs and seeps, and larger waterbodies. Therefore, protecting these cultural sites would directly benefit riparian and wetland systems. However, data recovery excavations would include direct and long-term soil surface disturbance and vegetation removal, but these areas are generally small (less than one acre). Vegetation disturbance would usually be direct and adverse but short term.

Cultural resources occur within greater than ten percent of all riparian/wetland vegetation communities and areas of high paleontological resources occur within five to ten percent of all riparian/wetland communities within the planning area; therefore, management actions common to all alternatives for cultural resources would have major beneficial effects and for paleontological resources moderate beneficial effects to riparian/wetland resources.

Visual Resources

Management of visual resources in VRM Class I and II areas could prohibit or limit some surface-disturbing activities and thereby protect riparian and wetland systems. VRM Class III and IV areas would have minor limitations. Management actions of visual resources that limit or prohibit surface-disturbing activities would have a direct and beneficial effect on riparian and wetland systems. Visual resources would be managed within greater than ten percent of all riparian/wetland vegetation communities within the planning area; therefore, management actions common to all alternatives would have major beneficial effects on riparian/wetland resources.

Land Resources

Forest Products

Prohibiting timber harvest within 200 feet of surface waters would directly benefit riparian and wetland systems over the long term; the fewer disturbances, the fewer impacts to the resource, including reducing the opportunity for invasive species to establish. Building roads and trails for timber removal would also need to be included in this management action to minimize potential soil erosion and water quality impairment. Forest products occur within less than one percent of all riparian/wetland communities within the planning area; therefore, management actions common to all alternatives for forest products would have negligible beneficial effects on riparian/wetland resources.

Lands and Realty

Considering land use authorizations (e.g., permits and leases) on a project-specific basis consistent with other resource objectives, and withdrawals from surface disturbances and minerals development on a project-specific basis would benefit riparian/wetland resources if those actions are consistent with riparian and wetland resource objectives. Withdrawals would have a direct, beneficial impact by limiting or denying the opportunity for surface disturbance and its associated impacts.

Vegetation on land proposed for exchange or acquisition would be indirectly affected due to a change in ownership and management. Land withdrawals, or available for exchanges and/or acquisitions occur in one to five percent of all riparian/wetland communities within the planning area; therefore, management actions common to all alternatives for lands and realty would have minor adverse or beneficial effects on riparian/wetland resources.

Renewable Energy

Effects are difficult to predict because renewable energy is considered future development, but most impacts are likely to occur from the removal of vegetation to construct these facilities. Most of the planning areas has low potential for wind-energy development; however, one area with high potential is the southern Big Horn Mountains (DOE 2010). Wind-energy development in that area could affect numerous riparian and wetland systems. Wind energy is likely to occur within one to five percent of riparian/wetland communities; therefore management action common to all alternatives for renewable energy will have minor adverse effects on riparian/wetland resources.

Rights-of-Way and Corridors

Most ROWs are associated with mineral development, which is primarily in south Campbell County, east-central Johnson County, and northern and eastern Sheridan County. For systems that might be affected, the effects from surface disturbance would be direct, adverse and long term. Corridors would limit locations and reduce acreages disturbed and would have a direct and long-term effect. ROWs and corridors will likely occur within greater than ten percent of all riparian/wetland communities within the planning area; therefore, management actions common to all alternatives for ROWs and corridors will have major adverse effects on riparian/wetland resources.

Travel and Transportation Management

Management actions to design, construct, and maintain roads and trails in consideration of other resources and to minimize surface disturbance, changes to surface water runoff, and erosion would have a beneficial effect on riparian and wetland systems over the long term. Transportation and access would occur within five to ten percent of all riparian/wetland communities in the planning area; therefore management actions common to all alternatives for transportation and access would have moderate effects on riparian/wetland resources.

Recreation

Management includes avoiding riparian and wetland habitat or developing and managing recreation sites, recreation facilities, and recreation access in a manner that minimizes impacts to riparian and wetland habitats, and prohibiting dispersed camping and commercial camps within 200 feet of surface water. Avoiding riparian and wetland habitat would be a management priority and would directly benefit these systems. However, it might be difficult to control recreation activities in these areas. If not controlled, recreation activities would likely have a direct adverse effect on riparian and wetland systems. Recreational activities will occur within less than one percent of all riparian/wetland communities in the planning area; therefore management actions common to all alternatives for recreation will have negligible adverse effects on riparian/wetland resources.

Lands with Wilderness Characteristics

Areas recognized as having wilderness characteristics would be managed to maintain suitability for preservation as wilderness. This would have indirect, beneficial effects on riparian and wetland systems. Lands with wilderness characteristics encompass less than one percent of all riparian/wetland communities within the planning area; therefore, management actions common to all alternatives would have negligible beneficial effects on riparian/wetland resources.

Livestock Grazing Management

Riparian and wetland systems are more susceptible to grazing impacts during the hot season (July and early August). Livestock are naturally attracted to areas with water and thermal cover. Many grazing management strategies, such as rotation, deferment, rest from use, and the manipulation of season of use and grazing intensity, would be implemented to manage vegetative composition, cover, and vigor to maintain or achieve PFC in riparian and wetland systems. Implementing riparian exclosures would increase the density, age class, and cover of desirable riparian plants, including willow, cottonwood, and herbaceous riparian/wetland plants, within the exclosures. Livestock grazing would reduce vegetative cover and cause surface disturbance from hoof action and compact soils in localized areas. Reducing vegetative cover also would result in increased sediment and salt loads in localized areas, increased surface runoff, and less storage and retention of soil moisture. Management actions include developing and implementing appropriate livestock grazing management actions to achieve Wyoming Standards for Healthy

Rangelands, to improve forage for livestock, improve forage and habitat for wildlife, and enhance rangeland health. Management actions also include managing livestock grazing to sustain riparian, wetland, mountain mahogany, SSS, or other special habitats. Wyoming Standards for Healthy Rangelands standard 2 addresses the health of riparian and wetland vegetation to include structural, age, and species diversity, resiliency and capability to recover from natural and human disturbance, to provide forage and cover, capture sediment, dissipate energy, and provide groundwater recharge. Managing livestock grazing to meet this standard and sustaining special habitats would direct benefit hydrophilic systems over the short and long terms. Short-term management would address each growing season according to precipitation levels and adjust grazing levels if necessary (drought conditions); and long-term management and benefits would be for the term of the grazing lease, generally 10 years. Livestock grazing allotments contain greater than ten percent of all riparian/wetland communities in the planning area; therefore, management actions common to all alternatives for livestock grazing management will have major beneficial effects on riparian/wetland resources.

Special Designations

Areas of Critical Environmental Concern and Wilderness Study Areas

Management actions would emphasize primitive, nonmotorized activities to maintain current natural values. WSA management would prohibit surface-disturbing activities, and land use restrictions in ACECs would limit the extent of surface disturbance. This would directly benefit riparian and wetland systems over the long term because it would minimize potential adverse impacts to vegetation. ACECs and WSAs each contain less than one percent of all riparian/wetland communities in the planning area; therefore, management actions common to all alternatives for both ACECs and WSAs will have negligible beneficial effects on riparian/wetland resources.

Scenic or Back Country Byways and Wild and Scenic Rivers

It is anticipated that these designations would have minimal overlap with riparian and wetland systems. These special designation areas would be managed to maintain or enhance their natural characteristics, which would indirectly benefit any associated riparian and wetland systems over the long term. Although human use of these special designation areas could increase and have an adverse effect on riparian and wetland systems, the affect would be minimal. Scenic or BCBs and WSRs each contain less than one percent of all riparian/wetland communities in the planning area; therefore; management actions common to all alternatives for both scenic or back country byways and WSRs will have negligible beneficial effects on riparian/wetland resources.

Socioeconomic Resources

Social and Economic Conditions

Multiple entities depend on public lands for their livelihoods or a portion of their livelihoods. Public land natural resources also can add to quality of life and monetary benefits can be directly and indirectly derived from activities such as hunting, outfitting, fishing, and guided hunts and tours. These activities can be beneficial and adverse to riparian and wetland systems.

Health and Safety

Management actions designed to prevent accidental spills of hazardous materials would protect riparian and upland systems. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is

a threat of accidents or spills. If there was a spill, mitigation and cleanup would rarely succeed in recovering a riparian or upland area to its original condition; therefore, there would be long-term adverse effects.

The following sections describe impacts by alternative. These impacts would be in addition to the impacts common to all alternatives described above.

4.4.3.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes potential impacts to riparian and wetland systems from management of other resources under Alternative A.

Vegetation – Riparian/Wetland Resources

Current management actions to prohibit surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams, unless the authorized officer waives the prohibition. This management action is adequate to protect these systems and waivers would only be granted as an exception. Waivers could allow direct, adverse effects on these systems and impact water quality over the short and long terms (days to years). Direct impacts result from surface-disturbing and other activities that cause removal of and/or mechanical damage to plants, soil medium, invertebrates, and biological soil crusts, both in terms of amount (overall biomass, density, cover) and in terms of diversity (species presence and richness). Direct impacts may also be the deposition of invasive species individuals or propagules (e.g., seeds or spores), soil compaction and/or erosion.

Physical Resources

Air Quality

The types of effects to riparian/wetland resources from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for air quality (vegetation conservation). In Alternative A, though, these impacts would be analyzed on a project specific basis. Without monitoring or oversight on a programmatic level, lack of consistency would cause the beneficial effects to likely only be negligible. Air quality resource management actions under Alternative A would have negligible beneficial effects on riparian/wetland resources.

Soil

Alternative A soils management would prohibit surface-disturbing activities in established timeframes and on slopes equal to or greater than 25 percent unless the authorized officer waives the prohibition. Waivers allow for inconsistent application of management. Restricting surface-disturbing activities on soils with poor reclamation suitability on a project-specific basis and the closure and reclamation of roads and trails if they are heavily eroded or washed out, or encouraging the use of other access roads in better condition if available are decisions that would direct benefit and protect soils and would therefore benefit and protect vegetative resources. Waivers from these decisions would allow disturbance of the soil surface and removal of or mechanical damage to plants and would have a direct and adverse effect over the long term. These restrictions could occur within greater than ten percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for soils could have major beneficial effects on riparian/wetland resources.

Water Resources

Prohibiting surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams unless the authorized officer waives the prohibition would adequately protect these systems from erosion promoting activities, disturbance of habitat, and invasive species establishment. Waivers would be the exception but allow for inconsistent application of management and could allow activities at distances that could adversely affect water quality and quantity; remove or crush vegetation, thus reducing its ability to hold the soils and filter water. Alternative A does not include decisions addressing on-channel reservoirs; therefore, construction of on-channel reservoirs has become a common means of disposing of CBNG produced water and has resulted in direct adverse effects on vegetation and the overall watersheds. These sites are usually constructed on steep slopes where reclamation would be difficult, and the wetted areas below the dams are havens for invasive plant species such as Canada thistle and salt cedar. Prohibitions for water resources under Alternative A occur within greater than ten percent of all riparian/wetland communities in the planning area; therefore the management actions under Alternative A would have major beneficial effects on riparian/wetland resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Cave and Karst Resources

There are no management actions under Alternative A for cave and karst resources; therefore, there would be no effect to riparian/wetland resources.

Mineral Resources

Locatable Minerals

Under Alternative A, withdrawing the Amsden Creek, E.O. Taylor, and Kerns game ranges 4,583 acres from mineral location and restricting locatable minerals activities in the Fortification Creek, Gardner Mountain, and North Fork WSAs (approximately 28,931 acres) would have a direct, long-term, beneficial effect on riparian and wetland systems at these sites because surface-disturbing activities would not be permitted or would be restricted. Under the locatable minerals program for the planning area, it is estimated that BLM actions would disturb approximately 554 acres over the next 20 years (less than one percent of available acres). Reclamation would occur on 144 acres of BLM actions. Management actions under Alternative A would have negligible adverse effects on riparian/wetland resources.

Leasable Minerals – Coal

Surface-disturbing activities would have a direct adverse effect on riparian and wetland systems in the areas of development. These impacts would be long term for the life of the project. Under Alternative A, coal exploration and development would occur within less than one percent of all riparian/wetland communities; therefore, management actions for coal under Alternative A would have negligible adverse effects on riparian/wetland resources.

Leasable Minerals – Fluids

Alternative A would continue to lease and allow development of federal oil and gas on 1,040,223 acres and would close the WSAs (28,931 acres) to leasing. Oil and gas wells avoid most riparian and wetland systems, but planning for linear construction projects such as pipelines, utility corridors, and roads does not avoid these systems. The road system, pipelines, and utility corridors would affect the frequency and magnitude of runoff, sediment transport, and surface hydrology by generating excess overland flow from road surfaces and cut slopes and

directing water into channels. Construction of reservoirs and ponds and other water disposal methods for CBNG development provide areas of soil disturbance and the perfect medium for establishment of invasive plant species, especially salt cedar. Under the leasable CBNG program for the planning area, overall it is estimated that BLM actions would disturb approximately 2,258 acres over the next 20 years (less than one percent of the total available acres). Reclamation will occur on 903 acres disturbed by BLM actions. Under the leasable oil and gas conventional program for the planning area, overall it is estimated that BLM actions would disturb approximately 8,317 acres over the next 20 years. Reclamation will occur on 5,575 acres disturbed by BLM actions (Appendix G (p. 1937)). Native grasses and forbs would dominate reclaimed sites initially, and forbs and shrubs would return over a longer period. Long-term disturbance, including roads that would be left in place after development, would have long-term effects on surface hydrology by removing vegetation and leaving bare ground, which would increase overland flow and sediment transport. There is no anticipated disturbance from geothermal-related activity. Under Alternative A, fluid mineral exploration and development could occur on greater than ten percent of all riparian/wetland communities; therefore, management actions for fluid minerals under Alternative A would have major adverse effects on riparian/wetland resources.

Salable Minerals

Alternative A would leave the entire planning area available for salable minerals leasing and the associated surface disturbance. This would have indirect and adverse effects on any riparian and wetland systems in these development areas for the term of the leases. However, this alternative prohibits salable minerals actions in the Fortification Creek, Gardner Mountain, and North Fork WSAs (approximately 28,931 acres) which is a direct benefit to those vegetative communities. Over the next 20 years, the estimated acres of salable minerals surface disturbance would be relatively small – 530 acres disturbed, 99 acres reclaimed, and 431 acres long-term disturbance (Appendix G (p. 1937)). Management actions for salable minerals under Alternative A would have negligible adverse effects on riparian/wetland resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Because they are wet, riparian and wetland systems are seldom affected by wildfire or prescribed fires, and certainly not to the degree as their upland counterparts. Over the next 20 years, approximately 14,000 acres are expected to be affected by prescribed fires and all acres are anticipated to be successfully reclaimed. Most of these acres would be grasslands and shrublands, but localized riparian/wetland systems could be affected. Applying different levels of suppression and restricting the use of some types of suppression equipment would have a direct beneficial effect on the vegetation and soils over the short term after any fire. If affected by fire, the short-term effects on vegetation and soils from the fire itself would be direct and adverse. Prescribed fires would be less severe than wildfires because the burn is conducted under controlled conditions (e.g., air and soil temperatures, wind conditions, and fuel types); however, the fires would still destroy any litter on the surface and the current year's growth. All acres affected by fire are expected to be successfully reclaimed. Overall, wildfires would have a minor adverse effect on riparian and wetland systems, and prescribed fires would have a negligible beneficial effect on riparian and wetland systems.

Biological Resources

Vegetation – Forests and Woodlands

No management actions are proposed under Alternative A; therefore no effects are anticipated from forests and woodlands.

Vegetation – Grassland and Shrubland Communities

Currently there are no management actions addressing grassland and shrubland communities. The past decade of energy development has disturbed vast acreages of public land. Reclamation of these lands has been difficult because of a lack of soil structures, limited precipitation, soil textures, inversion of spoil piles, unavailability of seed of preferred species, herbicide application to reclaimed sites, drought, and other reasons. The absence of protective management actions for the vegetative communities has a direct, adverse effect for the long term. Due to the challenges of these projects, energy-development companies have inquired about the use of non-native species (mostly sterile, small-grain cereal crops such as oats, triticale, and barley) for temporary cover on exposed soils until successful reclamation with native species is achieved. Use of non-native species could be a direct benefit by quickly establishing vegetation on sites and reducing the opportunity for erosion and invasive plant establishment. This could indirectly benefit riparian and wetland systems by reducing erosion potential. However, non-native species also could invade outside plant communities and outcompete native plants for water and soil nutrients, which would then make the non-native species an invasive plant. This would be a direct adverse impact. Grassland and shrubland communities indirectly affect (due to their adjacency) greater than ten percent of all riparian/wetland communities in the planning area; therefore, the lack of management actions addressing restoration of grasslands and shrublands would have a major adverse effect on riparian and wetland systems.

Invasive Species and Pest Management

Under Alternative A, control of invasive plant species and pests on public lands (approximately 8,000 acres annually) in cooperation with county weed and pest districts would have direct, short- and long-term, beneficial effects on riparian and wetland systems. Most control efforts include the use of chemical, mechanical and biological means. Controlling weeds by chemical and mechanical methods can directly and adversely affect other plant species. For example, if an herbicide is nonselective for all broadleaf plants, the chemical also could adversely affect forb species. If mechanical methods are used, any plant in the direct path of the application would be affected. Biological methods are generally species specific and effects are adverse, direct, and long term to the host species; other plants benefit indirectly through from improving the health of the vegetative community through the removal of host pest species. Pest control is primarily by chemical application and the effects would be to riparian and wetland systems would be indirect and short term. The quality of habitat may be diminished from vegetation removal by the pest species but the effect would be short term.

Fish and Wildlife Resources – Fish

Under Alternative A, enhancement of fisheries habitat is likely to have direct benefits to riparian and wetland systems. Less than one percent of all riparian/wetland communities in the planning area contain fish-bearing streams; therefore; management actions under Alternative A for fish would have a negligible beneficial effect on riparian and wetland resources.

Fish and Wildlife Resources – Wildlife

Under Alternative A, prohibiting surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek Game Ranges, within 750 feet of sharp-tailed grouse leks, and within 0.5 mile of raptor nests, unless the authorized officer waives the prohibition has a beneficial effect for the long term. If the waiver is executed the surface-disturbing activities

would have a direct, adverse effect on any riparian and wetland systems in those areas, and the effects would continue for the duration of the project or permit (usually 10 or more years). The prohibitions/restrictions would occur in greater than ten percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for wildlife would have major beneficial effects on riparian/wetland resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Special Status Species – Plants

Alternative A does not address the protection of special status plant species. Ute ladies'-tresses orchid can be found in riparian and wetland systems. Currently USFWS guidelines would be followed but there are no additional management actions to protect this or other potential sensitive plant species. Less than one percent of all riparian/wetland communities occur within special status plant habitats; therefore, management actions under Alternative A for special status plant resources would have negligible beneficial effects on riparian/wetland resources.

Special Status Species – Fish

Alternative A does not directly address the protection of special status fish species.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Providing and managing habitat for Threatened, Endangered, and special status wildlife species on all public lands in compliance with the ESA and BLM policy associated with management of habitat would have a direct, beneficial effect on riparian and wetland systems over the long term.

Prohibiting surface disturbance and occupancy with no exceptions would affect approximately 3,594 acres, and prohibiting surface disturbance except when the authorized officer waives the prohibition affects approximately 203,724 acres. Prohibitions leave the soil surface and plant communities intact. Waivers allowing surface-disturbing activities would mechanically damage soils and plants which could promote soil erosion, impair water quality, promote establishment of invasive species, loss of habitat and would have a direct, adverse effect on riparian and wetland systems in those areas, and the effects would continue for the duration of the project or permit (usually 10 or more years).

Establishing a year-round disturbance-free buffer zone for known bald eagle winter roosts would affect approximately 402 acres, and for activity zones for known roosts, would affect approximately 3,013 acres. This management would directly benefit riparian and wetland systems. Prohibiting surface disturbance or occupancy within a biologic buffer zone around active nests would affect approximately 28,437 acres, unless the authorized officer waives the prohibition. Prohibiting surface disturbance would protect plants and soils from mechanical damage, leaving plant communities intact and reducing the potential threat of soil erosion and invasive establishment. Waivers allowing surface-disturbing activities would have a direct adverse effect on riparian and wetland systems, and the effects would continue for the duration of the project or permit (usually 10 or more years).

Alternative A does not address the protection of habitat for amphibians and reptiles. Not restricting or limiting surface-disturbing and disruptive activities would allow these habitats to be compromised, which would have a direct, adverse effect on riparian and wetland systems in these areas.

Overall, the prohibitions/restrictions under this alternative would encompass greater than ten percent of all riparian/wetland communities in the planning area; therefore, the management actions for special status wildlife species would have major beneficial effects on riparian/wetland resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Heritage and Visual Resources

Cultural Resources

Management actions that protect sites of cultural significance would conserve riparian/wetland vegetation that occurs within them. This would have an indirect, beneficial effect on riparian and wetland systems over the long term. Sites of cultural significance and their protective buffers encompass one to five percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for cultural resources would have minor beneficial effects on riparian/wetland resources.

Paleontological Resources

No effects are anticipated from paleontological resources management actions.

Visual Resources

Under Alternative A, the BLM could prohibit or limit some surface-disturbing activities in VRM Class I and II areas and thereby protect any riparian and wetland systems in those areas. VRM Class III and IV areas would have minor limitations on surface-disturbing activities. Prohibitions on surface-disturbing activities for management of visual resources would have an indirect, beneficial effect on riparian and wetland systems over the long term. These visual resources classes encompass greater than ten percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for visual resources would have major beneficial effects on riparian/wetland resources.

Land Resources

Forest Products

No effects are anticipated from forest products management actions.

Lands and Realty

The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for lands and realty actions (habitat loss, fragmentation, and degradation). Under this alternative, lands available for tenure adjustments include those that contain one to five percent of all riparian/wetland communities in the planning area; therefore, the management actions under Alternative A for lands and realty would have minor adverse effects on riparian/wetland resources.

Renewable Energy

Alternative A does not establish guidelines for the development of renewable energy resources. Without management action related guidelines there are no protective measures in place for the resources. This would have an indirect, adverse effect on riparian and wetland systems due to potential loss of vegetation during facility construction. Renewable energy could be permitted within one to five percent of all riparian/wetland communities in the planning area;

therefore, management actions under Alternative A for renewable energy would have minor adverse effects on riparian/wetland resources.

Rights-of-Way and Corridors

Alternative A allows actions that would include installing linear surface-disturbing projects that can transect riparian and wetland systems. Disturbance is usually localized. This alternative could permit ROWs within one to five percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A would have minor adverse effects on riparian/wetland resources.

Travel and Transportation Management

Alternative A limits motorized vehicle use to existing roads and vehicle routes. Closing areas with saturated soils and with slopes equal to or greater than 25 percent to motorized vehicles would directly benefit vegetation, soils, and water quality over the long term. Prohibiting vehicular travel in certain areas, limiting vehicular travel to designated roads and trails in other areas, and seasonally closing areas to vehicular travel would have a direct, beneficial effect on riparian and wetland systems over the long term as it would conserve these vegetative communities. These prohibitions/restrictions would occur in less than one percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for recreation would have negligible beneficial effects on riparian/wetland resources.

Recreation

Recreation site development often is close to perennial water or other natural water systems. Runoff from roads, trails, and established campgrounds results in direct adverse impacts over the long term. Vegetation is removed from these sites and is trampled in adjacent areas. These effects are direct, adverse, and long term. Development of recreation sites is anticipated to disturb approximately 5 acres. Although the estimated impacted acreage is small, the localized impact would be adverse for the long term. Recreational areas occur within less than one percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for recreation would have negligible adverse effects on riparian/wetland resources.

Lands with Wilderness Characteristics

Alternative A does not manage for the protection of wilderness characteristics outside the three WSAs.

Livestock Grazing Management

With proper grazing management and implementation of rangeland improvement projects, the health of riparian and wetland systems can be sustained or improved. The degree and extent of grazing-related impacts to riparian and wetland systems over the long term are expected to continue to decrease. Improper livestock grazing practices adversely affect riparian and wetland systems through soil compaction, physical removal and destruction of vegetation, and trampling of stream banks, causing bank failure. Alternative A prohibits livestock grazing on approximately 10,000 acres where grazing has been determined to be incompatible with other resource uses, values, and locations. Excluding livestock grazing in these sensitive areas directly benefits vegetation. Most of these areas have fragile soil surfaces and steep slopes, and produce little vegetation. Under Alternative A, any permanent increases in the amount of forage produced would be considered for wildlife and watershed protection before additional livestock use is authorized. Providing increases in forage toward habitats and watershed protection would facilitate the healthy ecological state for these resources. This would directly benefit vegetation over the short term. Alternative A does not address the placement of livestock supplements to prevent them

from compromising other resource requirements. This alternative does not address proper rest periods from livestock grazing following prescribed fire and other vegetative treatments.

Estimations for surface disturbance in the planning area over the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 70 acres (80 miles), with successful reclamation on approximately 50 acres (57 miles) and 20 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1937)).

Overall, Alternative A management of livestock grazing would have a minor beneficial effect on riparian and wetland systems.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways

Currently there are no designated ACECs or scenic or BCBs. The lack of designations and lack of management actions leaves nothing to protect their natural values. Riparian and wetland systems can be a part of these special designated areas so a lack of protective management has an indirect adverse effect.

Wild and Scenic Rivers

The Middle Fork Powder River was determined to be eligible and suitable as a WSR and is managed to protect those values. Riparian and wetland systems are a part of the special designation area, the protective management has an indirect beneficial effect. WSRs occur in less than one percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for WSRs would have negligible beneficial effects on riparian/wetland resources.

Wilderness Study Areas

Alternative A management action make WSAs unavailable for mineral leasing in the interim until Congress decides whether to designate the WSAs as Wilderness. Riparian and wetland systems can be found in WSAs, so protection from mineral leasing is a direct benefit long term, unless Congress designates otherwise. Current WSAs contain less than one percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A would have negligible beneficial effects on riparian/wetland resources.

Socioeconomic Resources

No effects are anticipated from socioeconomic resources management actions.

4.4.3.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to riparian and wetland resources due to their implementation.

Vegetation – Riparian/Wetland Resources

Prohibiting surface-disturbing activities for minerals leasing within 500 feet of riparian and

wetland systems, aquatic habitats, and floodplains would directly benefit these systems by reducing the potential for soil and water erosion and the potential to impair water quality. Restoring vegetation on all CBNG-supported riparian and wetland systems, including areas receiving direct-discharge waters, would apply reclamation to all parts of the system. All systems are very susceptible to water-tolerant invasive species such as salt cedar and Canada thistle, and reclamation would establish competitive, native species that would keep the invasive species from establishing.

Physical Resources

Air Quality

Under Alternative B, air quality modeling would be performed on a project-specific basis. In addition, projects expected to approach or exceed emissions standards would be evaluated for potential mitigation strategies, which would have a major beneficial effect on riparian/wetland resources.

Soil

Alternative B soils management actions would include prohibiting surface-disturbing activities on slopes equal to or greater than 25 percent, on soils with a severe erosion hazard and on soils with poor reclamation potential, and on badlands, rock outcrops, or slopes susceptible to mass movement. All these actions would have a direct, beneficial effect on riparian and wetland systems over the long term as they would promote conservation of this vegetation. These prohibitions would occur in greater than ten percent of the riparian/wetland communities in the planning area; therefore, management actions under Alternative B for soil would have major beneficial effects on riparian/wetland resources.

Water Resources

Alternative B water management actions would prohibit surface disturbance within 500 feet of any natural or man-made water feature. This action would prohibit removal of vegetation and disturbance of soil which would reduce potential for soil runoff into nearby water systems; soil runoff could contribute to the impairment of water quality. Other management actions include prohibiting activities that would result in surface discharge of water and prohibiting construction of on-channel reservoirs that could adversely affect natural flow regimes. These actions would have a direct, beneficial effect on riparian and wetland systems by preventing the natural transition of plant species from dry land species to more wetland-tolerant species in riparian and wetland systems, and minimizing the opportunity for invasive plant species to establish on these sites. These prohibitions would encompass greater than ten percent of all riparian/wetland communities in the planning area; therefore management actions under Alternative B for water would have major beneficial effects on riparian/wetland resources.

Cave and Karst Resources

No effects are anticipated from cave and karst management actions.

Mineral Resources

Locatable Minerals

In addition to areas currently withdrawn or restricted from locatable minerals development, Alternative B includes a number of new areas to protect and preserve cultural, paleontological, recreation, lands with wilderness characteristics, and special designation resource values (ACECs, scenic or BCBs, WSRs, and WSAs). This would result in 618,256 public land acres withdrawn.

Existing withdrawals and restrictions were implemented to protect and preserve other resource values. Under Alternative B, withdrawing or restricting additional areas from locatable minerals development would have a direct beneficial effect on riparian and wetland systems over the long term. The majority of the disturbance will not take place in riparian/wetland vegetation types. The management actions for locatable minerals under Alternative B would have negligible adverse effects on riparian/wetland resources.

Leasable Minerals – Coal

Under Alternative B, approximately 28,738 acres would be available to exploration. Where development does occur, vegetation would be directly and adversely affected over the long term for the life of the project and would require successful reclamation to ensure the native vegetative component was reestablished to predisturbance conditions. Under this alternative, approximately 186,600 acres would be disturbed (existing leases and new leases), with reclamation occurring on approximately 120,600 acres, 36,500 acres being actively mined, and approximately 66,000 acres disturbed over the long term (Appendix G (p. 1937)). The majority of the disturbance will not take place in riparian/wetland vegetation types. Management actions under Alternative B for coal would have minor adverse effects on riparian/wetland resources.

Leasable Minerals – Fluids

Alternative B would make lands available for fluid minerals leasing and exploration in accordance with management identified to conserve other resources. This would result in 2,612,920 public land acres (41% of total public land) closed to minerals leasing. This would directly benefit riparian and wetland systems because more acreage would be protected from development over the long term. There is no anticipated disturbance from geothermal-related activities. Overall, Alternative B management of leasable fluid minerals would allow exploration and development in less than five percent of all riparian/wetland communities in the planning area; therefore, management actions for fluid minerals under Alternative B would have minor adverse effects on riparian/wetland resources.

Salable Minerals

Alternative B would close 3,218,690 acres of mineral estate to salable mineral activity. Although a large portion of public land is unavailable, development is localized and small-scale. Under the salable minerals program for the next 20 years, the estimated areas of surface disturbance would be small; 114 acres disturbed, 21 acres reclaimed, and 5,163 acres of long-term disturbance (Appendix G (p. 1937)). The majority of the disturbance will not take place in riparian/wetland vegetation types. Management actions for salable minerals under Alternative B would have negligible adverse effects on riparian/wetland resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Alternative B management actions involving the application of full suppression in areas where fire is undesirable would affect approximately 42,232 acres. Monitoring fire behavior only in areas where fire can be used as a management tool based on resource goals and objectives would directly benefit riparian and wetland systems. Limiting suppression vehicles to existing roads and trails unless they are in identified full suppression areas would affect approximately 739,910 acres, and rehabilitating all fire-related damage also would directly benefit vegetative communities over the short and long terms by reducing the potential for water and soil erosion. Alternative B protected acres would be the same as under Alternative A. Long term, the application of prescribed fire to support riparian and wetland systems and wildlife habitat

objectives is estimated to affect approximately 3,500 acres from BLM actions. All acres would be successfully reclaimed (Appendix G (p. 1937)). This management would have minor beneficial effects on riparian and wetland systems.

Biological Resources

Vegetation – Forests and Woodlands

No effects are anticipated from forests and woodlands management actions.

Vegetation – Grassland and Shrubland Communities

Under Alternative B, authorizing only native plant species for all reclamation activities would promote native species and eliminate or reduce the opportunities for non-native species to be introduced and possibly cross pollinate with native species, outcompete native species for water and soil nutrients, and possibly move off reclamation sites. Native plants can be more difficult to establish than non-native species. Overall, Alternative B management of grasslands and shrublands would have a moderate beneficial effect on riparian and wetland systems.

Invasive Species and Pest Management

Alternative B would control invasive plant species in cooperation with county weed and pest districts. Treating plants on the Wyoming Weed and Pest Control Act Designated List, the appropriate county lists, and other species of concern as determined by BLM resource specialists would treat all species that adversely affect native plant communities. Annual bromes (cheatgrass) are present throughout the planning area; therefore, a treatment management plan addressing cheatgrass should incorporate the entire planning area. Treatment of annuals would improve the ecological state of the vegetative communities. Application of herbicides can be beneficial and adverse, depending on the species being controlled and the herbicide itself. Nonselective herbicides could affect other broadleaf plants (forbs, SSS, and shrubs) along with the target species. Certain herbicides are safe for water application and others require certain buffers depending on application method (10 feet for hand, 25 feet for boom, and 100 feet for aerial are BLM standard buffer zones, unless the herbicide label recommends a wider buffer). The greater the buffer area around sensitive resources where chemicals are applied or mixed, the less potential for impacts associated with vegetation removal, soil disturbances, or chemical spills to the vegetative communities. Other implications for establishing buffers in wetlands, riparian systems, and aquatic habitats are the difficulty in treating invasive species in riparian and wetland systems. Invasive species left untreated have the potential to spread and could outcompete native species and potentially destroy riparian and wetland habitat. This would be a direct adverse impact. All other actions would have direct beneficial effects over the long term (Appendix G (p. 1937)). Overall, Alternative B invasive species and pest management would have a moderate beneficial effect on riparian and wetland systems.

Fish and Wildlife Resources – Fish

Alternative B management actions include introducing, protecting, and enhancing fish populations and habitats and maintaining or enhancing fish habitat with actions that affect perennial waters, reservoirs, and riparian systems to improve or enhance potential fisheries. Management also includes managing fish habitat toward DFC, restoring important instream segments for fish habitat, and designing crossings to allow fish passage. Actions that would improve habitat for fish would directly benefit riparian and wetland systems capable of supporting fish. Prohibiting surface-disturbing and disruptive activities within 0.25 mile of naturally occurring waterbodies would also conserve the riparian/wetland communities within these buffers. The prohibitions encompass less than one percent of all riparian/wetland communities in the planning area;

therefore, management action for fish under Alternative B would have negligible beneficial effects on riparian/wetland resources.

Fish and Wildlife Resources – Wildlife

Under Alternative B, a number of wildlife management actions could be implemented, including distance and timing limitations or prohibitions on surface disturbance or occupancy in and near established winter ranges or big game transition ranges, within traditional big game migration and travel corridors, and in calving areas. These actions would have a direct, beneficial effect by conserving riparian and wetland systems over the long term. These prohibitions/restrictions would encompass greater than ten percent of all riparian/wetland communities; therefore, management actions for wildlife under Alternative B would have major beneficial effects on riparian/wetland resources.

Special Status Species – Plants

Alternative B management actions would prohibit surface-disturbing or disruptive activities in designated areas that contain special status plant habitat. Limiting activities in habitats with known populations of special status plant species would have a direct, beneficial effect on less than one percent of all riparian and wetland systems over the long term. Management actions for special status plants under Alternative B would have negligible beneficial effects on riparian/wetland resources.

Special Status Species – Fish

Alternative B management actions would prohibit surface-disturbing activities, disruptive activities, impoundments, and instream structures on or near existing or potential fisheries sites and fish habitat. This would have a direct, beneficial effect greater than ten percent of all riparian and wetland systems over the long term through conservation of this vegetation. Management actions for special status fish species would have major beneficial effects on riparian/wetland resources.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative B maintenance or enhancement of special status wildlife species habitat would usually have a direct, beneficial effect on riparian and wetland systems unless protective measures compromised the health of the other native species, such as limiting or prohibiting control measures on invasive or pest species.

Alternative B management actions would prohibit renewable-energy projects in Greater Sage-Grouse nesting, brood-rearing, and winter concentration areas. Nesting and brood-rearing activities are often close to riparian and wetland systems. The larger the area protected from surface disturbances the greater the benefit to these vegetative communities. This management would have a direct, beneficial effect on any associated riparian and wetland systems over the long term.

The management action to allow no more than three percent removal of sagebrush habitats per 640-acre section might or might not benefit grassland and shrubland communities and any associated riparian and wetland systems in the affected areas, depending on the ecological condition of the systems and other resource objectives. Greater Sage-Grouse habitat restoration actions, though, would promote increased health of both grassland and shrubland and riparian/wetland systems.

The Alternative B management action to establish a year-round disturbance-free zone for bald eagle roosting and nesting corridors would affect approximately 12,937 acres. This management action would have a direct, beneficial effect on riparian and wetland systems over the long term.

Alternative B management actions that prohibit surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats would affect approximately 176,636 acres. This management would have a direct, beneficial effect on these preferred riparian and wetland sites over the long term.

Overall, prohibitions/restrictions for the conservation of habitats important to SSS wildlife would also conserve over ten percent of all the riparian/wetland communities in the planning area; therefore management actions under Alternative B for special status wildlife species would have major beneficial effects on riparian/wetland resources.

Heritage and Visual Resources

Cultural Resources

Prohibiting surface disturbance in areas with historic properties, or within 5 miles or the visual horizon (whichever is closer), would affect approximately 330,592 public land acres of historic properties. This would have a direct, beneficial effect on riparian and wetland systems over the long term through vegetation conservation. These areas of restrictions would encompass greater than ten percent of all riparian/wetland systems in the planning area; therefore, management actions for cultural resources under Alternative B would have major beneficial effects on riparian/wetland resources.

Paleontological Resources

Requiring paleontological field surveys to determine types and locations of classes, monitoring, and then initiating protective measures, including limiting or prohibiting surface-disturbing activities would protect vegetation from possible large-scale surface disturbance. This could affect up to 754,668 acres of public land. The effect on riparian and wetland systems would be direct and long term. Prohibitions could encompass five to ten percent of all riparian/wetland systems in the planning area; therefore management actions for paleontological resources under Alternative B would have moderate beneficial effects on riparian/wetland resources.

Visual Resources

Under Alternative B, the BLM could prohibit or limit some surface-disturbing activities in VRM Class II areas on about 217,021 acres and thereby protect riparian and wetland systems. VRM Class III and IV areas encompass approximately 276,107 and 258,866 acres respectively on which the BLM would allow surface-disturbing activities with minor limitations. Prohibiting or limiting surface-disturbing activities for management of visual resources would have a beneficial effect on riparian and wetland systems as it would promote the conservation of these vegetative communities. Visual resources class restrictions would encompass greater than ten percent of all riparian/wetland systems in the planning area; therefore management actions under Alternative B for visual resources would have major beneficial effects on riparian/wetland resources.

Land Resources

Forest Products

No effects are anticipated from forest products management actions.

Lands and Realty

No effects are anticipated from lands and realty management actions.

Renewable Energy

Alternative B management actions would exclude development in specific areas on about 730,530 acres of public land. Renewable energy and the related infrastructure, namely roads and pipelines, would likely transect riparian and wetland systems, since the preferred location for development is the higher elevations where the headwaters for riparian systems are located. Under the renewable-energy program for the planning area, overall it is estimated that approximately 5,000 acres would be disturbed over the next 20 years. Reclamation would occur on 4,500 acres, leaving 500 acres of long-term disturbance (Appendix G (p. 1937)). Renewable energy development could be permitted in five to ten percent of all riparian/wetland system in the planning area and would, therefore, have a moderate adverse effect on riparian and wetland systems.

Rights-of-Way and Corridors

Management actions include prohibiting ROW on slopes equal to or greater than 25 percent and on highly erodible soils to minimize impacts to soil resources. Requiring co-location of new communication sites within designated areas, authorizing transmission lines in identified corridors, and avoid constructing facilities along major transportation routes. Linear features such as ROW and utility corridors will transect riparian and wetland systems. Actions that would reduce surface disturbance would directly benefit vegetation over the long term by avoiding or limiting removal or mechanical damage to vegetation and reduce the potential for water and wind to erode soil. ROW development on public land would be excluded on 706,556 acres and avoided on 56,857 acres of public land. Under Alternative B, ROW disturbances for pipelines, communications sites, roads, and powerlines are estimated to affect approximately 32,536 acres (5,750, 28, 9,275, and 2,458 acres, respectively), with successful reclamation on approximately 8,685 acres (5,750, 0, 2,690, and 245 acres, respectively) and 8,826 acres (0, 28, 6,585, and 2,213 acres, respectively) of long-term disturbance (Appendix G (p. 1937)). ROWs and corridors could be permitted in greater than ten percent of all riparian wetland communities in the planning area; therefore, management actions under Alternative B for ROWs and corridors would have major adverse effects on riparian/wetland resources.

Travel and Transportation Management

Alternative B management actions would allow motorized vehicles off designated routes with a special use permit. Management actions would close 625,854 acres to motorized use, including areas with saturated soils or on slopes of 25 percent or greater, in habitat for SSS, special designation areas, and big game ranges during specific timeframes; and also limit travel to designated roads and trails on 137,126 acres. These actions would have a direct, long-term, beneficial effect on riparian and wetland systems by protecting the resources during conditions when soil and plants are highly susceptible to erosion. Prohibiting vehicular travel on saturated soils and requiring closure and reclamation of roads if they are heavily eroded, washed out, or if other access roads in better condition are available would directly benefit vegetative resources. Motorized access would be prohibited on 80 percent of the planning area and because SSS habitat has significant overlap with the riparian/wetland systems in the planning area, management actions for transportation and access under Alternative B would have direct, moderate, beneficial effects on riparian and wetland systems over the long term.

Recreation

Alternative B management actions to designate eight specified areas as SRMAs (55,529 acres) and prohibit surface disturbance in designated SRMAs unless the disturbance is for

administrative purposes would generally help protect, maintain, and enhance vegetative resources. However, the BLM promotes visitor use and access in SRMAs, which would increase the areas' popularity and visitation. This would increase vegetation disturbance from trampling and increase the potential for invasive plant species introduction and spread. The SRMAs would encompass less than one percent of all riparian/wetland systems in the planning area; therefore, management actions for recreation under Alternative B would have negligible beneficial effects on riparian/wetland resources.

Alternative B also proposes to close 372 acres along the Tongue River of the Welch Ranch Recreation Area to Grazing. In the short term this would increase vegetative cover in the riparian area. However, over the long term, vegetation diversity may actually decrease with the absence of grazing. Overall the recreation management actions would have a negligible beneficial effect on riparian/wetland resources.

Lands with Wilderness Characteristics

Alternative B includes management actions for the lands with wilderness characteristics areas, which would directly benefit vegetative communities by limiting surface-disturbing activities in those areas on approximately 12,237 acres. This management would encompass less than one percent of all riparian/wetland systems in the planning area; therefore the management actions for lands with wilderness characteristics under Alternative B would have negligible beneficial effects on riparian and wetland systems.

Livestock Grazing Management

Management actions include limiting or prohibiting livestock grazing where it has been determined to be incompatible with other resource values; locating livestock salt and mineral supplements a minimum of 0.5 mile from water sources, riparian systems, and aspen stands; and authorizing permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority and to livestock grazing as the second priority. All these management actions benefit vegetative communities over the long term.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long term-disturbance. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and approximately 30 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1937)).

Livestock grazing allotments encompass greater than ten percent of all riparian/wetland systems in the planning area. Alternative B livestock grazing management would have a major beneficial effect on riparian and wetland systems.

Special Designations

Areas of Critical Environmental Concern

Alternative B management actions include designating eight areas as ACECs, which would affect approximately 511,000 acres and between one and five percent of all riparian/wetland systems in the planning area. The associated management plans for these sites would initiate specific conservation measures to protect soils and vegetation from adverse effects. This management

would have a direct, **minor** beneficial effect on any riparian and wetland systems in these special designated areas over the long term.

Scenic or Back Country Byways

No effects are anticipated from scenic or BCB management actions.

Wild and Scenic Rivers

Under Alternative B, management would continue in accordance with the Middle Fork Interim Management Plan to retain its free-flowing characteristics and outstanding remarkable values until Congress acts to release or designate the Middle Fork Powder River as a WSR. The Middle Fork Powder River is within less than one percent of all riparian/wetland systems in the planning area. Continuing interim management would have an indirect, negligible, beneficial effect on riparian and wetland systems over the long term.

Wilderness Study Areas

There are three WSAs in the planning area totaling 28,931 acres, containing less than one percent of all riparian/wetland systems in the planning area. There are restrictions to preserve wilderness conditions in these areas until Congress acts on their Wilderness status. Designation of these areas and interim management is based on conservation of the natural resources, which would directly benefit vegetative communities and limit vehicular travel and surface-disturbing activities. This management would have a negligible beneficial effect on riparian and wetland resources.

Socioeconomic Resources

No effects are anticipated from socioeconomic resources management actions.

4.4.3.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to riparian and wetland resources due to its implementation.

Vegetation – Riparian/Wetland Resources

Alternative C management actions would allow surface-disturbing and disruptive activities and apply standard lease terms for minerals leasing within 500 feet of riparian and wetland systems, aquatic habitats, and floodplains. These actions would remove any protective buffer and would directly and adversely affect riparian and wetland systems by promoting activities that lead to erosion of soils and water and impair water quality. Restoring vegetation only on direct CBNG disturbance areas (e.g., dams and reservoirs) rather than on all CBNG-supported riparian and wetland systems would apply reclamation only to a very small number and acreages of the affected systems. These systems would be a catalyst for water-tolerant invasive plant species such as salt cedar and Canada thistle. These management actions adversely effect riparian and wetland systems over the long term.

Physical Resources

Air Quality

There would be no air quality modeling under Alternative C. Industrial projects would be expected to approach or exceed emissions standards, and no mitigation strategies would be examined. This would have indirect adverse impacts to riparian/wetland vegetation. Vegetation is

possibly more sensitive to air pollutants than humans. In particular, acid rain has left areas barren or with severely damaged vegetation. Ground-level ozone and reactive nitrogen can cause discoloration, damage, and loss of leaves, which can reduce photosynthesis by as much as 50 percent. As a result, biologically significant quantities of reactive nitrogen are now reaching the highest places. At lower elevations in the western United States, introduced grasses stoked by nitrogen are overwhelming many ecosystems. Plants also become more vulnerable to attacks by pests, disease, and environmental disasters. Consequently, the plant's ability to store food, grow, and reproduce is hindered. Adverse impacts to vegetation would be major.

Soil

There would be no soils, slopes, or land-type restrictions under Alternative C. Allowing surface-disturbing activities over greater than ten percent of riparian/wetland systems in the planning area would directly remove and mechanically damage vegetation, remove soils and soil microbes, decrease forage availability, remove habitat, and increase the opportunity for invasive species to establish. This would have a direct, major, adverse effect on riparian and wetland systems over the long term.

Water Resources

There would be no constraints on surface disturbance around springs, reservoirs, water wells, and perennial streams or on-channel reservoirs under Alternative C. Damage to vegetation could be allowed within greater than ten percent of all riparian/wetland systems in the planning area. This would have a direct, major, adverse effect on riparian and wetland resources.

Cave and Karst Resources

No effects are anticipated from cave and karst management actions.

Mineral Resources

Locatable Minerals

Alternative C does not include recommendations for new withdrawals or restrictions on locatable minerals development. Lands open to mineral entry (open is about 3,305,032 acres and withdrawn are about 11,373 acres) are consistent with other resource values. Riparian and wetland systems would be directly and adversely affected by not protecting more areas from locatable minerals activities. Under the locatable minerals program for the planning area, overall it is estimated that approximately 1,455 acres would be disturbed over the next 20 years. Reclamation would occur on 378 acres. Of the areas disturbed only a small percentage will be in riparian/wetland systems. Alternative C management actions for locatable minerals would have negligible adverse effects on riparian and wetland resources.

Leasable Minerals – Coal

Alternative C would open all federal coal lands to availability for exploration. Development is only likely to occur in those areas identified as acceptable for further coal leasing consideration. Where development does occur there is a direct and adverse impact to the vegetation through removal and mechanical damage. Effects are long-term until successful reclamation is achieved. Allowing these surface-disturbing activities would have a direct, major, adverse effect on riparian and wetland systems.

Leasable Minerals – Fluids

Alternative C makes all lands administratively available for fluid mineral development. Development would include surface-disturbing activities at the production sites and all

necessary infrastructure. Surface-disturbing activities would have a direct and adverse effect on vegetation for the long term until successful reclamation is achieved. Linear infrastructure supporting these activities would directly and adversely affect riparian and wetland systems. Under the leasable CBNG program for the planning area, overall it is estimated that BLM actions would disturb 13,200 acres over the next 20 years. Reclamation will occur on 5,280 acres. It is estimated that leasable conventional oil and gas program actions would disturb approximately 9,055 acres over the next 20 years. Reclamation will occur on 6,070 acres. There is no anticipated disturbance from geothermal activities. Fluid mineral exploration and development could be permitted in greater than 10 percent of all riparian/wetland systems in the planning area. Alternative C management of leasable fluid minerals would have a major adverse effect on riparian and wetland systems.

Salable Minerals

Alternative C does not recommend new closures or restrictions. The existing closures and restrictions were imposed to protect and preserve other resource values. Not adding areas to be protected from these minerals activities would have a direct, adverse effect on riparian and wetland systems. For salable minerals over the next 20 years, the estimated areas of surface disturbance would be small; 2,090 acres disturbed, 392 acres reclaimed, and 1,698 acres long-term disturbance (Appendix G (p. 1937)). Of the areas disturbed only a small percentage will be in riparian/wetland systems. Management actions for salable minerals under Alternative C would have negligible adverse effects on riparian/wetland resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative C, management actions that involve full suppression regardless of other resource objectives would have a direct adverse effect on riparian and wetland systems. The use of heavy equipment with few constraints would have a direct adverse effect on vegetative communities over the short and long terms by increasing opportunities for water and soil erosion, soil compaction, and invasive plant species establishment. Long-term estimates for the application of prescribed fire to support vegetative communities and wildlife habitat objectives is estimated to affect approximately 42,000 acres. All acres are expected to be successfully reclaimed.

Biological Resources

Vegetation – Forests and Woodlands

No effects are anticipated from forests and woodlands management actions.

Vegetation – Grassland and Shrubland Communities

Under Alternative C, allowing non-native plant species, only if native species will not accomplish initial reclamation objectives, would provide another tool for achieving reclamation goals, but also would provide an opportunity for non-native species to cross pollinate with native species, outcompete native species for water and soil nutrients, and move outside the reclamation area and become an invasive species. Helping to achieve reclamation objectives would directly benefit surrounding plant communities. Overall, Alternative C management of grasslands and shrublands would have a major adverse effect on riparian and wetland systems.

Invasive Species and Pest Management

Under Alternative C, restricting aerial application to only insecticides would limit herbicide applications to motorized vehicle and hand application. This would restrict where application

could occur and the size of treatments, therefore allowing vast acreages (in the case of leafy spurge, which inhabits thousands of acres across multiple landscapes, plant communities, remote locations, and a variety of terrain) to go untreated. This would have a direct adverse effect on upland and hydric plant communities over the long term. Treatments over the next 20 years are estimated to affect approximately 10,000 acres from BLM actions; reclamation would occur on 8,500 acres (Appendix G (p. 1937)).

Annually treating only designated areas for cheatgrass would be ineffective because there would be only small, scattered treatments and most of the cheatgrass would be unaffected. This would have an adverse effect on riparian and wetland systems.

Fish and Wildlife Resources – Fish

Alternative C would not apply constraints on surface-disturbing and disruptive activities, and would apply only the standard lease terms for minerals leasing in naturally occurring waterbodies. This lack of constraints would directly and adversely affect these systems over the long term by promoting surface disturbance, establishment of invasive species, lowering the ecological condition of the sites, and degrading the riparian/wetland communities. These effects would be adverse and long-term. Less than one percent of all riparian/wetland system in the planning area are near fish-bearing streams; therefore, management actions for fish under Alternative C would have negligible adverse effects on riparian/wetland resources.

Fish and Wildlife Resources – Wildlife

Alternative C impacts to riparian/wetland resources from wildlife would be the same minor beneficial effects as described under Alternative A.

Special Status Species – Plants

Alternative C impacts to riparian/wetland resources from special status plant species would be the same negligible beneficial effects as described under Alternative A.

Special Status Species – Fish

Alternative C management actions would prohibit surface-disturbing and disruptive activities if impacts could not be mitigated. Other actions include designing impoundments and instream structures to minimize impacts on or near existing or potential sites and habitats. These actions would reduce, but not prevent, adverse effects. The prohibitions under Alternative C would encompass, and therefore conserve five to ten percent of all riparian/wetland systems in the planning area. Management actions for special status fish under Alternative C would have moderate beneficial effects on riparian/wetland resources.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative C impacts to riparian/wetland resources from special status wildlife species management would be the same minor beneficial effects as described under Alternative A.

Heritage and Visual Resources

Cultural Resources

Alternative C impacts to riparian/wetland resources from cultural resource management would be the same minor beneficial effects as described under Alternative A.

Paleontological Resources

Alternative C management actions that would require paleontological field surveys would affect 28,177 public land acres. Restricting protective measures, including limiting or

prohibiting surface-disturbing activities, would subject riparian and wetland systems to possible large-scale, direct, adverse effects making the benefits negligible.

Visual Resources

Under Alternative C, WSAs and WSRs are managed as VRM Class I, manage VRI Class II as VRM Class III, and manage all VRI Class III and IV areas as VRM Class IV. Management would be applied at a lower level of VRM class, therefore less surface-disturbing activities would be restricted which would have a direct, beneficial effect on vegetation over the long term. Surface-disturbing restrictions would occur in less than one percent of all riparian/wetland systems in the planning area; therefore, management actions for visual resources under Alternative C would have negligible beneficial effects on riparian/wetland resources.

Land Resources

Forest Products

No effects are anticipated from forest products management actions.

Lands and Realty

Under Alternative C, disposing of lands with agricultural potential, water, or important natural resource values would have a minor adverse effect on riparian/wetland resources. Alternative C does not consider these values on a project-specific basis and does not require that these lands be retained based on these important values. Disposal of these lands would dispose of one to five percent of all riparian/wetland systems in the planning area. Management actions for lands and realty under Alternative C would have minor adverse effects on riparian/wetland resources.

Renewable Energy

Alternative C would allow sites and areas for energy development, which would likely involve surface-disturbing activities. The majority of the disturbance would occur on upland sites but development could affect riparian and wetland systems in the southern Big Horn Mountains. This would have a minor adverse effect on riparian and wetland systems as it contains one to five percent of all riparian/wetland systems in the planning area. Under the renewable-energy program for the planning area, overall it is estimated that BLM actions would disturb approximately 40,000 acres over the next 20 years. Reclamation would occur on 22,500 acres. Management actions under Alternative C for renewable energy would have minor adverse effects on riparian/wetland resources (Appendix G (p. 1937)).

Rights-of-Way and Corridors

Alternative C management actions would not place constraints on the development of or the location of ROW and corridors. This management would have a direct adverse effect on vegetation over the long term since there would be no protective measures in place to prevent removal or damage to the vegetation. This could promote erosion of soils by water which in turn could impair water quality in the riparian and wetland systems. ROW disturbances from powerlines, pipelines, roads, and communications sites could occur in greater than ten percent of all riparian/wetland systems in the planning area. Alternative C management would have major adverse effects on riparian and wetland resources.

Travel and Transportation Management

Alternative C management actions would allow motorized vehicles within the stock driveways, on saturated soils and on slopes greater than 25 percent, and in special species habitat. Management actions would close or limit travel to designated routes to motorized vehicle use and would

implement winter closures (November 15 – April 30) on designated big game ranges. These actions would have a direct, long-term, adverse effect on riparian and wetland systems by not protecting the soil or vegetation resources. Transportation and access management actions would be permitted in less than one percent of all riparian/wetland systems in the planning area; therefore management actions for transportation and access would have negligible adverse effects on riparian/wetland resources.

Recreation

Alternative C management actions include designation six areas as SRMAs with no consideration to additional lands for SRMA designation, leasing minerals in accordance with management for areas surrounding SRMAs, and allowing surface disturbance and salable minerals development in the six designated SRMAs. This would have a direct, adverse effect on riparian and wetland systems. The proposed SRMAs encompass less than one percent of all riparian/wetland systems in the planning area; therefore, management actions under Alternative C for recreation would have negligible adverse effects on riparian/wetland resources.

Lands with Wilderness Characteristics

Alternative C management actions include managing the lands with wilderness characteristics areas the same as the surrounding areas. Effects on riparian and wetland systems from these actions would be indirect, negligible and adverse over the long term.

Livestock Grazing Management

Alternative C management actions include locating livestock salt or mineral supplements a minimum of 500 feet from water sources, riparian systems, and aspen stands; vegetative treatments would compromise the health of vegetative systems. Moving supplements only 500 feet away from these sensitive sites would not be adequate to protect these sites. This would have a direct adverse effect on riparian and wetland systems over the long term.

Estimates of surface disturbances in the planning area over the next 20 years for range improvement projects include spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres as long-term disturbance. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and 30 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1937)).

One to five percent of all riparian/wetland systems in the planning area would be protected by these smaller buffers, therefore, livestock grazing management actions under Alternative C would have a minor adverse effect on riparian and wetland resources.

Special Designations

Areas of Critical Environmental Concern

Alternative C would not designate ACECs. Lack of designation would allow these areas to be eligible for surface-disturbing activities and possibly other actions that could adversely alter or impair these systems. The lack of ACEC designation would fail to conserve vegetation in less than one percent of all riparian/wetland systems in the planning area; therefore management actions for ACECs under Alternative C would have negligible, adverse effects on riparian and wetland resources.

Scenic or Back Country Byways

No effects are anticipated from scenic or BCBs management actions under Alternative C.

Wild and Scenic Rivers

Alternative C management would be the same as management in the surrounding areas until Congress acts. Rather than developing a specific management plan for this area, these management actions would be generic. Riparian and wetland systems would indirectly benefit over the long term from this management action, but likely not to the same degree as the more protective measures under a specific management plan.

Wilderness Study Areas

There are three WSAs in the planning area totaling 28,931 acres. Alternative C management would be the same as management in surrounding areas, which would be generic and might not address all resource issues. This would have an indirect, negligible, adverse effect on riparian and wetland systems over the long term as these areas contain less than one percent of all riparian/wetland systems in the planning area.

Socioeconomic Resources

No effects are anticipated from socioeconomic resources management actions.

4.4.3.6. Alternative D

This section describes management actions under Alternative D, which utilizes a combination of resource conservation and resource use, and the likely impacts due to their implementation and potential impacts to riparian and wetland systems from those management actions.

Vegetation – Riparian/Wetland Resources

Alternative D would allow surface-disturbing activities and apply CSU stipulations for any mineral lease within 500 feet of springs, reservoirs, water wells, and perennial streams based on resource values if resource objectives can be met; this management would affect approximately 23,831 acres, greater than ten percent of riparian/wetland systems in the planning area.

Reclaiming vegetation in all CBNG-supported riparian and wetland systems in accordance with ecological site protection would help return water-affected systems to their pre-CBNG natural state. This management would directly benefit riparian and wetland systems by limiting opportunities for invasive species to establish and spread. Reclaiming sites with appropriate native species would sustain vegetative communities over the long term. See Alternative B for systems capable of achieving DFC.

Physical Resources**Air Quality**

Alternative D impacts to riparian/wetland resources from the air quality management would be the same beneficial as impacts under Alternative B (vegetation conservation). Under Alternative D, though, modeling would only occur on a project-specific basis and mitigation strategies would then be developed. The modeling and mitigation would likely occur within greater than ten percent of riparian/wetland systems; therefore, management actions for air quality under Alternative D would have major beneficial effects on riparian/wetland resources.

Soil

Surface-disturbing activities would be allowed under Alternative D in accordance when soil resource objectives can be met. Development on and disturbance of sensitive soils would have approved reclamation and stabilization plans and comply with CSU stipulations. Management actions under Alternative D would avoid surface disturbances on badlands, rock outcrops, and slopes susceptible to mass movement unless resource objectives could be met. Alternative D supported surface disturbance would have a direct, long-term, adverse effect on riparian and wetland systems. However, the established criteria under Alternative D would work toward ensuring projects are capable of being reclaimed before they are approved on greater than ten percent of all riparian/wetland systems in the planning area. Alternative D management actions would have a negligible adverse effect on riparian and wetland systems.

Water Resources

Alternative D water management actions would allow surface disturbance within 500 feet of any natural or man-made water feature in accordance when resource objectives can be met based on management decisions for other resource values; this would affect approximately 19,861 acres, greater than ten percent of all riparian/wetland systems in the planning area. Allowing disturbances in these areas would have a direct and adverse effect on vegetation and water quality at these sensitive sites. Effects would be long-term for the life of the project through approved reclamation. Alternative D would allow on-channel reservoirs. Under Alternative D, CBNG reservoirs would be evaluated to determine whether they could be converted to another use, or should be removed and reclaimed. All water management actions under Alternative D would have a direct, negligible adverse effect on riparian and wetland systems over the long term.

Cave and Karst Resources

No effects are anticipated from cave and karst management actions.

Mineral Resources**Locatable Minerals**

In addition to areas currently withdrawn or restricted under Alternative A, Alternative D includes a number of new areas to conserve other resource values; this would leave 4,720,586 acres open to mineral entry, with 82,691 acres recommended for withdrawal from mineral entry in addition to the 11,373 acres of existing withdrawals. Riparian and wetland systems would directly benefit over the long term from the additional withdrawn acreage.

In riparian/wetland areas where development did occur, any related actions that disturbed the surface would have a direct and adverse effect until successful reclamation is achieved. Under the locatable minerals program for the planning area, overall, it is estimated that BLM actions would disturb approximately a total of 1,252 acres (0.2% of federal locatable minerals) over the next 20 years and reclamation would occur on 329 acres. Given the very small percentage of the planning area that is riparian/wetland vegetation, it is anticipated that the majority of the development would not occur in that vegetation type. Therefore, the long-term disturbance would have a direct negligible adverse effect on those areas.

Leasable Minerals – Coal

Under Alternative D would open all federal coal lands (federal mineral estate for coal retained by the federal government) to exploration. Though all acres are open, actual development is anticipated to occur only in areas identified as acceptable for further coal leasing consideration. A very small percentage of the planning area is riparian/wetland vegetation,

therefore it is anticipated that the majority of the development would not occur in that vegetation type. However, in areas where coal development does occur vegetation would be directly and substantially affected for the life of the project until reclamation goals and objectives are achieved. The long-term disturbance from coal would have a direct minor adverse effect on those riparian/wetland areas.

Leasable Minerals – Fluids

Alternative D would make lands available for fluid minerals leasing and exploration in accordance with management identified to conserve other resources. Effects of conventional oil and gas and CBNG development on riparian/wetlands systems could include: riparian zone soils becoming water logged, salt contamination of the plant root zone, and decrease in plant production. Reduction in plant growth can include grasses, hay crops such as alfalfa, and woody species like cottonwoods. There is no anticipated disturbance from geothermal activities under Alternative D.

This alternative would make a total of 101,214 acres of mineral estate closed to minerals leasing. Therefore, fluid mineral exploration and development could be permitted in greater than ten percent of all riparian/wetland systems in the planning area. However, given the very small percentage of the planning area that is riparian/wetland vegetation, it is anticipated that the majority of the development would not occur in that vegetation type. Also the impacts to riparian/wetland vegetation would be further reduced by applying a CSU stipulation to any fluid mineral lease within 500 feet of riparian/wetlands systems, and aquatic habitats (management action, Riparian – 4009). Therefore, overall the effects on riparian/wetland communities from fluid mineral development would be moderately adverse.

Salable Minerals

Alternative D would open 2,725,060 acres of federal minerals to salable minerals leasing (greater than ten percent of all riparian/wetland systems in the planning area) and close 623,061 acres. For salable minerals development over the next 20 years, the estimated areas of surface disturbance would be 1,193 acres disturbed (Appendix G (p. 1937)). Only a very small portion of this disturbance would impact riparian and wetland vegetation. Management actions for salable minerals under Alternative D would have negligible adverse effects on riparian/wetland resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative D, impacts to riparian/wetlands systems would be similar to effects under Alternative B. However, Alternative D would decrease adverse impacts through rehabilitation after fires on an as-needed basis only; this could result in an increase in natural regeneration of riparian/wetland systems.

Biological Resources

Vegetation – Forests and Woodlands

No effects are anticipated from forests and woodlands management actions.

Vegetation – Grassland and Shrubland Communities

Under Alternative D, allowing non-native plant species for initial reclamation practices would provide another tool for achieving reclamation goals. Non-native species would be used on those sites where soils, topography, and timing are not conducive to native plant seed establishment. It

is anticipated that non-native species would be used on in the short term (1 to 3 years). Use of non-native species could have the direct benefit of quickly establishing vegetation on sites and reducing the opportunity for erosion and invasive species establishment. This would have a major, beneficial effect on riparian and wetland systems as the overall health of these communities would improve in greater than ten percent of all riparian/wetland systems in the planning area.

Invasive Species and Pest Management

Alternative D would allow aerial application in areas where topography, extent of infestation, target species, and timing limit other application methods. Areas with annual bromes would be designated and prioritized for treatment. These actions would have a direct, moderate, beneficial effect on riparian and wetland systems over the long term as the overall health of these communities would improve.

Fish and Wildlife Resources – Fish

Alternative D management actions that would prohibit or limit surface-disturbing activities and project construction, and the application of practices that would enhance fisheries by limiting soil erosion and improving water quality within greater than ten percent of all riparian/wetland systems in the planning area would have a direct, major, beneficial effect on riparian and wetland systems over the long term.

Fish and Wildlife Resources – Wildlife

Alternative D would prohibit surface disturbance and occupancy in established big-game winter ranges, without exception. Activities that enhance habitat for wildlife would likely have an indirect, moderate, beneficial effect on riparian and wetland systems over the long term.

Alternative D management actions would allow surface disturbance or occupancy within a biological buffer zone around nests of conservation concern raptor species with identified criteria. Surface-disturbing activities would be prohibited within USFWS recommended buffers and time periods. These limitations and prohibitions would protect vegetative resources and would have a beneficial effect over the long term.

Any limitations, restrictions, or prohibitions on surface-disturbing activities and motorized travel would directly benefit five to ten percent of all riparian/wetland systems in the planning area over the long term.

Special Status Species – Plants

Alternative D management actions would require plant surveys before placement of water developments, salt, and mineral supplements. Upon completion of surveys, surface-disturbing activities, mineral development, fire suppression activities (outside of human and property safety), and authorized ROWs, would be allowed in habitats but not in known populations. Currently the only known riparian and wetland system dependent sensitive plant species is Ute ladies'-tresses orchid, and these prohibitions would encompass eleven percent of all riparian/wetland systems in the planning area. Management actions for special status plant species under Alternative D would have a direct, long-term, major, beneficial effect on all riparian/wetland resources.

Special Status Species – Fish

Alternative D management actions would prohibit surface-disturbing and disruptive activities within 0.25 mile of any water that contains special status fish species (818 acres), also conserving vegetation in five to ten percent of all riparian/wetland systems in the planning area.

This action would have a direct, moderate, beneficial effect on riparian and wetland systems over the long term.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative D management actions would prohibit surface-disturbing and occupancy in established winter ranges; allow surface disturbance and disruptive activities only when resource objectives can be met; prohibit commercial renewable energy projects in big game winter range, calving areas and identified priority travel corridors. These management actions would be direct if the activities occurred in the riparian and wetland system and indirect if it occurred in the uplands. Effects would be beneficial and long term. Fluid mineral production and by-products are required to be piped out of crucial elk winter ranges and calving areas, unless a suitable alternative is developed. Construction of pipelines would have a direct and adverse effect on the vegetation for the long term.

Alternative D management actions would prohibit renewable-energy projects in Greater Sage-Grouse Priority Habitat Area. Actions also would prohibit or avoid surface-disturbing activities during specific periods within a specified distance from designated leks, identified nesting and early brood-rearing habitat, and Greater Sage-Grouse winter habitat. Inside current Priority Habitat Area are limitations on the amount of sagebrush removal and the number of disturbances allowed.

Alternative D management actions would prohibit surface disturbance and disruptive activities during nesting periods and around active nests for specific times for specific birds. Management actions also would include establishing a year-round disturbance-free buffer zone for known bald eagle winter roosts (402 acres), and a limited-activity zone for known roosts (3,013 acres). These actions would have an indirect, beneficial effect on riparian and wetland systems over the long term.

Alternative D management actions would allow surface-disturbing and disruptive activities only when resource objective can be met in known areas of special status amphibian and reptile species and their habitats. Known populations would be protected with an additional 1,640-foot (500 meter) buffer. This would affect approximately 176,636 acres, and would have a direct, beneficial effect on riparian and wetland systems over the long term.

Overall, management actions under Alternative D that prohibit or restrict surface-disturbing activities, also conserve greater than ten percent of all riparian and wetland systems in the planning area; therefore, they would have a major beneficial effect on riparian/wetland resources.

Heritage and Visual Resources

Cultural Resources

Alternative D would prohibit surface disturbance in areas with historic properties, or within three miles or the visual horizon (whichever is closer) of historic properties that retain their integrity of setting. This area would also conserve greater than ten percent of all riparian/wetland systems in the planning area and would have a direct, major beneficial effect on riparian and wetland resources over the long term.

Paleontological Resources

Paleontological resources of high importance that will be managed under Alternative D are not located within any riparian/wetland systems.

Visual Resources

Under Alternative D, VRI Class II areas and special emphasis areas (SRMAs, ACECs, etc.) would be managed as VRM Class II. All VRI Class III areas, plus the Powder River Breaks and Fortification Creek, would be managed as VRM Class III. VRM Class I and II areas could prohibit or limit some surface-disturbing activities. VRM Class III and IV areas would have minor limitations that could allow surface-disturbing activities. Overall, the management actions restricting surface-disturbing activities would encompass greater than ten percent of all riparian/wetland systems in the planning area and would have a direct, major, beneficial effect on riparian and wetland systems over the long term.

Land Resources**Forest Products**

No effects are anticipated from forest products management actions.

Lands and Realty

No effects are anticipated from lands and realty management actions.

Renewable Energy

Alternative D management actions would exclude renewable-energy development in the southern Big Horn Mountains, areas closed to mineral leasing for fluids and solids, locatable, salables, ROW exclusions areas, and other areas where surface disturbance is prohibited for a total exclusion acreage of 352,068 public land acres. Renewable-energy development would also be avoided on 374,518 public land acres, leaving less than 6 percent of public land available for development (see Map 56 for specific locations). Under the renewable-energy program for the planning area, overall, it is estimated that BLM actions would disturb approximately 75,240 acres over the next 20 years within five to ten percent of all riparian/wetland systems in the planning area. Reclamation would occur on 50,240 acres (Appendix G (p. 1937)). This management would have a moderate adverse effect on riparian and wetland systems.

Rights-of-Way and Corridors

Alternative D management actions would exclude 79,777 acres from ROW development and avoid 321,149 acres. Newly proposed transmission lines and ground facilities would be allowed within existing ROW and other disturbance areas. ROW activities would be avoided on slopes equal to or greater than 25 percent and on highly erodible soils. All these actions would directly benefit vegetation. ROW disturbances are estimated to affect approximately 14,000 for pipelines and 56 acres for communications sites within five to ten percent of all riparian/wetland systems in the planning area during the planning period; successful reclamation is estimated to occur on all affected acres. Powerlines are estimated to affect approximately 4,916 acres (1,000 miles), with successful reclamation on approximately 491 acres, leaving 4,425 acres of long-term disturbance (Appendix G (p. 1937)). This management would have a moderate adverse effect on riparian and wetland systems.

Travel and Transportation Management

Like Alternative B, Alternative D would close special designation areas to motorized vehicle use. Motorized vehicle use in stock driveways would be allowed on designated routes. Motorized vehicle use would be allowed with travel management designations in SSS habitat and on saturated soils or on slopes 25 percent or greater. Alternative D would limit motorized vehicle travel to designated roads and trails, consistent with management of other resources and would seasonally prohibit travel in game ranges. Alternative D management actions would limit access

within five to ten percent of all riparian/wetland systems in the planning area and have a direct, moderate beneficial effect on riparian and wetland systems over the long term.

Recreation

Alternative D designates seven areas as SRMAs (54,160 acres) and eight ERMAs (349,663 acres). Prohibiting surface disturbance in designated SRMAs unless for administrative use would generally help protect, maintain, and enhance riparian and wetland resources. Alternative D allows additional recreation facilities consistent with other resource values which would have a direct adverse effect on vegetation in and around the facilities over the long term. Visitor use and access is promoted in SRMAs, which would increase popularity and visitation and increase vegetation disturbance from trampling and increase the potential for introduction and spread of invasive plant species. The SRMAs would encompass less than one percent of all riparian/wetland systems in the planning area; therefore, management actions for recreation under Alternative D would have negligible beneficial effects on riparian/wetland resources.

Lands with Wilderness Characteristics

Alternative D actions would include managing about 6,864 acres. Managing these lands would conserve vegetation in less than one percent of all riparian/wetland systems in the planning area and have an indirect, negligible, beneficial effect on riparian and wetland systems over the long term.

Livestock Grazing Management

Under Alternative D, range improvements would be developed in accordance with resource needs and livestock management objectives, rather than developing range improvements and then monitoring to detect undesirable changes (as under Alternative A). AMPs would continue to be developed, but increases in vegetative production would be allocated for watershed protection first, then forage and habitat, rather than allocated for wildlife first, then livestock use (as under Alternative A). Livestock grazing would be allowed on all public lands except for areas described under Alternative A, with the addition of evaluated areas determined to be incompatible with other resource uses or values such as entrances of caves, campgrounds, and culturally significant sites. Permanent increases in forage allocations would be considered for watershed protection, livestock grazing, wildlife habitat, and other resource values; under Alternative D, any permanent increases in forage would be considered for wildlife and watershed protection before additional livestock use. Rest and deferment following wildfires, prescribed fires, and vegetative treatments would continue until resource objectives were met. Other management actions that do not address previous decisions include locating livestock salt and mineral supplements as described under Alternative C. Construction of range improvements would have a direct adverse effect on vegetation for the life of the project. All other livestock-related actions would have an indirect, beneficial effect on riparian and wetland systems over the long term.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 38 acres (150 miles), with successful reclamation on approximately 35 acres (140 miles) approximately 3 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1937)).

Restrictions for livestock grazing conserve greater than ten percent of riparian/wetland systems; therefore management actions for livestock grazing under Alternative D would have major beneficial effects on riparian/wetland resources.

Special Designations

Areas of Critical Environmental Concern

Alternative D management actions include evaluating four proposed areas as ACECs, which would affect approximately 2,849 acres, less than one percent of all riparian/wetland systems in the planning area. The associated management plans for these sites would initiate specific conservation to protect soils and vegetation from surface-disturbing activities and would have a direct, negligible, beneficial effect on riparian and wetland systems over the long term.

Scenic or Back Country Byways

No effects are anticipated from scenic or BCBs management actions.

Wild and Scenic Rivers

Under Alternative D, management would continue in accordance with the Middle Fork Interim Management Plan to retain its free-flowing characteristics and outstanding resource values until Congress acts to release or designate the Middle Fork Powder River as a WSR. Continuing interim management in less than one percent of all riparian/wetland systems in the planning area would have an indirect, negligible, beneficial effect on riparian and wetland systems over the long term.

Wilderness Study Areas

There are three WSAs in the planning area totaling 28,931 acres, less than one percent of all riparian/wetland systems in the planning area. There are restrictions to preserve wilderness conditions in these areas until Congress acts on these WSAs. Designation of these areas and interim management is based on conservation of the natural resources, which would limit vehicular travel and surface-disturbing activities. This management would have a negligible beneficial effect on riparian and wetland systems.

Socioeconomic Resources

No effects are anticipated from socioeconomics management actions.

4.4.3.7. Cumulative Impacts

The effects to riparian and wetland systems from past and present actions, BLM-administered and non-BLM projects are included as part of the affected environment. As with water resources in general, adverse impacts to riparian-wetland systems are a product of surface-disturbing activities associated with mineral resource development, motorized vehicle use, road construction, and agricultural land uses. These activities lead to increases in runoff and sedimentation into riparian-wetland areas.

Surface-disturbing activities such as mineral development and road construction impact localized areas of riparian-wetland systems, removing vegetation, compacting hydric soils, and creating a vector for runoff and invasive species establishment. BLM-administered development may have fewer impacts than non BLM-administered projects given the stipulations outlined in this RMP.

Livestock grazing can result in a direct adverse impact to riparian-wetland areas through the removal of vegetation, compaction of riparian-wetland soils, and reduction of bank stability. If prolonged, this activity can lead to a change in plant community that will not support riparian-wetland health and will create a non-functioning system as riparian-wetland-obligate species are replaced by upland species and more salt-tolerant communities. The cumulative impacts to riparian-wetland systems from these activities would vary widely, not only by alternative, but by the individual watershed in which these activities occur.

In forested riparian habitats, the greatest threat is catastrophic fire and the resulting erosion.

The large percentage of riparian/wetland areas on private lands means that actions by private landowners can have substantial impacts on the health of these systems and their performance of critical water quality protection functions. Programs and projects, such as those by County Conservation Districts, the NRCS, and county weed and pest districts, have had success in the implementation of proactive measures to improve riparian habitat and other vegetation and water sources. Cumulative effects on riparian habitats would be varied and site-specific due to the scattered land ownerships along most streams. Management changes implemented on BLM-administered lands to improve riparian conditions also could improve conditions on lands of other ownerships if the same management is applied to those lands.

To manage riparian/wetland areas that occur on BLM-administered lands, alternatives A, B, and D apply proactive management measures that reduce surface-disturbing activities. Active management may be required to meet, or make progress towards meeting resource objectives, such as PFC and *Wyoming Standards for Healthy Rangelands*.

4.4.4. Invasive Species and Pest Management

This section describes potential impacts to invasive species and pest management from management actions under other resource programs. Chapter 3 provides a general discussion and information about invasive species and pest management. Objectives are to maintain and improve the condition and trend in plant communities that conserve soil and water, and provide forage, wildlife habitat, SSS habitat, recreation, scenic, ecological, and scientific benefits for consumptive and nonconsumptive uses.

Most management activities on BLM-administered lands have the potential to introduce or promote the proliferation of invasive plants. Motor vehicles, animal movement, roads, motorized vehicles, livestock, wildlife, and recreation trails and all surface-disturbing activities increase the potential to introduce and spread invasive species.

Actions that contribute to the decline in abundance, distribution, or functionality of native vegetation and promote invasive species result in adverse effects. Conversely, beneficial effects result from activities that protect or restore proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

4.4.4.1. Methods and Assumptions

This section describes the methods and assumptions used in the impact analysis for invasive species and pest management.

Most management activities on BLM-administered lands have the potential to introduce or promote the proliferation of invasive plants. Impact analyses and conclusions are based on interdisciplinary team knowledge of resources in the planning area, best professional judgement, review of existing literature, and information provided by other agencies. Existing literature and analyses include the Buffalo RMP (BLM 1985c), the PRB EIS (BLM 2003c), Vegetation Treatment and Fuels Reduction on Western Public Lands EIS (BLM 2007h). Spatial analysis was performed using the ESRI ArcGIS Desktop 10.0 computer software. Effects are quantified where possible. In the absence of quantifiable data, best professional judgment was used. The term invasive species as used in this section refers to noxious and invasive weeds, including cheatgrass.

Allowable uses and management actions that could affect the spread and introduction of invasive species and pests include all surface-disturbing activities; concentrated livestock and native ungulate grazing; fire and fuels management; recreation, motorized vehicle use, and dispersed travel; and proactive management actions. As the management of invasive and pest species are affected by the alternatives, invasives and pests can, in turn, impact other resources.

Assumptions

- The introduction of invasive species can threaten the stability of ecosystems, create serious human health consequences, and cause substantial economic burdens.
- Surface-disturbing activities, recreation sites, and concentrated grazing (livestock and wildlife) contribute to the introduction and spread of invasive species.
- Invasive species occur in greatest density in areas of past or present surface disturbance. Reclaimed areas can continue to be host sites for these species.
- Invasive species and pest control would be carried out in coordination with the appropriate county weed and pest control district, owners of adjacent property, private industry, and other federal agencies.
- Annual bromes pose a major threat to most vegetative communities and habitats.
- Baseline inventory, establishment of planning units, and an integrated approach are needed for successful management of invasive species.
- Wetted areas provide a haven for invasive species.
- Transportation routes are directly proportional to the opportunities for invasive species to establish and spread.
- Grasshopper outbreaks generally cycle approximately every seven years, last approximately three years, and infest every land type.

Significance Criteria

- Extent of invasive species and pests exceeds the budget for controlling these species and pests.
- Activities or impacts that would encourage invasive species establishment or spread into or adjacent to SSS populations and habitat.
- Excessive limitations on control methods that prevent noxious weed treatment from occurring.

4.4.4.2. Impacts Common to All Alternatives

Management of **Visual Resources, Lands and Realty, Scenic and Back Country Byways, Wild and Scenic Rivers, Social and Economic Conditions, and Health and Safety** would have no effect on invasive species and pest management and are not further addressed in the *Invasive Species and Pest Management* sections.

Invasive Species and Pest Management

Invasive species management actions include efforts to minimize surface-disturbing activities and enforce the use of vegetation products certified to be free of weed seed on all BLM-administered projects and lands to reduce opportunities for invasive species to establish or spread. Pest management actions include managing designated pests on public lands using an IPM approach while working cooperatively with county weed and pest control districts, state agencies, private industry, grazing lessees, and other stakeholders, and working with APHIS as actions relate to insect and other pest control. These actions help mitigate adverse on invasive species and pest management because continued corporation and management of lands promotes restore proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

Physical Resources

Soil and Water Resources

Management actions to evaluate the effects on soils from a proposed surface-disturbing activity using NRCS Soil Survey data and onsite investigation, and actions to ensure authorized surface-disturbing activities will include reclamation plans would facilitate activities in locations where soils are capable of supporting the activities and have the potential to be successfully reclaimed. Both these actions would reduce the potential for invasive species to establish or spread. Management actions include preventing degradation of water quality for all waters and managing water resources to meet the Wyoming Standards for Healthy Rangelands, to achieve PFC, and to meet Wyoming water quality standards. Taking appropriate actions to improve the biological, chemical, and geomorphic conditions of streams affected by BLM-authorized actions and permitted activities would help vegetative and riparian/wetland communities by improving or maintaining the present health of these plant communities. These mitigation measures will help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. This would affect more than 10 percent of the area. All these actions would have a direct, major adverse effect on invasive species and pest management.

Cave and Karst Resources

Management actions to conduct cave inventories and significance determination would gather information important to making management decision on activities near or around cave and karst resources. This would affect less than one percent of BLM-administered lands. Management actions that protect or restore proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread would be negligible beneficial.

Mineral Resources

Locatable Minerals, Leasable Minerals – Coal, Leasable Minerals – Fluids, and Salable Minerals

No coal leases will be issued outside areas identified as acceptable for further coal leasing consideration (BLM 2001a). For other leasable minerals any lands not withdrawn from or closed to minerals exploration and development would be available to locatable, leasable, and salable minerals activities. Areas open to oil and gas leasing would be open to geothermal development. Minerals resource development includes surface-disturbing activities, which provide an opportunity for invasive plants to establish or spread. This would affect more than

10 percent of the area. All these actions would have a direct, major adverse effect on invasive species and pest management because surface-disturbing activity would allow for transport of invasive species seed, crush or removal of vegetation, and expose bare soils where invasive species could establish.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Management actions include rehabilitating firelines that were constructed using heavy equipment and firelines on steep slopes to prevent or control erosion. Rehabilitation would include, but not be limited to, water barring and reseeded. These actions would facilitate reclamation of soil disturbances, which would reduce the opportunity for invasive species to establish. Most wildfires are weather related and the primary ignition source is fine fuels (dormant grasses), especially cheatgrass. Cheatgrass responds positively (establishes and spreads) to burning and to surface-disturbing activities. The effects of wildfires are generally negligible because major events occur only every five to seven years. Rehabilitation and reclamation following wildfires, prescribed fires, surface disturbance associated with fireline construction and the use of heavy equipment, and other fire suppression activities are integral to protecting vegetative communities and watersheds from erosion. This would affect less than one percent of the area. This reduces the opportunity for invasive species to establish or spread, which would have an indirect, negligible, beneficial effect on invasive species and pest management.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Managing vegetative communities (Map 25) in accordance with the Wyoming Standards for Healthy Rangelands and managing to protect, preserve, or enhance plant communities would reduce opportunities for and reduce existing impacts from invasive species. Managing the planning and development of travel routes, recreational uses, minerals exploration and development, ROW, siting of facilities and related infrastructure (e.g., utility corridors and roads) to reduce impacts to vegetative resources also would reduce opportunities for invasive species to establish or spread. Using an integrated management approach (e.g., mechanical, chemical, and biological treatments, prescribed fire, and grazing management techniques) to maintain, restore, and enhance the health and diversity of plant communities to achieve resource or multi-resource objectives, and developing a contingency plan to address catastrophic natural events all would help in managing invasive species. Working with landowners on split estate lands to reestablish disturbed sites to healthy plant communities in accordance with the ecological site potential includes control of invasive species. This would affect less than one percent of the area. All these actions would have a negligible beneficial effect on invasive species and pest management.

Vegetation – Riparian/Wetland Resources

Riparian and wetland systems are favored locations for invasive species due to prolonged or continuous wet conditions and nutrient-rich soils. Management actions to prioritize management and develop activity and implementation plans to manage riparian and wetland systems to be at or above, or continue to be improving toward, PFC while achieving the Wyoming Standards for Healthy Rangelands includes managing any invasive plant or pest species. Actions also include managing riparian and wetland systems to enhance forage conditions and improve water quality, managing all riparian systems with sensitive species concerns; and preventing degradation, loss, or destruction of riparian/wetland habitat. These actions would indirectly benefit the control of

invasive species and would minimize opportunities for invasive plant and pest species to establish and spread. This would affect less than one percent of the area. These negligible beneficial effects would be long term.

Fish and Wildlife Resources – Fish

Management actions address the introduction, protection, and enhancement of fish species, populations, and habitats. Actions also include managing harmful non-native riparian vegetation in river and stream systems; this would help to control the spread and establishment of invasive species. This will help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management. Treatment and application methods need to be analyzed for potential unwanted adverse effects on non-target species. Establishing motorized vehicle and walking trails to provide public access to fish-bearing waters would directly and adversely affect vegetation by trampling or removal, and increase opportunities for invasive species to establish or spread. This would affect less than one percent of the area. This would have a negligible adverse effect on invasive species and pest management.

Fish and Wildlife Resources – Wildlife

Management actions include developing appropriate mitigation for surface-disturbing and disruptive activities associated with wildlife habitat management through use of defined mitigation guidelines. Actions also include maintaining or improving important wildlife habitats through vegetation manipulations, habitat improvement projects, livestock grazing strategies, and providing, to the extent possible, suitable habitat and forage to support wildlife population objectives. Enhancement of habitats would reduce opportunities for invasive species establishment and spread. These will help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. Wildlife trails, bedding areas, and concentration areas have a direct, adverse effect on vegetation over the long term. These areas would be conducive to invasive species establishment and spread. This would affect less than one percent of the area.

Special Status Species (including Greater Sage-Grouse)

Management includes implementing actions in recovery plans, conservation measures, terms and conditions, and appropriate BMPs. These species would take priority in planning and implementing on-the-ground activities and projects that could conflict with or promote native vegetation. Actions that would enhance ecological health would indirectly benefit the management of invasive species. Managing habitats for SSS in a lower ecological state or in a degraded health condition could promote invasive species establishment or spread. Treatment and application methods would need to be analyzed for potential unwanted effects on non-target species. This would affect approximately four percent of the area. Management of SSS would have a major beneficial effect on invasive species and pest management because activities that protect or restore proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

Heritage and Visual Resources

Cultural Resources, Paleontological Resources, and Visual Resources

Management actions include completing site stabilization and implementing long-term protections for significant cultural and paleontological sites experiencing adverse effects, and managing

identified areas important to tribes to minimize disturbance. Designating WSAs and the Middle Fork Powder River WSR as VRM Class I areas would help keep these areas natural and pristine, including prohibiting or limiting surface-disturbing activities. This would affect less than one percent of the area. All these actions would have direct, long-term, negligible beneficial effects on invasive species and pest management by minimizing opportunities for their establishment and spread. Effects from management of visual resources would not differ by alternative and are not further addressed in this section.

Land Resources

Forest Products, Renewable Energy, Rights-of-Way and Corridors, Travel and Transportation Management, Recreation, and Lands with Wilderness Characteristics

Management actions include prohibiting timber harvest areas within 200 feet of surface waters. If this also prohibits associated roads, trails, and staging and work areas, then all actions would indirectly benefit invasive species management over the long term. Management actions also include: (1) limiting mechanical activity, recreation facilities and sites, and motorized vehicle activity in riparian/wetland areas; (2) prohibiting dispersed camping and commercial camps within 200 feet of surface water; (3) designating ROW corridors to minimize surface disturbance and impacts; (4) co-locating new ROW with existing ROW considering land use authorizations (e.g., permits and leases); (5) withdrawing areas from ROW and minerals development on a project-specific basis consistent with other resource objectives; (6) designing, constructing, and maintaining roads, including all BLM road easements, to meet or exceed BLM standards; and (7) determining road and trail closures, abandonments, reclamation, and needs for new roads. All prohibitions, reductions, and limitations on surface-disturbing and disruptive activities would have the direct benefit by reducing opportunities for invasive species to establish or spread. Increasing recreation opportunities could allow invasive species introduction and spread in new areas via vehicles, footwear, horses, dogs, clothing, and recreation equipment. Managing for wilderness characteristics likely would reduce opportunities for invasive species establishment and spread by prohibiting or limiting surface-disturbing activities in these areas over the long term. This would affect approximately eight percent of the area. Prohibiting or limiting surface-disturbing activities at recreation sites and special management areas would also have indirect benefits by limiting opportunities for invasive species establishment and spread over the long term. The effects would be moderate and beneficial.

Livestock Grazing Management

Livestock grazing management actions include achieving the Wyoming Standards for Healthy Rangelands; managing livestock grazing to sustain riparian, wetland, mountain mahogany, specials status species, or other special habitats; and implementing strategies that best protect rangeland resources during periods of drought. Proper livestock grazing can improve native vegetative cover and plant vigor, making plant communities more resistant to invasive species (Pittroff No Date). These management actions will help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because use of the lands promotes invasive species and pest establishment. Livestock can contribute to the introduction and expansion of invasive plant species by transporting seeds to new locations and disturbing soils and removing vegetation in areas of concentration, primarily around water sources, around supplement sites, and along trails. Range improvements that disturb large areas of soil surface could provide locations for invasive species to become established and spread if the areas are not properly reclaimed. This would affect less than one percent of the area. These actions would have indirect, negligible adverse effects on invasive species management over the long term.

Special Designations

Areas of Critical Environmental Concern and Wilderness Study Areas

Management actions for special designations can contribute to the establishment and spread of invasive species by enticing recreationists and others to these areas, which usually involves establishing access trails for foot, hoof, nonmotorized, or motorized travel. These actions can have indirect, long-term adverse effects on invasive species management. However, special designation areas often have prohibitions, limitations, or restrictions on surface-disturbing activities, which have a direct, long-term, moderate beneficial effect by minimizing opportunities for invasive species to establish and spread. This would affect approximately five percent of the area.

The following sections describe impacts by alternative. These impacts would be in addition to the impacts common to all alternatives described above.

4.4.4.3. Alternative A

Alternative A would continue invasive species and pest management in accordance with the 1985 RMP as amended and maintained.

Invasive Species and Pest Management

Alternative A management actions include working cooperatively with county weed and pest control districts to set annual and long-term treatment priorities. Weed control treatments occur every year to reduce and control weed infestations over the long term. The goals for treatment are to maintain weed seed-free, native communities to sustain their natural values. Lack of a complete invasive species inventory and an overall invasive species and pest management plan to prioritize species, locations, treatment types, and application methods has led to a “band-aid” type of approach to short-term (1 to 3 years) planning of treatments.

Most control efforts include chemical, mechanical, and biological methods. Controlling weeds by chemical and mechanical methods can directly harm other plant species. For example, if an herbicide is non-selective for all broadleaf plants, the chemical also could harm forb species. If mechanical methods are used, any plant in the direct path of the application would be affected. Biological methods generally are species specific and effects are direct, long term, and harmful to the host species; other plants indirectly benefit from improving the health of the vegetative community by removal of the host pest species.

Control measures on invasive species and pests on public lands are done in cooperation with county weed and pest control districts and private energy companies. Herbicides applied to areas under mineral permits or leases are the responsibility of the private energy company. Over the next 20 years, it is estimated that BLM invasive species and pest management actions would disturb approximately one percent BLM acres.

Invasion of cheatgrass has adverse effects on the grassland and shrubland communities. Exact acreages are not known, due to a lack of vegetative inventory, but professional judgment estimates canopy cover to be 15 percent to 20 percent of the planning area. Control treatments have not been pursued because cheatgrass is not on the Wyoming Weed and Pest Control Act Designated List and a lack of funding. Cheatgrass management has not been addressed and populations are increasing.

Pest species (grasshoppers and Mormon crickets) primarily impact grassland and shrubland species. Pest control is primarily by chemical application and the effects are direct and

beneficial to pest management, and indirect and beneficial to the host plants. Rangeland forage production can be drastically reduced if insect populations are above average. Annual rangeland forage production losses to grasshoppers average approximately 15 to 20 percent; in years of high grasshopper populations (15 or more grasshoppers per square yard for above-average economic impact) losses can increase to 50 to 70 percent of annual forage production (APHIS). Unsuccessful reclamation, improper grazing, and large pest populations can impede native vegetation and promote the establishment and expansion of invasive plants and pests.

Alternative A would help mitigate adverse effects and manage invasive species and pests. Alternative A management actions would have a direct, minor beneficial effect on invasive species and pest management.

Physical Resources

Soil

Alternative A soils management would prohibit surface-disturbing activities on soils with slopes greater than or equal to 25 percent and would restrict surface-disturbing activities on soils with poor reclamation suitability unless the authorized officer waives the prohibition. Allowing waivers would be the exception but results in inconsistent application of management, which would have a direct and adverse effect on vegetation and soil resources. The RFD predicts that a total of 37 percent of BLM-administered lands will be disturbed from BLM actions, 31 percent of BLM-administered lands will be reclaimed, and six percent of BLM-administered lands will be left with long-term disturbance.

Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Prohibition or restriction of surface disturbance would help prevent spread of invasive species and pest management for the long term because factors that allow for invasive species and pests to spread would be removed.

Development on soils greater than or equal to 25 percent or with poor reclamation suitability could present reclamation challenges. Reclamation in these areas could be limited or unattainable which would allow for the spread of invasive species and pests.

Alternative A management would help mitigate adverse effects by prohibiting or restricting surface-disturbing but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment. Alternative A management actions would have a direct, moderate adverse effect on invasive species and pest management.

Water Resources

Alternative A water management would prohibit surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams on 2.54 percent of the area unless the authorized officer waives the prohibition allows for inconsistent application of management. Disturbances could remove or crush vegetation and impact water quality and quantity. A reduction in habitat for numerous plant and animal species that inhabit these systems would occur and a reduction in potential SSS. This would allow for invasive species to establish and spread. Therefore, the

prohibition would have a direct beneficial effect for the long term. Waivers would be the exception in these areas. This would affect approximately three percent of the area.

Alternative A does not include decisions addressing on-channel reservoirs, which have become a common means of disposing of CBNG produced water. These sites are usually constructed on steep slopes where reclamation would be difficult, thus providing opportunities for invasive species to establish and spread, and the wetted areas below dams are havens for invasive plant species such as Canada thistle and salt cedar. If on-channel reservoirs are allowed there could be direct adverse effects.

Alternative A management actions would have a direct, minor beneficial effect on invasive species and pest management.

Cave and Karst Resources

There are no anticipated effects from cave and karst management actions.

Mineral Resources

Locatable Minerals

Alternative A management actions that do not withdraw or close lands make lands available for mineral leasing and development which promote surface-disturbing activities. Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Under the locatable minerals program for the planning area, overall it is estimated that the BLM actions would disturb less than one percent of BLM-administered lands. This can have direct adverse effects over the long term by providing opportunities for invasive species to establish and spread during the life the lease or through surface-disturbing activities. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Leasable Minerals – Coal

Under Alternative A, on coal leases for which mining and reclamation plans have been approved, stipulate that oil and gas leases to regulate oil and gas operations that would interfere with approved coal mining. Under the leasable minerals (coal) program for the planning area, overall it is estimated that the BLM actions would disturb 25 percent of the area. Reclamation would occur on 15 percent of the area, leaving a total of 3.8 percent of the area of long-term disturbance. There is 5.8 percent of the area in active BLM mines. Those sites where development did occur would have impacts for the life of the project and would require successful reclamation to ensure the native vegetation component was reestablished to predisturbance conditions and to reduce the potential introduction and establishment of invasive species. This can have adverse effects on vegetation and soil resources by providing opportunities for invasive species to establish and spread during the life the lease or project through surface-disturbing activities that promote invasive species and pest spread. Alternative A management actions would have a direct, moderate adverse effect on invasive species and pest management.

Leasable Minerals – Fluids

Alternative A would continue to lease and allow for development of federal oil and gas minerals on but would close the WSAs to leasing. Surface disturbance from well sites, pipelines, and utility corridors would allow for transport of invasive species seed, crush or

removal of vegetation, and expose bare soils where invasive species could establish. Construction of reservoirs and ponds and other water disposal methods for CBNG development provide areas of soil disturbance and the perfect medium for establishment of invasive plant species, especially salt cedar. These reservoirs and ponds can provide breeding habitat for mosquitoes carrying the WNV. Under the leasable CBNG program for the planning area it is estimated that BLM actions would disturb less than one percent of the total available acres. Reclamation will occur on portions of that disturbance. Total CBNG and oil development would be less than one percent of the total available acres. The acres of long-term disturbance make these actions direct, negligible adverse effects on invasive species and pest management.

Salable Minerals

Under the salable minerals program, Alternative A would leave the entire planning area available for salable minerals leasing and the associated surface disturbance other than in the Fortification Creek, Gardner Mountain, and North Fork WSAs. Salables would involve surface-disturbance activities which would have direct, adverse effects on invasive species and pest management for the life of the project(s) because the disturbance associated with this action promotes the spread of invasive species and pests. Such actions include the creation of trails, crushing or removal of native vegetation, vehicle use, human presence, and equipment use. Over the next 20 years the estimated acres of salable minerals surface disturbance would be less than one percent of available acres. There is no anticipated disturbance from geothermal activities. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative A, the application of different levels of suppression and restricting the use of some types of suppression equipment has the potential to allow for the spread of invasive species through road and trail construction, vehicles, equipment, and people. Even though there is potential to allow for the spread of invasive species rehabilitating fire and suppression damage would directly benefit invasive species and pest management over the long term, especially in vegetative communities where cheatgrass is a component because competitive native species would be established through rehabilitating fire and suppression. These plant communities help to prevent invasive species from establishing because they can outcompete invasive species for nutrients, space, and water. Implementing prescribed fires to support vegetation and wildlife habitat objectives also would have direct beneficial effects because burn conditions (air and soil temperatures, wind conditions, and fuel types) would be less severe than wildfires. However, in the short term, prescribed fire would still destroy any litter on the surface and the current year's growth. Improving ecological conditions through the application of prescribed fire and other vegetative treatments would directly benefit invasive species and pest management because through these actions healthier plant communities would be able to become established and help prevent invasive species from establishing. Long term, the application of prescribed fire to support plant communities and wildlife habitat objectives is estimated to affect approximately two percent of BLM-administered lands. All acres are expected to be successfully reclaimed. Prescribed fire would have minor beneficial effects on invasive species and pest management.

Unplanned fire would have adverse effects, with severity dependent on the fire sizes, soil types, types of vegetative communities, and burn conditions. Unplanned fire usually has more severe air and soil temperatures, wind conditions, and/or fuel types. Native vegetation can be destroyed

allowing for invasive species and pest to establish. Overall level of effect is anticipated to be moderate.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative A, forestry treatment actions in the planning area, including timber harvesting, firewood gathering, and other permitted activities related to forest products, could result in the introduction and spread of invasive species from road and trail construction, vehicles, equipment, animals, and people. The actions are estimated to affect less than one percent of BLM-administered lands. This would have a direct, adverse, negligible effect on invasive species and pest management over the long term.

Vegetation – Grassland and Shrubland Communities

Alternative A does not address grassland and shrubland communities. The past decade of energy development has disturbed tens of thousands of acres of public land. Reclamation of these lands has been difficult. Livestock and wildlife season-long and overgrazing can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. At present, there are no management actions addressing grassland and shrubland communities. Approximately 16 percent of BLM-administered lands are grassland and shrublands. Disturbance on this area would be permitted although unlikely to occur on all 16 percent of BLM-administered lands. Alternative A management of grassland and shrubland communities would have a major adverse effect on invasive species and pest management because invasive species and pests have been able to establish in a variety of plant communities due to ongoing development and multiple uses of the lands that promote invasive species and pest establishment.

Riparian/Wetlands Communities

Current management actions prohibit surface-disturbing activities within 500 feet of springs, reservoirs, water wells, or perennial streams unless the prohibition is waived by the authorized officer. Surface-disturbing activities and continuous wildlife and livestock grazing in these wet areas can promote the establishment of invasive species and stress native plants, making it easier for invasive species to compete for nutrients, space, and water. This would affect three percent of BLM-administered lands. Alternative A management of riparian and wetland communities would have direct, minor, beneficial effects on invasive species and pest management over the long term because activities that promote invasive species and pest establishment are not allowed within 500 feet of riparian/wetlands communities.

Fish and Wildlife Resources

Fish and wildlife resources include fish, wildlife, upland game birds, raptors, migratory birds, and amphibians and reptiles and their habitats. Alternative A management actions include prohibiting, limiting, and restricting surface-disturbing activities unless waived by the authorized officer, and timing limitations for disruptive activities. Restriction of surface-disturbing activities would leave soils and plant communities intact which would limit the opportunity for invasive species to establish. Alternative A would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development (from waivers, in surrounding areas, or with limited use) promote invasive species and pest establishment. The actions are estimated to affect less than one percent of acres. All acres are expected to be successfully reclaimed. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Special Status Species (including Greater Sage-Grouse)

Alternative A does not address invasive species and pests in habitats known to have populations of SSS with the exception of Greater Sage-Grouse, bald eagles, and special status raptor species. Under Alternative A, treatment of invasive species in known populations of SSS would not be likely unless analysis shows that the presence of the invasive plant or pest poses a greater threat to the SSS than the application of control methods. This would affect less than one percent of BLM-administered lands. Greater Sage-Grouse, bald eagles, and special status raptor species have surface-disturbance buffers unless waived by the authorized officer. Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Approximately 33 percent of BLM-administered lands contain special status raptor species. Prohibition or restriction of surface disturbance would have a direct beneficial effect on invasive species and pest management for the long term because factors that allow for invasive species and pests to spread would be removed. Alternative A management actions for special status wildlife species would have a direct, major beneficial effect on invasive species and pest management. Special status plant and fish management would have a negligible beneficial effect due to their limited occurrence within the planning area.

Heritage and Visual Resources**Cultural Resources**

Alternative A would apply NSO stipulations to mineral leases along the Bozeman Trail and within the Crazy Woman Battle Sites. Prohibition or restriction of surface disturbance would have a direct beneficial effect on invasive species and pest management for the long term because factors that allow for invasive species and pests to spread would be removed. The actions are estimated to affect less than one percent of BLM-administered lands. Alternative A management actions would have a direct, negligible beneficial effect on invasive species and pest management.

Paleontological Resources

Paleontological management actions were not addressed in Alternative A, therefore there are no protective measures for these sites and surface-disturbing activities would be allowed. This would allow for transport of invasive species seed, crush or removal vegetation, and exposure of bare soils where invasive species could establish. The actions are estimated to affect less than one percent of BLM-administered lands. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Land Resources**Forest Products**

Alternative A management actions include prohibiting timber harvest within 200 feet of surface water. All other timber harvest is allowed in suitable areas. Surface-disturbing activities associated with timber harvest would have a direct adverse effect on invasive species and pest management because they could provide opportunities for invasive species introduction and spread. The development of trails and roads could crush or remove native vegetation. Vehicles, humans, and equipment could import invasive species. The application of forestry treatment actions is estimated to affect approximately up to one percent of BLM-administered lands. All

acres are expected to be successfully reclaimed. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Renewable Energy

Alternative A does not address renewable-energy development. Under Alternative A, activities that involve surface-disturbing activities would have a direct adverse effect on invasive species and pest management because they could provide opportunities for invasive species introduction and spread. The development of primitive motorized, hoof, and foot trails could crush or remove native vegetation and vehicles, animals (horses and dogs), humans, and equipment could import invasive species. Surface disturbance from BLM action would be approximately three percent of BLM-administered lands, with reclamation on approximately two percent of BLM-administered lands, with long-term disturbance of one percent of BLM-administered lands. Alternative A management actions would have a direct, minor adverse effect on invasive species and pest management.

Rights-of-Way and Corridors

Alternative A actions address ROW for pipelines, roads, powerlines communication sites, and other facilities. Under Alternative A, communication site locations would be prohibited on the North Middle Butte (Pumpkin Buttes area) unless necessary. Communication site locations would be allowed on the South Middle Butte only. Transmission lines would be within identified corridors where feasible. Soil disturbance would be prohibited on slopes greater than or equal to 25 percent and timing stipulations on areas that are highly erodible. Surface-disturbing activities would have a direct adverse effect on invasive species and pest management because they could provide opportunities for invasive species introduction and spread.

Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Alternative A would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. BLM actions would disturb three percent of BLM-administered lands. Reclamation would occur on two percent of BLM-administered lands, leaving a total of one percent of BLM-administered lands with long-term disturbance. This can have direct adverse effects over the long term by providing opportunities for invasive species to establish and spread during the life the lease or project. Alternative A management actions would have a direct, minor adverse effect on invasive species and pest management.

Travel and Transportation Management

Under Alternative A vehicle travel on saturated soils and slopes greater than 25 percent would be prohibited and damage would result. There will be winter motor vehicle closures from November 15th to April 30th in North Fork, Barnum Mountain, Middle Fork, E.O. Taylor, and Fort Creek.

Surface-disturbing activities would have a direct adverse effect on invasive species and pest management because they could provide opportunities invasive species introduction and spread. Alternative A would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and

water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Prohibition or restriction of surface disturbances limit spread and establishment on invasive species and pests because factors that allow of invasive species and pests to spread and establish would be removed.

It is estimated that the BLM actions would disturb less than one percent of BLM-administered lands. Reclamation would not occur on the area leaving the area affected with long-term disturbance. This can have direct adverse effects over the long term by providing opportunities for invasive species to establish and spread during the life of the lease or project. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Recreation

Under Alternative A recreation would prohibit camping within 200 feet of surface water, prohibit livestock grazing within developed recreation sites, prohibit oil and gas development in Mosier Gulch, prohibit surface disturbance, and occupancy within 0.5 mile of Dry Creek Petrified Tree.

Surface-disturbing activities would have a direct adverse effect on invasive species and pest management because they could provide opportunities for invasive species introduction and spread.

Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Prohibition or restriction of surface disturbance limits invasive species and pest spread and establishment because factors that allow for invasive species and pests to spread would be removed. Alternative A would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment.

It is estimated that BLM actions would disturb less than one percent of BLM-administered lands. Reclamation would not occur on the area leaving the areas affected with long-term disturbance. This can have direct adverse effects over the long term by providing opportunities for invasive species to establish and spread during the life the lease or project. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Lands with Wilderness Characteristics

Alternative A does not address invasive species and pests in areas with wilderness characteristics. Activities in these areas involving surface-disturbing activities would have a direct, minor adverse effect on invasive species and pest management because they could provide opportunities for invasive species introduction and spread. The development of primitive motorized, hoof, and foot trails could crush or remove native vegetation and vehicles, animals (horses and dogs), humans, and equipment could import invasive species. It is estimated that BLM actions would disturb less than one percent of BLM-administered lands. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Livestock Grazing Management

Alternative A management actions include increasing available forage, implementing range improvements, and requiring rest following vegetative treatments. All these actions would

contribute to healthier ecological conditions that would make plant communities more resistant to invasive species. Alternative A would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because livestock grazing of the lands promotes invasive species and pest establishment. It is estimated that BLM actions would disturb less than one percent of BLM-administered lands. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Special Designations

Areas of Critical Environmental Concern

Currently there are no designated ACECs in the planning area. The lack of designations and lack of management actions makes management of invasive species and pests easier to administer due to the absence of any constraints. Alternative A management actions would have a direct, negligible beneficial effect on invasive species and pest management.

Wilderness Study Areas

Alternative A management actions make WSAs unavailable for mineral leasing in the interim until Congress decides to designate the WSAs as wilderness or not. Protection from mineral leasing is a direct benefit long term, unless Congress designates otherwise. If Congress decides not to designate the WSAs as wilderness, Alternative A would allow leasing for minerals. This would allow for surface-disturbing activities of development and needed infrastructure. At present, there are no decisions addressing motorized travel in these areas. It is important to establish guidance for the protection of the natural resources in these areas. Limiting motorized travel would benefit invasive species management by reducing opportunities of invasive species to establish and spread even though it restricts the application of herbicides to control invasive species in the plant communities. Alternative A management actions would have a direct, minor beneficial effect on invasive species and pest management.

4.4.4.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to invasive species and pest management due to their implementation.

Invasive Species and Pest Management

In addition to the Alternative A management actions, Alternative B management actions include developing a pest management plan for the planning area. Specific management areas would be delineated based on native, invasive, and pest species, treatment methods, resource concerns, geographic features and limitations, and goals and objectives for each area. Treating plants on the State of Wyoming Designated Noxious Weed List, the appropriate county lists, and other species of concern as determined by BLM resource specialists would treat all species that adversely affect native plant communities and habitats. Cheatgrass is present throughout the planning area; therefore, the management plan would incorporate the entire planning area, including adjacent landowners and agencies. Goals would include improving the ecological condition of vegetative communities and wildlife and SSS habitat. The benefit of aerial application of pesticides would include treatment of large acreages for widely distributed species such as cheatgrass, leafy spurge, grasshoppers and mountain pine beetle, access to remote locations, and lower rates of herbicide application. All these actions would have direct, minor beneficial effects on invasive species and pest management over the long term. Over the next 20 years it is estimated that BLM actions

would disturb approximately two percent of BLM-administered lands. Reclamation would occur on approximately two percent of BLM-administered lands, leaving less than one percent of BLM-administered lands with long-term disturbance. Alternative B management actions would have a direct, minor beneficial effect on invasive species and pest management.

Physical Resources

Soil

Alternative B soils management actions prohibit surface disturbing activities on soils with severe erosion hazard, prohibit surface-disturbing activities on soils with slopes greater than or equal to 25 percent, prohibit surface-disturbing activities on soils with poor reclamation suitability, prohibit surface-disturbing activities on badlands, rock outcrops, and slopes subject to mass failure, prohibit vehicle travel on saturated soils, and prohibit prescribed fire on highly erodible soils. The RFD predicts that a total of 30 percent of BLM-administered lands will be disturbed from BLM actions, 25 percent of BLM-administered lands will be reclaimed, and five percent of BLM-administered lands will be left with long-term disturbance. This would reduce the opportunity for the introduction of invasive species. Prohibiting surface-disturbing activities on soils with severe erosion hazard would reduce opportunities for invasive species to establish or spread.

Alternative B management would mitigate adverse effects by prohibiting or restricting surface-disturbing but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment. Alternative B management actions would have a direct, minor adverse effect on invasive species and pest management.

Water Resources

Alternative B water management actions would prohibit surface disturbance within 500 feet of any natural or man-made water feature and prohibit on-channel reservoirs. This would affect three percent of the area. Alternative B does not include the waiver option further helping invasive species and pest management because it reduces the opportunity for the introduction of invasive species. Alternative B management actions would result in a minor beneficial effect on invasive species and pest management.

Cave and Karst Resources

Alternative B cave and karst management actions would manage human activity in caves with significant resources through cave specific Cave Management Plans, prohibit surface-disturbing activities in areas containing cave and karst resources, prohibit timber harvest in areas containing cave and karst resources, and restrict livestock from entrances to significant caves. People using trails that lead to popular cave and karst areas could trample and remove vegetation, and possibly promote the introduction of invasive species. Livestock use can also trample and remove vegetation, and possibly promote the introduction of invasive species. Current management practices do not have any prohibitions or restrictions to cave and karst trails. Prohibiting surface-disturbing activities would prevent such activities from occurring and protect proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread. This would affect 13 percent of the area. Alternative B would have a direct, major beneficial effect on invasive species and pest management.

Mineral Resources

Locatable Minerals

Alternative B includes a number of new areas to protect and preserve cultural, paleontological, recreation, wilderness, and special designation resource values (ACECs, Scenic or BCBs, WSRs, and WSAs). These withdrawals and restrictions would be for the protection and preservation of other resource values. This would result in 12 percent withdrawn from mineral exploration and development. Existing withdrawals and restrictions were implemented to protect and preserve other resource values. Under Alternative B, withdrawing or restricting additional areas from locatable minerals would help to minimize the spread of invasive species and pests because by restricting or withdrawing these areas proper ecological conditions in vegetative communities and habitat types would remain intact and limit opportunities for invasive species establishment and spread. Locatable minerals management would affect less than one percent of the area. Alternative B management would help mitigate adverse effects by prohibiting or restricting surface-disturbing activities but would still have an adverse effect on invasive species and pest management because continued development promotes invasive species and pest establishment and spread. Alternative B management actions would have a direct, negligible adverse effect on invasive species and pest management.

Leasable Minerals - Coal

Under Alternative B, invasive species and pest management actions could include area- and/or species-specific treatment strategies, applied on a project-specific basis to public lands. Successful treatments will decrease the spread of undesirable species. However, where development does occur, vegetation would be directly and adversely affected over the long term for the life of the mining and would require successful reclamation to ensure the native vegetative component was reestablished to predisturbance conditions. Surface-disturbing activities have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands in surrounding areas promote invasive species and pest establishment. Under this alternative, approximately 39 percent of solid leasable mineral acres would be disturbed from BLM actions (existing leases and new leases). Reclamation will occur on approximately three percent solid leasable mineral acres. One percent solid leasable mineral acres are actively being mined. Less than one percent solid leasable mineral acres would be disturbed over the long term. Alternative B management actions would have a direct, minor adverse effect on invasive species and pest management.

Leasable Minerals – Fluids

Alternative B would make lands available for fluid minerals leasing and exploration in accordance with management identified to conserve other resources. This would result in 2,612,920 acres of BLM-administered lands closed to minerals leasing. More acreage would be protected from development over the long term and would help native vegetation to remain intact. Under the leasable CBNG program for the planning area, overall it is estimated that BLM and non-BLM actions would disturb approximately less than one percent of available acres over the next 20 years. There is no anticipated disturbance from geothermal-related activities. Alternative B would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. Alternative B management actions would have a direct, negligible adverse effect on invasive species and pest management.

Salable Minerals

Alternative B would make mineral materials unavailable in accordance with management identified to conserve other resources, would result in 3,218,690 federal mineral acres closed. Management under Alternative B would help mitigate adverse effects because the alternative

would protect additional acreage from development over the long term, but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. Under the salable minerals program for the next 20 years, the estimated areas of surface disturbance less than one percent of available acres. Overall, Alternative B management would have a negligible adverse effect over the long term.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Alternative B management actions involving the application of full suppression of unplanned fires in areas where fire is undesirable would affect approximately six percent of the area. Full suppression in these areas would directly benefit vegetation communities by reducing the potential for soil erosion. These vegetation communities are important because they can outcompete invasive species. Additionally, limiting suppression vehicles to existing roads and trails unless they are in identified full suppression areas would reduce the opportunity for the introduction of invasive species. Rehabilitating all fire-related damage also would directly benefit vegetation communities over the short and long terms by reducing the potential for soil erosion. This management would have moderate beneficial effects.

Long term, the application of prescribed fire to improve the health of the vegetation community and/or enhance habitat is estimated to affect approximately less than one percent of BLM-administered lands. All acres would be successfully reclaimed. This management would have negligible beneficial effects over the long term because competitive native species would be established and prevent invasive species from establishing because they can outcompete invasive species for nutrients, space, and water.

Biological Resources

Vegetation – Forests and Woodlands

Alternative B management actions allowing fire and natural pathogens to take their natural course could result in massive destruction of vegetation. This would have a direct adverse effect on invasive species and pest management over the long term because invaders and fire would move regardless of land status and the economic impact could be massive. Non-native species could move out of their original niche and become an invasive species requiring control. The actions are estimated to affect less than one percent of BLM-administered lands. This management would have negligible adverse effects.

Vegetation – Grassland and Shrubland Communities

Alternative B authorizes only native plant species for all reclamation activities. Management actions for grassland and shrubland communities that would allow native plant species for initial reclamation practices would provide another tool for achieving reclamation goals. Timely reclamation (1 to 3 years) would limit opportunities for invasive species to establish and spread but not prevent them. Alternative B would help mitigate adverse effects on grassland and shrubland communities but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment. The actions are estimated to affect less than one percent of the area from BLM actions. This management would have negligible adverse effects.

Vegetation – Riparian/Wetland Resources

Alternative B prohibits surface-disturbing activities within 500 feet of springs, reservoirs, water wells or perennial streams in riparian and wetland communities. Alternative A allows waivers to this prohibition; not including the waiver option makes this alternative more restrictive than Alternative A. Additionally, restoring vegetation in all CBNG-supported riparian and wetland systems would have a direct beneficial effect on invasive species and pest management over the long term because it allows native plant species to develop and outcompete invasive species.

These systems are very susceptible to water-tolerant invasive species such as salt cedar and Canada thistle. Under Alternative B, reclamation actions would have a direct, long-term, beneficial effect on invasive species and pest management by establishing competitive native species. This would affect three percent of BLM-administered lands. Overall, Alternative B vegetation management actions would have a minor beneficial effect on invasive species and pest management.

Fish and Wildlife Resources

Alternative B wildlife management actions apply appropriate wildlife seasonal restrictions on disruptive activities to maintenance and operation of developed projects. This alternative does not allow disruptive activity in crucial elk winter range between November 15 and April 30, and in elk calving areas from May 1 to June 30 (Map 29). Actions also prohibit disruptive activities within 0.5 mile of big game migration corridors. Treatment of invasive species and pests would be considered a disruptive activity. These specific locations and timing restrictions would encumber the management of invasive species and pests and would have a direct adverse effect. Timing restrictions could affect the effectiveness of the treatment and would increase costs. Prohibiting or limiting surface-disturbing activities in designated areas, improving the ecological condition of plant communities and associated habitats, and reducing fragmentation of grassland and shrubland communities would help mitigate adverse effects on grassland and shrubland communities but would still have an adverse effect on invasive species and pest management because it is likely these surface-disturbing activities would relocate to other plant communities or to soils at higher risk to invasive species and pest establishment. Continued development and multiple uses of the lands promote invasive species and pest establishment. The actions are estimated to affect less than one percent of BLM-administered lands. This management action would have a direct, negligible, adverse effect over the long term.

Special Status Species – Plants and Wildlife (including Greater Sage-Grouse)

Alternative B management actions prohibit the aerial application of herbicides in areas with habitat for special status plant species. Invasive species would be allowed to thrive because of the potential for special status plants to be present. Surveys for special status plant species would be required prior to approving any project or activity that may impact the habitat for these species. By definition (Glossary) treatment of invasive species and pests would be considered a disruptive activity. The requirement to survey for special status plants prior to treatments, prohibiting aerial application of herbicide treatments within areas containing habitat, and the number of acres and locations encumbered by distances or date limitations would have a major adverse impact on the treatment management of invasive species and pests.

Management actions would also prohibit or restrict disruptive activities and occupancy in the perimeter of Greater Sage-Grouse leks, establish a disturbance-free zone in corridors consistently used by bald eagles, and prohibit or restrict disruptive activities raptors. Treatment of invasive species could affect Greater Sage-Grouse habitat. Preferred herbicides are not species specific, and other broadleaf plants (forbs) can be affected. Greater Sage-Grouse, especially chicks feed on forbs, these plants also attract insects upon which Greater Sage-Grouse do feed. The control of invasive species, including cheatgrass, would need to be assessed for the potential impacts

of treating versus the impacts of not treating areas with significant populations of Greater Sage-Grouse and in habitats where Greater Sage-Grouse dwell. Large populations and significant numbers will be defined depending on the USFWS status (Sensitive, Threatened, or Endangered) of the Greater Sage-Grouse at the time of assessment. Timing limitations that address disruptive activities could postpone invasive species treatments, which could diminishing the effectiveness of the treatment and increase the cost of treatments. This could affect up to 33 percent of BLM-administered lands. Overall, Alternative B management of special status plant and wildlife species would have a major adverse effect on invasive species and pest management.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Alternative B management actions would limit or prohibit salable minerals exploration and development in areas with significant paleontological resources and prohibit surface disturbance in areas with cultural or historic properties. Closing leasing, withdrawing lands from minerals development, and prohibiting surface-disturbing activities would have a direct, minor, beneficial effect on invasive species and pest management over the long term by keeping invasive species from establishing and spreading. The actions are estimated to affect less than one percent of the area from BLM actions. This management would have negligible beneficial effects.

Land Resources

Forest Products

Alternative B management actions would limit timber harvests to five acres per group harvest and manage product sales within ecologically sustainable limits. Timber harvest projects requiring the development of roads, trails, and staging and work areas, would increase the opportunities for invasive plant establishment and spread. The actions are estimated to affect less than one percent of the area from BLM actions. This management would have an indirect, negligible adverse effect on invasive species and pest management over the short term for the life of the project(s).

Renewable Energy

Alternative B management actions would exclude development in specific areas of public land. Exclusion or limiting energy development and the related infrastructure, namely utility roads and transportation pipelines, would limit surface disturbance. These actions would then limit the opportunity for invasive plant establishment and spread in these areas. Alternative B would help mitigate adverse effects in specific area but would still have an adverse effect on invasive species and pest management because development of renewable outside these specific area promote invasive species and pest establishment. Estimated renewable-energy development would disturb less than one percent of the area from BLM actions. This management would have negligible adverse effects.

Right-of-Way and Corridors

Management actions include prohibiting ROW on slopes equal to or greater than 25 percent and on highly erodible soils to minimize impacts to soil resources. Requiring co-location of new communication sites within designated areas, authorizing transmission lines in identified corridors, and avoids constructing facilities along major transportation routes. All these actions would reduce surface disturbance where ROWs are permitted and would help improve invasive plant management by limiting removal or mechanical damage to vegetation and reduce the opportunities for invasive plant establishment and spread. Mitigation measures will

help reduce the spread of invasive species and pests but not eliminate the potential for spread because disturbance for ROWs will occur in other areas. Alternative B would have an adverse effect on invasive species and pest management because development of ROWs promotes invasive species and pest establishment through removal of vegetation, soils, and invasive seed transport. ROW disturbances from BLM actions would be from pipelines, communications sites, roads, and powerlines. These disturbances are estimated to affect approximately one percent of BLM-administered lands. This would have a negligible adverse effect on invasive species and pest management.

Travel and Transportation Management

Alternative B management actions would allow motorized vehicles off designated routes with a special use permit. Management actions would close areas with saturated soils or on slopes of 25 percent or greater, in habitat for SSS, special designation areas (a total of 625,854 acres), and big game ranges during specific timeframes; also limit travel to designated roads and trails on 137,126 acres. These actions will help reduce the spread of invasive species and pests by protecting the resources during conditions when soil and plants are highly susceptible to erosion but not eliminate the potential for spread and may affect implementation of restoration projects. Alternative B would have an adverse effect on invasive species and pest management because invasive species and pest establishment would be promoted through removal of vegetation, soils, and increase invasive seed transport. These disturbances are estimated to affect less than one percent of BLM-administered lands. Alternative B management of transportation and access would have negligible adverse effects on invasive species and pest management.

Recreation

Alternative B management actions limiting recreation facilities and prohibiting surface disturbance in the eight designated SRMAs will help reduce the spread of invasive species and pests by protecting the resources in these areas. However, the BLM promotes visitor use and access in SRMAs; this would increase the popularity of and visitation to these areas, which would result in increased vegetation disturbance from trampling and increased potential for the introduction and spread of invasive plant species. These disturbances are estimated to affect less than one percent of BLM-administered lands. Alternative B would have negligible adverse effects on invasive species and pest management.

Lands with Wilderness Characteristics

Alternative B includes management actions for the lands with wilderness characteristics areas, which would directly benefit vegetative communities by limiting surface-disturbing activities in those areas. These disturbances are estimated to affect less than one percent of BLM-administered lands. This management would have a negligible beneficial effect over the long term.

Livestock Grazing Management

Alternative B management actions include providing a minimum of two years rest from livestock grazing, with additional rest if needed following prescribed fires and other vegetative treatments. This would improve the ecological condition of vegetative communities and help prevent the spread of invasive species and pests. Limiting or prohibiting livestock grazing where it would be incompatible with other resource values, and locating salt, water sources, and mineral supplements a minimum of 0.5 mile away from sensitive sites would also help keep invasive species from establishing. Management actions base allotment objectives on allotment health and other resource objectives rather than on AUMs and forage allocations. This management emphasizes healthy habitat and ecological conditions, which would indirectly reduce the opportunities for invasive species to establish and/or spread. Annual plants (mustards) would be the first to take

root, followed by cheatgrass or other perennial invasive species. Successful reclamation would reduce opportunities for invasive species to establish and spread. These mitigation measures will help reduce the spread of invasive species and pests but not eliminate the potential for spread because disturbance will occur from livestock grazing. These disturbances are estimated to affect less than one percent of BLM-administered lands. Alternative B would have negligible adverse effects on invasive species and pest management.

Estimations for surface disturbance in the planning area over the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. These disturbances are estimated to affect less than one percent of BLM-administered lands. Overall, Alternative B management of livestock grazing would have a negligible adverse effect on invasive species and pest management.

Special Designations

Areas of Critical Environmental Concern

Alternative B management actions include designating eight areas as ACECs (511,000 acres), which would affect approximately 68.5 percent of BLM-administered lands. The associated management plans for these sites would initiate specific conservation to protect soils and vegetation from surface-disturbing activities, including minerals development, vehicular travel, ROW, and any other activity not compatible with retaining or enhancing the area's values. These restrictions would protect proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread. All these restrictions would have direct, moderate beneficial effects on invasive species and pest management over the long term.

Wilderness Study Areas

There are three WSAs in the planning area totaling four percent of BLM-administered lands. There are restrictions to preserve wilderness conditions in these areas until Congress acts on their wilderness status. Designation of these areas and interim management is based on conservation of the natural resources, which would directly benefit vegetative communities and limit vehicular travel and surface-disturbing activities. This management would have a minor beneficial effect on invasive species and pest management.

4.4.4.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to invasive species and pest management due to its implementation.

Invasive Species and Pest Management

Alternative C would limit aerial application to just the use of insecticides and would restrict application methods for herbicides to motorized vehicles and foot travel. Large tracts of land would be inaccessible due to topography and would therefore go untreated. In the case of leafy spurge, which inhabits thousands of acres across multiple landscapes and plant communities, in remote locations, and in various terrains, Alternative C management would greatly limit where herbicides can be applied and the number of treated acres. This would have a direct, adverse effect on invasive species and pest management over the long term because invasive species would not be controlled and able to spread. Annually treating only designated areas for cheatgrass would not be effective and would leave large landscapes of this annual grass untreated having a direct,

adverse effect on native plant communities. Lack of constraints would increase opportunities for invasive species to establish and spread. Remote and sensitive areas and sites could transition to monocultures of invasive species. Over the next 20 years disturbances are estimated to affect less than one percent of BLM-administered lands. Alternative C management actions would have negligible adverse effects on invasive species and pest management.

Physical Resources

Soil

Under Alternative C, there would be no constraints on surface-disturbing activities, which would greatly increase the opportunity for invasive species infestation. Soils that have limiting factors such as severe erosion hazard, slopes greater than 25 percent, poor reclamation suitability, badlands, rock outcrops, and slopes susceptible to mass movement are especially susceptible to invasive species infestation because activities on these soils increase the potential for vegetation to be trampled or removed exposing bare soil. Bare soil is a prime area for invasive species to inhabit because there is a lack of native species to outcompete invasive species thus allowing the locations and densities of invasive species to establish and increase. Surface-disturbing activities would be allowed on 100 percent of the area. Although 100 percent of soils will be allowed to have surface-disturbing activities it is unlikely that 100 percent of these soils will be utilized. The RFD predicts that 47 percent of BLM-administered lands will be disturbed from BLM actions, 38 percent of BLM-administered lands will be reclaimed, and nine percent of BLM-administered lands will be left with long-term disturbance. Alternative C management actions would have a direct, major adverse effect on invasive species and pest management over the long term.

Water Resources

Under Alternative C, there would be no constraints on surface-disturbing activities or on-channel reservoirs. Disturbances could directly and adversely affect water quality and quantity by removing or crushing vegetation. A reduction in habitat for numerous plant and animal species that inhabit these systems would occur and a reduction in potential SSS. This would allow for invasive species to establish and spread. This would affect less than three percent of the area. Alternative C would have a direct, minor adverse effect on invasive species and pest management over the long term.

Cave and Karst Resources

Alternative C management actions include establishing project-specific buffers (100 feet from entrances to significant caves) to minimize effects from surface-disturbing activities. People using trails that lead to popular cave and karst areas could trample and remove vegetation, and possibly promote the introduction of invasive species. Livestock use can also trample and remove vegetation, and possibly promote the introduction of invasive species. Alternative C management actions limit surface-disturbing activities thus reducing the opportunity for the introduction of invasive species. This would affect less than one percent of the area. Alternative C management actions would have a direct, negligible beneficial effect on invasive species and pest management.

Mineral Resources

Locatable Minerals

Alternative C does not include recommendations for new withdrawals or restrictions on locatable minerals development. Lands open to mineral entry are consistent with other resource values.

Alternative C would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. Under the locatable minerals program for the planning area, overall it is estimated that BLM actions would disturb approximately less than one percent of BLM-administered lands over the next 20 years. Alternative C management of locatable minerals would have a negligible adverse effect on invasive species and pest management.

Leasable Minerals - Coal

Alternative C would stipulate fluid mineral leases when nominated within the areas identified as acceptable for further consideration for coal leasing (BLM 2001a) to require a mitigation plan allowing for maximization of both coal and oil and gas resources. Alternative C would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. It is estimated that BLM actions would disturb approximately four percent of BLM-administered lands, reclaim approximately three percent of BLM-administered lands, and leave less than one percent of BLM-administered lands with long-term disturbance. One percent of BLM-administered lands are active mines. Alternative C management of leasable coal minerals would have a minor adverse effect on invasive species and pest management.

Leasable Minerals - Fluids

Alternative C would continue to lease and allow development of federal oil and gas. This would result in the disturbance of predominantly grassland and shrubland systems. Alternative C would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. Most surface-disturbing activities, including linear infrastructure supporting oil and gas development, would require successful reclamation. Under the leasable CBNG program for the planning area, overall it is estimated that BLM actions would disturb less than one percent of acres over BLM leasable minerals over the next 20 years. There is no anticipated disturbance from geothermal activities. Alternative C management of leasable fluid minerals would have a negligible adverse effect on invasive species and pest management.

Salable Minerals

Alternative C does not recommend new closures or restrictions. The existing closures and restrictions were imposed to protect and preserve other resource values. Not adding areas to be protected from these minerals activities would have a direct adverse effect over the long term. Alternative C would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. For salable minerals over the next 20 years, the estimated areas of surface disturbance would be less than one percent of acres over BLM minerals. Alternative C management of salable minerals would have a negligible adverse effect on invasive species and pest management.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative C, management actions involving full suppression of wildfires and the use of heavy equipment with few constraints. Unplanned fire usually has more severe air and soil temperatures, wind conditions, and/or fuel types. Native vegetation can be destroyed allowing for invasive species and pest to establish. The use of heavy equipment increases the chance for invasive species to be spread in these areas. Unplanned fire with the use of heavy equipment with

few constraints would have a direct adverse effect on invasive species and pest management over the short and long terms. Unplanned fire would have moderate adverse effects, depending on the fire sizes, soil types, types of vegetative communities, and burn conditions.

Under Alternative C, the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives is estimated to affect approximately five percent of BLM-administered lands. All acres would be successfully reclaimed. Even though there is potential to allow for the spread of invasive species rehabilitating fire and suppression damage would directly benefit invasive species and pest management over the long term because competitive native species would be established through rehabilitating fire and suppression. These plant communities help to prevent invasive species from establishing because they can outcompete invasive species for nutrients, space, and water. This would have a minor beneficial effect on invasive species and pest management.

Biological Resources

Vegetation – Forests and Woodlands

Alternative C management actions would include intensive tactics to reduce natural events and control pathogens; this could minimize the destruction of vegetation, which would directly benefit vegetation. The actions are estimated to affect less than one percent of the area from BLM actions. This would have a direct, beneficial, negligible effect on invasive species and pest management over the long term.

Vegetation – Grassland and Shrubland Communities

Management actions for grassland and shrubland communities that would allow non-native plant species for initial reclamation practices would provide another tool for achieving reclamation goals. Timely reclamation (1 to 3 years) would limit opportunities for invasive species to establish and spread. Successfully reclaiming disturbed areas would have a direct beneficial effect on invasive species and pest. The actions are estimated to affect less than one percent of the area from BLM actions. This would have a direct, beneficial, negligible effect on invasive species and pest management over the long term.

Vegetation – Riparian/Wetland Resources

Alternative C would apply no constraints on surface-disturbing and disruptive activities in riparian and wetland systems; this would have a direct adverse effect on these systems over the long term because the actions would allow for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. Restoring vegetation only on direct CBNG disturbance areas (e.g., dams and reservoirs) rather than on all CBNG-supported riparian and wetland systems would reclaim a very small portion of each system, and large acreages would not be reclaimed. This would have a direct adverse effect on the health of the riparian and wetland systems and an indirect adverse effect on adjacent grassland and shrubland communities, which also would be susceptible to invasive species establishment and spread. The actions are estimated to affect less than one percent of the area from BLM actions. This would have a direct, adverse, negligible effect on invasive species and pest management over the long term.

Fish and Wildlife Resources

Alternative C fish and wildlife management actions would not constrain any impacts to habitat of fish, big game animals, upland game birds, raptors, and migratory birds in designated areas, and during designated periods. Special areas would be managed to be consistent

with other resource values, rather than primarily for big game. Management actions would consider other resources a higher priority than fish and fish habitat in reservoirs, riparian and wetland systems, and perennial water management. This lack of constraints would directly and adversely affect these systems and habitats over the long term by promoting the establishment of invasive species, lowering the ecological condition of the sites, and degrading potential habitat. Surface-disturbing activities would impact less than one percent of BLM-administered lands. Lack of constraints for fish and wildlife management actions would have a negligible adverse effect on invasive species and pest management over the long term.

Special Status Species – Plants and Wildlife (including Greater Sage-Grouse)

Alternative C would allow aerial application of herbicides in areas with habitat for special status plant species, and would restrict such treatments in areas of known special status plant populations. Restrictions in areas of known special status plant populations would encumber the management of invasive species and pests and would have a direct adverse effect on control of invasive species populations.

Alternative C management actions to provide habitat for prairie dogs or for SSS that depend on prairie dog colonies would maintain vegetation at a lower ecological condition and with a large cheatgrass component. Limiting constraints would allow surface-disturbing activities in prairie dog habitat, this would further adversely affect vegetation and increase the opportunity for resident cheatgrass to spread and other invasive species to establish because surface-disturbing activities would allow for the spread of invasive species seed, crush or remove vegetation, and exposing bare soils where invasive species could establish.

Surface-disturbing activities would affect less than one percent of BLM-administered lands. Overall, Alternative C management of special status plant and wildlife species would have a negligible adverse effect on invasive species and pest management because surface-disturbing activities would allow for the spread of invasive species seed and restricting treatments encumber the management of invasive species and pests.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Alternative C management actions would allow development in areas with significant paleontological resources and allow surface disturbance in areas with cultural or historic properties. BLM actions would disturb less than one percent of the total available acres. Allowing these surface-disturbing activities would have an indirect, negligible adverse effect on invasive species and pest management over the long term because surface-disturbing activities would allow for transport of invasive species seed, crush or remove vegetation, and exposure of bare soils where invasive species could establish.

Land Resources

Forest Products

Under Alternative C, timber harvests would not be limited and forest product sales would be conducted to maximize economic return. There would be an increase in roads, trails, and staging areas which would allow for seed transport. Vegetation would be crushed or removed and bare soils would be exposed allowing for species establishment. BLM actions would disturb approximately three percent of the total available acres. All areas are expected to be

reclaimed. These actions would have an indirect, minor, adverse effect on invasive species and pest management over the long term.

Renewable Energy

Alternative C management actions would allow renewable-energy development anywhere in the planning area consistent with other resource values. This lack of restrictions would have direct adverse effects on invasive species and pest management over the long term because it would allow for surface-disturbing activities that would allow for transport of invasive species seed, crush or remove vegetation, and exposure of bare soils where invasive species could establish. Under the renewable-energy program for the planning area, overall it is estimated that BLM actions would disturb approximately five percent of BLM-administered lands over the next 20 years. Reclamation would occur on three percent of BLM-administered lands, leaving a total of two percent of BLM-administered lands with long-term disturbance. These actions would have an indirect, moderate, adverse effect on invasive species and pest management over the long term.

Rights-of-Way and Corridors

Alternative C management actions would not constrain ROW and corridor locations. ROW disturbances from powerlines, pipelines, roads, and communications sites from BLM actions will adversely affect ROWs because they would allow for surface-disturbing activities that allow for transport of invasive species seed, crush or remove vegetation, and exposure of bare soils where invasive species could establish. Disturbances are estimated to affect approximately four percent of BLM-administered lands, with successful reclamation on approximately four percent of BLM-administered lands, leaving one percent of BLM-administered lands with long-term disturbance. This management would have a direct, minor adverse effect on invasive species and pest management over the long term.

Travel and Transportation Management

Alternative C management actions would allow motorized vehicles within the stock driveways, on saturated soils and on slopes greater than 25 percent, and in special species habitat. Management actions would close or limit travel to designated routes to motorized vehicle use and would implement winter closures (November 15 – April 30) on designated big game ranges. Travel and transportation will adversely affect ROWs because they would allow for surface-disturbing activities that allow for transport of invasive species seed, crush or remove vegetation, and expose of bare soils where invasive species could establish. Alternative C management actions would disturb less than one percent of the total of BLM-administered lands. These actions would have a direct, long-term, negligible, adverse effect by not protecting the soil or vegetation resources.

Recreation

Alternative C management actions include the establishment of six SRMAs with no consideration for more. Actions also included leasing of minerals in accordance with management for areas surrounding SRMAs, allowing surface disturbance and salable minerals development in designated SRMAs, and allowing additional recreation facilities. Alternative C management for recreation will adversely affect these areas because they would allow for surface-disturbing activities that allow for transport of invasive species seed, crush or remove vegetation, and expose of bare soils where invasive species could establish. Alternative C management would disturb less than one percent of the total available BLM-administered lands. These actions would have a direct, long-term, negligible, adverse effect by not protecting the protecting the soil or vegetation resources.

Lands with Wilderness Characteristics

Alternative C management actions include managing lands with wilderness characteristics areas the same as the surrounding areas. Alternative C management for lands with wilderness characteristics will adversely affect these areas because they would allow for surface-disturbing activities that allow for transport of invasive species seed, crush or remove vegetation, and expose of bare soils where invasive species could establish. Alternative C management would disturb less than one percent of the total available BLM-administered lands. These actions would have an indirect, long-term, negligible, adverse effect by not protecting the protecting the soil or vegetation resources.

Livestock Grazing Management

Alternative C would focus primarily on livestock management. Management actions include providing a minimum of 2 years rest from livestock grazing following prescribed fires and other vegetative treatments, which would improve the ecological condition of vegetative communities. Alternative C management would continue to limit or prohibit livestock grazing where it is currently not authorized, but would not consider limits or prohibitions in new areas. Locating salt, water sources, and mineral supplements a minimum of 500 feet away from sensitive sites would likely increase the presence of invasive species in these areas where livestock would congregate.

Estimations for surface disturbance in the planning area over the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. The actions are estimated to affect less than one percent of the area from BLM actions.

Overall, Alternative C management of livestock grazing would have a negligible adverse effect on invasive species and pest management.

Special Designations**Areas of Critical Environmental Concern**

Alternative C would not designate ACECs. Lack of designation would allow these areas to be eligible for surface-disturbing activities and other actions. Surface-disturbing activities allow for transport of invasive species seed, crush or remove vegetation, and expose of bare soils where invasive species could establish. This would adversely affect approximately eight percent of BLM-administered lands. Alternative C management actions would have a direct, moderate adverse effect on management for invasive species and pests.

Wilderness Study Areas

Alternative C management would be the same as management in surrounding areas, which would be generic and might not address all resource issues. The lack of special management actions including treatments of existing invasive species would increase the opportunity for invasive species to spread and outcompete native species. There are three WSAs in the planning area totaling four percent of BLM-administered lands. Alternative C management of WSAs would have an indirect, minor, adverse effect on invasive species and pest management.

4.4.4.6. Alternative D

This section describes management actions under Alternative D, which balances resource use with resource enhancement and protection, and the potential impacts to invasive species and pest management from those management actions.

Invasive Species and Pest Management

Alternative D would allow aerial application of herbicides and pesticides in areas where topography, extent of infestation, target species, and timing limit other application methods. Pest management plans would be developed to establish long-range goals and set priorities in cooperation with stakeholders. Plants treated would include those identified under Alternative B. Annual bromes would be addressed as described under Alternative C. Over the next 20 years it is estimated that BLM actions would render approximately two percent of BLM-administered lands of treated disturbance. Reclamation would occur on one percent of BLM-administered lands from BLM actions, leaving less than one percent of BLM-administered lands with long-term disturbance. Control efforts would be beneficial because controlling invasive species and pest would prevent or hinder their growth and/or spread. Alternative D management actions would have a direct, minor beneficial effect on invasive species and pest management.

Physical Resources

Soil

Under Alternative D, surface-disturbing activities on soils with severe erosion hazard, with poor reclamation potential, and on slopes equal to or greater than 25 percent would have to have an approved reclamation and stabilization plan and comply with CSU stipulations. Alternative A would prohibit, but allow waivers on prohibitions, surface-disturbing activities on slopes equal to or greater than 25 percent, on soils with poor reclamation, potential, and on soils with severe erosion hazard. Alternative A does not address surface-disturbing activities in miscellaneous areas such as badlands, rock outcrops and slopes susceptible to mass movement. Alternative D addresses these areas as described above.

Alternative A prohibits or restricts development on these areas unless the authorized officer waives the prohibition or restriction. Alternative D would protect badlands, rock outcrops, and slopes susceptible to mass movement. Alternatives A and D both allow development, but Alternative D requires that certain criteria be met. The established criteria under Alternative D help ensure project disturbances are capable of being reclaimed before the project is approved. Alternative A has fewer restrictions on the locations and types of development, with no assurances of reclamation success. The criteria requirements would help control invasive species and pest spread but would not prevent spread. Surface-disturbing activities would adversely affect invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment.

Surface-disturbing activities would be allowed on all other soils but it is unlikely that 100 percent of these soils will be utilized. The RFD predicts that 47 percent of BLM-administered lands will be disturbed from BLM actions, 37 percent of BLM-administered lands will be reclaimed, and nine percent of BLM-administered lands will be left with long-term disturbance. Alternative D management actions would have a direct, moderate adverse effect on invasive species and pest management over the long term.

Water Resources

All wet and water sites and systems have high potential for invasive species establishment and spread. Alternative D water management actions would allow surface disturbances within 500 feet of such sites in accordance with identified criteria and based on management decisions for other resource values. This would affect approximately three percent of BLM-administered lands. Allowing disturbances in these areas would have a direct adverse effect on vegetation and water quality in these sensitive areas; however, meeting the stipulations and criteria would reduce

the areas where development could occur and would minimize adverse effects. Alternative C would allow on-channel reservoirs. Under Alternative D, CBNG reservoirs would be evaluated to determine if they could be converted to another use or removed and reclaimed. This would reduce the areas where development occurs and would minimize adverse effects. Although Alternative D minimizes adverse effects surface-disturbing activities will still occur and adversely affect invasive species and pest management through activities that would allow for transport of invasive species seed, crush or remove vegetation, and exposure of bare soils where invasive species could establish. Alternative D water management actions would have a direct, minor adverse effect on invasive species and pest management.

Cave and Karst Resources

Alternative D stipulations include site-specific buffers around cave and karst resources for timber sales and surface-disturbing activities. People using trails that lead to popular cave and karst areas could trample and remove vegetation, and possibly promote the introduction of invasive species. Livestock use can also trample and remove vegetation, and possibly promote the introduction of invasive species. Disturbances around cave and karst resources would affect less than one percent of the area, the same as under Alternative C. Alternative D management of cave and karst resources would have a negligible beneficial effect on invasive species and pest management because by having site-specific stipulations limits surface-disturbing activities thus reducing the opportunity for the introduction of invasive species.

Mineral Resources

Locatable Minerals

In addition to areas currently withdrawn or restricted under Alternative A, Alternative D includes a number of new areas to conserve other resource values; this would leave 41 percent of leasable mineral acres open to mineral entry, with approximately 2 percent of leasable mineral acres recommended for withdrawal from mineral entry in addition to existing withdrawals. These areas would protect proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread. However, in areas where development did occur, any related actions that disturbed the surface would have a direct and adverse effect because surface-disturbing activity would allow for transport of invasive species seed, crush or removal of vegetation, and expose bare soils where invasive species could establish. Under the locatable minerals program for the planning area, it is estimated that BLM actions would disturb approximately less than one percent of leasable mineral acres over the next 20 years. Alternative D management actions would have a direct, negligible adverse effect on invasive species and pest management.

Leasable Minerals – Coal

Alternative D would stipulate fluid mineral leases when nominated over existing coal leases to allow for maximum recovery of the coal resources. Though all acres are open, actual development is anticipated to occur only in the higher potential areas of northwest Sheridan County and south central Campbell County. In areas where coal development does occur vegetation would be directly and adversely affected for the life of the project until reclamation goals and objectives are achieved. Alternative D would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. It is estimated that BLM actions would disturb approximately four percent of BLM-administered lands, reclaim approximately three percent of BLM-administered lands, and leave less than one percent of

BLM-administered lands with long-term disturbance. One percent of BLM-administered lands are active mines. Alternative D management of locatable minerals would have a minor adverse effect on invasive species and pest management.

Leasable Minerals - Fluids

Alternative D would make lands available for fluid minerals leasing and exploration in accordance with management identified to conserve other resources. Alternative D would help mitigate adverse effects by being in accordance with management identified to conserve other resources communities but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment. Alternative D would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. This would affect approximately less than one percent of leasable mineral acres over the next 20 years. There is no anticipated disturbance from geothermal activities under Alternative D. Alternative D management actions would have a direct, negligible adverse effect on invasive species and pest management.

Salable Minerals

Alternative D would open 2,725,060 acres of federal minerals to salable minerals leasing and close 623,061 acres. Alternative D would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. For salable minerals development over the next 20 years, the estimated areas of surface disturbance would be less than one percent of total salable mineral acres. Alternative D management actions would have a direct, negligible adverse effect on invasive species and pest management.

Fire and Fuel Resources

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Alternative D response to wildland fires would be the same as under Alternative B. Alternative A would restrict the use of some types of suppression equipment in some areas and Alternative D would prohibit heavy equipment use in specifically identified areas except when human safety is at risk or if the expected effects of fire would cause more resource damage than the use of heavy equipment. Prohibiting the use of heavy equipment would directly benefit vegetation over the short and long terms. Under Alternative D, full protection strategies and tactics would be used in designated areas, while priority suppression strategies and tactics would be used in Alternative A. All protection measures would directly benefit vegetation over the long term, unless fire would improve vegetative health. All fires would be evaluated for rehabilitation and severity of impacts. All rehabilitation efforts would have the direct beneficial effect of reducing invasive species, especially cheatgrass. Under Alternative A, only prescribed fire would be utilized to support vegetation and wildfire habitat objectives; Alternative D would use wildfire and other vegetative treatments to meet management objectives. Both unplanned fire and prescribed fire would affect less than one percent of the area. Alternative D management actions would have a direct, negligible beneficial effect on invasive species and pest management.

Biological Resources

Vegetation – Forests and Woodlands

Alternative D would implement intensive management tactics to reduce or circumvent events such as insect infestations, disease, and wildfire. This would affect less than one percent of the area. This management would have a direct, negligible beneficial effect on invasive species and pest management over the long term because these activities protect or restore proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

Vegetation – Grassland and Shrubland Communities

Alternative D management actions address the use of non-native species for initial reclamation as a portion of an approved reclamation plan. This would affect less than one percent of the area. This management would have a direct, negligible beneficial effect on invasive species and pest management over the long term because the use of some non-native species for initial reclamation can help native species to establish improving ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

Vegetation – Riparian/Wetland Resources

Alternative D would allow surface-disturbing activities with defined criteria. Reclaiming vegetation in all CBNG riparian and wetland systems in accordance with ecological site protection would return all water-affected systems to their pre-CBNG natural state. Alternative D would help mitigate adverse effects on riparian and wetland communities but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment. This would affect less than one percent of the area. These actions would have a direct, negligible, adverse effect on invasive species and pest management over the long term.

Fish and Wildlife Resources

Alternative D wildlife management actions allow surface-disturbing and disruptive activities to occur throughout the entire life of projects during seasons important for wildlife in accordance with identified criteria; criteria includes a resource protection plan which includes an IPM plan. Historic uses would be exempted from prohibitions in crucial big game winter range (and in elk calving areas). Disruptive activities within big game migration corridors would not be prohibited. Locations and timing restrictions would not encumber the management of invasive species and pests and would help limit opportunities for invasive species establishment and spread. Alternative D would help mitigate adverse effects on fish and wildlife resources but would still have an adverse effect on invasive species and pest management because continued surface disturbance promotes invasive species and pest establishment. This would affect less than one percent of the area. Alternative D management actions would have a direct, negligible adverse effect on invasive species and pest management.

Special Status Species (including Greater Sage-Grouse)

Alternative D SSS management actions include managing disruptive activities to mitigate impacts on special status wildlife species and their habitats, allowing disruptive activities within active prairie dog colonies on BLM-administered lands, in accordance with identified criteria, that do not adversely impact suitable habitat for SSS dependent upon prairie dog colonies, restricting disruptive activities and occupancy near occupied Greater Sage-Grouse leks, and prohibiting disruptive activities during specific timeframes. Alternative D would manage within occupied Greater Sage-Grouse habitat outside of Core Population Areas and Connectivity Corridors by restricting disruptive activities within the perimeter of occupied Greater Sage-Grouse leks. Prohibitions addressing raptor nests are as stated in Alternative B. Surveys would be required

for special status amphibian, reptile, and bat species prior to approving any project or activity that may impact the habitat for these species. Allow disruptive activities where special status amphibian, reptile, and bat species occur in accordance with defined criteria.

Prohibitions and limitations on these locations could help mitigate invasive species spread because it would limit activity that can spread invasive species seed. These actions would protect ecological conditions habitat types and limit opportunities for invasive species establishment and spread. Although these limitations can benefit invasive species management they could postpone invasive species treatments, which could diminishing the effectiveness of the treatment and increase the cost of treatments. Overall, prohibitions and limitations on these locations will benefit invasive species and pest management by preventing activity in these areas and therefore limiting the spread of invasive species. This would affect up to 23 percent of the area. Alternative D management actions would have a direct, beneficial effect on invasive species and pest management.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Alternative D management actions would place limitations, stipulations, mitigations, prohibitions, and allowances for surface-disturbing activities as part of cultural and paleontological resources management with defined criteria. These actions would protect ecological conditions habitat types and limit opportunities for invasive species establishment and spread. This would affect less than one percent of the area. Alternative D management actions would have a direct, negligible beneficial effect on invasive species and pest management.

Land Resources

Forest Products

Under Alternative D, timber harvest areas would be adapted to natural features and product sales would be ecologically sustainable while maximizing economic return. Any areas of surface disturbances would have to be reclaimed to their natural state. This management minimizes opportunities for invasive species to establish and spread. This would affect less than one percent of the area. Alternative D would help mitigate adverse effects on forest products but would still have an adverse effect on invasive species and pest management because uses of the lands promote invasive species and pest establishment. Alternative D management actions would have a direct, negligible adverse effect on invasive species and pest management.

Renewable Energy

Alternative D management actions would exclude renewable-energy development in the southern Big Horn Mountains, areas closed to mineral leasing for fluids and solids, locatables, salables, ROW areas, and other areas where surface disturbance is prohibited. Renewable-energy development would also be avoided on public lands leaving less than six percent of public land available for development. These restrictions would limit invasive species and pest management spread and establishment (see Map 56 for specific locations). Under the renewable-energy program for the planning area, overall it is estimated that BLM actions would disturb approximately 10 percent of BLM-administered lands over the next 20 years. Reclamation would occur on six percent of BLM-administered lands disturbed by BLM actions, leaving a total of three percent of BLM-administered lands with long-term disturbance. Alternative D would help limit adverse effects because where renewable energy is excluded proper ecological

conditions, vegetative communities, and habitat types will remain intact, limiting invasive species establishment and spread. Although adverse effects will be limited, Alternative D would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. Alternative D management actions would have a direct, moderate adverse effect on invasive species and pest management.

Rights-of-Way and Corridors

Alternative D management actions would avoid on slopes equal to or greater than 25 percent and on highly erodible soils. Newly proposed transmission lines and ground facilities would be allowed within existing ROW and other disturbance areas. All these actions would limit spread of invasive species and pest because where ROWs are limited or avoided proper ecological conditions, vegetative communities, and habitat types will remain intact limiting invasive species establishment and spread. ROW disturbances from BLM actions and non-BLM actions are estimated to affect approximately three percent of BLM-administered lands, with successful reclamation on approximately two percent of BLM-administered lands and one percent BLM-administered lands left with long-term disturbance. Alternative D would help mitigate adverse effects on ROW corridors but would still have an adverse effect on invasive species and pest management because continued development of the lands promote invasive species and pest establishment and spread. Alternative D management actions would have a direct, minor, adverse effect on invasive species and pest management.

Travel and Transportation Management

Like Alternative B, Alternative D would close special designation areas to motorized vehicle use. Motorized vehicle use in stock driveways would be allowed on designated routes. Motorized vehicle use would be allowed with travel management designations in SSS habitat and on saturated soils or on slopes 25 percent or greater. Alternative D would limit motorized vehicle travel to designated roads and trails, consistent with management of other resources and would seasonally prohibit travel in game ranges. All these actions would limit spread of invasive species and pests because where ROWs are limited or avoided proper ecological conditions, vegetative communities, and habitat types will remain intact limiting invasive species establishment and spread. This would affect less than one percent of the area. Alternative D would help mitigate adverse effects TTM but would still have an adverse effect on invasive species and pest management because continued use of the lands promote invasive species and pest establishment and spread. Alternative D management actions would have a direct, negligible, adverse effect on invasive species and pest management.

Recreation

Alternative D management actions designate the eight areas as SRMAs, with possible consideration of additional lands for SRMA designation. Prohibiting surface disturbance in designated SRMAs unless for administrative use would generally help protect, maintain, and enhance vegetative resources. Alternatives C and D allow additional recreation facilities consistent with other resource values and would have a direct adverse effect on vegetation in and around the facilities over the long term. Visitor use and access is promoted in SRMAs, which would increase popularity and visitation and increase vegetation disturbance from trampling and increase the potential for introduction and spread of invasive plant species. This would affect less than one percent of the area. Alternative D management actions would have a negligible adverse effect on invasive species and pest management over the long term because there would be increased vegetation disturbance.

Lands with Wilderness Characteristics

Alternative D actions would include managing non-WSA lands with wilderness characteristics to emphasize vegetative health, natural values, and primitive recreational opportunities on about three percent of BLM-administered lands. Managing these lands to those standards would have an indirect, negligible beneficial effect on invasive species and pest management over the long term because Alternative D will protect or restore proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

Livestock Grazing Management

Alternative D management actions would add areas where livestock grazing is not allowed and would allow for rest or deferment following vegetative treatments. This would help invasive species and pest management by limiting opportunities of invasive species to establish and spread. Alternative D also allows for flexibility in livestock grazing practices both before and after vegetative treatments occur. This will increase opportunities to use livestock grazing management as a tool to build plant communities resistance to invasive species establishment and to control invasive species populations. Alternative D stipulations for locating livestock salt or mineral supplements would be the same as described for Alternative C. Alternative D would help mitigate adverse effects on where livestock grazing occurs but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment.

Surface disturbances from installation of range improvements, if not properly reclaimed, could have direct adverse effects on invasive species and pest management by providing opportunities for invasive species to establish and spread. Estimations for surface disturbance in the planning area over the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. This would affect less than one percent of BLM-administered lands. Alternative D management actions would have a negligible, adverse effect on invasive species and pest management.

Special Designations

Areas of Critical Environmental Concern

Alternative D management actions designate two areas as ACECs, which would affect less than one percent of BLM-administered lands. The associated management plans for these sites would initiate specific conservation to protect soils and vegetation from surface-disturbing activities; this would have direct, minor, beneficial effects over the long term because protection from surface-disturbing activities would maintain proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

Wilderness Study Areas

There are three WSAs in the planning area totaling four percent of BLM-administered lands. There are restrictions to preserve wilderness conditions in these areas until Congress acts on these WSAs. Designation of these areas and interim management is based on conservation of the natural resources, which would limit vehicular travel and surface-disturbing activities. This management would have a minor beneficial effect on invasive species and pest management because conservation of the natural resources would maintain proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

4.4.4.7. Cumulative Impacts

Chapter 4 describes effects to invasive species and pest management from past and present actions, federal and non-federal, as part of the affected environment. Non-federal actions will affect invasive species management similar to federal actions but mitigation for effects to vegetation resources would differ between federal and non-federal actions. The more activity on the public lands, the greater the chance for establishment and spread of invasive plants whether it be from motorized transportation, surface disturbance, animal or human activity. As the demands on public land increases from recreational needs, energy development, desire for open spaces, and economic livelihood; these demands can contribute to the spread or management of invasive species. Once a pest establishes, it is difficult to pinpoint the source, therefore responsibility of controlling or managing infestations is difficult. As an example, roads developed for energy development can also be used by hunters, recreationists, and ranchers. As more activities occur in more confined spaces, the likelihood of the presence of invasive plants increases. Motorized travel and recreational use of horses with feed can transport invasive species.

Pest species are usually more mother nature driven and proactive measures can be taken to reduce opportunities but most pest species management is reactive, addressing the pest once populations have reached an economic threshold. Pest management is often large scale and expensive to administer. The costs of preventing invasive species and pests is considered to be less than the costs of control.

4.4.4.8. Conclusion

In general, alternatives B and D management actions would be more conservative than management under alternatives A and C for soils, water, riparian and wetland communities, SSS, fish, wildlife, cultural and paleontological resources, ROW, grazing, recreation, and special designations. Alternatives B, C, and D do not include the waiver option included in multiple conservation management actions under Alternative A. Alternatives B and D include a number of restrictions on surface-disturbing and disruptive activities (e.g., timing and location). Increases in recreation sites, facilities, and opportunities under alternatives D and C would likely increase the presence and spread of invasive species.

Under alternatives B and D, motorized travel is limited to designated roads and vehicle routes and closing areas to motorized vehicles would reduce soil and vegetation disturbance and reduce opportunities for invasive species to establish and be transported. The use of designated roads and vehicle routes would result in closure (and reclamation) or road maintenance of existing roads in poor locations, which would eliminate or minimize degradation of vegetation in these areas and therefore decrease opportunities for invasive species to establish and spread.

Treatment of invasive plant species including cheatgrass and other annual grasses, as stated under alternatives B and D, would benefit vegetation systems and improve the habitat for the aquatic and terrestrial species that inhabit these plant communities. Alternative C limits application methods and the species to be treated.

Alternatives B and D allow aerial application of herbicides within areas containing special status plant species; Alternative D allows only narrow spectrum (selective) herbicide treatments.

Management actions associated with Alternative D would allow surfacing-disturbing activities if defined criteria can be met or there is an approved reclamation plan. Other management actions

would be allowed if project and resource objectives were met. Alternative D does not include the option for the authorized officer to waive prohibitions, and the management action must meet certain criteria to be allowed. There would be fewer acres of vegetation and soil disturbance under Alternative D than under Alternative A, more than under Alternative B, and fewer than under Alternative C. Leasing and permitting have few limitations under alternatives A and C, which would have an overall adverse effect on invasive species and pest management because there would be few limitations on surface disturbances.

Alternatives C and D locate salt or mineral supplements a minimum of 500 feet from defined sensitive sites and Alternative B states 0.5-mile distance from defined sensitive sites. These areas of livestock concentration can be sites where invasive species establish and spread.

SRMAs and other special designation areas would in most cases protect and enhance vegetative resources. More restrictive management under Alternative B and Alternative D with qualifiers, would reduce surface disturbance, which would reduce the opportunity for invasive species to be introduced or spread. Under Alternative C these areas would be available for minerals leasing and permitting thus subverting invasive species and pest management.

The following conclusions are based on meaningful differences in short- and long-term disturbance acreage; surface disturbance and limiting activities on highly erosive soils, on soils with a severe erosional potential, on soils with poor reclamation suitability, and on slopes equal to or greater than 25 percent; use of certified weed seed-free products, timing, and reseeding requirements in reclamation of disturbed areas; management of livestock, including areas unavailable for livestock grazing, for resource protection; motorized vehicle use limitations; and management of soil disturbance during fire suppression activities. Potential adverse impacts under Alternative A are anticipated to be the most adverse, followed by alternatives C and B, with impacts under Alternative D anticipated to be the least adverse regarding the introduction and spread of invasive species.

4.4.5. Fish and Wildlife Resources – Fish

Various management actions under the alternatives could affect fish in the planning area. This section describes potential effects on fish from management of other resources. See Map 28 for a depiction of the distribution of fish in the planning area. Effects would be adverse if they contribute to the decline in fish abundance or range; effects would be beneficial impacts if they increase fish population numbers or viability, protect habitats, or reduce the risk of harm to fish species in the planning area.

Surface-disturbing activities, water depletions, changes in stream hydrology, increased sedimentation, changes in water quality (including clarity), and introduction of exotic species (e.g., mussels or whirling disease) can adversely affect fish. The primary means by which fish could be directly affected are surface development (e.g., mining and urbanization), loss of sufficient upland and riparian/wetland vegetation that increases sedimentation; barriers to fish passage; discharged water; and storm water runoff. Indirect impacts to fish species would result from actions that aid or compromise the protection of these species. Indirect impacts to potential habitats for fish species also could occur when actions, such as those listed above, change habitats in a way that makes them unsuitable.

For purposes of this analysis, short-term impacts to fish species result from activities that contribute to the decline in abundance or distribution of a species within five years after the

activity. Long-term impacts to fish species plants require more than five years to manifest on the surface.

Effects to Fish from Sedimentation

Excessive sediments deposited on stream and lake bottoms can choke spawning gravels, impair sources of food for fish (macroinvertebrates), fill in rearing pools, and reduce the complexity of habitat instream channels. Large quantities of suspended sediment also can make it more difficult for fish to find prey and can cause direct physical harm, such as clogged gills. In some cases, man-made disturbances that result in hydrologic modifications can cause sediment deficits that create stream-channel scour and cause loss of habitat structure (EPA 1999). Erosion rates in stream channels increase along with instream flows, which can augment sedimentation in streams. Increased sedimentation can affect aquatic resources by filling interstitial (intergravel) spaces and pool habitats. This increase in sedimentation can reduce the availability of suitable spawning and rearing habitats. Aquatic macroinvertebrates also are highly dependent on interstitial spaces for different life stages, and sedimentation can cause large decreases in population and change species composition. Benthic invertebrates are excellent candidates for monitoring sediment conditions in streams because substrate is believed to be the most important factor in regulating invertebrate distribution and abundance at the local or reach scale (BLM 2003c). Changes in invertebrate communities caused by deposited sediment can be difficult to isolate and quantify because they often accompany other modifications in the stream, such as removal of riparian vegetation, alterations of flow and temperature regimes, and nutrient enrichment (BLM 2003c). These community changes can be detrimental to fisheries that depend on macroinvertebrates as primary food supplies and can change the abundance and diversity of fish populations. Increased sedimentation also can reduce the productivity of, or eliminate, rooted and unrooted aquatic vegetation upon which many species of macroinvertebrates and fish depend for food and habitat; this could reduce populations of fish and macroinvertebrates. An increase in sediment load in the streams in the planning area can impact fish and macroinvertebrates and their habitats. The density and taxa richness of benthic invertebrates substantially decreased in three of four Missouri study streams well before 30 percent deposited sediment was reached (BLM 2003c). As deposited sediment increases, the community structure and diversity also can be altered. Community changes generally involve a shift in dominance from Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) to Oligochaetes (worms) in general (BLM 2003c). Management of the riparian zone has a strong influence on the degree to which streams behave as sources or sinks of fine sediment (Rabeni and Smale 1995).

It is likely that an increase in sediment loads would favor such species as the black bullhead, common carp, flathead chub, northern plains killifish, plains minnow, goldeye, river carpsucker, sand shiner, sturgeon chub, and white crappie. Such species as the brassy minnow, common shiner, creek chub, mountain whitefish, northern redhorse, brown trout, brook trout, cutthroat trout, Yellowstone cutthroat trout, rainbow trout, smallmouth bass, and walleye could be adversely affected by an increase in sediment.

Proper management of soil, water, and vegetative resources would benefit fish. Implementing mitigation measures to protect soils, water, and vegetation on a project-specific basis, particularly in the riparian zones of watersheds, would reduce disturbance to fish habitats and aid in the recovery of aquatic habitats from permitted uses. Improper management of soil, water, and vegetative resources can lead to increased sediment loads in affected watersheds. Evaluating surface disturbance to soils, applying mitigation, relocating to better soils, and including reclamation plans would minimize sedimentation. Approximately 2,800,000 acres in fish-bearing

watersheds within the planning area have soils with poor reclamation potential that if disturbed could increase sediment loads.

Water Quality

Water management actions could be beneficial or detrimental to fish species. Depletions would almost always be detrimental, whereas increased flows would generally be beneficial. Actions that protect water quality would be beneficial. Increased salt concentrations can alter the algae and macroinvertebrate composition of streams and, if sufficiently elevated, can change the abundance and diversity of fish species. Parameters such as electrical conductivity, TDS, or salinity are used as a measure of the concentrations of common ions in fresh water (Mount et al. 1997). The toxicity of water high in TDS to some aquatic invertebrates depends on the specific ionic composition. Ion imbalance can result from the composition and concentration of anions and cations that make up salinity (Goodfellow et al. 2000). Toxicity is affected by the ionic composition of the effluent and the species and life history stage (Chapman et al. 2000; Pillard et al. 1999). The EPA Phase 1 Toxicity Identification Evaluation can be used to measure concentrations of specific inorganic ions. Based on cost and timing, most effluent toxicity testing methods generally do not attempt to segregate the effects of salinity or ionic strength on test and species performance. Mount et al. (1997) developed models to test individual and combined ion toxicity on invertebrates such as *C. dubia* and *D. magna* and vertebrates such as the *P. promelas* (fathead minnow). The models followed the general guidelines of the EPA for performing acute whole effluent toxicity tests (EPA 1994). These models can be used to project changes in toxicity that result from modifications in industrial processes, effluent treatment, or other remedial measures. As a general screening tool, the concentration of TDS can be high enough to adversely affect freshwater test species if the conductivity of a freshwater effluent is above 2,000 micro siemens per cubic meter (Goodfellow et al. 2000).

Water Temperature

Water temperature can affect growth, metabolism, reproduction, emergence, and the distribution of aquatic species (Vannote and Sweeney 1980). The magnitude and pattern of historical, annual, seasonal, and daily fluctuations in temperature can be important in selecting and maintaining a variety of aquatic insects in a stream reach (Vannote and Sweeney 1980). Sudden increases or decreases in water temperature could result in population- and community-level changes in aquatic insects in the planning area.

4.4.5.1. Methods and Assumptions

This section describes the methods and assumptions used in the analysis of impacts to fish. The assumptions and methods include, but are not limited to:

- The fish-bearing streams GIS layer used for analysis is representative of fish-bearing streams.
- The BFO waterbodies identified as perennial in the GIS layer support fish.
- The term “lake” refers to any impoundment (e.g., reservoir, pond, and natural lake); “fish” refers to any fish species.
- In general, analysis is performed on a watershed scale. Resource management actions which would result in surface disturbance occurring within 0.25 mile of a fish bearing stream would directly impact fish habitat, and are used to quantify acres impacted.
- Impacts to fish are representative of impacts to aquatic community health. Organisms at lower trophic levels (periphyton and invertebrates) respond more quickly to environmental stressors than fish. To detect changes in aquatic systems over 1 to 5 years, monitoring periphyton and

invertebrates would better allow for the implementation of management actions where there are impacts to fish.

- The total amount of new surface disturbance allowed by an alternative is an index of potential impacts to fish. Success of reclamation measures varies. It is assumed that BLM-applied reclamation will be successful in preventing impacts to fish.
- Activities that cause substantial disturbance to soils and vegetation can adversely impact water quality and quantity, which adversely impacts fisheries habitats.
- Surface disturbances accelerate runoff and sediment delivery to stream channels, which alters streamflows and reduces habitat quality for fish that require clear water, moderated streamflows, and clean substrates.
- Increasing sedimentation adversely affects fish adapted to clear-water systems (those originating from the Big Horn Mountains) in the planning area.
- Decreasing turbidity can adversely affect fish adapted to turbid waters (streams with prairie origins).
- Activities that affect water quantity are regulated by the WSEO.
- Activities that affect water quality are regulated by the Wyoming DEQ.
- Management toward DPC is assumed to exceed the requirements of managing toward PFC.
- The potential for sedimentation of streams and rivers is minimized through the implementation of BMPs.

Significance Criteria

In addition to the scale of impacts listed in the beginning of this chapter, an adverse impact on fish species as a result of project actions would be considered potentially significant if there was: (1) substantial loss of the biological integrity and habitat function of aquatic ecosystems that would make species eligible for listing under the ESA; (2) substantial loss (more than 10 percent) of habitat function or disruption of life history requirements of fish species that would preclude maintenance or improvement of their status; (3) a degrading change in the Wyoming DEQ classification for a stream or river reach.

4.4.5.2. Impacts Common to All Alternatives

This section describes management actions and resulting impacts to fish species common to all alternatives. The following paragraphs describe the sources and types of potential impacts. The section then describes management actions and impacts to fish from management of other resources. Management actions common to all alternatives that are administrative processes (e.g., development and prioritization of plans, providing outreach and education, updating existing habitat management plans (HMPs), and adherence to rules, regulations, and agreements such as MOUs) would have negligible to moderate beneficial effects.

Due to a lack of overlapping resources, management of **Air Quality** would not affect fish and is not further addressed in the **Fish and Wildlife Resources – Fish** section.

Fish and Wildlife Resources – Fish

Managing barriers to fish passage in cooperation with the WGFD and other stakeholders would have a beneficial effect on fish species because removing or bypassing these barriers can allow fish to move into new habitats, or complete critical life history requirements. Impacts from the management of activities potentially affecting native and desirable non-native fish species in

collaboration with the WGFD and other stakeholders should be beneficial as it would likely result in increased populations, protected habitats, and reduced risk of harm to fish.

Managing public access to fish-bearing waters that protect crucial habitats could have an adverse effect on fish. Future access routes would increase the likelihood of introducing whirling disease and invasive species to fish-bearing waters. These impacts could be mitigated to negligible through education and enforcement programs for fisheries.

Physical Resources

Soil

Evaluating the effects to soil resources from a proposed surface-disturbing activity using NRCS Soil Survey data and onsite investigation would help identify mitigation measures, relocate the activity to a more suitable soil type, or deny the authorization. Reclamation plans also would minimize impacts. This management of soil resources would reduce the risk of harm to fish on five to ten percent of the fish-bearing streams in the planning area; therefore, management actions Common to All Alternatives for soil would have a moderate beneficial effect on fish.

Water Resources

Water management actions would beneficially affect fish by reducing sedimentation, increasing aquatic vegetation and macroinvertebrates through (1) providing an alternative or “off-source” water supply (e.g., piping water to troughs, tanks, or ponds) in locations where BLM-authorized uses are fenced out of water sources; (2) installing flow-control devices on new and existing BLM-authorized water wells and spring developments and evaluating the need for additional flow-control devices on a project-specific basis; (3) managing water resources to meet the Wyoming Standards for Healthy Rangelands and achieve PFC; (4) taking appropriate actions to improve the biological, chemical, and geomorphic conditions of streams adversely affected by BLM-authorized actions and permitted activities; and (5) designing and managing land use and surface-disturbing activities to reduce channel and bank erosion and the associated loss of riparian habitats. All these actions influence greater than ten percent of the fish-bearing streams in the planning area and would have a major beneficial effect on fish.

Cave and Karst Resources

The management actions common to all alternatives for cave and karst resources are administrative and would have no effect on fish resources.

Mineral Resources

Locatable Minerals

Leaving lands open to locatable minerals exploration and development could lead to increased sedimentation, removal of riparian vegetation, changes instream channel morphology, and decreased water quality. This would have a major adverse effect on fish resources, depending on the scale of exploration and development. A 2009 MOU between the BLM and the U.S. Nuclear Regulatory Commission to address uranium development and reclamation activities would moderately benefit fish by increasing protections to fish-bearing streams from runoff and decreased water quality. Locatable minerals occur within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area; therefore the management actions Common to All Alternatives for locatable minerals would have a major adverse effect on fish resources.

Leasable Minerals – Coal

Making the federal coal estate areas identified as acceptable for further coal leasing consideration (BLM 2001a) available for exploration could impact five to ten percent of the fish-bearing streams in the planning area. If coal mining affected these streams, the effects (increased sedimentation and surface disturbances) could rise to a population or community level and have a moderate adverse effect.

Leasable Minerals – Fluids and Salable Minerals

Opening mineral estate to fluid minerals leasing and mineral materials exploration (unless the mineral estate is specifically identified as closed to minerals leasing) could adversely affect fish if fluid or other leasable minerals, and mineral materials were developed in fish-bearing watersheds.

In general, surface mining activities increase erosion and accelerate sedimentation into nearby lakes and streams. Streams could be dewatered or rechanneled to accommodate surface mines. Surface mining operations also have the potential to increase pollution that can enter streams through runoff and disrupt subsurface and surface water flow patterns. Bridges, culverts, and low-flow crossings are integral features to road development associated with surface mining. If improperly designed, these features also can interfere with fish migrations to spawning, feeding, rearing, and overwintering sites. Proper placement of these structures is critical to minimizing impacts to fish.

Increasing streamflows from produced water could have beneficial and adverse effects on aquatic species. Oil and gas produced water can be beneficial in enhancing or creating fish habitat, and adverse if water quality suffers, hydrologic regimes are modified to an extent that affects fish, or naturally turbid waters are clarified. The primary beneficial effect would be to provide habitat to fish and macroinvertebrates in areas that are normally dry. This new habitat could provide opportunities for population growth. Increased flows also could benefit fisheries where containment or flow-through ponds are developed for fisheries. With proper water quality, these ponds could serve as sport fisheries or be used for breeding native species.

Produced water can change turbidity, water quality, and the hydrography. Decreased water quality (for example increases in Sodium Absorption Ratio or TDS) can adversely impact fish. A change in streamflow translates to a change in the water depth and velocity for any specific location in a stream. Consequently, changes in streamflow can be regarded as modifications to the physical composition of the aquatic habitat (Bain and Finn 1988). Fish that inhabit streams in the planning area are frequently exposed to disturbances from floods and droughts, and must persist in environments characterized by fluctuating flows. Produced water can stabilize flows in a system adapted to fluctuations. Potential adverse effects to fish and invertebrates caused by changes in flow could be physical, behavioral, habitat, and food changes that could occur if streamflows change substantially, especially during spawning. Increased flows in rearing areas could make survival more difficult for young fish. Bain and Finn (1988) and Fausch and Bramblett (1991) reported that shallow- and slow-water fish were adversely affected by an artificially high variability in flow.

Streams and rivers receiving clear (low turbidity) discharge could become less turbid because produced water is relatively low in sediments. This decrease in turbidity could be detrimental to fish that depend on turbid waters and could allow changes to the fish community. Increased clarity provides an advantage to predatory fish such as centrarchids (e.g., bass and sunfish), resulting in higher predation rates to native fish adapted to turbid waters.

Leasable fluid minerals and salable minerals each occur within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area; therefore, the impacts described here would have major adverse effects on fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Adhering to the National Wildland Fire Management Policy and current FMP for the WHPD, ensuring all prescribed-fire activities comply with Wyoming DEQ standards and rules, and using a fire resource advisor would help reduce impacts to fish species to a minor level. Prohibiting the use of retardants or foam within 300 feet of surface water sources would reduce impacts to fish to a minor level. Some runoff into occupied stream segments would be likely, which would kill individual fish, but population-level effects are not anticipated. Implementation of the BLM Emergency Stabilization and BAR standards and rehabilitation of fire lines would reduce sedimentation from runoff to a minor level. Landscape treatments to enhance fuels management and restore fire-adapted ecosystems could result in a short-term, minor adverse effect on fish and fisheries from sedimentation during fire treatments. Long-term effects from treatments would be moderately beneficial because the threat of catastrophic wildfire would be reduced.

Fire affects fish populations through both physical and chemical changes (increased siltation, altered water quality [dissolved oxygen, pH, suspended and dissolved solids, total hardness, and turbidity], and changes in water temperature). Nutrient flow changes that adversely affect aquatic insect production also would affect fish populations. Although there is limited BLM surface estate congruent with fish streams (615 stream miles in the planning area on BLM-administered lands), the threat of adverse effects from unplanned ignitions and prescribed fires occurs on all lands surrounding fish streams, and therefore could affect any fish populations in BLM-administered streams. The extent of surface erosion after fire depends largely on the topography and soil types in the immediate area. Stream siltation can occur following fire. Siltation is a particular problem where severe burns occur on steep or moderate slopes, in riparian habitats, or where heavy equipment is used in fire suppression activities. Water temperature in cold-water fisheries, such as the upper forks of the Powder River and the Tongue River tributaries, could change if shading vegetation is removed from the sides of the stream. Generally, fish will rapidly recolonize fire-affected areas. Fuels management projects are designed and implemented in a non-emergency manner that minimizes impacts to aquatic resources. Competent planning and implementation would minimize the effects on fish from fuels treatments. For example, prescribed fires conducted in spring and fall are less likely to escape containment and are therefore less of a threat to riparian vegetation and less likely to contribute to erosion.

Biological Resources

Vegetation – Forests and Woodlands

No management actions common to all alternatives have been identified for forests and woodlands.

Vegetation – Grassland and Shrubland Communities

Managing vegetative communities in accordance with Wyoming Standards for Healthy Rangelands and siting facilities and related infrastructure, travel routes, recreational uses, mineral exploration and development, and ROW to reduce impacts to vegetative resources would minimize sedimentation and channel modifications within 0.25 mile of greater than ten percent

of the fish-bearing streams in the planning area. Maintaining sustainable forage levels for livestock and wildlife habitat would minimize sedimentation. Management actions common to all alternatives for grassland and shrubland communities would have major beneficial effects on fish resources.

Vegetation – Riparian/Wetland Resources

Prioritizing and developing activity and implementation plans to manage riparian and wetland systems to be at or above, or continue to be improving toward, PFC while achieving the Wyoming Standards for Healthy Rangelands would minimize sedimentation and channel modifications. Managing riparian and wetland systems to enhance forage conditions and improve water quality, to a succession stage appropriate for that system, including vertical and horizontal vegetative structure and composition, would minimize sedimentation and channel modifications. These actions would influence greater than ten percent of the fish-bearing streams in the planning area; therefore, they would have major beneficial effects on fish resources.

Invasive Species and Pest Management

BLM weed and pest control work on public lands adjoining deeded and state lands could have an adverse effect on fish if chemical applications encounter fish-bearing waters and alter the water quality in these areas. Proper use of chemicals, for example not applying them within 200 feet of fish-bearing waters, would minimize this risk. Specific, careful and appropriate grasshopper and Mormon cricket treatments can prevent over-utilization and thereby limit erosion, resulting in a beneficial effect in some areas. Moderate adverse impacts to fish resources will result from management actions common to all alternatives for invasive species and pest management.

Fish and Wildlife Resources – Wildlife

Management actions common to all alternatives support efforts to protect and improve riparian ecosystems. These actions include restoring fish habitats and managing harmful non-native riparian vegetation in river and stream systems important to fish species, and would have beneficial effects on fish. Management actions common to all alternatives support efforts to protect and improve various ecosystems throughout the planning area. These actions include managing vegetative diversity, minimizing disturbances to springs and riparian zones, and improving riparian plant communities.

Special Status Species – Plants

Management actions common to all alternatives for special status plant species include allowing treatments that would benefit the plant species. Special status plant species occur along five to ten percent of the fish-bearing streams in the planning area. Treatments that improve the health of vegetation would also improve the health of the neighboring stream; therefore, management actions common to all alternatives for special status plant species would have moderate beneficial effects on fish resources.

Special Status Species – Fish

Prioritizing special status fish species over other fish species in planning and management actions may be a minor adverse effect for those fish-bearing waters that are not identified as a priority as it would leave one to five percent of the fish-bearing streams as a lower priority.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Avoidance areas, whether for the application of broad-spectrum insecticides or for the protection of nesting bald eagles, would have a major beneficial effect on fish where these resources overlap. Due to the overlap of wildlife and fish habitats (greater than ten percent), the overall beneficial effects of habitat protection would be major.

Heritage and Visual Resources

Cultural Resources

Management actions include completion of site stabilization and long-term protection of significant sites. This would benefit fish through habitat conservation when the sites occur within close proximity to fish habitats. Currently, significant sites occur within 0.25 mile of less than one percent of the fish-bearing streams in the planning area. Management actions for cultural resources would have negligible beneficial effects on fish resources.

Paleontological Resources

Management actions common to all alternatives would occur on less than one percent of habitats important to fish species, and would have a negligible beneficial effect on fish resources by retaining public lands under the management of the BLM.

Visual Resources

Management of WSAs and the Middle Fork Powder River as VRM Class I could prohibit or limit some surface-disturbing activities in those areas, thereby protecting fish habitats. VRM Class IV areas have minor limitations. Managing visual resources would indirectly affect fish habitats, depending on the locations, types, and durations of approved projects. Beneficial effects under the management actions common to all alternatives would occur on less than one percent of habitats important to fish species, and would therefore have negligible beneficial effects on fish resources.

Land Resources

Forest Products

Prohibiting forest management areas within 200 feet of surface waters on approximately 10,318 acres will protect streams and rivers from sedimentation, soil erosion, and increased water temperatures, and result in a major beneficial effect to fish, as this would affect over 10 percent of fish-bearing streams.

Lands and Realty

Negotiating with willing landowners to obtain access across non-BLM-administered lands to isolated parcels of public land that contain fish would increase the risk of spreading whirling disease or unwanted species (e.g., zebra mussels). This could have an adverse effect on fish. Project-specific analysis of lands and realty actions, such as approval of R&PP permits, land use authorizations, and withdrawals and land disposals require NEPA analyses, which would identify any conflicts before adverse effects could occur. Potential lands and realty actions could occur along one to five percent of the fish-bearing streams in the planning area; therefore, management actions common to all alternatives would have minor adverse effects on fish resources.

Renewable Energy

Management actions common to all alternatives for renewable energy are administrative and will have no effect on fish resources.

Rights-of-way and Corridors

Reasonable access could be provided for ROWs and corridors within 0.25 mile of five to ten percent of the fish-bearing streams in the planning area. ROWs cause habitat degradation through vegetation removal and trampling. Adverse effects to fish-bearing waters from ROWs would occur when these accesses cause increased sedimentation in the streams.

Management actions common to all alternatives for ROWs and corridors would have moderate adverse effects on fish resources.

Travel and Transportation Management

Because roads typically are void of vegetation and exhibit impervious surfaces or compacted soil, they often promote increased surface runoff and lead to soil erosion and transport of pollutants to nearby streams, wetlands, or riparian areas. Inventory and evaluation of all existing roads and trails into one transportation plan would designate those to be upgraded, maintained, or abandoned. These actions would reduce erosion, protect and stabilize soils and vegetation, and reduce opportunities for invasive plants and weeds to establish. Restricting motorized vehicles and implementing temporary closures would contribute to stabilizing soils and reducing erosion. All new roads would be designed to minimize surface disturbance and surface runoff and erosion potential. Constructing new roads and trails have a direct, long-term adverse impact on fish-bearing streams. Roads and trails for motorized vehicles result in localized direct and adverse impacts on fish habitats, such as reducing vegetation cover and density and changing community compositions. Reclaiming abandoned roads and trails with appropriate herbaceous and shrubby vegetation and upgrades on utilized roads would promote soil stabilization and reduce opportunities for erosion and for invasive plant and weed species to establish; this would have a direct beneficial impact on fish resources over the long term. Overall, transportation and access could be permitted within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area; therefore, management actions for transportation and access would have major adverse effects on fish resources.

Recreation

There is minimal public access at present to BLM waters in the planning area that containing fish. The Middle Fork Powder River, North Fork Powder River, Pass Creek, Bear Trap Creek, Crazy Woman Creek, Poison Creek, Eagle Creek, Bachus Creek, Blue Creek, Tongue River, Belle Fourche River, and the main stem Powder River all have public access and fishing pressure. The South Fork Tongue (15 miles on the Bighorn National Forest), North Fork Powder (13.2 miles), and Middle Fork Powder (12.8 miles) are classified as Wyoming Game and Fish designated Blue Ribbon fishery - meaning a fishery of national importance. The Powder River segments include BLM-administered lands. The North Fork Tongue River (20.2 miles on the Bighorn National Forest), Tongue River (13 miles on mixed ownership), Sheely Creek (3.5 miles on National Forest Service land), Wolf Creek (6.7 miles on the Bighorn National Forest), South Fork Tongue River (7.2 miles on the Bighorn National Forest), Piney Creek (3.2 miles), Clear Creek (10 miles), North Fork Powder River (17.3 miles in two segments), Blue Creek (2.5 miles), and Buffalo Creek (10.5 miles) are classified by WGFD as Red Ribbon waters, a WGFD designation meaning a fishery of regional importance as trout fisheries. Only the last three include BLM-administered lands.

The primary adverse effect from recreation would be the introduction of diseases such as whirling disease, and invasive species such as zebra mussels. Humans, particularly fishermen, can transport infected sediments or water on boots, bait, boats, and other equipment. The effect on fish and fisheries from introducing diseases and invasive species can be adverse. Invasive species and disease introductions can be avoided and minimized through education, and educational opportunities will increase with increased recreational access to fisheries.

Avoiding riparian habitat or developing and managing recreation sites, recreation facilities, and recreation access in a manner that minimizes impacts to riparian habitats, and prohibiting dispersed camping and commercial camps within 200 feet of surface water would moderately benefit fish.

Lands with Wilderness Characteristics

Management actions common to all alternatives for lands with wilderness characteristics are administrative and will have no effect on fish resources.

Livestock Grazing Management

Improper livestock grazing management could adversely impact stabilization of riparian vegetation, which can lead to stream instability and an associated loss of habitat complexity, and the loss of shading vegetation, which can lead to elevated stream temperatures, increased sediment delivery, and loss of stream channel complexity provided by fluvial processes and woody debris. Dispersed grazing from construction of water developments for livestock use, will reduce impacts to riparian habitats. The degree of adverse impact, if any, would depend on livestock grazing timing and intensity, site characteristics, and species habitat requirements. Stock driveways and rests in riparian areas (Bear Trap Creek and Middle Fork Powder River for example) tend to concentrate high levels of livestock use that can cause degradation (e.g., near-complete removal of vegetation and soil compaction), impacting wildlife habitats. Beneficial impacts of proper grazing include reducing competition by removing encroaching woody plant cover; hoof action that keeps topsoil loose, increases litter and precipitation penetration, and incorporates seeds into soil; nutrient recycling; removing wildfire fuels; and controlling invasive plant and weed species with properly timed grazing rotations and species (e.g., goats). There are 779,034 acres of BLM surface lands in grazing allotments in the planning area, which occur along greater than ten percent of the fish-bearing streams in the planning area. Management actions common to all alternatives for livestock grazing would have moderate adverse and beneficial effects on fish resources.

Special Designations

Areas of Critical Environmental Concern

Management actions common to all alternatives for ACECs will have no effect on fish resources.

Scenic or Back Country Byways

Increased road maintenance and human activity on byways would have adverse impacts to fish habitat from dust, soil erosion, and spread of invasive species, adversely impacting water quality and aquatic plant communities. Management actions common to all alternatives associated with scenic or BCBs will have a negligible adverse effect on fish resources.

Wild and Scenic Rivers

Management actions common to all alternatives for WSRs will have no effect on fish resources.

Wilderness Study Areas

WSAs will be managed to preserve natural conditions and processes, and restrict motorized activities. These actions would occur on over ten percent of habitat important to fish species; however, WSAs are localized and few stream segments would be impacted. Management actions common to all alternatives for WSAs will have minor beneficial effects on fish resources.

Socioeconomic Resources

Social and Economic Conditions

Management actions common to all alternatives are administrative processes and will have no effect on fish resources. Impacts to social and economic resources will be quantified on a project

specific basis. Management actions that vary by alternative are also administrative; therefore, social and economic management actions will not be discussed further in this section.

Health and Safety

Management actions common to all alternatives are designed to control and mitigate threats to health and human safety and to the environment. Management actions designed to prevent accidental spills of hazardous materials or environmental contamination would have beneficial impacts to fish by protecting riparian and wetland areas and water quality across the resource area. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is a threat of accidents or spills. If there was a spill, mitigation and cleanup would rarely succeed in recovering a riparian or wetland area to its original condition over the short term; therefore, there would be localized long-term adverse impacts.

Only management actions common to all alternatives are identified; therefore, health and safety will not be discussed further in this section.

4.4.5.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes management actions and potential impacts to fish from implementing Alternative A.

Fish and Wildlife Resources – Fish

Cooperating with the WGFD stocking programs and designing reservoirs to enhance fisheries where there is a potential to do so would benefit fish. Maintaining or improving reservoirs and riparian areas could increase population numbers or viability in one to five percent of the fish-bearing streams in the planning area and have a minor beneficial effect on fish resources.

Physical Resources

Soil

Under Alternative A, prohibiting surface-disturbing activities in areas with severe erosion hazard (215,496 acres) from March 1 through June 15, on slopes equal to or greater than 25 percent (170,590 acres), and on soils with poor reclamation potential (455,090 acres) would limit erosion and subsequent sedimentation. The scope of these actions, in combination with the limited timing restriction for areas with severe erosion hazard (i.e., allowing disturbance from June 16 through February 28) could result in increased sedimentation. These prohibitions/restrictions, in general, would reduce the risk of harm in greater than ten percent of the fish-bearing streams in the planning area and constitute a major beneficial effect on fish.

Water Resources

Under Alternative A, reservoir construction in historic or existing fish habitat would require site-specific analysis through BLM and EPA authorities. The management of produced water from oil and gas development does overlap with fish habitat. Current prohibitions regarding the placement of oil and gas wells and facilities prohibit these elements within 500 feet of streams and lakes. This prohibition reduces impacts to fish habitat from sedimentation.

Prohibiting surface disturbance within 500 feet of any spring, reservoir, water well, or perennial stream, unless the authorized officer waives the prohibition, would have a beneficial effect by

reducing sedimentation. Application of waivers without defined criteria can result in inconsistent application of management and unknown levels of protection. These prohibitions/restrictions currently contain greater than ten percent of the fish-bearing streams in the planning area; therefore, management actions for water under Alternative A would have major beneficial effects on fish resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Cave and Karst Resources

There are no management actions for cave and karst resources under Alternative A.

Mineral Resources

Locatable Minerals

Under Alternative A, withdrawing the Amsden Creek (525 acres), Ed O. Taylor (approximately 3,896 acres, and a Wyoming Game and Fish designated Blue Ribbon fishery - meaning a fishery of national importance), and Kerns game range (163 acres) from mineral locations and restricting locatable minerals activities in the approximately 28,931 acres of Fortification Creek, Gardner Mountain, and North Fork (a Wyoming Game and Fish designated Blue Ribbon fishery - meaning a fishery of national importance). Locatable mineral activities (causing surface disturbance and increased sedimentation) under Alternative A could be permitted within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area. Management actions for locatable minerals under Alternative A would have major adverse effects on fish resources.

Leasable Minerals – Coal

The management action listed under Alternative A will have no effect on fish resources.

Leasable Minerals – Fluids

Continuing to lease and allow development of federal oil and gas could adversely affect greater than ten percent of the fish-bearing streams in the planning area through increased sedimentation from surface disturbing activities near fish-bearing streams, changes instream hydrology and water quality from produced water discharge. Virtually all warm-water fish-bearing streams in the planning area are over surface with CBNG potential. Current knowledge of the distribution of coalbeds harboring natural gas indicate drainages containing fish-bearing waters would continue to be developed, potentially resulting in a major adverse effect on fish.

Salable Minerals

The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for salable minerals (habitat degradation). Salable mineral development under Alternative A would be permitted within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area; therefore, salable mineral management actions under Alternative A would have major adverse effects on fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative A, limiting fire suppression on BLM-administered land where fire control would be very difficult or extremely hazardous to firefighting personnel could allow fires to

damage streams in occupied fish range. Suppressing unwanted wildland fires would prevent sedimentation from post-fire erosion. Use of fire retardants could adversely affect fish if the chemicals reach occupied streams. Rehabilitating fire and fire suppression damage would benefit fish by decreasing runoff and sedimentation. Conducting prescribed fires to support vegetation and wildlife habitat objectives would have either an adverse or beneficial effect on fish. Prescribed fires could increase runoff and sedimentation in the short term, adversely affecting fish; however, prescribed fires could benefit fish over the long term by removing invasive plant species and increasing streamflows. Overall, Alternative A fire and fuels management would have a minor adverse effect on fish.

Biological Resources

Vegetation – Forests and Woodlands

Treatments including cutting, thinning, and prescribed burning may pose an adverse short-term impact on fish resources resulting from soil erosion and potential sedimentation in streams and rivers. However, improved forest health (vegetation composition, soil stability, decreased risk of wildfire) resulting from the treatments would be beneficial. Actions would impact over ten percent of habitat important to fish species, having major beneficial effects on fish resources over the long-term.

Vegetation – Grassland and Shrubland Communities

There are no management actions for grassland and shrubland communities under Alternative A.

Vegetation – Riparian/Wetland Resources

Prohibiting surface-disturbing activities within 500 feet of springs, reservoirs, water wells, or perennial streams would benefit fish by preserving the riparian and adjacent upland communities of all the fish-bearing streams in the planning area. Management actions for riparian/wetland resources under Alternative A would have major beneficial effects on fish resources.

Invasive Species and Pest Management

IPM, as currently practiced and when appropriately applied in the planning area, complies with restrictions on chemical labels that provide adequate buffers from fish-bearing water. Aggressive treatment of invasive plants, particularly riparian plants, could adversely affect fish in the short term by increasing sedimentation and removing shade. Over the long term, these treatments would benefit fish by replacing invasive plants with native species that generally require less water and by increasing stream flow. Overall, Alternative A management of vegetative resources would result in a major beneficial effect on fish, but the short-term adverse effects reduce this to moderate.

Fish and Wildlife Resources – Wildlife

Under Alternative A, seasonally prohibiting surface disturbance and disruptive activities and limiting timber harvest in crucial elk ranges would have a beneficial effect on fish in the Fortification Creek drainage. Prohibiting surface disturbance or occupancy within a biologic buffer zone around active nests of raptor species of high federal interest unless the authorized officer waives the prohibition would limit surface disturbance and oil and gas activities in association with these nests. Approximately 303 miles, greater than ten percent, of fish-bearing streams intersect identified raptor buffers. Overall, Alternative A management of wildlife resources would have a major beneficial effect on fish.

Special Status Species – Plants and Fish

There are no management actions for special status plants or special status fish under Alternative A.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Managing vegetation resources to comply with the ESA and BLM policy associated with management of habitat for SSS would have beneficial effects to fish. Surface disturbance restrictions for Greater Sage-Grouse breeding grounds and raptors nests would have beneficial effects on fish. Protections afforded Threatened, Endangered, and sensitive species, such as oil and gas disturbance-free zones around bald eagle nests and roosts, would prevent surface disturbance and have beneficial effects on fish. Overall, these protection zones for special status wildlife habitats encompass greater than ten percent of the fish-bearing streams in the planning area. Management actions for special status wildlife species under Alternative A would have major beneficial effects on fish resources.

Heritage and Visual Resources

Cultural Resources

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for cultural resources (habitat conservation). NSOs are currently applied to the Bozeman Trail and Crazy Woman Battle Site only. These restrictions would be beneficial to any fish habitats they encompass as they would reduce the risk of harm to the fish resource. All other management of cultural resources is considered on a project specific basis. Under Alternative A, cultural resource protection would encompass less than one percent of the fish-bearing streams in the planning area. Management actions for cultural resources under Alternative A would have negligible beneficial effects on fish resources.

Paleontological Resources

Under Alternative A, management of lands containing paleontological resources would be considered on a site-specific basis. In areas where mineral development was not allowed, water quality would remain unchanged, having a negligible beneficial effect on fish resources.

Visual Resources

Management of VRM Class I and II areas could prohibit or limit some surface-disturbing activities and thereby protect fish habitats. VRM Class III and IV areas have minor limitations. Managing visual resources would indirectly affect fish habitats, depending on the locations, types, and durations of approved projects. Beneficial effects under the management actions associated with Alternative A would occur on approximately 67,089 acres, over ten percent of habitats important to fish resources and would therefore have major effects.

Land Resources

Forest Products

Management actions associated with Alternative A have the potential to have both adverse and beneficial impacts to fish. Sedimentation and soil erosion can result from access roads and techniques used to harvest forest products, reducing water quality. Limiting areas of clear cuts to 20 acres, rehabilitation of harvested areas, and protecting regeneration from over utilization will all serve to limit the amount of sedimentation, and will result in beneficial long-term effects to fish by increasing forest health (increased soil stability, plant community composition and structure). Management actions will occur on approximately 3,430 acres, five to ten percent of

habitat important to fish; however, beneficial effects to forest health would lessen the adverse effects to some of the habitat. Overall, a minor adverse effect to fish would result.

Lands and Realty

Lands identified for acquisition or disposal and pursuing easements to BLM-administered lands may impact fish resources by changing public access to fisheries. Acquisitions and easements would increase access to fisheries, while disposals would reduce public access. In both cases, potential increases in sedimentation and surface disturbance near fish-bearing streams would be negligible. Changes in land status current could occur along less than one percent of the fish-bearing streams in the planning area.

Renewable Energy

There are no management actions for renewable energy under Alternative A.

Rights-of-Way and Corridors

ROWs could be permitted, under this alternative, within greater than ten percent of the fish-bearing drainages in the planning area. ROW and corridor construction would cause surface disturbance and increase sedimentation. Management actions for ROWs and corridors under Alternative A would have major adverse effects on fish resources.

Travel and Transportation Management

Under Alternative A, there would be indirect effects on fish species from travel management and OHV use. OHV use on and off designated trails has the potential to destroy vegetation, compact soils, and lead to soil erosion and ponded water. By designating areas where OHV use is limited to designated roads and trails, adverse effects on fish habitats can be reduced. In cases where motorized vehicle use is closed for only portions of the year, these closures would not be as great a benefit to special status fish species. Regardless of intensity of management, OHV use is still anticipated to have an adverse effect on one to five percent of fish habitats. Management actions for TTM under Alternative A would have minor adverse effects on special status fish resources.

Recreation

Under Alternative A, pursuing easements to provide access to BLM-administered lands for recreation and administrative purposes could expose occupied fish streams to whirling disease, zebra mussels, or other introduced species and disease, which would have a moderate adverse effect on fish. Prohibiting surface disturbance and occupancy on slopes equal to or greater than 25 percent or more would minimize sedimentation. Areas where OHV use is limited to designated roads and trails would limit access to fisheries and reduce the potential for introduction of invasive species and disease. Prohibiting oil and gas leasing and development in the Mosier Gulch Recreation Area would provide some protection from the impacts of oil and gas development along a section of Clear Creek, which would have beneficial effect on fish. Recreational areas occur within 0.25 mile of less than one percent of the fish-bearing streams in the planning area. The overall management actions for recreation under Alternative A would have negligible beneficial effects on fish resources.

Lands with Wilderness Characteristics

No lands with wilderness characteristics have been identified. Lands would be evaluated and managed on a project-specific basis. Adverse impacts to fish resources would occur if surface-disturbing activities were permitted; however, the low potential for mineral development, commercial timber, and renewable-energy projects to be proposed in remote, road less areas would make these impacts negligible.

Livestock Grazing Management

Under Alternative A, suspending or adjusting livestock grazing use in areas where timber harvest has occurred whenever grazing would impair forest regeneration would moderately benefit the Billy Creek, North Fork Powder, and Pass Creek areas by reducing sedimentation.

Managing Category M allotments to continue the current authorized livestock use on 98 Category M allotments at 43,573 AUMs would continue to affect fish in some areas by continued livestock use of riparian habitats.

Alternative A management of Category I allotments would include performing baseline inventories; developing, implementing, and monitoring AMPs; and increasing available forage first to wildlife after range condition class has been upgraded to good on allotments now rated poor to fair, would benefit fish.

Under Alternative A, livestock grazing is not authorized on approximately 4,000 acres of public land in the canyons and slopes of the southern Big Horn Mountains because of rough terrain and steep slopes. Allowing livestock grazing on all public lands in the planning area except on approximately 6,000 acres (1%) where it has been determined to be incompatible with other resource uses or values would have an adverse effect on fish due to continued sedimentation, reduced water quality, removal of riparian habitat, and transport of invasive plant species.

Cumulatively the livestock grazing management actions could occur within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area. Management actions for livestock grazing under Alternative A would have major adverse effects on fish resources.

Special Designations

Areas of Critical Environmental Concern

There are no ACECs proposed under Alternative A.

Scenic or Back Country Byways

No scenic or BCBs are proposed near fish habitat under Alternative A.

Wild and Scenic Rivers

If Congress releases the Middle Fork Powder River from WSR designation, management will continue to retain free-flowing characteristics and outstanding resource values. This would be a negligible benefit to fish as it represents less than one percent of the fish-bearing streams in the planning area.

Wilderness Study Areas

Under Alternative A, if Congress decides not to designate the North Fork and Gardner Mountains WSAs as wilderness, there would be no effect to fish resources as oil and gas potential is low.

4.4.5.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to fish resources due to their implementation.

Fish and Wildlife Resources – Fish

Under Alternative B, prohibiting surface-disturbing and disruptive activities within 0.25 mile

of any waters rated by the WGFD as Blue or Red Ribbon streams (trout streams of national or statewide importance) would benefit these fisheries by minimizing sedimentation. Designing crossings of waterbodies identified as supporting fish to allow fish passage would benefit fish. Managing riparian and uplands in historically perennial systems to restore perennial flows or standing water could increase fish distribution and benefit fish. Restoring important instream segments for fish habitat in accordance with WGFD priorities could increase fish densities and distribution and benefit fish. Overall, these management actions would have a major beneficial effect on fish.

Physical Resources

Soil, Water Resources , and Cave and Karst Resources

Alternative B would analyze impacts to soil, water, and cave and karst resources on a project-specific basis. In addition, Alternative B would prohibit surface-disturbing activities or apply NSO stipulations to activities on badlands, rock outcrops, and slopes susceptible to mass movement, and prohibit prescribed fires on highly erodible soils; prohibit such activities as on-channel reservoirs, conversion of abandoned oil and gas wells to water supply wells, and activities within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated habitat; and prohibit activities in cave and karst areas. Under Alternative B, applying an NSO stipulation on soils with poor reclamation suitability, in badlands, on rocky outcrops, on slopes susceptible to mass movement, and on slopes equal to or greater than 25 percent would prevent sedimentation and have a major beneficial effect on fish. These soil types overlap almost all the fish-bearing drainages in the planning area. Prohibiting surface-disturbing activities for the protection of water resources under Alternative A would conserve all the fish-bearing drainages in the planning area. Prohibiting surface-disturbing activities for the protection of cave and karst resources under Alternative A would conserve vegetation in five to ten percent of the fish-bearing drainages in the planning area. Overall, Alternative B management of soils and water would result in major beneficial effects on fish resources and cave and karst resources would result in moderate beneficial effects on fish resources.

Mineral Resources

Alternative B recommendations to withdraw additional lands from minerals entry would protect portions of the Tongue River. Decreasing the availability of BLM-administered mineral reserves for leasable fluid minerals, leasable coal, and salable minerals would not affect fish if minerals were not developed or were developed with sufficient protective measures to prevent adverse effects.

Locatable Minerals, Leasable Minerals – Fluids, and Salable Minerals

Under Alternative B, 2,612,920 acres would be closed to minerals leasing; 1,225 acres would be subject to the standard lease terms and conditions; 124,467 acres would be subject to moderate constraints; and 642,232 acres would be subject to major constraints. These acreages do not all coincide with fish-bearing waters; however, the restrictions on surface disturbance are already in place in much of the Tongue River drainage and Middle and North Forks Powder River. These restrictions would mostly benefit cold water fish (trout) and most of the recreational fisheries in the planning area. Locatable minerals, leasable fluid minerals, and salable minerals could all be permitted within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area. Management actions for locatable, fluid, and salable minerals under Alternative B would have major adverse effects on fish resources.

Leasable Minerals – Coal

The management action listed under Alternative B will have no effect on fish resources.

Fire and Fuels Management**Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)**

Under Alternative B, using full suppression in areas where fire would be undesirable to monitoring fire behavior in areas where fire could be used as a management tool based on resource goals and objectives; limiting the use of heavy equipment in certain areas; rehabilitating all fire-related damage; and using wildland fire and other vegetative treatments to restore fire-adapted ecosystems and reduce hazardous fuels would reduce sedimentation from catastrophic wildfires. This would have a moderate beneficial effect on fish.

Biological Resources**Vegetation – Forests and Woodlands**

Using natural processes to manage forests and woodlands is a short-term beneficial impact to fish resources; however, managing forests and woodlands for old growth and climax vegetation communities may result in an increased risk of wildland fire which would result in unstable soil conditions and poor water quality having adverse impacts overall. Management actions would occur in over ten percent of habitat important fish species, however, wildland fire is unpredictable and likely to only occur in localized areas reducing those effects to minor.

Vegetation – Grassland and Shrubland Communities

The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for grassland and shrubland communities (habitat improvement). Under Alternative B, native plant species would be the only type authorized for reclamation activities. This would be beneficial to fish habitats as it would promote natural reclamation and regeneration of vegetative communities in the fish-bearing drainages. Under Alternative B, native plant reclamation would occur within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for grassland and shrubland communities would have major beneficial effects on fish resources.

Vegetation – Riparian/Wetland Resources

Prohibiting surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would benefit fish by preserving the riparian and adjacent upland communities. Using produced water, where reasonable and practical, to develop and enhance waterfowl habitat and fisheries would benefit fish, provided water quality is adequate. Identifying and managing systems capable of achieving DFC could have a major beneficial effect on fish. Prohibitions for water would encompass all fish-bearing streams in the planning area. Management actions for riparian/wetland resources would have major beneficial effects on fish resources.

Invasive Species and Pest Management

Not limiting aerial application of pesticides and herbicides could decrease water quality and have a moderate adverse effect on fish populations in those waters.

Fish and Wildlife Resources – Wildlife

The types of effects to fish from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for wildlife. Under Alternative B, though, NSOs

prohibit or restrict surface-disturbance within greater than ten percent of fish-bearing drainages; therefore, management actions for wildlife would have major beneficial effects on fish resources.

Special Status Species – Plants

Management actions for special status plants that restrict grazing, herbicides and surface disturbance would benefit fish. Restricting fire suppression could result in larger fires that would increase sedimentation and create an adverse impact. Prohibiting disturbance within a mile of Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River would be considered a benefit to fish by reducing sources of sedimentation. Overall, these actions would occur within five to ten percent of the fish-bearing drainages in the planning area. Management actions for special status plants under Alternative B would have moderate beneficial effect on fish resources.

Special Status Species – Fish

The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for special status fish resources (habitat improvement and conservation). Under Alternative B, stream segments important to special status fish species would be improved or enhanced and surface-disturbing restriction would be applied within 0.25 mile of water bodies containing special status fish species. These restrictions would also encompass five to ten percent of all fish-bearing streams in the planning area; therefore, special status fish species management actions under Alternative B will have moderate beneficial effects on fish resources.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Under Alternative B, protections for identified elk, bald eagles, big game ranges, raptor nests, Greater Sage-Grouse, special status reptiles and amphibians and T&E species would have a beneficial effect on fish. Establishing a year-round disturbance-free zone of at least 0.5 mile for Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River would reduce sedimentation and have a beneficial effect on fish.

Overall, Alternative B special status wildlife management actions would encompass greater than ten percent of the fish-bearing drainages in the planning area and would have a major beneficial effect on fish.

Heritage and Visual Resources

Cultural Resources

Management actions under Alternative B would have no effect on fish resources.

Paleontological Resources

Under Alternative B, areas with high quality paleontological resources do not overlap habitat important to fish species and would therefore have no effect on fish resources.

Visual Resources

Under Alternative B, management of VRM Class II areas could prohibit or limit some surface-disturbing activities and therefore protect fish habitats. VRM Class III and IV areas would have minor limitations. Alternative B visual resources management would benefit over ten percent of habitats important to fish resources; therefore, VRM actions under Alternative B would have major beneficial effects on fish resources.

Land Resources

Forest Products

Under Alternative B, limited harvest of forest products would occur and natural regeneration would be utilized on five to ten percent of fish habitat. Although less soil disturbance may occur, forest health would not be actively managed, and would have a moderate adverse effect on fish over the long-term.

Lands and Realty

Under Alternative B, retaining land identified for disposal (which occurs in less than one percent of fish-bearing drainages), but having important natural resource values, until all other lands identified for disposal are disposed of, regardless of difficulty or cost to manage, could have a negligible beneficial effect on fish by subjecting these lands to federal management, which would be more protective.

Renewable Energy

Alternative B would have the fewest adverse impacts to fish through the exclusion of renewable-energy development in areas also closed to other forms of energy development (minerals leasing, locatable minerals, salable minerals, ROW, and other areas where there are restrictions on surface disturbance). Renewable energy would be allowed on 6,131 acres. This would impact one to five percent of the fish-bearing drainages in the planning area; therefore renewable-energy management actions under Alternative B would have minor adverse effects on fish resources.

Rights-of-Way and Corridors

Requiring co-location of facilities and identifying and implementing specified utility corridors in coordination with the resource specialist would decrease the potential for adverse impacts to fish-bearing drainages by ensuring their complete avoidance. Acreages of ROW avoidance and exclusion areas would be greatest under this alternative. Excluding ROWs on slopes of 25 percent or greater and highly erodible soils would benefit fish through reduced erosion and sedimentation. Limiting linear ROW development to existing routes would protect habitat quality, minimize fragmentation in sensitive areas, and help protect riparian areas. Under Alternative B, ROWs and corridors would be permitted in five to ten percent of the fish-bearing drainages in the planning area; therefore ROW and corridor management actions under Alternative B would have moderate adverse effects on fish resources.

Travel and Transportation Management

Under Alternative B, closing areas with saturated soils or on slopes equal to or greater than 25 percent to motorized vehicles and closing areas in fish habitat, including activities related to fire suppression and geophysical exploration, would reduce sedimentation. This would have beneficial effect on fish. Limiting motorized vehicle use to designated routes within stock driveways would have a beneficial effect on fish by reducing sedimentation and nutrient loads. Allowing travel off designated routes in areas limited to designated routes only under a special use permit would reduce sedimentation and pollution, and have a beneficial effect on fish. Closing the Middle Fork Powder River area to motorized vehicle use to protect sensitive resources would limit the spread of invasive species; the importance of the Middle Fork Powder River fishery and the combination of all of the other management actions for transportation and access under Alternative B would have a moderate beneficial effect on fish.

Recreation

Limiting development of additional recreation facilities to SRMAs and other high-use areas would have a beneficial effect on fish by limiting fishing pressure and reducing the risk of

establishing invasive aquatic species. SRMAs proposed in Alternative B encompass less than one percent of the fish-bearing drainages in the planning area; therefore, management actions for recreation under Alternative B would have negligible beneficial effects on fish resources.

Lands with Wilderness Characteristics

Approximately 12,237 acres of BLM-administered lands has been identified for management of lands with wilderness characteristics under Alternative B, 3,596 acres of which occur near a fish bearing stream. Management actions include closing the area to solid mineral development, motorized use, ROWs, renewable energy development, commercial woodcutting, and all other surface-disturbing activities not compatible with retaining natural values. Emphasizing ecosystem health and retaining natural values will retain or enhance fish habitat and would have a beneficial effect on fish resources. Management actions would occur in five to ten percent of habitats important to fish, but effects would be localized, making the effects negligible.

Livestock Grazing Management

Under Alternative B, authorizing permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority and livestock grazing as a second priority; locating livestock salt or mineral supplements a minimum of 0.5 mile away from water sources, riparian areas, and aspen stands; and providing a minimum of two years rest from livestock grazing following prescribed fires and other vegetative treatments would have a minor beneficial effect on fish as they will protect habitats and reduce the risk of harm to one to five percent of the fish-bearing drainages in the planning area.

Special Designations

Areas of Critical Environmental Concern

An ACEC designation at Welch Ranch on the Tongue River could have an adverse effect on that fishery. Additional human use could occur with ACEC designation, which would increase the potential for introduction of invasive aquatic species and illegal stocking, and the risk of fire in the riparian forest. These potential issues would be adequately mitigated through education. The designation would have indirect, long-term beneficial effects through public outreach and education regarding the rarity and value of prairie river riparian systems and would encompass less than one percent of the fish-bearing streams in the planning area; therefore, management actions for ACECs under Alternative B would have negligible beneficial effects on fish resources.

Scenic or Back Country Byways

Increased road maintenance and human activity on byways would have adverse impacts to fish habitat from dust, soil erosion, and spread of invasive species, adversely impacting water quality and aquatic plant communities. Approximately 48 miles of proposed byways intersect with habitat important to fish. Management actions in Alternative B for scenic or BCBs will have a negligible adverse effect on fish resources.

Wild and Scenic Rivers

If Congress releases the Middle Fork Powder River from WSR designation, management will continue to retain free-flowing characteristics and outstanding resource values. This would protect habitats and reduce the risk of harm to less than one percent of the fish-bearing streams in the planning area and would have a negligible benefit to fish resources.

Wilderness Study Areas

Under Alternative B, if Congress decides not to designate the North Fork and

Gardner Mountain WSAs as wilderness, there would be beneficial effects to fish as management would be consistent for lands with wilderness characteristics until a plan amendment has been completed. WSAs will be managed to preserve natural conditions and processes, and restrict motorized activities. These actions would occur on over ten percent of habitat important to fish species; however, WSAs are localized and few stream segments would be impacted. Management actions associated with Alternative B will have minor beneficial effects on fish resources.

4.4.5.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to fish resources due to its implementation.

Fish and Wildlife Resources – Fish

Managing reservoirs and riparian areas to improve or enhance other resource values first and potential fisheries second, as well as managing for PFC would have an adverse impact to fisheries. Allowing surface disturbance within 0.25 mile of naturally occurring water bodies consistent with other resource values could have an adverse impact to fisheries if, for example, the mineral resource is determined to be of higher value and development increased sedimentation. The protections in Alternative C will only protect five to ten percent of the entirety of fish-bearing drainages in the planning area; therefore, moderate adverse effects are expected.

Physical Resources

Soil

Under Alternative C, allowing surface-disturbing activities on soils with a severe erosion hazard, on slopes equal to or greater than 25 percent, on soils with poor reclamation suitability, in badlands, on rock outcrops and on slopes susceptible to mass movement would increase sedimentation and adversely affect fish if those activities took place in drainages that support fish-bearing waters. Allowing the use of prescribed fire on highly erodible soils and allowing activities in these sensitive soil areas could have adverse effect on fish through increased sedimentation, changed streamflows, and increased water temperatures. Lack of soil restrictions would leave greater than ten percent of the fish-bearing drainages vulnerable to impacts from improper soil management. Management actions for soil under Alternative C would have major adverse effects on fish resources.

Water Resources

Under Alternative C, allowing on-channel stream reservoirs could inhibit fish passage and have an adverse effect on fish. Allowing surface-disturbing activities, or not applying an NSO stipulation to any mineral lease within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated riparian habitat would increase runoff and sedimentation in fish habitat, resulting in an adverse effect. This alternative would permit activities within greater than ten percent of the fish-bearing drainages in the planning area; therefore, management actions for water under Alternative A would have major adverse effects on fish resources.

Cave and Karst Resources

Under Alternative C, there would be no restrictions on activities in or around cave and karst resources. Five to ten percent of the fish-bearing drainages in the planning area also contain cave and karst resources. Lack of conservation of cave and karst resources would have a moderate adverse effect on fish resources as it would increase the potential for increased runoff and sedimentation.

Minerals Resources

Locatable Minerals

The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for locatable mineral resources (habitat loss and degradation). Alternative C would open 3,319,535 acres to locatable minerals exploration and development and withdraw 11,373 acres from locatable mineral exploration and development. This would have an adverse effect on fish. Locatable mineral development could be permitted in greater than ten percent of the fish-bearing drainages in the planning area. Management actions for locatable minerals under Alternative C would have major adverse effects on fish resources.

Leasable Minerals – Coal

The management action listed under Alternative C will have no effect on fish resources.

Leasable Minerals – Fluids

The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for fluid mineral resources (habitat loss and degradation). Consistent with other resources values, Alternative C would open 539,499 acres for fluid minerals leasing and exploration subject to standard lease terms and conditions; 2,472,472 acres subject to moderate constraints; and 303,601 acres subject to major constraints. Fluid mineral exploration and development could be permitted in greater than ten percent of the fish-bearing drainages in the planning area. Management actions for fluid minerals under Alternative C would have major adverse effects on fish resources.

Salable Minerals

The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for salable mineral resources (habitat loss and degradation). Opening 3,290,908 acres to salable mineral exploration and development and closing 57,213 acres would cause an adverse impact where those areas open to salable minerals overlap fish-bearing watersheds. Salable mineral exploration and development could be permitted in greater than ten percent of the fish-bearing drainages in the planning area. Management actions for salable minerals under Alternative C would have major adverse effects on fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative C, use of full protection strategies and tactics, heavy equipment with few tactical constraints, and rehabilitating only suppression-related damage would increase sedimentation from suppression activities and have a moderate adverse effect on fish. If suppression activities prevent catastrophic fires, this action could be beneficial over the long term.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative C, forests and woodlands would be managed to meet forest health objectives using silvicultural treatments and intensive management, and to reduce impacts from disease, insects, and wildfire. Methods such as cutting and thinning could adversely impact fish in the short-term, but would have an overall beneficial effect on fish resulting from improved forest

health. Management actions would occur on five to ten percent of habitat important to fish, however, short-term adverse impacts will offset some of the long-term benefits, making effects to fish resources minor.

Vegetation – Grassland and Shrubland Communities

Under Alternative C, allowing non-native plant species, only if native species will not accomplish initial reclamation objectives, would provide another tool for achieving reclamation goals, but also would provide an opportunity for non-native species to cross pollinate with native species, outcompete native species for water and soil nutrients, and move out side the reclamation area and become an invasive species. Helping to achieve reclamation objectives would directly benefit surrounding plant communities. Overall, Alternative C management of grasslands and shrublands would have a major adverse effect on the riparian vegetation within the fish-bearing drainages and therefore, have a major adverse effect on fish resources.

Vegetation – Riparian/Wetland Resources

Allowing surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams could have an adverse effect on fish by increasing sedimentation, changing hydrography, and decreasing water quality. Riparian/wetland areas contain greater than ten percent of the fish-bearing drainages in the planning area; therefore management actions under Alternative C for riparian/wetland resources would have major adverse effects on fish resources.

Invasive Species and Pest Management

Authorizing aerial application of pesticides in areas where topography, extent of infestation, target species, and timing limit other application methods could have a minor adverse effect on fish if appropriate buffers are not applied or applications drift/flow into waters.

Fish and Wildlife Resources – Wildlife

Under Alternative C, allowing surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges could increase sedimentation and invasive species establishment in the Middle Fork Powder River, Tongue River, and Little Bighorn River, which would have an adverse effect on fish in those drainages.

Protections for identified big game ranges, raptor nests, and elk would have beneficial effects on fish in the drainages that also support these species.

Because protections for some wildlife species remain in place and would conserve fish habitats under this Alternative, overall, Alternative C wildlife management would still have a major beneficial effect on fish.

Special Status Species – Plants

Alternative C impacts to fish resources from special status plant species would be the same negligible beneficial effects as described under Alternative A.

Special Status Species – Fish

Restoring or improving important stream segments for fisheries habitat, only for special status fish species, would have a beneficial impact on other (non-special status) fish that occupy the same drainages. Alternative C incorporates a smaller protective buffer, restricting surface-disturbing activities from within 500 feet of any waters containing special status fish species. This would conserve habitats within five to ten percent of all fish-bearing drainages in the planning area. Management actions for special status fish species would have moderate beneficial effects on fish resources.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Under Alternative C, protections for Greater Sage-Grouse and T&E species would have a beneficial effect on fish. Protections for bald eagle and other raptor nests have the greatest potential for reducing impacts to fish-bearing waters. Allowing surface-disturbing and disruptive activities in habitats for special status amphibian and reptile species, in identified 100-year floodplains, and within 500 feet of perennial waters would have an adverse effect on fish. Alternative C, protections for identified SSS raptor nests, Greater Sage-Grouse and the other special status wildlife would be limited, surface disturbing and disruptive activities would be generally allowed. However, management must comply with ESA and BLM's sensitive species policy which would supply some benefit to special status wildlife species and indirectly fish. Overall, the protective buffers that exist in this alternative would conserve habitats in greater than ten percent of the fish-bearing drainages in the planning area; therefore, management actions for special status wildlife species would have major beneficial effects on fish resources.

Heritage and Visual Resources**Cultural Resources**

Alternative C impacts to fish from cultural resources would be the same negligible beneficial effects as described under Alternative A.

Paleontological Resources

Under Alternative C, areas with high quality paleontological resources do not overlap habitat important to fish species and would therefore have no effect on fish resources.

Visual Resources

Under Alternative C, managing VRM Class II areas as VRM Class III would allow more surface-disturbing activities. This would reduce the beneficial effects of VRM on fish habitat by increasing opportunities for soil and water erosion and for invasive species to get established. Active management would now occur on less than one percent of habitats important to fish species; therefore, Alternative C management of visual resources would have a negligible beneficial effect on fish resources.

Land Resources**Forest Products**

Alternative C would have an adverse impact on fish resources. Management actions focus on maximizing forest product harvest and sales, and on managing forests for economic benefit and would occur on five to ten percent of habitat important to fish. Sediment flow and soil erosion associated with increased disturbance and decreased forest health would have a moderate adverse effect to fish.

Lands and Realty

Management actions that dispose of lands with water, do not acquire lands that create large blocks of BLM, or do not pursue easements for access to BLM-administered lands would not increase public access to fish resources. Lands identified for disposal under this alternative contain or could provide access to one to five percent of the fish-bearing waters in the planning area. Management actions for lands and realty under Alternative C would have moderate adverse effects on the fish resources.

Renewable Energy

Allowing renewable-energy development anywhere in the planning area consistent with other resource values could have an adverse effect on fish if sedimentation occurs in fish-bearing drainages. Renewable energy could be permitted under this alternative within greater than ten percent of the fish-bearing drainages in the planning area. Management actions under Alternative C would have major adverse effects on fish resources.

Rights-of-Way and Corridors

Allowing ROW on slopes equal to or greater than 25 percent and on highly erodible soils would have an adverse effect on fish from sedimentation. ROWs could be permitted, under this alternative, within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for ROWs and corridors under Alternative C would have major adverse effects on fish resources.

Travel and Transportation Management

Alternative C would continue to open stock driveways to motorized vehicle use. Stock resting in Bear Trap Meadows and on the Middle Fork Powder River removes riparian vegetation, destabilizes banks, and increases sedimentation and nutrient loads in the respective waters and would cause an adverse effect to fish in those drainages. Allowing travel up to 300 feet off designated routes for necessary tasks if the travel would not damage resources would increase access and therefore the potential to spread invasive species and have an adverse effect on fish. Allowing motorized vehicle use in areas with saturated soils or on slopes equal to or greater than 25 percent consistent with travel management designations for those areas, and within habitat of SSS consistent with travel management designations for those areas could increase sedimentation have an adverse effect on fish. Overall, these actions would permit adverse effects within less than one percent of the fish-bearing drainages. Management actions for TTM would have negligible adverse effects on fish resources.

Recreation

Managing the entire planning area as the Buffalo ERMA and designating six SRMAs (totaling 30,570 acres) would have an adverse effect on fish through an increase in OHV use and resulting sedimentation. The six proposed SRMAs contain less than one percent of the fish-bearing drainages in the planning area. The management within these areas would conserve habitats surrounding the fish-bearing waters. Management actions for recreation under Alternative C, through designation of the six SRMAs, would have negligible beneficial effects on fish resources.

Lands with Wilderness Characteristics

Under Alternative C, lands with wilderness characteristics would not have any special restriction applied and would be managed in accordance with surrounding areas. Adverse impacts to fish resources would result from increased development; however, these impacts are likely to be negligible based on low potential for mineral development, commercial timber, and renewable energy projects to be proposed in remote, road less areas.

Livestock Grazing Management

Not including actions to reduce or eliminate potential impacts from livestock grazing to meet regeneration objectives following timber harvests would increase sedimentation in the Billy Creek, North Fork Powder River, and Middle Fork Powder River drainages. This would have an adverse effect on fish. Basing AMP goals and objectives on livestock management only in Category I allotments, authorizing permanent increases in forage allocations to livestock grazing as the first priority, allowing increases in livestock stocking rates as a result of vegetative

treatments would increase grazing use in riparian areas; some vegetative treatments, particularly when combined with water improvements, may draw livestock away from riparian areas due to an increase of palatable, nutritious forage, resulting in beneficial impacts for riparian areas and fish. This would have an adverse effect on fish by exposing all Category C and M allotments to heavier grazing pressure. Limiting or prohibiting livestock grazing only in areas where it is currently prohibited and locating livestock salt or mineral supplements a minimum of 500 feet from water sources, riparian areas, and aspen stands and providing a minimum of two growing seasons rest from livestock grazing after prescribed fire and vegetative treatments would have an adverse effect on fish due to increased sedimentation, reduced water quality, removal of riparian habitat, and transport of invasive plant species. Grazing allotments encompass greater than ten percent of the fish-bearing drainages in the planning area. All of the management actions under Alternative C for livestock grazing management would have major adverse effects on fish resources.

Special Designations

Areas of Critical Environmental Concern

No ACECs are proposed under Alternative C, therefore, there would be no effect to fish resources.

Scenic or Back Country Byways

Under Alternative C, no roads would be evaluated for inclusion as scenic or BCBs.

Wild and Scenic Rivers

If Congress releases the Middle Fork Powder River from WSR designation, management will follow the management within surrounding areas. The Middle Fork Powder River drainage contains less than one percent of the fish-bearing drainages in the planning area. This would be a negligible adverse impact to fish should surrounding management allow for increased sedimentation.

Wilderness Study Areas

Under Alternative C, if Congress decides not to designate the North Fork and Gardner Mountain WSAs as wilderness, there would be beneficial effects to fish as management would be consistent for lands with wilderness characteristics until a plan amendment has been completed. These actions would occur on over ten percent of habitat important to fish species; however, WSAs are localized and few stream segments would be impacted. Management actions associated with Alternative C will have minor beneficial effects on fish resources.

4.4.5.6. Alternative D

This section describes management actions under Alternative D, the **Proposed RMP**.

Fish and Wildlife Resources – Fish

Management actions for fish under Alternative D will benefit fish. Improving habitat at reservoirs and riparian areas, managing toward Desired Functioning Potential where possible, properly designing stream crossings, managing vegetation to restore perennial flows, and prohibiting surface disturbance near fish-bearing waters would improve habitats, prevent disturbance and sedimentation, maintain water quality and increase overall stream health. These actions would occur in all of the fish-bearing drainages, therefore, management actions for fish under Alternative D would have major beneficial effects on fish resources.

Physical Resources

Soil

Allowing surface-disturbing activities on soils without a severe erosion hazard, on slopes equal to or greater than 25 percent, and with reclamation potential and evaluating exceptions for areas with highly erosive soils, on slopes equal to or greater than 25 percent, and soils with poor reclamation potential has the potential for major adverse effects on fish from sedimentation. Waivers allow for activities to occur when mitigated appropriately for the fisheries resource. Surface disturbance associated with development of federal minerals on soils with poor reclamation potential could affect 1,514,445 acres in the planning area. Disturbances would require a reclamation plan. The intent of these plans is to avoid sedimentation. Disturbances could be permitted under this alternative within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for soil, under Alternative D would have major adverse effects on fish resources.

Water Resources

Under Alternative D, authorizing activities associated with the surface discharge of water produced during federal activities if erosive conditions, channel stability, soil characteristics, and other resource values would be adverse as it may still alter water quality. Allowing for on-channel stream reservoirs and surface-disturbing activities or not applying an NSO stipulation to any mineral lease within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated riparian habitat only by exception and in consideration of other resource values would have adverse effects on fish. For the impacts to be beneficial, the exceptions must be evaluated for site-specific impacts to wildlife and must not be granted where there would be conflicts. Disturbance, under this alternative, could be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for water, under Alternative D would have major adverse effects on fish resources.

Cave and Karst Resources

The cave and karst resource areas identified in Alternative D do not encompass any fish-bearing drainages, therefore, management actions for cave and karst resources under Alternative D would have no effect on fish resources.

Mineral Resources

The amount of minerals extraction under this alternative would create a substantial increase in land use intensity, and would result in a greater potential for increased sedimentation, produced water discharge, spills, and changes instream morphology.

Locatable Minerals

Alternative D locatable minerals management would have effects on fish similar to management under Alternative B, although Alternative D would open more area (4,720,586 acres) to locatable minerals entry. Locatable minerals entry would be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for locatable minerals, under Alternative D would have major adverse effects on fish resources.

Leasable Minerals – Coal

The management action listed under Alternative D will have no effect on fish resources.

Leasable Minerals – Fluids

Alternative D impacts associated with leasable fluid minerals management would

be the same as under Alternative C, with 3,314,254 acres open to oil and gas leasing. Fluid mineral exploration and development would be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for fluid minerals, under Alternative D would have major adverse effects on fish resources.

Salable Minerals

Alternative D impacts associated with salable minerals management would be the same as under Alternative C, with 2,725,060 acres open to salable minerals leasing. Salable mineral exploration and development would be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for salable minerals, under Alternative D would have major adverse effects on fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative D, impacts to wildlife would be similar to effects under Alternative B. However, Alternative D would decrease adverse impacts through rehabilitation after fires on an as-needed basis only; this could result in an increase in natural regeneration of riparian communities along fish-bearing waters.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative D, forests and woodlands would be managed to meet forest health objectives using silvicultural treatments and intensive management and to reduce impacts from disease, insects, and wildfire. Methods such as cutting and thinning could adversely impact fish in the short-term, but would have an overall beneficial effect on fish resulting from improved forest health. Management actions would occur on five to ten percent of habitat important to fish, however, short-term adverse impacts will offset some of the long-term benefits, making effects to fish resources minor.

Vegetation – Grassland and Shrubland Communities

Alternative D effects on fish resources from management of grassland and shrubland communities would be similar to effects under Alternative C, although Alternative D would place slightly more emphasis on multiple resource values than Alternative C. Alternative D would allow desirable non-native plant species for short-term reclamation activities, which would result in effects similar to Alternative B. Desirable non-native plant persistence could increase adverse impacts to fish resources if non-native proliferation causes loss of suitable riparian habitats along fish-bearing streams.

Vegetation – Riparian/Wetland Resources

Allowing surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams could have an adverse effect on fish by increasing sedimentation, changing hydrography, and decreasing water quality. Not identifying and managing systems capable of achieving DFC could also have an adverse effect on fish by allowing activities that impact riparian vegetation, resulting in increased water temperature and sedimentation. Impacts from the management of riparian/wetland resources will influence all of the fish-bearing streams in the planning area. Management actions for riparian/wetland resources under Alternative D would have major adverse effects on fish resources.

Invasive Species and Pest Management

Allowing aerial application of pesticides could impair water quality and have a moderate adverse effect on fish populations in those waters if the chemical is inappropriately applied or it drifts into fish-bearing water. Strict adherence to pesticide labels, which is anticipated, would minimize this to minor.

Fish and Wildlife Resources – Wildlife

Under Alternative D, prohibiting surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges could decrease sedimentation and invasive species establishment in the Middle Fork Powder River, Tongue River, and Little Bighorn River, which would have a beneficial effect on fish. Protections for elk would have a beneficial effect on fish resources in the Upper Fork Powder River. Protections for identified big game ranges and raptor nests would have a beneficial effect on fish. Overall, the protective buffers for wildlife would conserve riparian vegetation within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for wildlife under Alternative D would have major beneficial effects on fish resources.

Special Status Species – Plants

Allowing the placement of water developments and salt or mineral supplements in habitat for special status plant species would decrease water quality and increase sedimentation where these resources overlap (in Ute ladies'-tresses orchid habitat). Managing to comply with the ESA and BLM policy associated with special status plant species would have a negligible benefit to fisheries management as their occupied habitat is limited to less than one percent of the fish-bearing drainages in the planning area.

Special Status Species – Fish

Alternative D impacts on fish from special status fish management would be similar to those under Alternative B, except that Alternative D could allow activities by exception within a 0.25-mile CSU area around naturally occurring water bodies containing native and desirable non-native fish species. For the impacts to be the same as those under Alternative B, those exceptions would have to be evaluated for the presence of special status fish species or habitat suitability and would not be granted where there would be conflicts. Special status fish-bearing streams represent five to ten percent of all of the fish-bearing streams in the planning area. Management actions for special status fish species would have moderate beneficial effects on fish resources.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Under Alternative D, protections for raptor nests, Greater Sage-Grouse and T&E species would have a beneficial effect on fish. Establishing a year-round disturbance-free zone of at least 0.5 mile for riparian corridors (Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River) consistently used by bald eagles would have a beneficial effect on fish. Protections for elk would have a minor beneficial effect on fish resources in the Upper Fork Powder River. Prohibiting surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats in identified 100-year floodplains and within 500 feet of perennial waters would have a beneficial effect on fish. Protections for bald eagle and other raptor nests would have the greatest potential for reducing impacts to fish-bearing waters. Overall, protections for special status wildlife species would conserve vegetation within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for special status wildlife species would have major beneficial effects on fish resources.

Heritage and Visual Resources

Cultural Resources

Alternative D impact types associated with cultural resources management would be the same as those under Alternative B, except Alternative D would protect 15,382 acres through cultural resources NSO restrictions and 613,601 acres through cultural resources CSU restrictions. These areas of prohibitions or restrictions would also conserve vegetation within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for cultural resources would have major beneficial effects on fish resources.

Paleontological Resources

Under Alternative D, areas with high quality paleontological resources do not overlap habitat important to fish species and would therefore have no effect on fish resources.

Visual Resources

Under Alternative D, effects to fish resources from management actions associated with VRM would be the similar to those described under Alternative B; however, management actions would impact five to ten percent of habitat important to fish making the effects moderate.

Land Resources

Forest Products

Under Alternative D, forest product harvest would be maximized within the bounds of maintaining forest health. Harvested areas would be managed for regeneration, utilizing protection techniques where needed. Although some beneficial impacts to fish from improved water quality over the long-term may result, the focus of economic return and sales will result in increased disturbance. Management actions will occur on five to ten percent of habitat important to fish; however, beneficial effects to forest health would lessen the adverse effects to some of the habitat. Overall, a minor adverse effect to fish would result.

Lands and Realty

Under Alternative D, acquisitions and disposals could have beneficial or adverse effects on fish, depending on which lands are acquired or disposed of. Land acquisitions that block up existing BLM-administered lands would have a negligible effect on fish because most existing blocks of BLM-administered lands are not along drainages. All other lands identified for acquisition or disposal contain less than one percent of the fish-bearing drainages in the planning area. Management actions for lands and realty under Alternative D would have negligible beneficial effects on fish resources.

Renewable Energy

Under Alternative D, excluding renewable-energy development on 352,068 acres would have a beneficial effect on fish by avoiding sedimentation from construction. This would be particularly true in the southern Big Horn Mountains. Renewable energy would be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for renewable energy under Alternative D would have major adverse effects on fish resources.

Rights-of-Way and Corridors

Avoiding ROW on slopes equal to or greater than 25 percent and on highly erodible soils would have a beneficial effect on fish. ROWs would be permitted within greater than ten

percent of the fish-bearing drainages in the planning area. Management actions for ROWs and corridors under Alternative D would have major adverse effects on fish resources.

Travel and Transportation Management

Alternative D impact to fish from management of travel and transportation would be similar to those under Alternative C, except that less than one percent of the fish-bearing drainages would be closed to motorized vehicle use. Allowing travel for dispersed camping and big-game retrieval up to 300 feet off designated routes, if it would not damage resources would have an adverse effect on fisheries. Management actions for TTM would have negligible adverse effects on fish resources.

Recreation

Designating seven SRMAs (totaling 54,160 acres) could have an adverse effect on fish. Allowing additional recreation facilities in areas where they are supported by recreational use and are consistent with other resource values could have an adverse effect on fish through increased fishing and the potential for increasing invasive aquatic species. Increased education would reduce these adverse impacts. Limiting motorized vehicle travel to designated roads and trails (other than within stock driveways) consistent with other resource values would have a beneficial effect on fish. Recreation management would occur within less than one percent of the fish-bearing drainages in the planning area. Management actions for recreation under Alternative D would have negligible adverse effects on fish resources.

Lands with Wilderness Characteristics

Approximately 6,864 acres of BLM-administered land has been identified for management of lands with wilderness characteristics under Alternative D, 2,313 acres of which occur near fish-bearing streams. Management actions include closing the area to solid mineral development, motorized use, ROWs, renewable energy development, commercial woodcutting, and all other surface-disturbing activities not compatible with retaining natural values. Emphasizing ecosystem health and retaining natural values will retain or enhance fish habitat and would have a beneficial effect on fish resources. Management actions would occur in one to five percent of habitats important to fish, but effects would be localized, making the effects negligible.

Livestock Grazing Management

Under Alternative D, including actions to reduce or eliminate potential impacts from livestock grazing to meet regeneration objectives following timber harvests would decrease sedimentation in the Billy Creek, North Fork and Middle Fork Powder River drainages. This would have a beneficial effect on fish. Performing baseline inventories; developing, implementing, and monitoring AMPs; and basing AMP goals and objectives in Category I and M allotments on resource protection and watershed health; considering any permanent increases in forage allocations for watershed protection, livestock grazing, wildlife habitat, and other resource values; locating livestock salt or mineral supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands; designating and managing future reserve common allotments as needed; providing rest and deferment from livestock grazing following wildfires, prescribed fires, and other vegetative treatments until resource objectives are met; and allowing increases in livestock stocking rates as a result of vegetative treatments when resource objectives are met would also have a beneficial effect on fish. Allowing livestock grazing on all public lands in the planning area, except where an evaluation has determined grazing would be incompatible with other resource uses or values, could have an adverse effect on fish due to increased sedimentation, reduced shading and bank stability, changes in water chemistry, and increased invasive plant species. Management of livestock grazing would occur in five to ten percent of the fish-bearing

drainages in the planning area. Management actions for livestock grazing management under Alternative D would have moderate beneficial effects on fish resources.

Special Designations

Areas of Critical Environmental Concern

An ACEC designation at Welch Ranch on the Tongue River could have an adverse effect on that fishery. Additional human use could occur with designation, which would increase the potential for introduction of invasive aquatic species and illegal stocking, and increase the risk of fire in the riparian forest. These potential issues would be mitigated through education. Designation would have beneficial effects through public outreach and education regarding the rarity and value of prairie river riparian systems. The proposed ACECs would encompass less than one percent of the fish-bearing drainages in the planning area. Management actions for ACECs would have negligible beneficial effects on fish resources.

Scenic or Back Country Byways

Effects to fish resources resulting from management actions in Alternative D, will be the same as those described in Alternative B.

Wild and Scenic Rivers

If Congress releases the Middle Fork Powder River from WSR consideration, management will continue to retain free-flowing characteristics and outstanding resource values. The Middle Fork Powder River drainage contains less than one percent of the fish-bearing drainages in the planning area. This would have a negligible beneficial effect to fish resources.

Wilderness Study Areas

Under Alternative D, if Congress decides not to designate the North Fork and Gardner Mountain WSAs as wilderness, there would be beneficial effects to fish as management would be consistent for lands with wilderness characteristics until a plan amendment has been completed. WSAs will be managed to preserve natural conditions and processes, and restrict motorized activities. These actions would occur on over ten percent of habitat important to fish species; however, WSAs are localized and few stream segments would be impacted. Management actions associated with Alternative D will have minor beneficial effects on fish resources.

4.4.5.7. Cumulative Impacts

Cumulative impacts to fish in the planning area would come from non-federal minerals development, non-BLM fire programs, and non-BLM-regulated recreation. In general, these actions can be grouped into actions that are apart from either BLM surface estate or BLM mineral estate. Most of the cold-water fisheries are on BLM or USFS lands, and actions on USFS lands would be similar to BLM actions regarding protective measures. In forested habitats of the cold-water fisheries, the greatest threat to fish is catastrophic fire and the resulting sedimentation and water temperature and chemistry changes. The Bighorn National Forest Plan addresses this threat with suppression efforts and forest health projects; however, the extent of diseased timber that could burn does represent a potential major adverse effect on fish.

Most fee minerals development has already occurred in the planning area. The potential for wind-energy projects on private lands that could affect fisheries is limited to the southern Big Horn Mountains and represents a moderate adverse effect.

Recreation off BLM surface would likely result in the transport and introduction of diseases and invasive species, which could have a major adverse effect on fish.

4.4.6. Fish and Wildlife Resources – Wildlife

Wildlife populations fluctuate, sometimes widely, in response to natural factors such as cycles in the abundance of prey base or extremes in seasonal weather (e.g., severe winters). It is sometimes difficult to determine whether impacts to wildlife result from any specific management action or from wildlife population changes caused by natural factors. Changes in stressors (e.g., increased human presence and noise) on habitat components such as vegetation, water, soil, or air are likely to cause direct and indirect impacts to wildlife.

Actions that remove, degrade, or fragment wildlife habitat would be adverse. Actions that conserve or improve habitats, such as crucial big game ranges, raptor nest sites, or grouse habitats would be beneficial.

Direct impacts to wildlife could result from the loss of habitats or key habitat features, such as nest sites or lek areas, or from the immediate loss of life. Human activities also can directly disturb wildlife and could cause wildlife to abandon nests, leks, or their home ranges. Disturbance during sensitive periods (e.g., winter and nesting) is known to adversely impact wildlife. Human activities such as OHV use, recreation, and noise from equipment associated with development and surface-disturbing activities impact some wildlife species. These activities are considered to be particularly detrimental to nesting and lekking grouse, nesting raptors, and wintering and calving big game.

Habitats can be lost and fragmented by activities such as vegetative treatments; fire and fuels management; minerals exploration and extraction; construction and maintenance of roads and trails; and development of renewable-energy resources. Indirect impacts to wildlife can occur by changing habitat characteristics or quality. Habitat quality can be impacted by various surface-disturbing activities and other actions that remove vegetation and disturb soil. Indirect impacts to wildlife habitats also could occur when specific actions change habitat in a way that would make it unsuitable for future habitation. Human disturbances from vehicular travel on roads, activities at drill sites or wellheads, or any other activity not associated with the natural environment (including noise from generators and compressors) can indirectly impact wildlife not accustomed to such disturbances.

Disturbance impacts range from short-term displacement and shifts in activities, to long-term abandonment of home ranges. For purposes of this analysis, short-term impacts to wildlife result from activities to which individuals or species respond immediately, but do not affect the population viability of the species. For example, many disturbance impacts are short-term because a species might temporarily abandon an area or nest, but return immediately following the cessation of the disturbance, such as a passing OHV. Short-term construction could cause an animal to abandon an area or nest, but the species is often able to return to the area and reproduce successfully the following season.

Long-term impacts to wildlife are those that would impact the viability of the population. These impacts include alteration of adequate habitats in size or health (direct loss, fragmentation, or degradation) for any or all life requirements (e.g., seasonal habitats), and activities that would affect reproductive success (e.g., activities that cause undue energy expenditure for prolonged periods, and removal of breeding grounds and nests). Human disturbance, whether from

harassment or by accident, results in increased energy cost to the disturbed animal, which incurs a physiological cost through excitement (preparation for exertion) or locomotion. A fleeing or displaced animal incurs additional costs through loss of food intake and potential displacement to poorer (lower) quality habitat. If the disturbance becomes chronic or continuous, these costs can result in reduced animal fitness, survival, and reproductive potential. In addition, physical or psychological barriers lead to habitat fragmentation, further limiting the availability of effective habitat. An area of intensive activity or construction becomes a barrier when animals cannot or will not cross it to access otherwise suitable habitat. These impacts are especially problematic when they occur within limiting habitat components such as winter ranges and reproductive habitats (WGFD 2004).

4.4.6.1. Methods and Assumptions

This section describes the methods and assumptions used in the analysis of impacts to wildlife. The assumptions and methods include, but are not limited to the following:

- The BLM, in cooperation with state and other federal wildlife agencies, is responsible for managing habitat (e.g., quality, suitability, and usability), whereas state and federal wildlife management agencies (e.g., the WGFD and the USFWS) have primary authority for overseeing management of wildlife populations. Therefore, this analysis relies primarily on vegetation changes and loss of habitat use due to disruptive activities to estimate effects to wildlife habitats.
- High-quality habitats foster healthy and abundant biological communities appropriate to those habitats.
- The quality and quantity of seasonal ranges and migration corridors are generally considered to be the limiting factors on big-game populations in the planning area. The ability of these areas to support wildlife populations is a factor in determining population levels.
- Natural variability in wildlife health, population levels, and habitat conditions will continue. Periods of mild or severe weather and outbreaks of wildlife disease or insects and plant diseases that impact habitat could impact wildlife population levels.
- For each alternative, changes to vegetative types, either in quantity, quality, or increased fragmentation, are compared to baseline conditions. Adverse and beneficial impacts to vegetative types (e.g., wildlife habitats) are assumed to have a corresponding adverse or beneficial impact on wildlife species.
- Disturbance impacts to wildlife are evaluated by comparing them to current management practices in the planning area; increased protections in time or space are beneficial, reduced protections result in adverse impacts.
- Management actions aimed at benefiting specific wildlife species can have adverse or beneficial impacts on other wildlife species.
- Alternatives with more acres of wetlands restored or protected will provide a greater benefit to migratory game birds and other riparian/wetland wildlife species compared to alternatives with fewer acres of wetlands restored or protected.
- Alternatives with more acreage managed toward DPC will exhibit a correspondingly greater benefit to wildlife than alternatives managing fewer acres toward DPC. Management toward DPC is assumed to exceed the requirements of managing toward PFC.
- The more acreage of habitats protected from fragmentation, the greater the benefit to wildlife species.
- Surface disturbance causes adverse impacts to wildlife habitats. Less surface disturbance in wildlife habitats has correspondingly fewer adverse impacts to wildlife compared to more surface disturbance.

- The higher the road density and frequency of use in the planning area, the greater the potential to degrade adjacent wildlife habitat quality in the planning area.
- The exact locations of future surface-disturbing activities cannot be predicted at the RMP level. For purposes of analysis, surface-disturbing activities are assumed to occur in vegetative types in proportion to their availability in the planning area. Impact acreages for vegetative types are not absolute, but provide a means to compare relative impacts among alternatives.
- Human activity that disturbs wildlife during sensitive periods causes adverse impacts.
- “Prohibit” means specified activities or impacts to wildlife during identified periods or in designated habitat areas would not occur unless specific biological exception criteria are met.
- Prohibiting surface disturbance or occupancy is more restrictive and provides more protections for wildlife than avoiding surface disturbance or occupancy.
- All known raptor nests from the GIS database maintained by the BLM BFO were used in the analysis. Buffers associated with raptor nests were analyzed in accordance with USFWS recommended spatial buffers to protect nesting raptors. Nests of unknown raptor species were analyzed as golden eagle nests when located in trees and as ferruginous hawk nests when located on the ground.

4.4.6.2. Impacts Common to All Alternatives

Fish and Wildlife Resources – Wildlife

Management actions common to all alternatives that would impact wildlife include: (1) developing mitigation measures for surface-disturbing and disruptive activities; (2) maintaining and improving wildlife habitats; (3) providing suitable habitat and forage to support population objectives as defined by the WGFD; (4) protecting crucial habitats; and (5) constructing new fences in accordance with BLM Fencing Handbook 1741-1. These management actions would generally have major beneficial impacts to wildlife. Preparing and implementing HMPs would have a long-term beneficial impact because they would maintain or improve wildlife habitat through on-the-ground improvements or control of other activities.

Human disturbance near raptor nesting sites could result in the abandonment of the nest; high nestling mortality from overheating, chilling, or desiccation when young are left unattended; premature fledging; and ejection of eggs or young from the nest. Raptors that successfully nest during a disturbance might abandon the nesting territory the following year. Responses of nesting raptors to human disturbance typically are determined by the type, duration, magnitude, noise level, and timing recurrence and frequency of activity in relation to nesting phenology. Although some level of habituation to disturbance could occur, repeated flushing of adult raptors increases energy expenditure during foraging and decreases energy ingestion, depleting energy reserves and resulting in premature mortality during harsh conditions. Evidence suggests that some falcons, ospreys, and owls are generally more tolerant of human-induced disturbance and human environments. Golden eagles, turkey vultures, northern harriers, Cooper’s hawks, and sharp-shinned hawks appear to be much less tolerant, while buteos exhibit a wide range of acceptance levels. Raptors are less tolerant of disturbance when populations of prey species are at low levels (Romin and Muck 2002).

Under each alternative, wildlife in the planning area could be disturbed by activities proposed across a variety of resource programs. Appendix G (p. 1937) lists projected surface disturbance by alternative over the life of this plan.

Physical Resources

Management actions common to all alternatives for physical resources (e.g., complying with rules and regulations and filing for water rights) that are administrative processes will have no impact on wildlife.

Air Quality

Reducing dust emissions, if they are reduced throughout the entire planning area, would have minor beneficial impacts to wildlife. Dust that covers vegetation reduces the photosynthesis process, and blocks light and potentially water from reaching the plant cells. Travel on roads that are or will be surfaced with gravel or scoria, if untreated, would cause large amounts of dust to be forced into the air. This dust could settle on vegetation, thereby degrading the quality of wildlife habitat. Reducing dust emissions would help maintain suitable habitat for all wildlife species. The beneficial effects would be major as this would improve habitat mostly along roads, covering greater than ten percent of habitats important to big game, trophy game, small game birds, and non-game migratory birds (five to ten percent of habitats important to small game mammals, furbearers, and non-game mammals, one to five percent of habitats important to migratory game birds and less than one percent of habitats important to raptors), therefore the management actions common to all alternatives for air quality would have major beneficial effects on wildlife in the planning area.

Soil

Evaluating proposed surface-disturbing activities for effects on soil resources would have major beneficial impacts to wildlife. Inclusion of reclamation plans in any authorized surface-disturbing activity would have long-term, major, beneficial impacts to wildlife if implemented on every project as greater than ten percent of habitats important to any wildlife species will be impacted by surface-disturbing activities of some kind. The more surface disturbance on steep slopes or on highly erosive soils, the greater the potential for adverse impacts to wildlife habitats. Implementing mitigation measures to protect soils, and therefore avoid impacts to vegetation, throughout the planning area would reduce disturbance to wildlife habitats and aid in the recovery of habitat from permitted uses. Once surface disturbance occurs, the goal of interim reclamation is to avoid or minimize soils erosion. The longer the reclamation takes, the greater the adverse impacts to wildlife habitats and wildlife species.

Water Resources

Management actions and allowable uses that protect surface water from impacts associated with soil erosion and pollutants are anticipated to benefit wildlife habitats. Wildlife species that use water sources and riparian habitats benefit from management actions common to all alternatives that promote protecting, developing, restoring, and improving water sources. However, livestock use around water sources also could alter vegetative diversity in these mesic areas, potentially reducing habitat quality for a wide variety of wildlife species.

There are approximately 237 miles of riparian corridors in the planning area, all of which could support greater than ten percent of habitats important to small game birds (five to ten percent of habitats important to big game, trophy game, and raptors and one to five percent of habitats important to small game mammals, migratory game birds, predator species, furbearers, non-game mammals, and non-game migratory birds), therefore, the beneficial effects of the management actions common to all alternatives would be major.

Cave and Karst Resources

Cave inventories, if performed in conformance with **WO IM 2010-181** and in a manner that prevents the spread of bat disease and infection (such as White-nose Syndrome

[WNS]), could benefit wildlife. Cave inventories include surveys for cave-inhabiting wildlife species. New information on populations could be acquired through these inventories. However, the geologic formations likely to contain caves are limited to the western edge of the planning area in the Big Horn Mountains and will provide only limited amounts of wildlife inventory information. The management actions common to all alternatives for cave and karst resources would beneficially affect greater than ten percent of habitats important to big game and trophy game, (less than one percent of habitats important to all other general wildlife species), therefore, cave inventories would have a major beneficial impact on wildlife.

Mineral Resources

Although 43 CFR 3161.2 directs the BLM to ensure that “all operations are conducted in a manner which protects other natural resources and the environmental quality,” it also contains scenarios in which operators may continue to conduct activities without requesting exceptions. Many studies have shown that actions involving increased human presence adversely impact wildlife populations such as big game, raptors, and grouse.

The primary impacts to wildlife species from minerals development in the planning area are the reduction in usable wildlife habitat and disruption of migration corridors. Reductions would be particularly severe in areas with continuous surface disturbance. Subsequent crowding into non-affected areas from affected areas could have the density-dependent impact of reducing animal survival and damaging resources.

The impacts of human activity, including those related to minerals development, on wildlife include loss of habitat and forage occurring from surface-disturbing activities at any time of the year, and displacement and physiological stress as a result of human presence and activity. As reclamation and habitat succession change the habitat type, the species with more specific micro-habitat requirements could re-inhabit these areas.

Large seismic projects, particularly the use of thumper trucks, adversely impact sagebrush habitats because they provide trails for increased predator access; fragment sagebrush habitats; crush live sagebrush and understory grass and forb species; and could disrupt breeding and nesting activities of sagebrush-obligate and other wildlife species.

Energy development is anticipated to be the greatest single contributor to disturbance of wildlife habitat in the planning area. Beyond initial exploration, land clearing, and construction of permanent aboveground structures and facilities, continued human disturbance to wildlife can occur from activities such as equipment maintenance, which is especially disruptive to wildlife during crucial periods (wintering, breeding, and nesting). Increases in wildlife mortalities are also likely to occur as a result of collisions with haul trucks.

All of the impacts associated with minerals development would be adverse to wildlife over the long term.

Locatable Minerals

Mineral development fragments vegetative communities, alters plant community structure and diversity, and alters landscapes. Potential impacts to wildlife include temporary disturbance in localized areas, temporary loss of habitat, long-term degradation of habitat, and possible direct mortality of small rodents or nesting birds. Long-term impacts would result from habitat fragmentation associated with roads, utility corridors, and construction, and wildlife avoidance of development sites and facility locations. Locatable mineral development is likely to occur in

five to ten percent of habitats important to migratory game birds (one to five percent of habitats important to all other general wildlife species), therefore, the management actions common to all alternatives will have a moderate adverse effect on wildlife.

Leasable Minerals – Coal

Coal development occurs primarily in areas identified as acceptable for further coal leasing consideration (BLM 2001a), namely northern Sheridan and Campbell counties. These areas identified as acceptable for further coal leasing consideration occur in over ten percent of the entire planning area and would have a major adverse impact on wildlife through habitat loss if leased and developed.

Leasable Minerals – Fluids

Depending on the economic feasibility of development and fluctuations in market price, and because of the extensive oil and gas reserves and existing leases in the planning area, important habitat could be lost throughout the planning area. As densities of wells, roads, and facilities increase, habitats in and near well fields become progressively less effective until most animals no longer use these areas. Although vegetation and other natural features might remain physically unaltered, many wildlife species make proportionately less use of the areas near oil and gas facilities. Animals that remain within the affected zones are subjected to increased physiological stress. This avoidance and stress response impairs habitat function by reducing the capability of wildlife to use the habitat effectively.

Elk herds in the Big Horn Mountains and in the Fortification Creek area have not yet experienced a high level of drilling activity in their crucial winter or calving ranges. Research has shown that elk are displaced out of the high-quality winter ranges during drilling and construction activities and do not return until those activities were completed. Continued development in these areas could lead not only to native winter and calving range abandonment, but also to loss of high-quality forage until habitats recover. These impacts are expected to be more severe for the Fortification Creek elk herd where mineral exploration has recently begun and is expected to continue. Impacts would be far less for elk in the Big Horn Mountains, where mineral development potential is low.

Mule deer exhibit a stress response to disturbances associated with noise and activity up to 4.65 miles from the source (Sawyer et al. 2009). The greater mobility and adaptability of these species to human activity and disturbed areas likely would prevent long-term impacts to populations; however, it is feasible that mule deer and pronghorn behavior or populations in the planning area could be altered at some level of development.

Evaporation ponds built for produced water from natural gas wells contain waters that could be highly alkaline and contain very high concentrations of salt. Waterfowl and shorebirds become attracted to these ponds and, over time, become encrusted. This can cause death from excess salts in the body from preening. Birds can drown from excess weight, or they can suffer from cold stress resulting from the loss of insulation from their feathers (USFWS 2006; Ramirez 2005).

Fluid mineral development is likely to occur in greater than ten percent of habitats important to all wildlife species, except trophy game (less than one percent), therefore management action common to all alternatives will have major adverse effects on wildlife resources.

Salable Minerals

Salable minerals extraction would result in direct, long-term, impacts on wildlife and associated habitat. Impacts would include displacement and disturbance of animals, removal of vegetation, and loss of habitat. The level of impacts would depend on the size of the salable minerals area

and the importance of the altered habitat to wildlife. Many sand and gravel areas are associated with riverine and alluvial plains. The vegetative communities normally associated with these areas would be impacted by the extraction of salable minerals.

Cottonwood communities normally associated with these minerals would be impacted by potentially lowering the water table, resulting in loss of these communities. Eyrries for nesting birds, such as great blue herons, eagles, several raptor species, and habitat for numerous waterfowl and neotropical migrants that rely on many of these communities would be lost. Many other species (e.g., big game and small mammals) also rely on these areas during winter to provide cover from the elements.

Potential salable mineral development may occur in greater than ten percent of habitats important to small game mammals, predator species, furbearers, non-game mammals, non-game migratory birds and raptors (five to ten percent of habitats important to small game birds and migratory game birds; one to five percent of habitats important to big game; and less than one percent of habitats important to trophy game), therefore, the management actions common to all alternatives will have major adverse effects on wildlife in the planning area.

Fire and Fuels Management

Fire has both direct and indirect impacts and may have either beneficial and adverse impacts on wildlife and their habitats. Generally, the impacts on habitat are much greater than the impacts on resident animals. Short-term adverse impacts from fire on resident wildlife include displacement, disruption of reproductive activities, habitat modifications and occasional mortalities. However, populations of certain species can recover quickly if suitable habitat is available. Adverse impacts to individuals are generally offset by the benefits of habitat changes for future generations.

Unplanned Fire (Wildfire)

Wildlife species have adapted to survive the pattern of fire frequency, season, size, severity, and uniformity that characterized their habitat in pre-settlement times. Historically, low-intensity fires created mosaics resulting in more variability in vegetation seral stage, species composition, vertical stratification, and improved herbaceous understory. If fire frequency or severity increases or decreases from pre-settlement patterns, habitat for many species would decline. Studies have shown a reorganization of animal communities in response to fire, with increases in some species and decreases in others. In areas where fire exclusion has changed species composition and fuel arrays over large areas, subsequent fires without prior fuel modification are unlikely to restore pre-settlement vegetation and habitat. In the last 10,000 years, fire in North American ecosystems has not operated in isolation from other disturbances or has occurred independent of human influence. Due to likely scattered nature of effects to all wildlife species in the planning area, the adverse effects of habitat removal from unplanned fire are likely to be minor.

Planned Fire (Prescribed Fire)

Prescribed fire where historical fire regimes occurred is a tool used to manage vegetative communities and can result in short-term adverse impacts with long-term beneficial impacts to wildlife and wildlife habitats. Prescribed fire, hazardous fuels reduction, and WUI projects that include fire would be considered beneficial practices. Preparing plans and coordinating with adjacent land owners before prescribed or wildland fires can provide important opportunities for taking advantage of the benefits wildland fire can provide to certain desirable wildlife habitats. These three efforts, usually planned on a project-specific basis, are generally

applied in the cooler seasons (spring, fall, and winter), and often involve adjacent land owners. These fires would generally be cooler than summer wildland fires and typically would not severely sterilize soils or the nutrients found in the ash of fire.

Rehabilitation and reclamation of wildfires, prescribed fires, and surface disturbance associated with fire suppression activities are integral to protect vegetative communities and watersheds from erosion and reduce the opportunity for invasive plant species to establish or expand. Management actions associated with fire will have short-term, localized, impacts to wildlife, and long-term minor beneficial impacts on wildlife across the planning area.

Biological Resources

Management actions common to all alternatives that are administrative processes (e.g., development and prioritization of plans; providing outreach and education; updating plans; and compliance with rules, regulations, and agreements such as MOUs) would have negligible to no impact on wildlife.

Management actions common to all alternatives that promote balanced management of biological resources in the planning area would promote a natural landscape, thereby promoting healthy wildlife habitats. These management actions include managing for forage enhancement and implementing cooperative IPM programs, which would have beneficial impacts to wildlife.

Vegetation – Forests and Woodlands and Vegetation – Grassland and Shrubland Communities

Management actions common to all alternatives that would reduce impacts to vegetative resources, by nature, would reduce impacts to wildlife habitats and would have beneficial impacts on wildlife. Vegetation inventories on all lands (grasslands and shrublands and lotic and lentic riparian/wetland systems, and evaluation of CBNG-created riparian and wetland systems for retention or reclamation) would have beneficial impacts on wildlife. Forest, woodlands, grassland, and shrubland communities contain greater than ten percent of habitats important to big game, small game birds, migratory game birds, non-game migratory birds, and raptors (five to ten percent of habitats important to trophy game and less than one percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals), therefore, the management actions common to all alternatives will have major beneficial effects on wildlife in the planning area.

Vegetation – Riparian/Wetland Resources

Restoration of disturbed sites, including split estate lands, would promote recovery of habitat function. This would have a localized, beneficial impact to wildlife. Expansion and enhancement of riparian/wetland systems and habitat would equally provide these same long-term, beneficial impacts to wildlife that inhabit riparian/wetland ecosystems. There are 296,359 acres of suitable riparian wildlife habitat on split estate (federal fluid mineral) lands and 23,831 acres of suitable riparian wildlife habitat on BLM surface. Riparian/wetland resource areas provide greater than ten percent of habitats important to big game, trophy game, small game birds, migratory game birds, non-game migratory birds, and raptors (five to ten percent of habitats important to all other wildlife species), therefore the management actions common to all alternatives would have major beneficial effects on wildlife over the entire planning area.

Invasive Species and Pest Management

The spread of invasive plant species contributes to loss of certain desirable wildlife habitats,

increases soil erosion, reduces water quality and quantity, and reduces structural and species diversity. Controlling the spread of invasive species is necessary to maintain the carrying capacity of wildlife habitats. Comprehensive management plans, including controlling and monitoring the spread of invasive species, are anticipated to be effective in reducing the adverse impacts of invasive species. Targeting and eradicating invasive species particularly detrimental to certain wildlife habitats are anticipated to benefit wildlife. For example, salt cedar is an invasive species often found adjacent to or within water courses, wetlands, and riparian areas – habitats that are important to numerous wildlife species. If the spread of invasive species in the planning area continues, adverse impacts to wildlife habitats are anticipated to be commensurate with the amount of wildlife habitat affected.

Controlling grasshoppers and Mormon crickets on public lands would have an adverse impact to wildlife over the short term because these insects provide a food source for many wildlife species. However, controlling these pests could be beneficial to wildlife over the long term by improving vegetation health. These long-term beneficial impacts typically are localized, but occur over the entire planning area, making them major.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Impacts to wildlife from the management of activities potentially affecting native and desirable non-native fish species are not known at this time. It is difficult to predict the impacts to wildlife from these as-yet defined activities.

Managing public access to fish bearing waters and to protect crucial habitats could have adverse impacts on wildlife. Future access routes have the potential to adversely impact wildlife resources by stripping away vegetation as part of the access route creation, trampling or eliminating vegetation, compacting soils throughout the footprint of the access route, and increasing human presence. New access routes could fragment wildlife habitat. There are 30,280 acres of wildlife habitat on BLM-administered land close (165 feet) to fish-bearing waters. Constructing new fences, even in accordance with the BLM Fencing Handbook, would have the same potential adverse impacts to wildlife for the same reasons. These impacts are typically localized, but would occur on one to five percent of BLM-administered lands.

Through the NEPA and permitting processes, protecting fish habitat and special status fish species habitats, and mitigating impacts to fish and special status fish species would have beneficial impacts to wildlife. Special status fish species and non-special status fish species management actions common to all alternatives support efforts to protect and improve riparian ecosystems. These actions include restoring fish habitats and managing harmful non-native riparian vegetation in river and stream systems important to fish species; this would have beneficial impacts to other wildlife species inhabiting these riparian areas. Actions that include managing vegetation diversity and minimizing disturbances to springs and riparian zones help maintain natural landscapes. Fish and special status fish species resource areas contain greater than ten percent of habitats important to all wildlife, except trophy game and small game birds (five to ten percent), therefore, management actions common to all alternatives would have major beneficial impacts to all wildlife.

Special Status Species – Plants

Implementation of actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate and reasonable and prudent measures within biological opinions for T&E species at this point in time, includes surface-disturbing restrictions for Ute ladies'-tresses orchids and their habitats, along with guidelines to prevent alteration of streamflow near known

populations. Management actions common to all alternatives also include allowing treatments within habitat for special status plant species and within known populations that are proven to benefit the species. These actions, including the prohibitions/restrictions encompass and therefore improve or conserve greater than ten percent of habitats important to big game and trophy game (one to five percent of habitats important to small game birds and less than one percent of habitats important to all other wildlife species); therefore, the management actions common to all alternatives would have major beneficial effects on wildlife resources.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Avoidance areas, whether for application of broad-spectrum insecticides or for the protection of nesting bald eagles, would have a beneficial impact to general wildlife where these resources overlap. Avoidance areas for other species would, by nature, be avoidance areas for general wildlife. Avoidance areas for broad-spectrum insecticide application are unknown at this time. There are 7,710 acres of suitable wildlife habitat within 0.5 mile of bald eagle nests (federal fluid mineral estate). These impacts are typically localized impacts, but would occur on less than one percent of BLM-administered lands in the planning area, making them negligible.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Maintaining and developing relationships with Native American tribes and maintaining federal ownership of areas important to Native Americans or with significant paleontological values are administrative processes and will not impact wildlife. Other cultural resources management actions common to all alternatives, such as the stabilizing and protecting of sites, are actions that would create avoidance areas to protect cultural resources and would, by nature, be avoidance areas for wildlife habitats. Avoidance areas for cultural and paleontological resources would conserve greater than ten percent of habitats important to all wildlife species in the planning area, except raptors (five to ten percent) and migratory game birds (less than one percent), therefore, management actions common to all alternatives for cultural and paleontological resources would have major beneficial effects on wildlife in the planning area.

Visual Resources

Management of VRM Class I and II areas could prohibit or limit some surface-disturbing activities and thereby protect grassland and shrubland communities and other wildlife habitats. VRM Class III and IV areas have minor limitations. Managing visual resources would indirectly affect wildlife habitats, depending on the locations, types, and durations of approved projects. Beneficial effects under the management actions common to all alternatives would occur on greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (less than one percent of habitats important to all other wildlife species), and would therefore, be major effects.

Land Resources

Forest Products

Vegetative treatments, such as silviculture, are used to manage forests. This management can impact wildlife habitats. Forest clear cuts alter wildlife habitats more than any other silviculture treatments because they set plant succession back to an early stage, disturbing soil, altering microclimate conditions, and completely removing forest habitats. In all timber management activities, the practice of leaving dead and dying trees, trees with heart rot, and other standing

unmerchantable timber would meet the ecological needs of numerous species, including woodpeckers, owls, and neotropical bird migrants. Forest management actions that replicate natural historical disturbance regimes instead of or in addition to managing forest products are anticipated to benefit wildlife habitats. Those forest products management actions that increase vegetative diversity and age classes will benefit wildlife. Some wildlife species depend on young or open stands, periodic wildfires, and endemic levels of insects and disease outbreaks. Fire and disease regimes have changed through time.

Potential short-term impacts on elk from forest management include loss of security habitat and calving cover and displacement of elk to other portions of the habitat. Displacement of elk has been detected as far as four miles from areas of summer logging activity. Timber harvest also would have long-term impacts on security cover. Timber harvest practices could lead to increased human presence, wildlife harassment, and increased hunting vulnerability in elk habitats.

Personal use of forest products by the public could have major adverse impacts on wildlife. Access routes to retrieve the forest products have the potential to adversely impact wildlife habitat by stripping away vegetation as part of the access route creation, trampling or eliminating vegetation, and compacting soils throughout the footprint of the access route. There are 16,234 acres of suitable wildlife habitat on BLM-administered lands that also contain forest products. The impacts identified above are typically localized, but due to the lack of overlap (one to five percent of BLM-administered lands in the planning area), when projected over the entire planning area, adverse impacts would be minor.

Prohibiting timber harvest and recreational camping within 200 feet of surface water sources would create avoidance areas to protect surface water resources; these also would be avoidance areas for wildlife. There are approximately 5,584 acres of suitable wildlife habitat on BLM surface within 200 feet of surface water resources. These beneficial impacts are typically localized, but would occur on more than ten percent of BLM-administered lands in the planning area.

Lands and Realty

Lands acquisitions, pursuit of easements, and tenure adjustments would improve management of public lands overall. Impacts to the vegetation would vary depending on the type of action and would be project specific. Lands and realty actions would have indirect beneficial impacts on wildlife. Effects would be minor for individual projects but could be moderate to major if a large acquisition was pursued and completed. Vegetation on land proposed for disposal, exchange, or acquisition would be directly impacted by this action due to a change in ownership and management. Land exchanges and acquisitions could provide opportunities for the BLM to manage more land in a manageable land pattern to promote healthy habitats for those species, thus providing greater benefits to those species. Lands available for tenure adjustments contain greater ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (one to five percent of habitats important to small game birds, non-game migratory birds, and raptors and less than one percent of habitats important to big game, trophy game and migratory game birds), therefore, the beneficial effects from management action common to all alternatives on wildlife would be major.

Renewable Energy

Potential renewable-energy development would include site development, utility corridors, and access routes that would have direct and adverse impacts to wildlife habitats. If renewable-energy sources such as wind are developed in the planning area, there would be direct and indirect impacts on wildlife. Direct impacts would include disturbance during construction and maintenance

activities, mortality due to bird strikes on wind towers, and mortality of small, less mobile animals such as small mammals or nestling birds during construction. On the basis of mortality estimates at existing wind-energy projects in the western United States, the mid-range expected for passerine mortality would be approximately 1.2 to 1.8 birds per turbine per year (BLM 2005c). Wind-energy facilities would be sited to minimize bird strikes. Indirect impacts would include minor loss of habitat due to facility construction. Little renewable-energy development is anticipated on BLM-administered lands in the planning area, so actual impacts would be minimal and would not impact wildlife populations. Because the potential for renewable-energy projects in the planning area is low, adverse impacts on wildlife would be negligible.

Rights-of-Way and Corridors

ROW and corridors in the planning area would impact wildlife in various ways.

For example, utility poles benefit raptors and other birds by providing perching or nesting structures; however, these same utility structures can cause raptor mortality through electrocution and collisions (Romin and Muck 2002). In addition to raptors, other species, such as ravens, crows, magpies, small flocking birds, and wading birds, are subject to electrocution by utility structures (Romin and Muck 2002). Erecting artificial nest platforms on utility structures could benefit birds such as osprey, eagles, and hawks, and nest boxes constructed on utility structures could benefit cavity-nesting birds (e.g., bluebirds) and bats (Romin and Muck 2002).

There would be habitat loss, degradation, fragmentation, and species displacement from approved linear features (e.g., powerlines, roads, and pipelines) and other permitted facilities. Linear ROW features could fragment habitat and disturb vegetation; increase erosion; and degrade the quality of riparian areas, watersheds, and habitats if features cannot be avoided or impacts mitigated. Impacts from buried pipeline construction could last from 30 to 40 years or more, depending on the time required for full reclamation of predisturbance vegetation, including sagebrush. The length of time of wildlife displacement would depend on the timeliness and effectiveness of reclamation efforts. Impacts from ROW-approved actions such as powerlines and communications sites would include increased injury to and death of bats, raptors, and other migratory birds as a result of collisions.

The designation of corridors for utility ROWs, the construction of new ROW projects adjacent to existing projects, a developmental plan to concentrate communications sites, approval of ROWs to access private lands, and a transportation management system would reduce the number of acres disturbed for these types of management actions. Acres disturbed would be directly and adversely impacted over the long-term (life of the projects). Concentrating these disturbances would reduce these adverse impacts to wildlife by reducing the potential for fragmentation.

Potential ROW and corridor development could be permitted within greater than ten percent of habitats important to all wildlife species in the planning area, except migratory game birds (one to five percent), therefore management actions common to all alternatives would have major adverse effects on wildlife resources.

Travel and Transportation Management

Roads and associated traffic have the greatest impact to wildlife and wildlife habitats. Roads remove vegetation and disturb soil when they are constructed and thereafter. Impacts to wildlife include mortality, habitat loss, and reduced habitat connectivity. Wildlife mortality and loss of habitats due to road construction are direct impacts; vehicle speeds and traffic volumes generally increase the mortality of wildlife due to wildlife collisions with vehicles. Road construction also causes habitat loss by converting wildlife habitats to permanent road surfaces and ROWs.

In addition, because roads typically are void of vegetation and exhibit impervious surfaces or compacted soil, they often promote increased surface runoff and lead to soil erosion and transport of pollutants to nearby streams, wetlands, or riparian areas. Roads also contribute to habitat fragmentation and can be barriers to some wildlife species. There are typically two wildlife responses to roads and their associated disturbances - avoidance of roads and numerical reductions in wildlife populations.

Inventory and evaluation of all existing roads and trails into one transportation plan would designate those to be upgraded, maintained, or abandoned. These actions would reduce erosion, protect and stabilize soils and vegetation, and reduce opportunities for invasive plants and weeds to establish. Restricting motorized vehicles and implementing temporary closures would contribute to stabilizing soils and reducing erosion. All new roads would be designed to minimize surface disturbance and surface runoff and erosion potential. Constructing new roads and trails have a direct, long-term adverse impact on wildlife. Roads and trails for motorized vehicles result in localized direct and adverse impacts on wildlife habitats, such as reducing vegetation cover and density and changing community compositions. Reclaiming abandoned roads and trails with appropriate herbaceous and shrubby vegetation and upgrades on utilized roads would promote soil stabilization and reduce opportunities for erosion and for invasive plant and weed species to establish; this would have a direct beneficial impact on wildlife over the long term.

Overall, travel and transportation actions would be conducted within greater than ten percent of habitats important to big game, trophy game, small game birds, and non-game migratory birds (five to ten percent of habitats important to small game mammals, predator species, furbearers and non-game mammals, one to five percent of habitats important to migratory game birds, and less than one percent of habitats important to raptors), therefore having major adverse effects to wildlife over the long term.

Recreation

Although many recreational activities are nonconsumptive, they can impact wildlife and their habitats. Increased human presence could result in habitat or water quality degradation or wildlife disturbance (e.g., dispersal or avoidance). If recreation activities took place in non-crucial habitats or during seasons when sensitive wildlife species are not present and in compliance with recreation management actions, impacts likely would be minimal. During seasonally sensitive periods (e.g., winter, calving, breeding, nesting, and early brood rearing), recreation activities could significantly alter animal behavior and result in increased winter mortality or lowered reproductive success. In areas that are repeatedly used for camping sites, there could be minor, site-specific degradation of habitats.

The installation of recreation facilities, particularly in new areas, could disturb habitat during construction, permanently alter habitat, or lead to increased human presence that could disturb wildlife. Animal avoidance of developed areas would be similar to that for any other types of development in wildlife habitat.

In addition to the stressors from BLM-permitted activities, game animals (big game, small game, furbearers, and game birds) are hunted seasonally. Pursuit of game animals during hunting seasons could present additional short-term stressors. Hunting seasons vary from weeks to months, depending on the game species, and are designed to harvest animals to maintain established population objectives or maintain populations at or below sustainable habitat thresholds (carrying capacity). Though the BLM has no jurisdiction over hunting as a whole, use of BLM-administered lands for the purpose of hunting is promoted.

In general, OHV management decisions that result in increased human presence would have a localized impact on wildlife. Impacts would include increased displacement of wildlife, increased stress during critical periods, and degradation of habitats. The greater area and the higher the density of OHV use, the more adverse impacts to wildlife habitats. OHV use can alter the seasonal use patterns of many wildlife species. The use of over-snow vehicles on winter range could lead to excessive wildlife disturbance and cause additional stress, more rapid depletion of fat (energy) reserves, and in extreme cases, death. New roads created from the extensive use of OHVs could provide access to areas that normally do not experience human presence; degrade habitat through vegetation loss; provide access for predator species and create competition for species; and compact soil, which would cause accelerated erosion or prevent water infiltration.

Development of recreation opportunities, trails, maintenance of established sites, facility construction, and designating trails to caves all have the potential to adversely impact wildlife habitats. Recreational use of caves containing suitable bat habitat and development of cave management plans would consider the strategy described in **WO IM 2010-181**, reducing the threat of WNS spread.

Recreation management actions would occur within one to five percent of habitats important to big game, trophy game, small game mammals, predator species, furbearers and non-game migratory birds (less than one percent of habitats important to all other wildlife species); therefore, management actions common to all alternatives for recreation would have minor adverse effects on wildlife.

Lands with Wilderness Characteristics

Identified and designated areas would be managed to maintain suitability for preservation as wilderness. This management would help maintain or improve wildlife habitat by limiting surface disturbance. Closing or limiting motorized vehicles to designated roads and trails would have a beneficial effect on wildlife. Avoidance areas for other resource concerns would also be avoidance areas for wildlife. **Lands with wilderness characteristics** could potentially occur in one to five percent of habitats important to small game mammals, predator species, furbearers and non-game migratory birds, (less than one percent for all other wildlife species); therefore, management actions common to all alternatives for **lands with wilderness characteristics** would have minor beneficial effects on wildlife in the planning area.

Livestock Grazing Management

Impacts to wildlife habitat from livestock grazing include competition for forage and water and habitat use and alteration. Stock driveways tend to concentrate high levels of livestock use that can cause degradation (e.g., near-complete removal of vegetation and soil compaction). These areas no longer provide forage or shelter, but could be used as wildlife movement corridors. Late-season grazing can remove residual vegetation that would be necessary on big game winter ranges. Livestock grazing also can enhance forage and brood-rearing conditions for wildlife species. Wildlife could favor regrowth areas previously used by cattle because of the resultant increase in forage palatability. Historic and current trailing of livestock on the established stock driveways can contribute to soil disturbance, trampled vegetation, deposited manure, loss of plant cover, and localized areas dominated by annual, invasive, and other weed species. The major stock driveways (The Slip, Trabling Road, and Hazelton Road) are designated county roads; therefore, trailing contributes only a small portion of adverse impacts. Trailing is also short term, occurring only 2 to 3 weeks in spring and fall.

Improper livestock grazing management could adversely impact stabilization of riparian vegetation, which can lead to stream instability and an associated loss of habitat complexity, and the loss of shading vegetation, which can lead to elevated stream temperatures, increased sediment delivery, and loss of stream channel complexity provided by fluvial processes and woody debris. The degree of adverse impact, if any, would depend on livestock grazing timing and intensity, site characteristics, and species habitat requirements. Early spring and late summer are periods when livestock are most likely to utilize shrubs, thereby reducing their availability to wildlife species. Browsing of shrubs could reduce their competitive ability against grasses, which could increase abundance and vigor of the herbaceous understory.

Livestock grazing in fall or early spring would remove the residual herbaceous understory and reduce its vertical structure, which reduces the visual security for upland nesting birds. This could lead to increased predation and lower nesting success. Removing residual cover could also hasten spring green-up of the herbaceous understory, providing quality forage for wildlife coming out of stressful winter conditions.

Livestock range improvements designed to alter grazing distribution and use of pastures, such as fences and water developments, would affect wildlife. Big game species use mineral supplements placed for livestock use. However, livestock fences create travel barriers, create stress, and could lead to decreased reproductive success (especially when constructed in big game migration corridors) and death from entanglement. Well planned, appropriate, range improvements may benefit wildlife by improving livestock management and distribution.

Placing water development projects for livestock in certain areas could lead to a redistribution of livestock on crucial winter ranges not previously used by livestock. This could lead to increased competition between livestock and big game for forage on crucial winter ranges. Water developments maintained throughout the year can be beneficial to wildlife where other water sources are limited. Properly distributed water developments can be used to facilitate rotational or other livestock grazing systems to improve rangeland health and provide better forage for wildlife. Well-designed water developments (reservoirs) and associated riparian vegetation create nesting, feeding, and brood-rearing habitat for waterfowl and other migratory birds. The development of water sources in dry regions would allow wildlife use to expand into habitats that previously were used only seasonally. Dispersion of wildlife to access water sources reduces potential impacts from predators; however, livestock use around water sources also could alter vegetative diversity in these mesic areas, potentially reducing habitat quality for a wide variety of wildlife species.

Beneficial impacts of proper grazing include reducing competition by removing encroaching woody plant cover; hoof action that keeps topsoil loose, increases litter and precipitation penetration, and incorporates seeds into soil; nutrient recycling; removing wildfire fuels; and controlling invasive plant and weed species with properly timed grazing rotations and species (e.g., goats). Rangelands provide open space and habitat for many wildlife species. Prolonged grazing during the growing season or summer months could reduce the vigor of desired species, change species richness, and increase the potential for invasion by annual grasses and invasive plant and weed species. Although there are BLM surface lands in the grazing allotments, most parcels are small and cannot be meaningfully managed for wildlife habitats. There are 779,034 acres of BLM surface in grazing allotments in the planning area, all of which are likely to support various wildlife species.

Overall, livestock grazing management would have minor adverse impacts on wildlife.

Special Designations

Areas of Critical Environmental Concern

Prohibiting surface-disturbing activities and implementing land use restrictions in ACECs would limit the extent of surface disturbance. This would have a direct beneficial impact on wildlife over the long term because it would minimize the potential for adverse impacts on habitat. ACECs could encompass as much as one to five percent of habitats important to big game, trophy game, small game mammals, predator species, furbearers, and non-game migratory birds (less than one percent of habitats important to all other wildlife species); therefore, management actions common to all alternatives for ACECs would have minor beneficial effects on wildlife species in the planning area.

Scenic or Back Country Byways and Wild and Scenic Rivers

Scenic or BCBs and WSRs would be managed to maintain or enhance their natural characteristics. These management actions would directly benefit wildlife over the long term. Although such areas could increase in popularity and increase impacts from human presence, impacts would be minimal. These actions would have a negligible effect on vegetative resources. Due to the large amounts of suitable wildlife habitat in the planning area and the localized impacts of Scenic or BCBs and WSRs, impacts to wildlife would be negligible.

Wilderness Study Areas

Management actions for WSAs would have beneficial impacts on wildlife habitat. WSAs would be managed to emphasize primitive, nonmotorized activities to maintain existing natural values. Management of WSAs would prohibit surface-disturbing activities and implement land use restrictions, which would limit the extent of surface disturbances. WSAs could encompass as much as five to ten percent of habitats important to big game (one to five percent of habitats important to trophy game and small game birds and less than one percent of habitats important to all other wildlife species), therefore, management actions common to all alternatives for WSAs would have moderate beneficial effects on wildlife species in the planning area.

Socioeconomic Resources

Social and Economic Conditions

Management actions common to all alternatives are administrative processes and will have no effect on wildlife resources. Impacts to social and economic resources will be quantified on a project specific basis. Management actions that vary by alternative are also administrative; therefore, social and economic management actions will not be discussed further in this section.

Health and Safety

Management actions common to all alternatives are designed to control and mitigate threats to health and human safety and to the environment. Management actions designed to prevent accidental spills of hazardous materials would have beneficial impacts to wildlife habitat by protecting riparian and upland areas. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is a threat of accidents or spills. If there was a spill, mitigation and cleanup would rarely succeed in recovering a riparian or upland area to its original condition over the short term; therefore, there would be localized long-term adverse impacts. Reclaiming abandoned mines would have indirect beneficial impacts on wildlife habitat on affected sites over the long term, although there would be short-term displacement of wildlife occupying those mines.

Only management actions in Common to All Alternatives are identified; therefore, health and safety will not be discussed further in this section.

4.4.6.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes management actions and potential impacts to wildlife from implementing Alternative A.

Fish and Wildlife Resources – Wildlife

Under Alternative A, only habitats currently designated as crucial seasonal wildlife habitat (75,175 acres of crucial elk habitats, 27,222 acres of big-game priority migration corridors, and 1,195,815 acres within biologic buffers for raptor nests) would be protected. There is a moderate probability that habitat loss, increased physiological stress, and lower reproduction and survival would occur in priority wildlife populations because of the extensive land use now occurring in the planning area.

Seasonal restrictions on land uses would benefit wildlife by preventing disturbance during critical winter and calving periods. These seasonal restrictions would not prevent activities, but merely delay them. Seasonal restrictions alone are not sufficient to reduce impacts to many wildlife species; therefore, Alternative A couples additional disturbance-free buffer zones with these restrictions. This would have a long-term beneficial impact on wildlife. Other long-term beneficial impacts would result from restrictions on access roads, pipelines, and powerlines to corridors and from piping oil and gas products out of crucial winter range for elk.

Wildlife also would benefit from prohibiting surface occupancy for oil and gas activities, restricting off-road vehicle activities in big-game winter ranges and elk calving areas, retaining sufficient escape and foraging habitat adjacent to timber cutting units, and exchanging or selling scattered parcels of public land areas could be blocked up into manageable units. From past experience, it is estimated that restrictions on oil and gas exploration, ROWs, and other surface-disturbing activities through wildlife seasonal or NSO stipulations are inconsistently applied. Furthermore, under Alternative A, the authorized officer may waive prohibitions and restrictions without defined criteria; this has resulted in inconsistent application of management and has not been effective in protecting wildlife.

Management actions under Alternative A are generally expected to maintain existing conditions for big game in the planning area. Black bears are impacted by management actions in forest and woodland habitats; these management actions generally are not focused on providing habitats for black bears or mountain lions. Although there are no specific management actions for mountain lions under the alternatives, mountain lions benefit from management actions for mule deer and big-game habitats.

Under Alternative A, there are no specific management actions for furbearing animals, predators, small game, or nongame mammals, but these species are impacted by other management actions. Badger and bobcat are habitat generalists and are therefore, are impacted by actions in a variety of habitats. The BLM does not perform any specific habitat management activities for predatory animals. Regardless, BLM management actions for wildlife habitats would affect predatory animals. All of these animals are largely habitat generalists and would be impacted by actions for a variety of habitat types.

Under Alternative A, the BLM preserves, protects, and restores natural function in riparian areas. Alternative A does not allow surface disturbance within 500 feet of riparian and wetland areas, which benefits beaver, muskrat, and mink. Although there are no specific management actions for migratory game birds, these species are impacted by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats for waterfowl. Under Alternative A, the BLM manages riparian and wetland areas to preserve natural functions and implements buffers in these areas and within 100-year floodplains and perennial streams where surface disturbance should be avoided; this benefits migratory game birds.

Although there are no specific management actions for reptiles and amphibians under Alternative A, these species would be impacted by other biological resource management actions. Snakes occur in a variety of habitat types, while lizards typically occur in drier habitats, particularly those with rock outcrops and cliffs. Aquatic turtles and amphibians require riparian and wetland habitats. Impacts to these habitat type from management actions are discussed throughout this section.

Physical Resources

Air Quality

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for air quality (habitat conservation). Under Alternative A, though, modeling and monitoring would be conducted only on a project-specific basis. The lack of direct management under Alternative A would make the beneficial effects to wildlife resources negligible.

Soil

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for soil (habitat conservation). Surface-disturbing prohibitions and restrictions apply to areas of severe erosion hazards and areas having poor reclamation suitability. Under Alternative A, though, these prohibitions and/or restriction can be waived by the authorizing officer without specifying criteria that must be met for the waiver. In addition, these prohibitions/restrictions are considered only on a project-specific basis. Soil resource conservation under Alternative A would occur in greater than ten percent of habitats important to all wildlife species, except migratory game birds, therefore, soil management actions under Alternative A would have major beneficial impacts on wildlife resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Water Resources

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for water (habitat conservation and improvement). Prohibition of surface disturbance within 500 feet of most water sources can be waived by the authorizing officer under Alternative A, and all other management is considered on a project specific basis only. Water resource management under Alternative A would occur in greater than ten percent of habitats important to small game birds, (five to ten percent of habitats important to big game, trophy game, and raptors and one to five percent of habitats important to all other wildlife species) therefore, water management actions under Alternative A would have major beneficial impacts on wildlife resources. Without oversight on a programmatic level and specified

criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Cave and Karst Resources

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for cave and karst resources (habitat conservation). Management of cave and karst resources is considered on a project-specific basis only. Cave and karst resource conservation under Alternative A would occur in greater than ten percent of habitats important to big game and trophy game (less than one percent of habitats important to all other wildlife species); therefore, cave and karst management actions under Alternative A would have major beneficial impacts on wildlife resources. Without oversight on a programmatic level, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Mineral Resources

Locatable Minerals

The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for locatable minerals (habitat loss, fragmentation, and degradation). Locatable mineral development under Alternative A would be restricted (game ranges only) in one of habitats important to all wildlife species, except non-migratory birds and raptors (less than one percent). This means that locatable mineral development would be permitted in greater than ten percent of habitats important to all wildlife species in the planning area. The adverse effects would be major.

Leasable Minerals – Coal

The management action listed under Alternative A is administrative, and will have no effect on wildlife resources.

Leasable Minerals – Fluids

The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for fluid minerals (habitat loss, degradation and fragmentation). Fluid mineral development under Alternative A would be permitted in greater than ten percent of habitats important to big game, small game birds, migratory game birds, non-game migratory birds, and raptors, (less than five percent of habitats important to all other wildlife species) therefore, fluid mineral management actions under Alternative A would have major adverse effects on wildlife resources.

Salable Minerals

The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for salable minerals (habitat loss, degradation and fragmentation). Salable mineral development under Alternative A would be permitted in greater than ten percent of habitats important to non-game migratory birds and raptors, (five to ten percent of habitats important to small game birds and migratory game birds, one to five percent of habitats important to big game, and less than one percent of habitats important to all other wildlife species) therefore, salable mineral management actions under Alternative A would have major adverse impacts on wildlife species.

Fire and Fuels Management

Unplanned Fire (Wildfire)

Fire suppression removes vegetation and disturbs soil, and can have both short-term and long-term impacts to wildlife habitats. For example, using heavy equipment to construct fire lines can cause habitat loss, degradation, and fragmentation over the short term. Moreover, if not rehabilitated, these fire lines can cause erosion and provide opportunities for the spread of invasive species, thereby resulting in long-term adverse impacts to wildlife habitat. Therefore, timely rehabilitation following fire is important to maintaining the quality of wildlife habitats. Fire suppression agents contain chemicals that can be detrimental and poisonous to macroinvertebrates, which are a necessary food source for numerous wildlife species. Some of these fire suppression chemicals also are directly poisonous to some wildlife species. Due to the likely scattered nature of effects to all wildlife species in the planning area, the adverse effects of habitat removal from unplanned fire are likely to be minor.

Planned Fire (Prescribed Fire)

Long term, the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives is estimated to affect approximately 14,000 acres from BLM actions. All acres are expected to be successfully reclaimed. All fires are suppressed; priority is given to areas with high value resources or where fires may spread to other land ownerships. Some types of suppression equipment is restricted in some areas, though not specified in this alternative. All fire and suppression damage is rehabilitated under Alternative A and vegetation treatments are used to support vegetation and wildlife habitat objectives. Prescribed fire under Alternative A is planned within greater than ten percent of habitats important to big game, trophy game, small game birds, and non-game migratory birds (five to ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals, one to five percent of habitats important to migratory game birds, and less than one percent of habitats important to raptors), therefore, prescribed fire management actions under Alternative A would have major adverse effects on wildlife resources.

Biological Resources

Alternative A actions that promote balanced management of biological resources in the planning area would promote a natural landscape, thereby promoting healthy wildlife habitats. These management actions include such things as managing vegetative resources for special status wildlife species, and controlling invasive species, which would have major beneficial impacts to wildlife habitat. There are 782,102 acres of BLM surface in the project area, all of which are assumed to provide suitable wildlife habitat for various wildlife species. Under Alternative A, the authorized officer may waive management actions without defined criteria, which has resulted in inconsistent application of management and has not been effective for protecting wildlife. Any beneficial effects that may be encountered through the use of habitat conservation measures are likely to manifest on half the anticipated scale as a consequence of their inconsistent application.

Vegetation – Forests and Woodlands

Forest management practices, which convert late-seral stage stands to early and mid-seral, would adversely affect wildlife adapted to late-seral forest types. Under Alternative A, vegetation treatment would be designed to meet overall resource management objectives and diseased old growth and overstocked forests would be managed in accordance with the Healthy Forest Restoration Act (HFRA). These actions would both promote the natural health of the forest and woodlands communities and would be beneficial to wildlife resources depending on them. Forest and woodlands contain five to ten percent of habitats important to big game and migratory game

birds (one to five percent of habitats important to trophy game and small game birds and less than one percent for all other wildlife species); therefore, management actions under Alternative A would have moderate beneficial effects on wildlife resources.

Vegetation – Grassland and Shrubland Communities

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for grassland and shrubland communities (habitat conservation and improvement). Under Alternative A, grassland and shrubland community conservation and improvements would occur in five to ten percent of habitats important to big game and migratory game birds (one to five percent of habitats important to trophy game and less than one percent of habitats important to all other wildlife species); therefore, grassland and shrubland management actions under Alternative A would have moderate beneficial impacts on wildlife resources.

Vegetation – Riparian/Wetland Resources

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for riparian/wetland resources (habitat conservation and improvements). Prohibition of surface disturbance within 500 feet of most water sources can be waived by the authorizing officer under Alternative A, and all other management is considered on a project-specific basis only. Under Alternative A, riparian/wetland conservation and improvements would occur in greater than ten percent of habitats important to small game mammals and birds, predator species, furbearers, non-game migratory birds, and raptors (five to ten percent of habitats important to all other wildlife species); therefore, riparian/wetland management actions under Alternative A would have major beneficial impacts on wildlife resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Invasive Species and Pest Management

The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for invasive species and pest management (habitat loss and degradation). Noxious weeds would be controlled only on public lands and in cooperation with county weed and pest districts. Under Alternative A, invasive species and pest management would occur in five to ten percent of habitats important to small game birds and migratory game birds (one to five percent of habitats important to big game and non-game migratory birds and less than one percent of habitats important to all other wildlife species); therefore, invasive species and pest management actions under Alternative A would have moderate adverse effects on wildlife resources.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for fish (habitat improvements). Alternative A management dictates that reservoirs and riparian areas are sometimes maintained to improve or enhance fisheries. Fish habitat improvements would occur in greater than ten percent of habitats important to big game and migratory game birds (five to ten percent of habitats important to trophy game and small game birds, one to five percent of habitats important to non-game migratory birds and less than one percent of habitats important to all other wildlife species); therefore, fish and SSS fish management actions under Alternative A would have major adverse effects on wildlife resources.

Special Status Species – Plants

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for special status plant species (habitat conservation and improvement). Management of special status plant species is considered on a project-specific basis only. Under Alternative A, special status plant conservation would occur in greater than ten percent of habitats important to big game and trophy game (one to five percent of habitats important to small game birds and less than one percent of habitats important to all other wildlife species); therefore, special status plant species management actions under Alternative A would have major beneficial impacts on wildlife resources. Without oversight on a programmatic level, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Under Alternative A, special status wildlife species habitat management complies with ESA and BLM policy. Greater Sage-Grouse management includes requiring anti-perching devices on new powerlines within 0.5 mile of occupied Greater Sage-Grouse leks and nesting habitat; surface disturbing and occupancy restrictions within 0.25 mile of Greater Sage-Grouse leks and a 1.75 mile TLS outside of that. Bald eagle management allows for a 0.5 mile year-round disturbance-free buffer zone around nest sites and a TLS up to a mile from the nest. Raptor nest protection involves a biologic buffer disturbance or occupancy zone around active nests. Under Alternative A, though, these prohibitions and/or restrictions can be waived by the authorizing officer without specifying criteria that must be met for the waiver. Special status wildlife prohibitions/restrictions would also conserve greater than ten percent of habitats important to all general wildlife, except big game and trophy game (five to ten percent), therefore, special status wildlife species management actions under Alternative A would have major beneficial impacts on wildlife resources. Without specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Heritage and Visual Resources

Cultural Resources

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for cultural resources (habitat conservation). NSOs are currently applied to the Bozeman Trail and Crazy Woman Battle Site only. These restrictions would be beneficial to any wildlife habitats they encompass. All other management of cultural resources is considered on a project specific basis. Under Alternative A, cultural resource protection would occur in greater than ten percent of habitats important to big game and trophy game (one to five percent of habitats important to small game birds and less than one percent of habitats important to all other wildlife species); therefore, cultural resource management actions under Alternative A would have major beneficial impacts on wildlife resources.

Paleontological Resources

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for paleontological resources (habitat conservation). Management of paleontological resources is considered on a project specific basis. Under Alternative A, paleontological resource protection would occur in less than one percent of habitats important to all wildlife species; therefore, cultural resource management actions under Alternative A would have negligible beneficial impacts on wildlife resources.

Visual Resources

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for visual resources (habitat conservation). There are no additional impacts anticipated from Alternative A management actions for visual resources for any specific wildlife species in the planning area.

Land Resources

Forest Products

The layout and timing of timber sales would largely determine the degree of impacts to wildlife. Forest management actions could impact feeding, breeding, and sheltering of raptors and other forest-dependent species. Habitat fragmentation and degradation, increased human presence, and habitat access by competitor species that normally cannot use these areas all could have an effect on these species, depending on whether the action is a harvest or thinning, where the access roads are constructed, the type of equipment used, and the rate of habitat rehabilitation. Projected over the entire planning area, the estimated occurrence of overlap would occur within one to five percent of habitats important to big game, trophy game, and migratory game birds (less than one percent for all other wildlife species); therefore, forest products management actions under Alternative A would have minor beneficial impacts on wildlife resources. Fencing of these regeneration areas would help allow the natural succession to return to each of the seral stages and promote the growth of suitable wildlife habitat.

Lands and Realty

Land tenure adjustments could impact wildlife, depending on the future use of the habitat. Even uses that maintain open spaces could have an impact if the habitat is altered. Approximately 108,243 acres have been identified as suitable for future consideration for disposal.

Disposing of all acres that meet the FLPMA disposal criteria could fragment sensitive habitats. Exchanging parcels rather than using other disposal methods could ensure that sensitive habitats remain secure, prevent further fragmentation, and address management gaps caused by isolated private landholdings. Disposing of or exchanging parcels with riparian/wetland and aquatic resources could reduce available habitat for various species. An exchange could be beneficial if the acquired habitat is high quality and has a diversity of wildlife.

Land acquisitions could increase the overall quantity or quality of wildlife habitat in the planning area. Land exchanges to acquire state and private lands in crucial habitats in important and predominantly federal management areas likely would result in long-term habitat sustainability. Lands available for tenure adjustments under Alternative A contain greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (one to five percent of habitats important to small game birds, non-game migratory birds, and raptors and less than one percent of habitats important to all other wildlife species); therefore management actions for lands and realty under Alternative A would have major adverse effects on wildlife resources.

Renewable Energy

Alternative A allows wind-energy development throughout the planning area, which would create collision hazards for bats and numerous avian species. Large wind-energy fields also involve surface disturbance, which could permanently change the habitat structure of the wildlife inhabitants. Management without defined criteria and evaluating renewable-energy projects on

project-specific basis has resulted in inconsistent application management and mitigation and has not been effective.

Renewable energy development potential in the planning area is low and not likely to occur. Renewable energy development within wildlife habitat or travel corridors may have adverse effects on wildlife.

Rights-of-Way and Corridors

Under Alternative A, routing linear ROWs (e.g., pipelines, powerlines, and roads) where impacts would be least disturbing would help to minimize fragmentation of sensitive habitats. However, habitat fragmentation would still occur as more ROWs are located and developed or as an existing ROW corridor is expanded. Restricting locations and heights of communications towers would reduce impacts on migratory birds, including collisions during periods of low visibility. Though these mitigations are implemented, ROWs occur in conflict with wildlife and habitat throughout the planning area. Currently, ROWs are permitted within greater than ten percent of habitats important to all wildlife species, except migratory game birds (one to five percent). Due to the scale of habitat fragmentation projected over the entire planning area, these adverse impacts would be major.

Travel and Transportation Management

Under Alternative A, there would be direct and indirect impacts on wildlife from travel management and OHV use. OHV use removes vegetation, disturbs soil, and transports invasive species, all of which degrade wildlife habitats. Higher, rockier terrain and remote areas are becoming more accessible over time as OHVs become more sophisticated and powerful, and as the human population in the planning area increases. In addition to the direct effects of vegetation removal and soil disturbance, disturbance to wildlife associated with OHV use includes movement and noise from vehicles and riders. This activity can cause noise that adversely impacts wildlife by increasing stress, can increase poaching, and can result in direct wildlife mortality from collisions with OHVs. By designating areas where OHV use is limited to designated roads and trails, these impacts can be reduced. In areas where motorized vehicle use is closed for only portions of the year, the closures would not have as great a benefit to wildlife as would a year-round closure. Allowing surface occupancy during any time of year would have an adverse impact to wildlife habitat. Current management protects resources in some areas (Middle Fork Canyon, Cantonment Reno, and Dry Creek Petrified Tree EEA). Transportation and access impacts would be allowed in greater than ten percent of habitats important to small game mammals, migratory game birds, furbearers, non-game mammals, and raptors (less than one percent of habitats important to all other wildlife species); therefore management actions for transportation and access management under Alternative A would have major adverse effects on wildlife resources.

Recreation

Recreational activities that result in increased human presence would have localized impacts on wildlife. These activities would include hiking, biking, camping, boating, fishing, hunting, and sightseeing. Although many recreational activities are nonconsumptive, they can affect wildlife and their habitats. Increased human presence could result in habitat or wildlife disturbance (e.g., dispersal or avoidance). If recreational activities occurred in non-crucial habitats or during seasons when sensitive wildlife species were not present and in compliance with recreation management actions, impacts likely would be negligible. During seasonally sensitive periods (e.g., winter, calving, breeding, nesting, and early brood rearing), recreational activities could significantly alter animal behavior and result in increased winter mortality or lowered reproductive success. Over the long term and where the two resources overlap,

recreational activities would have major adverse impacts on wildlife. Surface-disturbing restrictions/prohibitions are applied to Dry Creek Petrified Tree EEA and Mosier Gulch Recreation Area. The prohibitions/restriction for recreation under Alternative A conserves one to five percent of habitats important to big game, trophy game, small game mammals, predator species, furbearers, and non-game migratory birds (less than one percent for all other wildlife species); therefore, the adverse effects, over the entire planning area, would be minor.

Lands with Wilderness Characteristics

Alternative A does not include decisions for and therefore does not manage for areas with wilderness characteristics. BLM's 1979 wilderness inventory (BLM 1979) concluded that there were no lands within the planning area except for the three WSAs that contained wilderness characteristics. There would be no effect on wildlife.

Livestock Grazing Management

Maintaining livestock grazing AUMs in areas of intense industrial activity could increase big-game forage competition. Many of these industrialized areas correspond to sensitive wildlife habitats. Where wildlife are being displaced from important habitats by human activity and industrial development, it increases the competition with livestock for forage and could be detrimental to the local wildlife population. This would cause degradation of the range for both livestock and wildlife.

Water projects developed on crucial winter ranges could lead to a redistribution of livestock on those ranges, which could result in the loss of sufficient forage to maintain wildlife during winter. Loss of forage could cause wildlife redistribution, particularly big game, to areas that might be occupied by other big-game herds, to areas with a lower quality habitat, or to private lands. Because native winter habitats can only support a limited wildlife population, this could result in increased winter mortality and reduced species viability. Restricting placement of mineral supplements within 500 feet of fish-bearing water or riparian/wetland areas would minimize soil compaction and subsequent runoff near surface waters.

Allocating forage increases realized from management prescriptions and range improvement practices to wildlife and livestock could benefit wildlife species. Forage increases achieved through vegetative treatment practices would be temporary if the vegetative community is successional. Active management of vegetative treatments would improve grazing conditions, potentially decreasing competition for forage between big game and livestock. Any increases in AUMs allocated to livestock (increasing permitted use) would have the potential to increase forage competition with wildlife. Under this Alternative A, the degree of impact would depend upon the number of animals involved, and seasonal frequency of presence in wildlife habitat.

Under Alternative A, livestock grazing is not authorized on approximately 10,000 acres of public land where grazing has been determined to be incompatible with other resource values, specifically 4,000 acres in the canyons and slopes of the southern Big Horn Mountains. Management of livestock grazing, under Alternative A, occurs in greater than ten percent of habitats important to big game, trophy game, small game birds, migratory game birds, and raptors (five to ten percent of habitats important to non-game migratory birds and less than one percent for all other wildlife species); therefore, the adverse effects, over the entire planning area, would be major.

Special Designations

Areas of Critical Environmental Concern, Scenic or Back Country By-ways, and Wild and Scenic Rivers

Management actions for ACECs, scenic or BCBs and for WSRs would have no effect on wildlife resources.

Wilderness Study Areas

Under Alternative A, the types of impacts to wildlife species from management actions for special designations would be the same as described under *Impacts Common to All Alternatives*, except that the additional 28,931 acres within the three WSAs would be open to oil and gas development. Impacts Common to All Alternatives describes impacts to wildlife and wildlife habitat from oil and gas development. Table 4.34, “Important Wildlife Habitats in Wilderness Study Areas” (p. 1144) lists the three WSAs and their important wildlife habitats.

Table 4.34. Important Wildlife Habitats in Wilderness Study Areas

Wilderness Study Area	Important Wildlife Habitat				
	Big-game ranges	Within 750 feet of sharp-tailed grouse leks	Within 0.64 mile of sharp-tailed grouse leks	Raptor nest buffers	Amphibian and reptile habitats
Gardner Mountain	1,034 / 0.2%	0	0	0	3,484 / 0.1%
North Fork	2,150 / 0.5%	0	0	0	4,783 / 0.1%
Fortification Creek	12,184 / 3%	73 / 2%	1,318 / 1%	530 / 0.02%	477 / 0.01%

Source: BLM 2012f

Note: Percentages in table represent the percent of important wildlife habitat (columns) that overlaps wilderness study areas (rows).

% percent

4.4.6.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to wildlife resources due to their implementation. Prohibiting surface-disturbing activities for the protection of any other resource would have a major beneficial impact to wildlife where these resources overlap. (See Chapter 4 introduction for the definition of surface disturbance.) Avoidance areas for other resources would, by nature, be NSO areas for wildlife. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed.

Fish and Wildlife Resources – Wildlife

Alternative B management actions for wildlife include modifying existing fences that prevent wildlife movement; applying restrictions on surface-disturbing and disruptive activities within various wildlife habitats (elk crucial winter range, biologic buffers for raptor nests, amphibian and reptile habitats); requiring burial of all new low-voltage powerlines and installation of perch-inhibiting devices on aboveground powerlines; limiting loss of elk security habitat; designating the Fortification Creek elk herd unit as a WHMA; and maintaining or enhancing various wildlife habitats throughout the planning area. This approach is the most conservative because it allows for the greatest protective measures for wildlife and wildlife habitats. This level of protection greatly increases the potential for future management decisions to expand the proliferation of these species through active management. Table 4.35, “Acres of Habitats Important to Wildlife in the Planning Area on BLM and Split Estate Lands” (p. 1145) lists the amount of habitats important to wildlife in the planning area on both BLM and split estate lands.

Table 4.35. Acres of Habitats Important to Wildlife in the Planning Area on BLM and Split Estate Lands

Surface	Big-game ranges	Big-game migration corridors with 0.5 mile buffer	Elk security habitat	Fortification Creek WHMA, including yearlong	Within 750 feet of sharp-tailed grouse leks	Within 0.64 mile of sharp-tailed grouse leks	Raptor nest biologic buffers	Within 1.5 miles of raptor nests	Amphibian and reptile habitats
BLM	4,583	9,587	132,148	54,300	323	7,607	255,129	429,328	176,636
Federal Minerals									
Coal	14,216	85,277	309,300	114,649	2,200	43,201	1,756,070	3,076,396	734,288
Oil and Gas	14,216	85,462	315,139	114,652	2,200	35,736	1,195,815	2,023,118	1,217,959
Source: BLM 2012f									
BLM Bureau of Land Management WHMA Wildlife Habitat Management Area									

Wildlife would benefit from conservative management of physical and biological resources. Alternative B management actions are anticipated to result in beneficial impacts to big game. These actions are anticipated to improve forest and woodland habitats, potentially providing improved habitat conditions that benefit black bears in the planning area. Under Alternative B, impacts to mountain lions are anticipated to be similar impacts to big game and big-game habitats. In addition, Alternative B would maintain or enhance large, contiguous blocks of aspen habitat.

Alternative B would manage all riparian areas toward mid- to late-successional stage vegetation, which would benefit riparian and wetland species such as beaver. This alternative places greater restrictions on surface disturbance in riparian and wetland areas by not allowing this type of disturbance within 0.25 mile of these areas and not allowing new permanent facilities in these areas. These actions are anticipated to ultimately result in riparian systems with increased vegetative and structural diversity throughout the planning area, with benefits to beaver, muskrat, mink, and other riparian and wetland species. Actions pertaining to water and riparian and wetland habitats also are anticipated to benefit migratory game birds. The buffer around wetlands, riparian areas, perennial streams, and 100-year floodplains where surface disturbance cannot occur would be large under Alternative B. These areas would be closed rather than avoided, which would benefit migratory game birds. In addition, management under Alternative B would reduce channel erosion, bank erosion, and channel incision, and restore damaged wetlands.

Restrictions around raptor nests are more extensive under Alternative B, because all buffers are 1.5 miles; resulting in fewer direct impacts to nesting raptors. Seasonal restrictions vary based on the species of raptor. Alternative B also would manage sagebrush, aspen, and mountain shrub communities in large, contiguous blocks and maintain connections among these communities. In addition, Alternative B would protect riparian areas and increase control of invasive species. These actions are anticipated to benefit birds and small mammals comprising raptor prey in the planning area.

Alternative B actions that would benefit different vegetative types in the planning area would benefit habitat generalists such as furbearing animals, predators, small game, or nongame mammals.

Impacts from conservative management of resources under Alternative B would, in some cases, be similar to those described for Alternative A and Impacts Common to All Alternatives. Where impacts to wildlife would vary in degree from impacts described for Alternative A, further rationale is provided below.

Physical Resources

Air Quality

Under Alternative B, air quality modeling would be performed on a project-specific basis. In addition, projects expected to approach or exceed emissions standards would be evaluated for potential mitigation strategies, which would have a major beneficial effect on wildlife.

Soil, Water Resources, and Cave and Karst Resources

Alternative B would analyze impacts to soil, water, and cave and karst resources on a project-specific basis. Human activity in caves would be managed through Cave Management Plans, developed considering direction described in WO IM 2010-181, which would reduce threats from WNS to bats. In addition, Alternative B would prohibit surface-disturbing activities or apply NSO stipulations to activities on badlands, rock outcrops, and slopes susceptible to mass movement, and prohibit prescribed fires on highly erodible soils; prohibit such activities as on-channel reservoirs, conversion of abandoned oil and gas wells to water supply wells, and activities within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated habitat; and prohibit activities in cave and karst areas. Prohibiting surface-disturbing activities for the protection of soil resources under Alternative B would conserve greater than ten percent of habitats important to all wildlife species. Prohibiting surface-disturbing activities for the protection of water resources under Alternative B would conserve greater than ten percent of habitats important to big game (five to ten percent of habitats important to trophy game, small game birds, non-game migratory birds, and raptors, and one to five percent of habitat important to all other wildlife species). Prohibiting surface-disturbing activities for the protection of cave and karst resources under Alternative B would conserve greater than ten percent of habitats important to big game (five to ten percent of habitats important to trophy game; one to five percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals; and less than one percent of habitats important to all other wildlife species). Overall, Alternative B management of soils, water, and cave and karst resources would result in major beneficial effects on wildlife.

Mineral Resources

Locatable Minerals

The types of effects from Alternative B would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for locatable mineral resources (habitat loss and degradation). Under Alternative B, 618,256 acres would be withdrawn from mineral entry and 2,686,776 acres of BLM surface would be left open to mineral entry. Locatable mineral entry could be permitted within one to five percent of habitats important to small game mammals, small game birds, migratory game birds, predator species, furbearers and non-game migratory birds (less than one percent of habitats important to all other wildlife species); therefore, locatable mineral management actions under Alternative B will have minor adverse effects on wildlife resources.

Leasable Minerals – Coal

The management action listed under Alternative B is administrative, and will have no effect on wildlife resources.

Leasable Minerals – Fluids

The types of effects from Alternative B would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for fluid mineral resources (habitat loss and degradation). Under Alternative B, all oil and gas exploration would be subject to license stipulations necessary to protect other resource values. Fluid mineral development, under Alternative B could be permitted within greater than ten percent of habitats important all wildlife species, except big game, migratory game birds, and raptors; therefore, fluid mineral management actions under Alternative B will have major adverse effects on wildlife resources.

Salable Minerals

The types of effects from Alternative B would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for salable mineral resources (habitat loss and degradation). Under Alternative B, 129,431 acres of BLM surface would be left open to salable mineral exploration. Salable mineral exploration, under Alternative B, could be permitted within greater than ten percent of habitats important to small game mammals, small game birds, predator species, furbearers, non-game mammals, and non-game migratory birds (five to ten percent of habitats important to migratory game birds and less than one percent of habitats important to all other wildlife species); therefore, salable mineral management actions under Alternative B will have major adverse effects on wildlife resources.

Fire and Fuels Management**Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)**

Alternative B would not limit the use of wildland fire as a tool for achieving objectives for vegetation, wildlife habitat, or forage. Alternative B would manage rehabilitation wherever there is fire-related damage. Adverse impacts to wildlife are expected from these actions. Alternative B would also restrict the use of heavy equipment to existing roads and trails. Unplanned fire management actions under Alternative B are likely to occur in greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (five to ten percent of habitats important to migratory game birds and big game; one to five percent of habitats important to trophy game and non-game migratory birds, and less than one percent of habitat important to migratory game birds and raptors); therefore, unplanned fire management actions under Alternative B would have major adverse effects on wildlife resources.

Biological Resources**Vegetation – Forests and Woodlands**

Alternative B forests and woodlands management would promote a natural landscape with little physical management or alteration of the forests and woodlands environment. In this natural environment, wildlife would likely thrive. Stochastic events that destroy large expanses of wildlife habitat would be more likely to occur under Alternative B without specific management to control insects, diseases, and wildfires, although treatment to prevent these events are just as likely to impact wildlife habitats as drastically over the short term.

Forest and woodland management actions under Alternative B are likely to occur in greater than ten percent of habitats important to big game, small game birds, non-game migratory birds,

and raptors (five to ten percent of habitats important to trophy game and migratory game birds and less than one percent of habitat important to all other wildlife species); therefore, forests and woodlands management actions under Alternative B would have major beneficial effects on wildlife resources.

Vegetation – Grassland and Shrubland Communities

The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for grassland and shrubland communities (habitat improvement). Under Alternative B, native plant species would be the only type authorized for reclamation activities. This would be beneficial to wildlife habitats as it would promote natural reclamation and regeneration of vegetative communities. Under Alternative B, native plant reclamation would occur within greater than ten percent of habitats important to big game, small game birds, migratory game birds, non-game migratory birds, and raptors (five to ten percent of habitats important to trophy game and less than one percent of habitats important to all other wildlife species); therefore, grassland and shrubland community management actions under Alternative B will have major beneficial effects on wildlife resources.

Vegetation – Riparian/Wetland Resources

The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for riparian/wetland resources (habitat improvement). Under Alternative B, natural riparian and wetland ecosystems would be restored and surface-disturbing restriction would be applied within 500 feet of riparian/wetland systems, aquatic habitat, and floodplains. These restrictions would also encompass greater than ten percent of habitats important to big game, trophy game, small game birds, migratory game birds, non-game migratory birds and raptors (five to ten percent of habitats important to all other wildlife species); therefore, riparian/wetland resource management actions under Alternative B will have major beneficial effects on wildlife resources.

Invasive Species and Pest Management

Not limiting aerial application of pesticides and treating cheatgrass on a landscape scale would provide an opportunity to apply large-scale treatments on a variety of topography. Over the long term this would benefit wildlife by improving the ecological condition of the treated sites. Over the short term this could greatly increase adverse effects on wildlife. The greater the distance from riparian and wetland areas that chemicals are applied, the less the potential for impacts associated with vegetation removal, soil disturbances, or chemical spills to these resources. Therefore, direct adverse impacts to wildlife habitat associated with management actions for invasive species and pests under Alternative B are expected to be negligible.

Fish and Wildlife Resources – Fish

The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for fish resources (habitat improvement and conservation). Under Alternative B, reservoirs and riparian areas would be improved or enhanced and surface-disturbing restriction would be applied within 0.25 mile of water bodies containing native and desirable non-native fish. These restrictions would also encompass greater than ten percent of habitats important to all wildlife species, except trophy game and small game birds; therefore, fish resource management actions under Alternative B will have major beneficial effects on wildlife resources.

Special Status Species – Plants

The types of effects from Alternative B would be the same beneficial effects as

described in the *Impacts Common to All Alternatives* section for special status plant species (habitat improvement and conservation). Under Alternative B, livestock grazing would be managed to protect special status plant species and surface-disturbing restriction would be applied within habitat for special status plant species. These restrictions would also encompass greater than ten percent of habitats important to big game and trophy game (five to ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals; one to five percent of habitats important to small game birds and less than one percent of habitats important to all other wildlife species); therefore, special status plant species management actions under Alternative B will have major beneficial effects on wildlife resources.

Special Status Species – Fish

The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for special status fish resources (habitat improvement and conservation). Under Alternative B, stream segments important to special status fish species would be improved or enhanced and surface-disturbing restriction would be applied within 0.25 mile of water bodies containing special status fish species. These restrictions would also encompass five to ten percent of habitats important to migratory game birds (one to five percent of habitats important to big game, trophy game, non-game migratory birds, and raptors and less than one percent of habitats important to all other wildlife species); therefore, special status fish species management actions under Alternative B will have moderate beneficial effects on wildlife resources.

Special Status Species – Wildlife (including Greater Sage-Grouse)

The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for special status wildlife species (habitat improvement and conservation). Under Alternative B, wildlife habitats would be enhanced; wildlife migration corridors would be maintained; fences would be altered to reduce hazards to Greater Sage-Grouse; anti-perching devices would be required on all overhead powerlines; Greater Sage-Grouse habitat restoration would occur throughout the planning area; and surface occupancy prohibitions and surface-disturbing restrictions would be applied within habitat for numerous special status wildlife species. These improvements and restrictions would also occur in greater than ten percent of habitats important to all wildlife species; therefore, special status wildlife species management actions under Alternative B will have major beneficial effects on wildlife resources.

Heritage and Visual Resources

Cultural Resources

Under Alternative B, prohibiting surface-disturbing activities within 5 miles or the visual horizon of historical properties would have beneficial effects to wildlife habitat where these resources overlap. Cultural site avoidance areas would also conserve greater than ten percent of habitats important to all wildlife species, except raptors (five to ten percent) and migratory game birds (less than one percent), therefore, cultural resources management actions under Alternative B would have major beneficial effects on wildlife resources.

Paleontological Resources

Under Alternative B, identifying paleontological casual collection areas, would not occur. This has the potential to adversely impact wildlife and wildlife habitat by trampling or eliminating vegetation and compacting soils throughout the footprint of the access and general causal use of areas containing wildlife and wildlife habitats. Therefore, direct adverse impacts

to wildlife and wildlife habitat associated with the management actions for unidentified casual collection areas in Alternative B are anticipated to be major.

Visual Resources

Under Alternative B, management of VRM Class II areas could prohibit or limit some surface-disturbing activities and therefore protect wildlife habitats. VRM Class III and IV areas would have minor limitations. Alternative B visual resources management would benefit greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (less than one percent of habitats important to all other wildlife species); therefore, VRM actions under Alternative B would have major beneficial effects on wildlife resources.

Land Resources

Forest Products

Limiting saw timber sales to specified forest areas and to limited acreage would lessen adverse impacts to wildlife and wildlife habitat. In coordination with wildlife specialists, important wildlife areas could be specified as saw timber sale avoidance areas during times of the year when it is most crucial for these species to remain undisturbed. Forest product harvest would be allowed in one to five percent of habitats important to small game mammals, migratory game birds, predator species, furbearers, and non-game mammals (less than one percent of habitats important to all other wildlife species); therefore, forest product management actions under Alternative B would have minor adverse effects on wildlife resources.

Lands and Realty

Under Alternative B, retaining lands with agricultural potential, water, or important natural resource values would benefit wildlife. These lands would be identified early and given a heightened level of importance, therefore retaining lands that might also be important to wildlife. Acquiring new lands also would benefit wildlife, because when new lands are acquired, management for wildlife and wildlife habitat on those lands would increase in intensity. Lands available for tenure adjustments under Alternative B contain greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (one to five percent of habitats important to small game birds, non-game migratory birds, and raptors and less than one percent of habitats important to all other wildlife species); therefore, management actions for lands and realty under Alternative B would have major beneficial effects on wildlife resources.

Renewable Energy

Alternative B would have the fewest adverse impacts to wildlife through the exclusion of renewable-energy development in areas also closed to other forms of energy development (minerals leasing, locatable minerals, salable minerals, ROW, and other areas where there are restrictions on surface disturbance). Renewable energy would be allowed on 6,131 acres. This would impact greater than ten percent of habitats important to big game, trophy game, small game birds, non-game migratory birds and raptors (five to ten percent of habitat important to all other wildlife species); therefore, renewable energy management actions under Alternative B would have major adverse effects on wildlife resources.

Rights-of-Way and Corridors

Alternative B ROW and corridors management actions would benefit wildlife. Requiring co-location of facilities and identifying and implementing specified utility corridors

in coordination with the wildlife specialist would decrease the potential for adverse impacts to wildlife and wildlife habitats by ensuring their complete avoidance. Acreages of ROW avoidance and exclusion areas would be greatest under this alternative. Exclusion restrictions would affect wildlife by preventing surface-disturbing activities that are detrimental to resource values in areas of potential sensitive habitats and by reducing the potential for habitat fragmentation or increased human-caused disturbance. Limiting linear ROW development to existing routes would protect habitat quality, minimize fragmentation in sensitive areas, and help protect riparian areas. Under Alternative B, ROWs and corridors would be permitted in greater than ten percent of habitats important to all wildlife species; therefore, ROW and corridor management actions under Alternative B would have major adverse effects on wildlife resources.

Travel and Transportation Management

Under Alternative B, allowing travel in areas other than those limited to designated routes only under a special use permit would benefit wildlife and wildlife habitats. Such permits specifically direct permit holders to avoid locations where the BLM has identified important wildlife habitats. Motorized travel would be closed in five to ten percent of habitats important to big game and trophy game, small game mammals, small game birds, predator species, furbearers, non-game mammals, and non-game migratory birds (one to five percent of habitats important to migratory game birds and less than one percent of habitats important to raptors). Transportation and access impacts could occur in the majority of wildlife habitats in the planning area; however, motorized vehicle use would only be allowed on designated roads and trails on approximately 20 percent of BLM-administered surface lands and restricted seasonally during critical periods for big game reducing impacts to wildlife where the BLM has discretion. Therefore, management actions for TTM under Alternative B would have minor adverse effects on wildlife resources.

Recreation

The types of impacts to wildlife under Alternative B from recreation management actions would be generally the same as under Alternative A, except Burnt Hollow, Cabin Canyon, Dry Creek Petrified Tree, Middle Fork Powder River, Mosier Gulch, Welch Ranch, Weston Hills, and Hole-in-the-Wall all would be managed as SRMAs. This action would reduce disturbance to wildlife and wildlife habitat on 55,529 acres, and 84,668 additional acres would be protected through the implementation of a 0.5-mile buffer surrounding SRMAs that would be closed to minerals leasing. These restrictions would conserve one to five percent of habitats important to all wildlife species except small game birds, non-game migratory birds, and raptor (less than one percent); therefore, recreation management actions under Alternative B would have minor beneficial effects on wildlife resources.

Lands with Wilderness Characteristics

Managing areas with wilderness characteristics and lands with wilderness characteristics areas to emphasize primitive recreational opportunities and natural values would benefit wildlife and wildlife habitat. Management would include closing areas to or limiting use of motorized vehicles, closing areas to minerals leasing, excluding ROWs, and prohibiting surface-disturbing activities not compatible with retaining or enhancing the areas' natural values. These prohibitions/restrictions would encompass one to five percent of habitats important to small game mammals, predator species, furbearers, and non-game migratory birds (less than one percent of habitats important to all other wildlife species); therefore, management actions for lands with wilderness characteristics would have minor beneficial effects on wildlife resources.

Livestock Grazing Management

Alternative B incorporates several actions to adjust livestock grazing management to achieve

multiple resource health and objectives. These measures would result in slightly less grazing pressure and trampling damage to wildlife habitat. Grazing livestock management under Alternative B would occur in greater than ten percent of habitats important to all wildlife species, except small game birds, non-game migratory birds, raptors (five to ten percent) and migratory game birds (one to five percent), therefore livestock grazing management actions under Alternative B would have major beneficial effects to wildlife resources.

Special Designations

Areas of Critical Environmental Concern

Under Alternative B, designating approximately 511,000 acres of ACECs in eight areas would protect sensitive habitats (see Table 4.36, “Habitats Important to Wildlife in ACECs under Alternative B” (p. 1152)).

Table 4.36. Habitats Important to Wildlife in ACECs under Alternative B

ACEC Designations	Habitats Important to Wildlife							
	Crucial big-game ranges	Big-game migration corridors	Elk security habitat	Fortification Creek WHMA, including yearlong	Within 750 feet of sharp-tailed grouse leks	Within 0.64 mile of sharp-tailed grouse leks	Raptor nest biologic buffers	Within 1.5 miles of raptor nests
Cantonment Reno	0	0	0	0	0	0	523 / 0.02%	523 / 0.01%
Burnt Hollow	0	365 / 0.03%	0	0	0	0	0	1,548 / 0.04%
Dry Creek Petrified Tree EEA	0	0	0	0	0	0	0	1 / 0.0%
Fortification Creek Elk Area	23,623 / 5%	0	20,308 / 2%	29,243 / 29%	74 / 2%	1,372 / 1%	7,134 / 0.3%	21,335 / 0.6%
Hole-in-the-Wall	75,909 / 17%	0	0	0	0	0	0	543 / 0.01%
Pumpkin Buttes	0	0	0	0	0	0	1,239 / 0.1%	1,691 / 0.04%
Welch Ranch	0	0	0	0	0	89 / 0.1%	48 / 0.0%	685 / 0.02%
Sagebrush Ecosystem	22,112 / 0.3%	4,035 / 0.05%	13,179 / 0.18%	15,871 / 0.22%	250 / 0.00%	3,581 / 0.05%	198,257 / 2.7%	317,613 / 4.32%

Source: BLM 2012f

Note: Percentages in table represent the percent of the habitats important to wildlife (columns) that overlaps ACECs (rows).

% percent

ACEC Area of Critical Environmental Concern

EEA Environmental Education Area

WHMA Wildlife Habitat Management Area

Measures identified for the proposed ACECs that would directly benefit wildlife and wildlife habitat include: (1) closing or limiting motorized vehicle use; (2) closing the areas to minerals leasing; (3) recommending withdrawal from locatable mineral entry; (4) closing the areas to salable minerals; (5) excluding ROWs; and (6) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values.

Scenic or Back Country Byways and Wild and Scenic Rivers

Management actions for scenic or BCBs and management actions for WSRs would have no effect on wildlife resources.

Wilderness Study Areas

Alternative B management of the three areas proposed to Congress as WSAs would provide an additional 28,931 acres of protection of sensitive habitats (Table 4.37, “Habitats Important to Wildlife in Wilderness Study Areas” (p. 1153)). This would have a minor beneficial effect on wildlife and wildlife habitats.

Table 4.37. Habitats Important to Wildlife in Wilderness Study Areas

Wilderness Study Areas	Habitat Important to Wildlife							
	Big-game ranges	Big-game migration corridors	Elk security habitat	Fortification Creek WHMA, including yearlong	Within 750 feet of sharp-tailed grouse leks	Within 0.64 mile of sharp-tailed grouse leks	Raptor nest buffers	Within 1.5 miles of raptor nests
Gardner Mountain	1,034 / 0.2%	204 / 0.2%	5,354 / 0.6%	12,417 / 12%	0	0	0	0
North Fork Powder River	2,150 / 0.5%	1,639 / 1%	10,019 / 1%	0	0	0	0	0
Fortification Creek	12,184 / 3%	0	11,233 / 1%	0	73 / 2%	1,318 / 1%	530 / 0.002%	7,212 / 0.2%

Source: BLM 2012f

Note: Percentages in table represent the percent of habitats important to wildlife (columns) that overlaps wilderness study areas (rows).

% percent
WHMA Wildlife Habitat Management Area

Measures identified for the WSAs that would directly benefit wildlife and wildlife habitat include: (1) closing the areas to minerals leasing; (2) recommending withdrawal from locatable minerals entry; (3) closing the areas to salable minerals; (4) excluding ROWs; (5) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values; and potentially (6) prohibiting all motorized and mechanized equipment.

4.4.6.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to wildlife resources due to its implementation.

Fish and Wildlife Resources – Wildlife

Alternative C wildlife management actions include not modifying fences that prevent wildlife movements; not augmenting wildlife populations; not applying restrictions (seasonal or year-round) to surface-disturbing or disruptive activities, other than seasonal restrictions for raptor nests; and not requiring burial of new powerlines. This approach would protect only nesting raptors during incubation periods and would not protect other wildlife resources. Under Alternative C, activities allowed in suitable habitat could preclude the potential for future management decisions to expand or maintain the proliferation of these species through active management.

Alternative C impacts to wildlife would, in most cases, be similar to those described for Alternative A and under Impacts Common to All Alternatives. Where impacts to wildlife would vary in degree from impacts under Alternative A, further rationale is provided below.

Physical Resources

Air Quality

There would be no air quality modeling under Alternative C. Industrial projects would be expected to approach or exceed emissions standards, and no mitigation strategies would be examined. This would have indirect adverse impacts to wildlife. Vegetation is possibly more sensitive to air pollutants than humans. In particular, acid rain has left areas barren or with severely damaged vegetation. Ground-level ozone and reactive nitrogen can cause discoloration, damage, and loss of leaves, which can reduce photosynthesis by as much as 50 percent. As a result, biologically significant quantities of reactive nitrogen are now reaching the highest places. At lower elevations in the western United States, introduced grasses stoked by nitrogen are overwhelming many ecosystems. Plants also become more vulnerable to attacks by pests, disease, and environmental disasters. Consequently, the plant's ability to store food, grow, and reproduce is hindered. Adverse impacts to vegetation would directly correlate with adverse impacts to wildlife and would be major.

Soil

Under Alternative C, soils management actions would include allowing surface-disturbing activities on slopes equal to or greater than 25 percent and on soils with a severe erosion hazard, and allowing proposed activities in badlands, on rocky outcrops, and on slopes susceptible to mass movement, all of which would affect 218,928 acres. Alternative C would not limit vehicular travel on saturated soils or require closure and reclamation of roads if they are heavily eroded, washed out, or if other access roads in better condition are available. All these actions would allow activities on all soil types, regardless of soil-limiting properties. These actions would not protect soil resources and would promote soil and water erosion. This would have an indirect adverse impact on wildlife by reducing the health of the medium in which vegetation (wildlife habitat) grows. Surface-disturbing activities on soils would be permitted in greater than ten percent of habitats important to all wildlife species; therefore, management actions under Alternative C would have major adverse effects on wildlife resources.

Water Resources

Alternative C water management actions that would allow surface disturbances within 500 feet of natural or man-made water features would have a direct adverse effect on wildlife habitats where these resources overlap. Additional project-specific allowances for on-channel reservoirs, even though they could adversely affect natural flow regimes, could have an indirect adverse impacts to wildlife habitat by transitioning the plant species in those communities and providing the opportunity for invasive plant species to move into these sites, making habitat no longer suitable for native wildlife. Surface-disturbing activities would now also be allowed within greater than ten percent of habitats important to small game birds and migratory game birds (five to ten percent of habitat important to big game, trophy game, and raptors and one to five percent of habitats important to all other wildlife species); therefore, management actions for water under Alternative C would have major adverse effects on wildlife resources.

Cave and Karst Resources

Alternative C management actions for cave and karst resources include establishing project-specific buffers (100 feet, for a total of 11 acres of protection) from significant cave

entrances to minimize the effects of surface-disturbing activities in cave and karst areas. Implementation of a Cave Management Plan would directly benefit wildlife communities because it would limit disturbance of the vegetative community from minerals development or by people. Development of the plans considering direction described in WO IM 2010-181, would reduce threats to bats from WNS. Mineral activities would be managed near cave entrances. Alternative C would not restrict livestock grazing in areas with cave and karst resources. This would have direct adverse impacts on wildlife and wildlife habitat where these resources are adjacent to one other. Cave and karst areas encompass greater than ten percent of habitats important to big game and trophy game (less than one percent of habitats important to all other wildlife species); therefore the management actions for cave and karst resources under Alternative C should have major adverse effects to wildlife resources.

Mineral Resources

Locatable Minerals

At present, the Amsden Creek, Middle Fork Canyon, and Kerns game ranges are withdrawn from minerals location. Locatable minerals activities are restricted in the Fortification Creek, Gardner Mountain, and North Fork WSAs. Alternative C does not include recommendations for new withdrawals or restrictions. The existing withdrawals and restrictions were imposed for the protection and preservation of other resource values. Not protecting additional areas from minerals location would have a direct, minor adverse effect on wildlife and wildlife habitats. Locatable mineral activities would be permitted in greater than ten percent of habitats important to all wildlife species; therefore, management actions for locatable minerals under Alternative C would have major adverse effects on wildlife resources.

Leasable Minerals – Coal

The management action listed under Alternative C is administrative, and will have no effect on wildlife resources.

Leasable Minerals – Fluids

Under Alternative C, fluid mineral development would be permitted, under some constraints, on all but 30,520 acres in the planning area. This would allow development within greater than ten percent of habitats important to all wildlife species, except migratory game birds (five to ten percent) and trophy game (no effect), therefore, management actions for fluid minerals under Alternative C would have major adverse effects on wildlife resources.

Salable Minerals

3,290,908 acres of federal mineral estate would be open to salable mineral activities. Salable mineral development could occur in greater than ten percent of habitats important to all wildlife species, except small game birds and migratory birds (five to ten percent), big game (one to five percent), and trophy game (less than one percent), therefore, management actions under Alternative C would have major adverse effects on wildlife resources. There is no anticipated disturbance from geothermal activities.

Fire and Fuels Management

Unplanned Fire (Wildfire)

Management actions involving the application of full suppression regardless of other resource objectives would have a direct adverse impact to wildlife communities. The use of heavy equipment with few constraints would have a direct adverse impact over the short and long

terms by increasing opportunities for soil and water erosion and invasive plant establishment. Unplanned fire is likely to occur in five to ten percent of habitats important to small game birds, non-game migratory birds, and raptors (and one percent or less of habitats important to all other wildlife species); therefore, management actions for unplanned fire under Alternative C would have moderate adverse effects on wildlife resources.

Planned Fire (Prescribed Fire)

The adverse effects described in the unplanned fire portion above would also be the adverse effects of planned fire. Prescribed fires are planned, during the next 20 years, within greater than ten percent of habitats important to all wildlife species, except migratory game birds and raptors (five to ten percent), big game (one to five percent), and trophy game (less than one percent); therefore, management actions for planned fire under Alternative C would have major adverse effects on wildlife resources.

Biological Resources

Vegetation – Forests and Woodlands

Alternative C impacts to wildlife and wildlife habitat from forests and woodlands management would be the same as impacts under Alternative A, except that Alternative C would increase the removal of trees. This would open larger spaces in the forest, which would alter habitats for most of the forest-dwelling wildlife in the planning area. Forest and woodland management would impact five to ten percent of habitats important to big game and migratory game birds (one to five percent of habitat important to trophy game and less than one percent of habitats important to all other wildlife species); therefore, management actions for forest and woodlands would have moderate adverse effects on wildlife resources.

Vegetation – Grassland and Shrubland Communities

Under Alternative C, allowing desirable non-native plant species for initial reclamation activities would have an adverse impacts to wildlife and wildlife cover and forage. This action could promote the growth of non-native plant species that might out-compete the native plants that wildlife desire. This type of reclamation would occur in greater than ten percent of habitats important to big game (five to ten percent of habitats important to trophy game and migratory game birds and less than one percent of habitats important to all other wildlife species); therefore, management actions for grassland and shrubland communities under Alternative C would have major adverse effects on wildlife resources.

Vegetation – Riparian/Wetland Resources

Under Alternative C, management actions for riparian and wetland areas would have the same major adverse effects on wildlife resources as described in the *Water* section of Alternative C.

Invasive Species and Pest Management

Allowing aerial application to only insecticides would limit the application of pesticides to terrain accessible only by foot, which would mean only small acreages would be treated. This would have a short-term beneficial impact to wildlife because it would be less disruptive. However, there would be an adverse impact to vegetative communities over the long-term by giving invasive species a competitive advantage over native vegetation. Annually treating only designated areas for cheatgrass would be ineffective because there would be only small, scattered treatments; therefore, most of the cheatgrass would be unaffected. This would have a moderate adverse effect on wildlife habitat.

Fish and Wildlife Resources – Fish

Fish management actions under Alternative C include allowing surface-disturbing and disruptive activities within 0.25 mile of naturally occurring water bodies, but not within 500 feet of these areas. These management actions would not limit the number of projects and would apply a minimal distance for projects way from streams. Disturbing soil and vegetation increase the potential for soil and water erosion and indirectly contributes to the decline in water quality over the long term. These areas are also very susceptible to hydrophilic invasive species such as Canada thistle and salt cedar that would out-compete native vegetation, essentially removing riparian communities. This would reduce wildlife habitat protection zones by 703,581 acres compared to Alternative B. Prohibition/restrictions would encompass greater than ten percent of habitats important to big game and migratory game birds only (five to ten percent of habitats important to trophy game and small game birds, one to five percent of habitats important to non-game migratory birds, and less than one percent of habitats important to all other wildlife species); therefore, management actions for fish under Alternative C would have major beneficial effects on wildlife resources.

Special Status Species – Fish, Special Status Species – Plants and Wildlife (including Greater Sage-Grouse)

Under Alternative C, prohibitions on surface-disturbing activities for the protection of special status plant, fish, and wildlife species would reduce adverse impacts to all wildlife. This management would have a major beneficial impact to wildlife habitats where these resources overlap. Avoidance areas for other resources would, by nature, be NSO areas for important wildlife habitats. Prohibitions for special status fish species would also conserve one to five percent of habitats important to big game, trophy game and migratory game birds (less than one percent for all other wildlife species); therefore, management action for special status fish species would have minor beneficial effects on wildlife resources. Surface-disturbing prohibitions for special status plant species would also conserve greater than ten percent of habitats important to big game and trophy game (one percent or less for all other wildlife species) and, for special status wildlife species, greater than ten percent of habitats important to all wildlife species, except trophy game (five to ten percent) and non-game migratory birds (one to five percent); therefore, management actions for both special status plant and wildlife species would have major beneficial effects on wildlife resources.

Heritage and Visual Resources

Cultural Resources

Under Alternative C, allowing surface disturbance in areas with historic properties would impact wildlife habitat adversely by increasing opportunities for soil and water erosion, invasive species to establish, and direct removal of habitat. There are 330,592 acres of important wildlife habitats on BLM surface within 5 miles of historic properties in the planning area. Alternative C management actions for cultural resources would be the same as under Alternative A (major beneficial).

Paleontological Resources

Alternative C management actions that limit the requirement for paleontological field surveys to all PFYC Class 4 and 5 formations potentially affected by proposed activities would affect 28,177 acres. Not restricting surface-disturbing activities would subject wildlife habitats to possible large-scale surface disturbance. This would increase the opportunity for wildlife habitat to be directly removed and further fragmented. However, identifying

paleontological casual collection areas could reduce adverse impacts to wildlife and wildlife habitat from trampling or eliminating vegetation, compacting soils throughout the footprint of the access, and general disruption to wildlife from causal use of these areas. The greater the avoidance distance from riparian areas, wetlands, sand dunes, and other such habitats, the less the potential for impacts associated with vegetation and soil disturbances. Prohibitions/restrictions for paleontological resources would encompass one to five percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (less than one percent of habitats important to all other wildlife species); therefore, management actions for paleontological resources under Alternative C would have minor beneficial effects on wildlife resources.

Visual Resources

Under Alternative C, managing VRM Class II areas as VRM Class III would allow more surface-disturbing activities; 167,334 acres would be managed as VRM Class III. This would reduce the beneficial effects of VRM on wildlife habitat by increasing opportunities for soil and water erosion and for invasive species to get established. Active management would now occur on less than one percent of habitats important to all wildlife species; therefore, Alternative C management of visual resources would have a negligible beneficial effect on wildlife.

Land Resources

Forest Products

Alternative C impacts to wildlife from forest product management actions would be similar to effects under Alternative A, except that adverse impacts would be greater under Alternative C because the sale of forest products would no longer be limited to minor products without limits to acreage, and with the intent to maximize the removal of harvested products. Offering a greater array of products would intensify the adverse impacts. In addition, not fencing regeneration areas could subject wildlife habitat in these areas to grazing and potential loss. Forest product harvests could occur in greater than ten percent of habitats important to migratory game birds (one to five percent of habitats important to big game and trophy game and less than one percent of habitats important to all other wildlife species); therefore, management actions for forest products under Alternative C would have major adverse effects on wildlife resources.

Lands and Realty

Under Alternative C, disposing of lands with agricultural potential, water, or important natural resource values would have a major adverse effect on wildlife and wildlife habitats. Alternative C does not consider these values on a project-specific basis and does not require that these lands be retained based on these important values. Disposal of these lands would dispose greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (one to five percent of habitats important to small game birds, non-game migratory birds, and raptors and less than one percent of habitats important to all other wildlife species); therefore, management actions for lands and realty under Alternative C would have major adverse effects on wildlife resources.

Renewable Energy and Rights-of-Way and Corridors

Renewable energy and ROWs and corridors management actions would not promote relocations of proposed new roads and access routes to those already in existence and would not prohibit renewable energy or ROWs and corridors on slopes equal to or greater than 25 percent and on highly erodible soils. Exclusion areas for ROWs, including renewable energy, would include 28,554 acres. Renewable energy and ROWs and corridors could be permitted within greater than ten percent of habitats important to all wildlife species, except small game migratory birds (one to

five percent), therefore, management actions for renewable energy and ROWs and corridors under Alternative C would have major adverse effects on wildlife resources.

Travel and Transportation Management

The types of effects from Alternative C would be the same adverse effects as described in Alternative A, TTM (habitat loss, degradation and fragmentation). Travel and transportation could be permitted within greater than ten percent of habitats important to all wildlife species, except migratory game birds (five to ten percent) and raptors (less than one percent), therefore, management actions for TTM under Alternative C would have major adverse effects on wildlife resources.

Recreation

Recreational activities that result in increased human presence would have localized impacts on wildlife. These activities would include hiking, biking, camping, boating, fishing, hunting, and sightseeing. Although many recreational activities are nonconsumptive, they can affect wildlife and their habitats. Increased human presence could result in habitat or wildlife disturbance (e.g., dispersal or avoidance). If recreational activities occurred in non-crucial habitats or during seasons when sensitive wildlife species were not present and in compliance with recreation management actions, impacts likely would be negligible. During seasonally sensitive periods (e.g., winter, calving, breeding, nesting, and early brood rearing), recreational activities could significantly alter animal behavior and result in increased winter mortality or lowered reproductive success. Surface-disturbing and salable mineral development activities would be allowed, where consistent with other resource values. The management actions under Alternative C would impact five to ten percent of habitats important to wildlife species. Over the long term and where the two resources overlap, recreational activities would have moderate adverse impacts on wildlife.

Lands with Wilderness Characteristics

Alternative C management actions include no specific management for wilderness characteristic. BLM's 1979 wilderness inventory (BLM 1979) concluded that there were no areas within the planning area that contained wilderness characteristics outside the three WSAs. Alternative C management of areas of wilderness characteristics would have no effect on wildlife and wildlife habitat.

Livestock Grazing Management

Livestock grazing management actions under Alternative C include allowing increases in livestock stocking rates as a result of vegetative treatments, and providing a maximum of two years rest following prescribed fire, wildfire (in lieu of an approved plan), and other vegetative treatments. These actions would compromise the health of wildlife habitat. Livestock are often attracted to new vegetation following vegetative treatments and fires. If not monitored, these sites can be overutilized, and if stocking rates are increased, could compound the issue. Two years of rest might not be enough to achieve preferred ecological condition and vegetation management goals. Alternative C also incorporates actions to adjust management of livestock grazing to make grazing the first priority. This measure would result in increased grazing pressure and trampling damage to wildlife habitat. Anticipated adverse impacts to wildlife from livestock grazing under Alternative C are anticipated to increase where grazing allotments contain suitable habitat for wildlife. (See the livestock grazing analysis under Alternative A for this overlap.) In addition, livestock salt or mineral supplements would be permitted within 500 feet of water sources, riparian areas, and aspen stands. This would decrease protection buffers for wildlife habitat in these areas by 19,861 acres throughout the planning area. Overall, livestock grazing management

under Alternative C would impact greater than ten percent of habitats important to all wildlife species; therefore, having major adverse effects on wildlife resources.

4.4.6.6. Alternative D

This section describes management actions under Alternative D, which employs a combination of resource conservation and resource use, and the likely impacts to wildlife resources due to their implementation and potential impacts to wildlife resources from those management actions.

Fish and Wildlife Resources – Wildlife

Alternative D impacts to wildlife would be similar to those under Alternative B, except that the following would be allowed by exception:

- Surface-disturbing and disruptive activities throughout the life of the project during seasons important for wildlife.
- Aboveground powerlines.
- Fluid minerals production and byproducts not be piped out of crucial elk winter range and calving areas.
- Aboveground facility development in elk crucial winter range and calving areas.
- Surface disturbance and occupancy within USFWS-recommended biologic buffer zones around active nests of raptor species of conservation concern.

A WHMA would not be designated for the Fortification Creek elk herd. In addition, although timber harvest would be allowed in crucial elk habitat and hiding cover, this activity would be performed in such a way as to maintain current amounts of functional habitat, and all other activities in elk seasonal ranges would remove or alter no more than 15 percent of the existing security habitat. These actions provide less protection for elk habitat, but would provide adequate elk habitat while allowing other uses on the landscape.

The types of impacts to wildlife associated with maintenance and reestablishment of travel corridors for big-game species would be the same as impacts under Alternative B, except that Alternative D would retain only identified priority travel corridors. This would result in 9,587 acres of travel corridor avoidance. Alternative D would prohibit surface-disturbing activities around plains sharp-tailed grouse leks on 3,601 acres, because the buffer under Alternative D would be within 0.25 mile of the perimeter of these leks.

Physical Resources

Air Quality

Alternative D impacts to wildlife from air quality management would be the same beneficial as impacts under Alternative B (habitat conservation). Under Alternative D, though, modeling would only occur on a project-specific basis and mitigation strategies would then be developed. The modeling and mitigation would likely occur within greater than ten percent of habitats important to big game, small game birds, migratory game birds, non-game migratory birds, and raptors (five to ten percent of habitats important to all other wildlife species); therefore, management actions for air quality under Alternative D would have major beneficial effects on wildlife resources.

Soil

Alternative D impacts on wildlife from soils management would be similar to impacts under Alternative B, except that Alternative D could allow activities by exception on 215,496 acres of highly erosive soils, 170,590 acres on slopes equal to or greater than 25 percent, on 455,090 acres

of soils with poor reclamation suitability, on a limited basis, on 218,928 acres of badlands, rock outcrops and slopes susceptible to mass movement. In addition, applying a CSU stipulation to oil and gas leases would protect wildlife on an additional 669,739 acres of highly erosive soils, 412,145 acres on slopes equal to or greater than 25 percent, 1,514,445 acres of soils with poor reclamation suitability, and on a limited basis, on 685,950 acres of badlands, rock outcrops and slopes susceptible to mass movement that might be associated with a federal mineral leases. For the impacts to remain the same as those described under Alternative B, these exceptions must be evaluated for site-specific impacts to wildlife and must not be granted where there would be conflicts. These CSU areas would encompass greater than ten percent of habitats important to all wildlife species; therefore, management actions for soil under Alternative D would have major beneficial effects on wildlife resources.

Water Resources

The following Alternative D water management actions would impact wildlife the same as Alternative A: prohibiting surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams, applying a CSU stipulation on oil and gas leases, and evaluating unneeded reservoirs. These CSU areas would encompass greater than ten percent of habitats important to big game (one to five percent of habitats important to trophy game and less than one percent of habitats important to all other wildlife species); therefore management actions for water under Alternative D would have major beneficial effects on wildlife resources.

Beneficial impacts to wildlife would be the same as described for Alternative B and result from management actions associated with water that encourage the use of alternative energy sources to power new water resource developments as opposed to overhead power or petroleum-based, and that manage riparian and upland areas to restore perennial flows or standing water. Conversely, adverse impacts to wildlife would be the same as described for Alternative C and result from management actions associated with water that allow on-channel reservoirs, surface water discharge, maintenance of existing water supply sources, and conversion of abandoned oil and gas wells to water supply wells.

Cave and Karst Resources

The types of impacts associated with Alternative D management of cave and karst resources would be generally the same types of impacts as Alternative A. In addition, implementation of a Cave Management Plan for the entire planning area would increase potential beneficial impacts to wildlife where these resource overlap. Human activity in caves would be managed through Cave Management Plans, developed considering direction described in **WO IM 2010-181**, which would reduce threats to bats from WNS. Cave and karst resources contain greater than ten percent of habitats important to big game (one to five percent of habitats important to trophy game and less than one percent of habitats important to all other wildlife species); therefore, management actions for cave and karst resources under Alternative D would have major beneficial effects on wildlife resources.

Mineral Resources

Locatable Minerals

Alternative D locatable minerals management actions would have effects on wildlife similar to management under Alternative B, although Alternative D would open more area (4,720,586 acres) to locatable minerals entry. Locatable minerals entry would be permitted within greater than ten percent of habitats important to small game mammals, predator species, furbearers and non-game mammals (five to ten percent of habitats important to migratory game birds, one to five

percent of habitats important to small game birds, and less than one percent of habitats important to all other wildlife species); therefore, management actions for locatable minerals under Alternative D would have major adverse effects on wildlife resources.

Leasable Minerals – Coal

The management action listed under Alternative D is administrative, and will have no effect on wildlife resources.

Leasable Minerals - Fluid, and Salable Minerals

Alternative D impacts to wildlife from the management of leasable minerals would be similar to impacts described under Alternative C, with 3,285,316 acres open to oil and gas leasing, and 2,725,060 acres open to salable minerals disposal. The amount of minerals extraction that would occur under this alternative would create a substantial increase in land use intensity, and would result in greater potential for loss or degradation of habitats that support various wildlife species. Leasable fluid minerals would be permitted in greater than ten percent of habitats important to all wildlife species, except migratory game birds (five to ten percent) and trophy game (no effect). Salable minerals would be permitted in greater than ten percent of habitats important to all wildlife species, except migratory game birds (five to ten percent), big game and trophy game (less than one percent). Management actions for coal, fluid minerals, and salable minerals would have major adverse effects on wildlife resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative D, impacts to wildlife would be similar to effects under in Alternative B. However, Alternative D would decrease adverse impacts through rehabilitation after fires on an as-needed basis only; this could result in an increase in natural regeneration of wildlife habitat communities.

Biological Resources

Vegetation – Forests and Woodlands

Alternative D effects on wildlife from management of forests and woodlands and grassland and shrubland communities would be similar to effects under Alternative C, although Alternative D would place slightly more emphasis on multiple resource values than Alternative C. Alternative D would allow desirable non-native plant species for short-term reclamation activities, which would result in effects similar to Alternative B. Desirable non-native plant persistence could increase adverse impacts to wildlife if non-native proliferation causes loss of suitable wildlife habitats.

Grassland and Shrubland Communities

Impacts to wildlife from grassland and shrubland communities management actions would be the same as *Forests and Woodlands* management actions, described above.

Vegetation – Riparian/Wetland Resources

Under Alternative D, activities may be permitted by exception within 500 feet of riparian/wetland systems and aquatic habitats. For impacts on wildlife to be the same as those described for Alternative B, exceptions would have to be evaluated for the presence of special status plant species presence or habitat suitability and would not be granted where there would be conflicts. The prohibitions/restrictions would encompass greater than ten percent of habitats important to small game birds and non-game migratory birds (five to ten percent of habitats important to all

other wildlife species), therefore, management actions for riparian/wetland resources under Alternative D would have major beneficial effects on wildlife resources.

Invasive Species and Pest Management

Under Alternative D, impacts to wildlife from management actions associated with invasive species and pest management would be the same as effects under Alternative A.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Alternative D impacts on wildlife from fish management, including special status fish species, would be similar to those under Alternative B, except that Alternative D could allow activities by exception within a 0.25-mile CSU area around naturally occurring water bodies containing native and desirable non-native fish species. For the impacts to be the same as those under Alternative B, those exceptions would have to be evaluated for the presence of special status fish species or habitat suitability and would not be granted where there would be conflicts. Restrictions for the protection of fish resources would conserve greater than ten percent of habitats important to small game birds and migratory game birds (five to ten percent of habitats important to all other wildlife species). Restrictions for the protection of special status fish species would conserve five to ten percent of habitats for migratory game birds (one percent of less for all other wildlife species). Management actions under Alternative D would have major beneficial effects on wildlife resources for fish resources and moderate beneficial effects on wildlife resources for special status fish resources.

Special Status Species – Plants

Alternative D impacts on wildlife from management of special status plant species would be the same as those under Alternative C, except that a CSU stipulation would be placed on mineral leases, which would require surveys before disturbance activities could be allowed.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative D impacts on wildlife from management of special status wildlife species would be similar to those under Alternative B, except that Alternative D could allow disturbance activities by exception in black-tailed prairie dog colonies (6,156 acres) and special status amphibian, reptile, and bat species habitat (176,636 acres). For the impacts to be the same as those under Alternative B, exceptions would have to be evaluated for the presence of special status wildlife species or habitat suitability and would not be granted where there would be conflicts. With habitat removal allowances under Alternative D, less acres of suitable Greater Sage-Grouse habitat would be protected than under Alternative B. Alternative D does provide surface occupancy restrictions for Greater Sage-Grouse leks in and outside of Core Population Areas and Connectivity Corridors (0.6 mile and 0.25 mile, respectively). In addition, Greater Sage-Grouse habitats would be restored throughout the planning area in areas meeting specified criteria. The prohibitions/restrictions would encompass greater than ten percent of habitats important to all wildlife species, except big game and trophy game (less than one percent). Therefore, management actions for special status wildlife species would have major beneficial effects on wildlife resources.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Alternative D impact types associated with cultural and paleontological resources management would be the same as those under Alternative B, except Alternative D would protect 15,382 acres through cultural resources NSO restrictions, 613,601 acres through cultural resources

CSU restrictions, and 860 acres through paleontological resources restrictions. Table 4.38, “Habitats Important to Wildlife that Overlap Heritage Resources” (p. 1164) identifies where these restrictions overlap areas currently identified as important to wildlife.

Table 4.38. Habitats Important to Wildlife that Overlap Heritage Resources

Heritage Resources	Habitats Important to Wildlife						
	WGFD big-game HMAs	Crucial big game ranges	Priority travel corridors for big game	Elk security habitat	Proposed Fortification Creek elk WHMA	Within 0.25 mile of plains sharp-tailed grouse leks	USFWS recommended buffer zones for raptor nests
Cultural NSOs	0	607 / 0.1%	590 / 0.0%	4,174 / 0.4%	0	0	12,140 / 0.6%
Cultural CSUs	12,095 / 45%	103,494 / 24%	40,268 / 34%	215,001 / 22%	0	996 / 2%	213,669 / 10%
Paleontological NSOs	0	0	0	0	0	0	524 / 0.0%

Source: BLM 2012f

Note: Percentages in table represent the percent of habitat important to wildlife (columns) that overlaps heritage resources (rows).

% percent
 CSU Controlled Surface Use
 HMA Habitat Management Area
 NSO No Surface Occupancy
 USFWS U.S. Fish and Wildlife Service
 WHMA Wildlife Habitat Management Area
 WGFD Wyoming Game and Fish Department

Visual Resources

Under Alternative D, effects to wildlife resources from management actions associated with VRM would be the same as the effects under Alternative B.

Land Resources

Forest Products

Temporary adverse impacts on wildlife and wildlife habitats would be the same under Alternative D as under all other alternatives, except that Alternative D would include forest products harvest with no area size limit, although managed within ecologically stable limits; those limits would be defined at the time of site-specific project development and would include involvement of wildlife resource needs. Long-term beneficial effects would be similar to those under alternatives B and C. Under Alternative D, conflicts between the harvest of forest products and management of suitable habitat for wildlife species could occur in one to five percent of habitats important to small game mammals, migratory game birds, predator species, furbearers, and non-game mammals (less than one percent of habitats important to all other wildlife species); therefore, management actions for forest products under Alternative D would have minor adverse effect to wildlife resources.

Lands and Realty

Impacts and the types of impacts to wildlife species and their habitat from the management of land and realty under this alternative would be similar to Alternative B.

Renewable Energy and Rights-of-Way and Corridors

The types of impacts on wildlife under Alternative D management of renewable energy would be the same as those under Alternative B, except that areas excluded from renewable-energy development would total 352,068 acres, areas to be managed as ROW exclusion areas would total 79,777 acres, and ROW avoidance areas would total 321,149 acres. Renewable energy and ROWs and corridors would be allowed within greater than ten percent of habitats important to all wildlife species; therefore, management actions for renewable energy and for ROWs and corridors would have major adverse effects on wildlife resources.

Alternative D could authorize new communications sites, transmission lines, and ground facilities outside existing disturbance areas or ROW corridors by exception. For the impacts to wildlife be same as those in Alternative B, exceptions would have to be evaluated for the presence of special status plant and wildlife species or habitat suitability and would not be granted where there would be conflicts.

Travel and Transportation Management

Alternative D impact to wildlife from management of travel and transportation would be similar to those under Alternative B, except that the following acres of areas currently identified as important to wildlife would be Closed to motorized vehicle use: one to five percent of areas within WGFD big-game Herd Management Areas (HMAs), crucial big-game ranges, priority travel corridors for big game, elk security habitat, and within 0.25 mile of plains sharp-tailed grouse leks and less than one percent of areas within USFWS-recommended biologic buffer zones for raptor nests. Travel and transportation would be permitted in greater than ten percent of habitats important to all wildlife species; therefore, management actions for TTM would have major adverse effects on wildlife resources.

Recreation

The types of effects on wildlife under Alternative D management of recreation would be the same as those under Alternative B, except that no additional buffer would be provided around SRMAs to prevent minerals leasing. Seven areas would be designated as SRMAs (54,160 acres), six of which contain areas important to wildlife. Table 4.39, "Habitats Important to Wildlife that Overlap Proposed Special Recreation Management Areas" (p. 1165) lists these SRMAs and CSU areas overlap with areas currently identified as important to wildlife.

Table 4.39. Habitats Important to Wildlife that Overlap Proposed Special Recreation Management Areas

Proposed Special Recreation Management Areas	Habitats Important to Wildlife				
	WGFD big-game HMAs	Crucial big-game ranges	Priority travel corridors for big game	Elk security habitat	USFWS recommended buffer zones for raptor nests
Dry Creek Petrified Tree	0	0	0	0	65 / 0.0%
Middle Fork Canyon	2,068 / 8%	1,041 / 0.2%	3 / 0.0%	1,985 / 0.2%	0
Mosier Gulch	0	374 / 0.09%	169 / 0.1%	278 / 0.03%	0
Welch Ranch	0	0	0	0	48 / 0.0%
Weston Hills	0	0	0	0	365 / 0.02%

Proposed Special Recreation Management Areas	Habitats Important to Wildlife				
	WGFD big-game HMAs	Crucial big-game ranges	Priority travel corridors for big game	Elk security habitat	USFWS recommended buffer zones for raptor nests
Hole-in-the-Wall	0	0	0	0	464 / 0.02%

Source: BLM 2012f

Note: Percentages in table represent the percent of habitat important to wildlife (columns) that overlaps Special Recreation Management Areas (rows).

% percent

HMA Habitat Management Area

USFWS U.S. Fish and Wildlife Service

WGFD Wyoming Game and Fish Department

Lands with Wilderness Characteristics

The types of effects on wildlife under Alternative D management of lands with wilderness characteristics would be the same as those under Alternative B, except that the overall acreage would be less (6,864 acres).

Livestock Grazing Management

Under Alternative D, the types of impacts to wildlife from management actions for livestock grazing would be the same as those under Alternative B, except in areas that have been identified as incompatible with livestock grazing due to recreation designation, steep slopes, etc. In addition, Alternative D would limit the placement of salt or mineral supplement, thereby avoiding trampling damage to habitat. Restrictions for livestock grazing conserve greater than ten percent of habitats important to all wildlife species, except small game birds, migratory game birds, non-game migratory birds, and raptors (five to ten percent), therefore management actions for livestock grazing under Alternative D would have major beneficial effects on wildlife species.

Special Designations

Areas of Critical Environmental Concern

The types of impacts to wildlife associated with ACEC management actions under Alternative D would be the same as under Alternative B, except that only the Pumpkin Buttes (1,731 acres) and Welch Ranch (1,116 acres) would be designated ACECs. Restrictions for these ACECs would encompass less than one percent of habitats important to all other wildlife species; therefore, management actions for ACECs under Alternative D would have negligible beneficial effects to wildlife resources.

Scenic or Back Country Byways and Wild and Scenic Rivers

Management actions for scenic and BCBs and for WSRs would have no effect on wildlife resources.

Wilderness Study Areas

WSA management actions and effects on wildlife under Alternative D would be the same as those under Alternative B.

4.4.6.7. Cumulative Impacts

Although the BLM proposes only minor amounts of sagebrush treatments on public lands, continued modification of sagebrush on other ownerships would cumulatively reduce the availability and quality of that habitat. Cumulative effects on riparian habitats would be much more localized and site-specific due to the scattered land ownership along most streams, although improper livestock grazing and upland vegetative treatments on all ownerships could lead to riparian habitat concerns. Management changes implemented on BLM-administered lands to improve riparian conditions also could improve conditions on lands of other ownerships if the same management is applied to those lands. If some uses are restricted or eliminated on BLM-administered lands, that could cause increased use on adjacent ownerships, which would lead to degraded riparian conditions on these lands.

Forest management activities could lead to timber harvest on adjacent private and State of Wyoming lands that would use roads left in place on BLM-administered lands if they suit the activity on adjacent lands. Such activities could reduce big-game hiding cover, increase road density, and increase the overall impacts of treatments on BLM-administered lands because they would effectively be larger in scale. There also could be some cases where vegetative treatments such as prescribed fires and fuel-reduction projects that might have similar cumulative impacts would extend to adjacent ownerships, because land owners would find it more economical to have their land treated at the same time as public lands.

Cumulative effects on raptors that would result from current, proposed, and future activities such as gas and minerals exploration and development, agriculture, and urban development could include increased disturbance to nesting raptors, degradation or destruction of nesting habitats, increased raptor collisions with powerlines, increased electrocutions, and increased vehicular collisions with raptors feeding on carrion. As development brings additional powerlines to the planning area, the availability of power poles, when built to most current Avian Power Line Interaction Committee (APLIC) standards, for use as perches could benefit raptors.

Effects on migratory birds described for each of the alternatives would be in addition to impacts that have already occurred and that would occur as a result of other activities in the planning area. Similar types of direct and indirect effects have already occurred, including direct mortality, habitat loss, displacement, habitat fragmentation, and population-level effects. Evaluating the cumulative impacts of past, ongoing, and reasonably foreseeable activities is difficult because of the general lack of data on migratory birds in the planning area and the range of effects that would occur in varying degrees to various species.

Cumulative effects on upland game from current, proposed, and future activities such as gas and mineral exploration and development, agriculture, and urban development could include increased mortality, especially from collisions with vehicles and powerlines; displacement and harassment; and physical degradation or destruction of leks and reproductive areas (nesting and brood-rearing areas).

4.4.7. Special Status Species – Plants

This section describes potential direct, indirect, short-term, and long-term effects on special status plant species under each alternative and whether those effects would be beneficial or adverse. Map 34 shows the distribution of special status plants in the planning area. Appendix

I (p. 2025) describes the effects of the Proposed RMP on Ute ladies'-tresses orchids, a threatened plant.

Direct impacts to special status plant species would result from actions that may cause the loss of individual special status plants. Surface-disturbing activities, urbanization, logging activities, quarrying, sand mining, herbivory, trampling, fire, and herbicide and pesticide application would be the primary means by which special status plants would be directly affected. Plant collection, improper grazing management practices, and OHV use also could remove vegetation and disturb soil, which would directly affect special status plant populations. Indirect effects to special status plants would result from actions that aid or compromise the protection of those plant species. The loss or degradation of suitable habitats for special status plant species would be an indirect effect. Indirect effects on potential habitats for special status plant species also could result when actions change habitats in a way that makes them unsuitable for future colonization. Alterations in stream function, demands for water, and competition from invasive plant species would be the primary sources of indirect effects on special status plant species.

For purposes of this analysis, short-term effects on special status plant species result from activities that contribute to the decline in abundance or distribution of a species and can be reversed within 5 years after the activities; long-term effects would require more than 5 years to restore.

Allowable uses and management actions that contribute to the decline in abundance or distribution of special status plant species would be adverse. Beneficial effects would result from activities that protect habitats or reduce the risk of harm to these special status plants. An increase in populations of special status plant species in response to enhanced habitat or the increased viability of a species would be beneficial.

4.4.7.1. Methods and Assumptions

This analysis and its conclusions are based on review of existing literature, interdisciplinary team knowledge of resources in the planning area, and information provided by other agencies. Existing literature and analyses include the 1985 Buffalo RMP (BLM 1985c), the 2003 PRB EIS (BLM 2003c), the Wyoming Natural Diversity Database (WYNDD), and WGFD Spatial Mapping and Analysis. Effects are quantified where possible. Spatial analysis was performed using the ESRI ArcGIS Desktop 10.0 computer software. In addition to literature review and in the absence of quantitative data, best professional judgement was used. Effects are sometimes described using ranges, or in qualitative terms if appropriate. Many effects are qualitatively assessed due to the unavailability of suitable data.

Analysis methods and assumptions and include, the following:

- Assumptions described in the *Vegetation – Riparian/Wetland Resources* section of this chapter are used to analyze effects on potential habitat for Ute ladies'-tresses orchid, an orchid not known to be present in the planning area, but which typically occurs in riparian and wetland habitat. Special status plant species present or with the potential to be present in riparian and wetland habitats could be affected by water quality or water use in the planning area.
- Consultation with the USFWS and following conservation measures identified in Appendix I (p. 2025) for all listed and sensitive species for the BLM Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Final Programmatic EIS (BLM 2007h) are anticipated to mitigate most impacts to special status plant species.

- Actions that reduce the threat of establishment or spread of invasive species directly benefit special status plant species. IM 2006-073 (BLM 2006b) establishes policy and guidance for the use of certified weed seed-free products and mulch in restoration projects on public lands.
- Reclaiming areas of surface disturbance and reestablishing vegetation minimizes adverse effects on soils and therefore to special status plant species. The sooner vegetation is reestablished, the greater the benefit to special status plant species.
- Management actions that preclude or restrict development, including those not specifically aimed at conserving special status plant species, are assumed to benefit special status plant species where populations overlap management action boundaries.
- The total amount of new surface disturbance allowed under an alternative is an index of potential effects on special status plants. Success of reclamation measures prescribed as a condition of development is unknown, and could underestimate the potential effect of surface disturbance on special status plant populations.
- Surface-disturbing activities in special status plant habitat would adversely affect special status plant species.
- Because the densities and locations of special status plant species in the planning area are not entirely known and because the locations of potential actions under the different alternatives also are not known, the impact analysis is based on the amount of vegetation and soil disturbed, the threats identified for special status plant species in Chapter 3, and the level of restrictions placed on BLM actions that could adversely affect special status plant species.
- Existing provisions (e.g., presence/absence surveys by a qualified botanist during the appropriate phenological stage [e.g., blooming] for positive identification and performed before proposed actions) to protect special status plants species are implemented and conditional monitoring is performed (e.g., grazing and surface disturbance reclamation) to ensure special status plant species are not jeopardized.
- As more monitoring and survey data become available, it is possible that additional populations of existing special status plants could be found.

Significance Criteria

In addition to the significance criteria indicated in the beginning of this chapter, project actions would be considered potentially significant if the following occurred:

- Substantial loss of the biological integrity and habitat function of terrestrial and aquatic ecosystems that would make a species eligible for listing under the ESA.
- Decreased viability or increased removal of Threatened, Endangered, Proposed, or Candidate species, or adverse alteration of their critical habitats.
- Substantial loss of habitat function or disruption of life history requirements of special status plant species that would preclude improvement of their status.

4.4.7.2. Impacts Common to All Alternatives

Special Status Species – Plants

Implementing all actions prescribed in USFWS Biological Opinions for Threatened or Endangered plant species would have major beneficial effects on special status plants. Biological Opinions provide guidance for the protection and recovery of special status plant species.

Physical Resources

Air Quality

Adherence to rules and regulations and enhancing cooperative processes are administrative processes that would have no direct effect on SSS plants. Dust that covers vegetation reduces the photosynthesis process by blocking light and potentially water from reaching the plant cells. Travel on roads that are or will be surfaced with either gravel or scoria, if untreated, would force large amounts of dust into the air; this dust could settle on vegetation. Reducing dust emissions and overall air quality management throughout the planning area would have a major beneficial effect on special status plant species.

Soil

Evaluating proposed surface-disturbing activities for effects on soils also would allow for surveys of plant species. Through this process, more populations of special status plant species could be discovered and adverse effects on those species avoided. Including reclamation plans in any authorized surface-disturbing activity would have a major beneficial effect on special status plants, if implemented on every project, because these plants could be identified and avoided or enhanced during the reclamation process throughout the entire planning area.

Water Resources

Altering water quantity, including alternative water supplies and flow controls, or water quality in any known population of special status plant species could have an adverse effect on species that rely on the existing water regime. Altering water quantity and quality also could provide water in areas suffering from drought, thereby supplementing existing populations or creating habitat for special status plant species in new areas. This would have a beneficial effect on special status plant species. Reducing channel and bank erosion and associated loss of riparian habitats would have beneficial effects on special status plants that inhabit riparian areas. Erosional features such as these, if uncontrolled, would alter habitat, potentially making it unsuitable for populations of special status plant species to persist, or would destroy existing populations. There are 19,861 acres (BLM surface) of suitable habitat for special status plants within 500 feet of riparian waterway segments in the planning area. Management actions common to all alternatives occur within five to ten percent of special status plant habitats; therefore, they would have moderate beneficial or adverse effects on special status plant resources. Other water management actions common to all alternatives, such as filing for water rights and plugging unneeded wells would have no to negligible effects on special status plant species. Due to the potential adverse effects, the overall conclusion is that the water management actions would have a moderate adverse effect on special status plants.

Cave and Karst Resources

Cave inventories could benefit special status plant species. There are 101,455 acres (BLM surface) of suitable habitat for special status plants in the cave formations area. Cave inventories include surveys for special status plant species. New population information could be acquired through these inventories. However, the geologic formations likely to contain caves are limited to the western edge of the planning area in the Big Horn Mountains; this is also where special status plant species are likely to occur. Inventories would occur within greater than ten percent of special status plant habitats; therefore, management actions common to all alternatives would have major beneficial effects on special status plant resources.

Mineral Resources

Development of new and concurrence with existing MOUs between the BLM and other agencies are administrative processes that would not effect special status plant species.

Locatable Minerals

Fifty-five acres of special status plant species occur in areas open to locatable mineral extraction. Impacts would include removal of vegetation and loss of habitat, potentially including removal of individual plants and/or entire populations of special status plants. This is less than one percent of all special status plant habitats, therefore, the loss of habitat would be negligible.

Leasable – Coal

Coal leasing management actions common to all alternatives will have no effect on special status plant species. There are no special status plant species on existing leased coal parcels. The leasing process involves NEPA analysis, thereby identifying any conflicts for special status plant species before there could be adverse effects. This and any decisions for deferral of coal leasing would have a major beneficial effect on special status plant species.

Leasable Minerals – Fluids

A requirement that lessees perform operations in a way that minimizes adverse effects to other resources and other land uses and users would also minimize adverse effects and result in minor beneficial effects on special status plant species. There is one population of William's wafer-parsnip on leased parcels. Opening all oil and gas mineral estate to leasing would have a major adverse effect on this special status plant at this location. Management of any acquired mineral estate in accordance with management of the surrounding areas might or might not affect special status plant species. Management of any mineral estate should be to avoid effects on special status plant species, regardless of management of surrounding areas. Any decisions for closures to fluid mineral leasing would not affect special status plant species. Making geothermal resources available for leasing would have a negligible adverse effect on special status plant species. The potential for geothermal development in the planning area is low. Effects identified above would be localized, and would occur only where leasable fluid minerals and special status plant species overlap. Fluid mineral development could occur in one to five percent of special status plant habitats; therefore, the management actions common to all alternatives would have minor adverse effects on special status plant resources.

Salable Minerals

Salable minerals extraction would result in direct, long-term, impacts on special status plant species. Impacts would include removal of vegetation and loss of habitat, potentially including removal of individual plants and/or entire populations of special status plants. The level of impacts would depend on the size of the salable minerals area. Many sand and gravel areas are associated with riverine and alluvial plains. The vegetative communities normally associated with these areas would be significantly impacted by the extraction of salable minerals.

Fire and Fuels Management**Unplanned Fire (Wildfire)**

Implementing the BLM Emergency Stabilization and Burned Area Rehabilitation standards and rehabilitating fire lines would reclaim areas faster, and therefore have a beneficial effect on special status plant species. Landscape treatments to achieve enhanced fuels management or restore fire-adapted ecosystems could result in short-term adverse effects through their removal during fire treatments. Long-term effects from treatments would be beneficial because the ecosystem would be returned to a more natural state in which these native plant species would thrive. In areas where these potential treatment areas and special status plant species directly overlap, there would be adverse or beneficial effects, respectively, on special status plant species. However, projected over the entire planning area, the locations where

wildfires are most likely to occur compared to locations of most of the populations of special status plant species in the planning area make these adverse effects negligible.

Planned Fire (Prescribed Fire)

Adhering to the current District FMPs and ensuring all prescribed fire activities comply with standards and rules are administrative processes that would have no effect on special status plant species. Consulting with a resource advisor on all wildland fires that involve or threaten BLM-administered lands would decrease the likelihood of effects on special status plant species. Resource advisors would be aware of known locations of special status plant species and would advise activities that would result in reducing risks to special status plant species as much as possible. These actions would have beneficial effects on special status plant species. Prohibiting the use of retardant or foam within 300 feet of surface water sources would have a beneficial effect. There is one population of Williams' wafer-parsnip within 300 feet of surface water resources in the planning area. There are approximately 10,762 acres (BLM surface) of suitable habitat for special status plant species within 300 feet of surface water resources. Special status plant species inhabiting riparian corridors surrounding surface water sources would be protected from the smothering effect of these chemicals. This protection would occur in one to five percent of SSS habitats; therefore, management actions common to all alternatives would have a minor beneficial effect on special status plant resources.

Biological Resources

Biological resources management actions common to all alternatives and that are administrative processes (e.g., development and prioritization of plans, providing outreach and education, updating plans, and adhering to rules, regulations, and agreements such as MOUs) would have no to negligible effects on SSS plants.

Management actions common to all alternatives that promote a balanced management of these resources in the planning area would promote a natural landscape, thereby promoting the growth of native plant species such as special status plant species. These management actions include such things as managing for forage enhancement, implementing cooperative IPM programs, and providing suitable wildlife habitat. These would have minor to major beneficial effects on special status plant species overall.

Vegetation – Forests and Woodlands

There are no management actions common to all alternatives for forests and woodlands.

Vegetation – Grassland and Shrubland Communities and Riparian/Wetland Resources

Reducing impacts to vegetative resources, by nature, would reduce impacts to special status plant species. Management actions common to all alternatives that would achieve this goal would have beneficial effects on special status plant species. Vegetation inventories on all lands (grasslands and shrublands and lotic and lentic riparian/wetland systems, and evaluation of CBNG-created riparian and wetland systems for retention or reclamation) would have beneficial effects on special status plant species. Inventories would help identify new populations and help monitor existing populations of special status plant species throughout the planning area. Knowledge of special status plant species locations and status would help the BLM make land management decisions. To date, there are 21 known populations of special status plant species (3 Porter's sagebrush 18 William's wafer-parsnip) on BLM-administered lands in the planning area. The effects identified would be localized, and would occur only where targeted vegetation and special status plant species overlap. Inventories for vegetation under these other resources would occur

within greater than ten percent of special status plant habitats; therefore, management actions common to all alternatives for grassland and shrubland communities would have major beneficial effects on special status plant habitats.

Restoring disturbed sites, including split estate lands, close to suitable habitat for special status plant species and known populations of such plants would increase suitable habitat and promote new, restore historic, or promote the spread and enhance the viability of known populations of special status plant species. This would have beneficial effects on special status plant species. Expansion and enhancement of riparian/wetland systems and habitat would have these same long-term beneficial effects on special status plant species that inhabit riparian/wetland ecosystems. There are three populations of Williams' wafer-parsnip on split estate lands in the planning area. There are 243,929 acres of suitable habitat for special status plant species on split estate lands (fluid minerals) in the planning area. Habitat restoration and enhancements for riparian/wetland systems would occur within greater than ten percent of special status plant habitats; therefore, management actions common to all alternatives for riparian/wetland resources would have major beneficial effects on special status plant habitats.

Invasive Species and Pest Management

Controlling grasshoppers and Mormon crickets on public lands would have adverse effects on special status plant species over the short term, but could prove to be beneficial over the long term. Initial treatment for grasshoppers and Mormon crickets could destroy flowering and fruiting special status plant species if pesticides were applied close to known populations of special status plant species while these plants were in bloom and these plants were trampled or otherwise destroyed during the application process. Reducing the numbers of these two pests would improve vegetative condition over the long term, thereby beneficially affecting special status plant species. In areas where these pesticide application and special status plant species overlap, there would be adverse effects on special status plants. However, projected over the entire planning area, the estimated amount of overlap would make these beneficial effects minor.

Fish and Wildlife Resources – Fish and Wildlife, and Special Status Species – Fish and Wildlife (including Greater Sage-Grouse)

Management of barriers to fish passage would have no effect on special status plant species because these barriers and populations of special status plant species are not present in the same locations. Effects on special status plant species from the management of activities potentially affecting native and desirable non-native fish species are not known at this time. It is difficult to predict impacts to special status plant species from these, at present, undefined activities.

Management of public access to fish bearing waters or to protect crucial habitats could have adverse effects on special status plant species. Future access routes have the potential to adversely affect special status plants and their habitats by stripping away vegetation as part of access route creation, trampling or eliminating vegetation, and compacting soils throughout the footprint of the access. Construction of new fences, even in accordance with the BLM Fencing Handbook, would have the same potential adverse effects on special status plant species for the same reasons. There are three known populations of Williams' wafer-parsnip on BLM-administered lands close to fish-bearing waters. There are 51,745 acres of suitable special status plant species habitat on BLM-administered lands close (within 0.25 mile) of fish-bearing waters. Access management and new fence construction is likely to occur within greater than ten percent of special status plant habitats.

The NEPA and permitting processes would be expected to result in indirect beneficial effects on special status plant species as a result of protecting fish and wildlife (including SSS), protecting fish and wildlife habitats, and mitigating impacts to fish and wildlife habitats (including habitats for SSS). Special status fish species and non-special status fish species management actions common to all alternatives support efforts to protect and improve riparian ecosystems. These actions include restoring fish habitats and managing harmful non-native riparian vegetation in river and stream systems important to fish species. This would have beneficial effects on special status plant species, in particular species that inhabit these same riparian corridors, such as Ute ladies'-tresses orchid. Special status wildlife species and non-special status wildlife species management actions common to all alternatives support efforts to protect and improve ecosystems of varying habitat types throughout the planning area. The actions that include managing vegetative diversity, minimizing disturbances to springs and riparian zones, and improving sagebrush plant communities are actions that would help maintain natural landscapes; this would have major beneficial effects on all special status plant species.

Avoidance areas, whether for application of broad-spectrum insecticides or protect nesting bald eagles, would have a beneficial effect on special status plant species where avoidance areas and populations of special status plant species overlap. Avoidance areas for other species would, by nature, be avoidance areas for special status plant species. Avoidance areas for fish, special status fish, wildlife, and special status wildlife will occur in greater than ten percent of special status plant habitats; therefore management actions common to all alternatives for fish, wildlife, and special status fish and wildlife will have major beneficial effects on special status plant resources.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Maintaining and developing relationships with Native American tribes and maintaining federal ownership of areas important to Native Americans or with significant paleontological values are administrative processes and would have no effect on special status plant species. Other cultural resources management actions common to all alternatives, such as the stabilization and protection of sites, are actions that would create avoidance areas to protect cultural resources. These avoidance areas would, by nature, be avoidance areas for special status plant species. There are 12 populations of Williams' wafer-parsnip within 5 miles of significant cultural sites in the planning area. These avoidance areas occur within greater than ten percent of special status plant habitats, therefore, management actions common to all alternatives for cultural and paleontological resources would have major beneficial effects on special status plant resources.

Visual Resources

No effects are anticipated from VRM actions common to all alternatives.

Land Resources

Forest Products

Prohibiting timber harvest and recreational camping within 200 feet of surface water sources would create avoidance areas to protect surface water; these would, by nature, be avoidance areas for special status plant species. There is one population of Williams' wafer-parsnip within 200 feet of surface water resources in the planning area. There are approximately 5,584 acres (BLM surface) of suitable habitat for special status plant species within 200 feet of

surface water resources. Areas prohibited from timber harvests encompass one to five percent of special status plants habitats.

Personal use of forest products by the public could cause an adverse effect on special status plant species. Access routes to retrieve forest products have the potential to adversely affect special status plant species and their habitats by stripping away vegetation as part of access route creation, trampling or eliminating vegetation, and compacting soils throughout the footprint of the access. There are five populations of Williams' wafer-parsnip on BLM-administered lands with forest products. There are 16,234 acres of suitable habitat for special status plant species on BLM-administered lands with forest products. Forest products occur within five to ten percent of special status plant habitats; therefore, management actions common to all alternatives would have moderate adverse effects on special status plant resources.

Lands and Realty

Lands and realty management actions common to all alternatives would have no to negligible effects on special status plant species. Project-specific analysis of lands and realty actions, such as approval of R&PP permits, land use authorizations, and withdrawals and land disposals require NEPA analyses, which would identify any conflicts for special status plant species before adverse effects could occur.

Renewable Energy

Promotion and coordination of renewable-energy opportunities are administrative processes that would have no effect on special status plant species.

Rights-of-Way and Corridors

ROW and corridors management actions common to all alternatives that promote identified preferred locations and minimize surface disturbance, including transportation and communications site planning, in the planning area also require NEPA analyses. There are 21 known populations of two special status plant species (3 Porter's sagebrush and 18 Williams' wafer-parsnip) on BLM-administered lands in the planning area. There are 126,811 acres of suitable habitat for special status plant species on BLM-administered lands. ROWs and corridors may be permitted in greater than ten percent of special status plant habitats; therefore, management actions common to all alternatives would have major adverse effects on special status plant resources.

Travel and Transportation Management

Management of public access common to all alternatives that are administrative processes (negotiation across non-BLM-administered lands to isolated public parcels, a BLM transportation system, road and trail closures and abandonment decisions, including inventories of all roads and trails, completion of Recreation Area Management Plans (RAMPs), providing general or educational information to the public) would have no effect on special status plant species.

Future access routes (roads and trails to isolated parcels of public land, to caves, or for any other recreational purposes) would have the potential to adversely affect special status plants species plants and their habitats by stripping away vegetation as part of access route creation, trampling or eliminating vegetation, and compacting soils throughout the footprint of the access. Allowing casual use of all public lands would intensify this effect because access would then be undirected and there would be no protection for special status plant species or their habitats. There are 21 known populations of two special status plant species (3 Porter's sagebrush and 18 Williams' wafer-parsnip) on BLM-administered lands. There are 126,811 acres of suitable habitat for special status plant species on BLM-administered land in the planning area. Areas

where these future access routes may be created occur within greater than ten percent of special status plant habitat; therefore, management action common to all alternatives would have major adverse effects on special status plant resources.

Recreation

Minimizing recreation impacts in riparian habitats and providing for temporary or permanent closures for public health and safety reasons would have a beneficial effect on special status plant species. Avoidance areas for other resource concerns would, by nature, be avoidance areas for special status plant species. In areas where these avoidance areas and populations of special status plant species directly overlap, there would be beneficial effects on special status plant species. However, projected over the entire planning area, the estimated small amount of overlap would make these beneficial effects minor.

Lands with Wilderness Characteristics

Evaluations of BLM-administered lands for wilderness characteristics would likely include surveys for special status plant species. These inventories could provide new information on plant populations. There are three populations of Williams' wafer-parsnip in lands with wilderness characteristics. Areas with wilderness characteristics occur in five to ten percent of special status plant habitats; therefore, management actions common to all alternatives for lands with wilderness characteristics would have moderate beneficial effects on special status plant resources.

Livestock Grazing Management

Management actions common to all alternatives that promote balanced management of land resources in the planning area would promote a natural landscape, thereby promoting the growth of native plant species such as special status plants. These management actions include such things as adjusting grazing leases; implementing new AMPs; and managing livestock grazing to sustain riparian, wetland, mountain mahogany, and other habitats. These actions would have beneficial effects on special status plant species. There are 29 populations of two special status plant species (3 Porter's sagebrush and 26 Williams' wafer-parsnip) within BLM grazing allotments. There are 126,811 acres of suitable habitat for special status plant species within BLM grazing allotments. Livestock grazing allotments occur in greater than ten percent of special status plant species habitats; therefore, management actions common to all alternatives would have major beneficial effects on special status plant resources.

Special Designations

Areas of Critical Environmental Concern

Management actions common to all alternatives associated with ACECs would have no effect on special status plant species.

Wild and Scenic Rivers

The canyon of the Middle Fork Powder River that is suitable and eligible for WSR designation overlaps with potential special status plants habitat. Preserving the outstandingly remarkable values (ORVs) would limit disturbance and development within Middle Fork Canyon, resulting in a benefit to special status plant species. Because there are no known populations within Middle Fork Canyon, the overall benefit would be negligible to minor.

Scenic or National Back Country Byways

Increased road maintenance and human activity on byways would have adverse impacts to plant species from dust, soil erosion, spread of invasive species, and unauthorized plant collection.

Management actions common to all alternatives associated with scenic or BCBs will have a minor adverse effect on special status plant resources.

Wilderness Study Areas

There are three populations of Williams' wafer-parsnip in WSAs. There are 28,931 acres of suitable habitat for special status plant species in WSAs. WSAs contain five to ten percent of all of the special status plant habitats in the planning area; therefore, management actions common to all alternatives would have moderate beneficial effects to special status plant resources.

Socioeconomic Resources

Social and Economic Conditions

Management actions common to all alternatives are administrative processes and will have no effect on special status plant resources. Impacts to social and economic resources will be quantified on a project specific basis. Management actions that vary by alternative are also administrative; therefore, social and economic management actions will not be discussed further in this section

Health and Safety

Any health and safety management actions common to all alternatives would likely have an adverse effect on special status plant species. Emergency response activities are likely to involve efforts in which little to no time is allowed to adjust actions to avoid impacts to special status plant species. Special status plant species are likely to be trampled, bulldozed, or otherwise altered by hazardous waste cleanup, reclamation of abandoned mines, and contaminant spills. Actions related to human health and safety could occur at any location throughout the planning area. It is likely that these would occur on a small scale. There would be adverse effects on special status plant species in locations where human health and safety actions and populations of special status plant species overlap. However, projected over the entire planning area and over an extended period, these adverse effects would be negligible.

The following sections describe impacts by alternative. These impacts would be in addition to the impacts common to all alternatives described above. Only management actions common to all alternatives are identified; therefore, health and safety will not be discussed further in this section.

4.4.7.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes potential impacts to special status plant species from management of other resources under Alternative A.

Special Status Species – Plants

Neither Alternative A nor other previous land use plans have included decisions for management of special status plant species. This lack of decision has left protections for special status plant species to be included in the analyses for individual projects. Thus far, this has provided adequate protections for known populations of special status plant species; however, absent surveys to discover new populations, there could have been activities that permanently altered habitat for these species or existing populations could have been missed and destroyed.

There are common themes throughout Alternative A for all resources. Where pertinent, these common themes are analyzed together.

Physical Resources

Air Quality

The types of effects to special status plant species from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for air quality (habitat conservation). In Alternative A, though, these impacts would be analyzed on a project specific basis. Without monitoring or oversight on a programmatic level, lack of consistency would cause the beneficial effects to likely only be negligible. Air quality resource management actions under Alternative A would have negligible beneficial effects on special status plant resources.

Soil

The types and magnitude of effects to special status plant species from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for soil (habitat conservation). In Alternative A, management actions for soil are beneficial where habitats are conserved through prohibitions of surface-disturbing activities and/or surface occupancy, both of which occur in greater than ten percent of special status plant habitats. Soil resource management actions under Alternative A would have major beneficial impacts on special status plant resources.

Water Resources

The types of effects to special status plant species from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for water resource management (habitat conservation and improvement). Management actions are beneficial when habitats are conserved through prohibitions of surface disturbance, which occurs in five to ten percent of special status plant habitats. Within Alternative A, the impacts to water resources are analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that the beneficial effects would be reduced by half, making the moderate beneficial effects only negligible.

Cave and Karst Resources

The types of effects to special status plant species from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for cave and karst (habitat conservation). Management actions are beneficial when habitats are conserved through prohibitions of surface disturbance, which occurs in greater than ten percent of special status plant habitats. Within Alternative A, the impacts to cave and karst resources are analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only minor.

Mineral Resources

Effects to special status plant resources from management actions associated with all mineral resources in Alternative A would be the same as those described in the *Impacts Common to All Alternatives* section above.

Fire and Fuels Management

Unplanned Fire (Wildfire)

Under Alternative A, suppression efforts and restricting the use of some types of suppression equipment would have a direct, short-term beneficial effect on special status plant

species for the life of the fires. Long-term, the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives is estimated to affect approximately 14,000 acres from BLM actions. Due to the potential long-term degradation of forest and woodland resources (limber pine habitats), but likely scattered nature of effects to all other special status plant habitats in the planning area, the adverse effects of habitat or individual removal from unplanned fire are likely to be minor.

Planned Fire (Prescribed Fire)

Impacts to SSS plants from management actions associated with planned (prescribed) fire in Alternative A would be the same as those described in the *Unplanned Fire* section above. Due to the locations of potential prescribed fire projects in the planning area, more than ten percent of limber pine habitats could be impacted. These actions also would have a direct beneficial effect on vegetation over the short and long terms because burn conditions (air and soil temperatures, wind conditions, and fuel types) would be less severe than in wildfires. Management actions for planned fire under Alternative A would have major beneficial effects on special status plant resources.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative A, forest management practices that convert late-seral stage stands to early and mid-seral stage would adversely affect special status plant species adapted to late-seral forest types. However, forest management practices would create a diversity of seral stages for different plant species habitat requirements, thereby increasing habitat for plant species diversity and richness. Temporary roads created for commercial timber harvesting would fragment habitat and possibly disturb existing populations of special status plant species for the life of the project. Reclaiming roads would decrease the amount of time it would take for native vegetation to reestablish, thereby facilitating special status plant species regeneration in the project area. Forests and woodlands contain five to ten percent of limber pine, William's waferparsnip, and Porter's sagebrush habitats; therefore management actions for forests and woodlands under Alternative A would have moderate beneficial effects on special status plant resources.

Vegetation – Grassland and Shrubland

Under Alternative A, reclamation seeds mixes are determined on a project-specific basis, allowing for site specific management of resource objectives and having a major beneficial effect to special status plant resources.

Vegetation – Riparian/Wetland Resources

Under Alternative A, surface-disturbing activities would not be prohibited within 500 feet of riparian and wetland areas, protecting special status plant species that inhabit these areas from direct loss. Site-specific management for desired species would allow for greater flexibility in restoring desired species and functionality to habitats. Management actions associated with Alternative A for riparian/wetland resources will have major beneficial effects on special status plant resources.

Invasive Species and Pest Management

Under Alternative A, invasive species and pest control projects are decided on an annual basis and in conjunction with the county weed and pest. Short-term beneficial effects on special status plant species would result from small-scale planning and less pesticide applications, with the ability to

prioritize areas annually. However, adverse effects to these plant species would be likely over the long term by giving invasive species a competitive advantage over the native special status plant species. Annually treating cheatgrass on a project-by-project basis would be ineffective, because only small, scattered treatments would occur; therefore, most of the cheatgrass would be unaffected. This would have an adverse effect on native special status plant species. Overall, Alternative A invasive species and pest management would have a minor beneficial effect on special status plant species.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Alternative A actions that promote balanced management of biological resources in the planning area would promote a natural landscape, thereby promoting the growth of native plant species such as special status plants. These management actions include such things as managing vegetative resources for special status wildlife species, and controlling invasive plant species.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Impacts to SSS plants from management actions associated with wildlife and SSS – wildlife in Alternative A would be the same as those described in the *Fish and Wildlife Resource – Fish and Special Status Species – Fish* section above. In addition, management actions for wildlife and special status wildlife include prohibitions of surface disturbance and/or surface occupancy for the protection of wildlife and special status wildlife resources. These prohibition areas also contain greater than ten percent of special status plant habitats; therefore, wildlife and special status wildlife management actions under Alternative A would have major beneficial effects on special status plant resources.

Heritage and Visual Resources

Impacts to SSS plants from management actions associated with all heritage and visual resources in Alternative A would be the same as those described in the *Impacts Common to All Alternatives* section above.

Land Resources

Forest Products

Under Alternative A, the layout and timing of timber sales would largely determine the degree of effects on special status plant species. Regeneration of commercial harvested areas begins with early successional stage vegetation, which provides habitat for plant species that depend on early successional habitats. The subsequent years would allow for natural seral-stage progression of the habitat and thereby provide habitat for various special status plant species that depend on different seral stages. This natural succession happens over an 80- to 100-year period. Over the short term and where the forest products and populations of special status plant species overlap, timber sales would have an adverse effect on such species. Over the long term and where the two resources overlap, natural regeneration would have a beneficial effect on special status plant species. Fencing the regeneration areas would help the natural succession to return to each of the seral stages and promote the growth of special status plant species. BLM-administered land with forest products also contains five to ten percent of special status plant habitats; therefore, management actions for forest products under Alternative A would have moderate beneficial effects on special status plant habitats.

Lands and Realty

No parcels available for land tenure adjustments contain special status plant habitats.

Renewable Energy and Rights-of-Way and Corridors

No areas suitable for renewable energy or ROWs and corridors contain special status plant habitats.

Travel and Transportation Management

Under Alternative A, there would be direct and indirect effects on special status plant species from travel management and OHV use. OHV use on and off designated trails has the potential to destroy vegetation, compact soils, and lead to soil erosion and ponded water. Special status plant species could be crushed and their habitats degraded. Higher, rockier terrain and remote areas are becoming more accessible over time as OHVs become more sophisticated and powerful, and as the human population in the planning area increases. These areas are also the areas where most of the special status plant species in the planning area are likely to be found. By designating areas where OHV use is limited to designated roads and trails, adverse effects on special status plants species can be reduced. In cases where motorized vehicle use is closed for only portions of the year, these closures would not be as great a benefit to special status plant species. Although this might prevent the removal of many special status plant species during their time of flowering or fruiting, it would not preclude removal of the vegetative layer as a whole. Allowing surface occupancy during any time of year would have an adverse effect on special status plant species. Regardless of intensity of management, OHV use is still anticipated to have a major adverse effect on special status plant species where OHV use and populations of such species overlap (greater than ten percent).

Recreation

Under Alternative A, there could be adverse effects on special status plant species from recreation activities. Hiking to or occasional repeated use of remote camp sites could have direct effects on special status plant species. Plants could be trampled or crushed, and soil could be compacted or disturbed. Holders of Special Recreation Permits are required to follow all rules and regulations, therefore, should avoid camping at locations where the BLM has identified populations of special status plant species. Given the low level of recreation use on most BLM-administered lands in the planning area, and the scattered, infrequent locations of populations of special status plant species, these adverse effects would mostly be minor.

Lands with Wilderness Characteristics

Alternative A does not identify any lands with wilderness characteristics, thus special status plant habitats are not affected.

Livestock Grazing Management

Livestock grazing has the potential to have major adverse effects on special status plant species through partial or complete removal of individual plants and through damage by trampling. The degree of effects would depend upon the number of animals involved and seasonal frequency of presence in special status plant species habitat. There are 29 populations of special status plant species (3 Porter's sagebrush and 26 Williams' wafer-parsnip) within BLM grazing allotments. There are 288,498 acres of suitable habitat for special status plant species within BLM grazing allotments, including 84 percent of all Williams' wafer-parsnip habitat in the planning area. Under Alternative A livestock grazing is not authorized on approximately 10,000 acres of public land where grazing has been determined to be incompatible with other resource values, specifically, 4,000 acres in the canyons and slopes of the southern Big Horn Mountains. Greater than ten

percent of special status plant habitats are present in the BLM grazing allotments; therefore, management actions for livestock grazing management would have major adverse effects on special status plant resources.

Special Designations

Areas of Critical Environmental Concern

Alternative A does not identify any ACECs, thus special status plant habitats are not affected.

Scenic and Back Country Byways

Alternative A does not identify any BCBs, thus special status plant habitats are not affected.

Wild and Scenic Rivers

Alternative A does not identify any management actions for WSRs, thus special status plant habitats are not affected.

Wilderness Study Areas

Vegetation inventories on all lands included in WSAs would have a moderate beneficial effect on special status plant species. Inventories would help identify new and help monitor existing subpopulations or populations of special status plant species throughout the planning area. Knowledge of special status plant species locations and status would help the BLM make land management decisions. There are four known populations of special status plant species in WSAs. There are 28,931 acres of suitable habitat for special status plant species in WSAs. WSAs contain five to ten percent of special status plant habitats; therefore, management actions for WSAs under Alternative A would have moderate beneficial effects on special status plant resources.

4.4.7.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to special status plant species due to their implementation.

Special Status Species – Plants

Alternative B management actions for special status plant species include prohibiting activities (surface disturbances, minerals exploration, motorized vehicle use, explosives and blasting, aerial application of herbicides, and use of fire suppression chemicals) in suitable habitat for special status plant species. This approach is the most conservative of all alternatives because it would allow for not only the protection of known populations of special status plant species populations, but would protect potential future populations. This type of protection greatly increases opportunities to expand the proliferation of these species through future active management decisions. There are approximately 126,811 acres (BLM surface) of suitable habitat for special status plant species in the planning area.

Impacts from conservative management of resources under Alternative B would, in most cases, be similar to impacts described for Alternative A and under *Impacts Common to All Alternatives*. Special status plant species would benefit from conscientious management of physical resources and biological resources. Where impacts to special status plant species vary in degree from impacts described for Alternative A, further rationale is provided below.

Physical Resources

Air Quality

Under Alternative B, air quality would be modeled and analyzed on a project-specific level as under Alternative A. However, under Alternative B, projects expected to approach or exceed emissions standards also would be evaluated for potential mitigation strategies. This would have a moderate beneficial effect on special status plant species.

Soil

Under Alternative B, effects on soil, resources would be analyzed on a project-specific basis. However, beneficial effects would be greatly increased under Alternative B through prohibiting surface-disturbing activities or applying an NSO stipulation to activities on badlands, rock outcrops, and slopes susceptible to mass movement and prohibiting prescribed fires on highly erodible soils. Avoidance areas for other resources would, by nature, be NSO areas for special status plant species. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed. Allowing surface occupancy during any time of year in populations of special status plant species or suitable habitat for those species would have adverse effects on special status plant species. These areas of protection for soil resources also conserves greater than ten percent of special status plant habitats; therefore, Alternative B management actions for soil would have major beneficial effects on special status plant resources.

Water Resources

Under Alternative B, effects on water resources would be analyzed on a project-specific basis as under Alternative A. However, beneficial effects would be greatly increased under Alternative B through prohibiting surface-disturbing activities or applying an NSO stipulation to activities as on-channel reservoirs, conversion of abandoned oil and gas wells to water supply wells, and activities with 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated habitat. Avoidance areas for other resources would, by nature, be NSO areas for special status plant species. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed. These areas of protection for water resources also conserves greater than ten percent of special status plant habitats; therefore, Alternative B management actions for water would have major beneficial effects on special status plant resources.

Cave and Karst Resources

Under Alternative B, effects on soil, resources would be analyzed on a project-specific basis as under Alternative A. However, beneficial effects would be greatly increased under Alternative B through prohibiting surface-disturbing activities or applying an NSO stipulation to activities in cave and karst areas. Avoidance areas for other resources would, by nature, be NSO areas for special status plant species. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed. These areas of protection for cave and karst resources also conserves greater than ten percent of special status plant habitats; therefore, Alternative B management actions for water would have major beneficial effects on special status plant resources.

Mineral Resources**Locatable Minerals**

Under Alternative B, closing 661,345 acres to leasing or exploration and development of mineral resources or to conserve other resource values would reduce disturbance to special status plant species and result in a restriction of locatable mineral development in one to five percent of

special status plant habitats. This means that, conversely, locatable mineral exploration and development could be permitted in greater than ten percent of special status plant habitats; therefore, management actions for locatable minerals under Alternative B would have major adverse effects on special status plant resources.

Leasable – Coal Minerals

The management action listed under Alternative B is administrative, and will have no effect on special status plant resources.

Leasable – Fluid Minerals

Alternative B limits the exploration and development of fluid mineral resources by closing 2,612,920 acres to leasing. Areas outside of this, where fluid mineral development could be permitted, contain greater than ten percent of special status plant habitats; therefore, management actions for fluid minerals under Alternative B would have major adverse effects on special status plant resources.

Salable Minerals

Alternative B limits the exploration and development of salable mineral resources by the making 661,345 acres (BLM surface) closed or restricted to salable mineral exploration and development. Salable mineral development would be open on 129,431 acres of BLM surface that also contain greater than ten percent of special status plant habitats; therefore, management actions for salable minerals under Alternative B would have major adverse effects on special status plant resources.

Fire and Fuels Management

Unplanned Fire (Wildfire)

Alternative B does not limit use of wildland fire as a tool for achieving management objectives for vegetation, wildlife habitat, or forage, and would manage rehabilitation wherever there is fire-related damage. Alternative B also restricts the use of heavy equipment to existing roads and trails. Adverse effects to special status plant species from this action would likely be minor.

Planned Fire (Prescribed Fire)

Effects to SSS plants from management actions associated with planned fire in Alternative B would be the same as those described in the *Unplanned Fire* section above.

Biological Resources

Though the majority of impacts to Biological Resources are analyzed on a project-specific basis within Alternative A, adverse impacts to special status plant species would be greatly reduced by prohibition of surface-disturbing activities for any other resources protection. This would have a major beneficial effect on special status plant species where targeted vegetation and special status plant species overlap. Avoidance areas for other resources would, in turn, be NSO areas for special status plant species. An NSO stipulation would not prevent all disturbances from occurring. Those activities that require surface disturbance to install underground facilities would still be permitted. Alternative B provides protections and minimizes effects.

Vegetation – Forests and Woodlands

Alternative B forests and woodlands management would promote a natural landscape with little physical management or alteration. This would minimize adverse effects on special status plant

species. In this natural environment, special status plant species would likely persist at current population levels, neither expanding nor decreasing in colony size. Stochastic events that kill entire populations of special status plant species would be more likely under Alternative B without specific management to control insects, disease, and wildfires. Stochastic events are unlikely to eliminate many special status plant populations; therefore, the overall effect is major beneficial due to the prohibitions of disturbance within special status plant habitat.

Vegetation – Grassland and Shrubland Communities

Reclaiming disturbed sites, including split estate lands, close to suitable habitat for special status plant species and known populations of such plants with only native plants would enhance the viability of known populations of special status plant species by decreasing risk of competition from non-native species. This would have beneficial effects on special status plant species. Reclamation of native plants would occur in five to ten percent of special status plant habitat, therefore; management actions for grassland and shrubland communities under Alternative B would have moderate beneficial effects on special status plant resources.

Vegetation – Riparian/Wetland Resources

Under Alternative B, NSOs prohibit surface-disturbing activities within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains. Restoring disturbed sites, including split estate lands, close to suitable habitat for special status plant species and known populations of such plants would increase suitable habitat and promote new, restore historic, or promote the spread and enhance the viability of known populations of special status plant species. Expansion and enhancement of riparian/wetland systems and habitat would have these same long-term beneficial effects on special status plant species that inhabit riparian/wetland ecosystems. These areas also conserve greater than ten percent of special status plant habitats; therefore, management actions for riparian/wetland resources under Alternative B would have major beneficial effects on special status plant resources.

Invasive Species and Pest Management

Under Alternative B, not limiting aerial application of pesticides and treating cheatgrass on a landscape scale would provide an opportunity to apply large-scale treatments on a variety of topography. Over the long term, this management would benefit special status plant species by reducing competition from invasive species and improving the ecological condition of treated sites. Over the short term, this could greatly increase adverse effects on special status plant species. The farther away from riparian areas, wetlands, and special status plant species chemicals are applied, the less the potential for effects associated with vegetation removal, soil disturbances, or chemical spills to these resources. Overall, invasive species and pest management actions associated with Alternative B will be moderately beneficial to special status plant species.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

In addition to analyzing impacts to fish resources on a project-specific basis, Alternative B prohibits surface-disturbing activities and applies NSO stipulations that would directly protect populations of special status plant species and suitable habitat for those species. Surface-disturbing prohibitions for fish resources also conserve greater than ten percent of special status plants habitats. Surface-disturbing prohibitions for special status fish species also conserve five to ten percent of special status plant habitats. Management actions for fish under Alternative B would have major beneficial effects on special status plant habitats. Management actions for special status fish under Alternative B would have minor beneficial effects on special status plant habitats.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

The types of effects to special status plant species from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for wildlife and SSS wildlife. Under Alternative B, though, NSOs prohibit or restrict surface disturbance within greater than ten percent of special status plant habitats; therefore, management actions for both wildlife and special status wildlife resources would have major beneficial effects on special status plant resources.

Heritage and Visual Resources

Cultural Resources

Though the majority of impacts to cultural resources are analyzed on a project specific basis within Alternative A, adverse impacts to special status plant species would be greatly reduced by prohibition of surface-disturbing activities for cultural resource protection in Alternative B. NSOs for cultural resources under Alternative B also conserve greater than ten percent of special status plant habitats; therefore, management actions for cultural resources under Alternative B would have major beneficial effects on special status plant resources.

Paleontological Resources

The types and magnitude of effects to special status plant species from Alternative B would be the same major beneficial effects as described in the *Impacts Common to All Alternatives* section for paleontological resources.

Visual Resources

The types and magnitude of effects to special status plant species from Alternative B would be the same major beneficial effects as described in the *Impacts Common to All Alternatives* section for visual resources.

Land Resources

Forest Products

Under Alternative B, limiting sawtimber sales to specified forest areas and to limited acreages would result in adverse effects on special status plant species. In coordination with resource specialists, special status plant species areas could be specified as sawtimber sale avoidance areas during times of the year when it is most crucial for these plants to remain undisturbed.

Lands and Realty

Under Alternative B, retaining lands with agricultural potential, water, or important natural resources would benefit special status plant species. These lands would be identified up front and assigned a higher level of importance, therefore retaining lands that could also be important for special status plant species. Acquiring new lands also would increase beneficial effects on special status plant species because management for such species on these lands would increase in intensity. Lands identified for tenure adjustments under Alternative B contain less than one percent of known special status plants habitats; therefore, until more inventory is completed, the management actions for lands and realty under Alternative B would have negligible beneficial effects on special status plant resources.

Renewable Energy

Alternative B would exclude renewable-energy development in areas also closed to other forms of

energy development (minerals leasing, locatable minerals, salable minerals, ROW, and other areas where surface disturbance restrictions are applied). This would have beneficial effects on special status plant species where areas with renewable-energy potential and populations of special status plant species overlap. Avoidance areas for other resources would, by nature, be NSO areas for these plant species. Renewable energy could be permitted under Alternative B in greater than ten percent of special status plant habitats; therefore, management actions for renewable energy under Alternative B would have major adverse effects on special status plant resources.

Rights-of-Way and Corridors

Alternative B management of ROW and corridors would benefit special status plant species. Requiring co-location of facilities and identifying and implementing specified utility corridor areas and recreation areas would be a processes that, in coordination with resource specialists, could protect special status plant species by ensuring they are completely avoided. Allowing any other travel in areas limited to designated routes only under a special use permit also would benefit these plant species because holders of special recreation permits are specifically directed via permit stipulation to avoid locations where the BLM has identified populations of special status plant species. However, ROWs and corridors could be permitted within greater than ten percent of special status plant habitats; therefore, management actions for ROWs and corridors under Alternative B would have major adverse effects on special status plant resources.

Travel and Transportation Management

Under Alternative B, motorized vehicle use would be closed in habitat for SSS, resulting in major beneficial effects. If travel was permitted in areas where SSS occur, effects may be similar to those adverse effects described in the *Rights-of-Way and Corridors* section above.

Recreation

Alternative B impacts to special status plant species from SRMA management actions would be the same as impacts under Alternative A, except that Alternative B would manage Burnt Hollow, Dry Creek Petrified Tree, Middle Fork Powder River, Mosier Gulch, Welch Ranch, Weston Hills, and Hole-in-the-Wall as SRMAs. This designation would protect 20,319 acres where special status plant species habitat occurs within the SRMA areas. Another 12,084 acres (fluid mineral estate) of special status plant habitat would be included with the institution of a 0.5-mile buffer surrounding the SRMAs that would be closed to mineral leasing. SRMAs conserve one to five percent of special status plant habitats; therefore, management actions for recreation under Alternative B would have minor beneficial effects on special status plant resources.

Lands with Wilderness Characteristics

Under Alternative B, managing lands with wilderness characteristics (12,237 acres) to emphasize primitive recreational opportunities and natural values would benefit special status plant species. Management would include closing areas to or limiting use of motorized vehicles, closing areas to minerals leasing, excluding ROW, and prohibiting surface-disturbing activities not compatible with retaining or enhancing the areas' natural values. Lands with wilderness characteristics contain one to five percent of special status plant habitats; therefore, management actions for lands with wilderness characteristics under Alternative B would have minor beneficial effects on special status plant resources.

Livestock Grazing Management

Alternative B incorporates several actions to adjust livestock grazing management to achieve multiple resource health and objectives. These measures would result in slightly less grazing pressure and trampling damage to special status plant species. The anticipated adverse effects on

special status plant species from livestock grazing under Alternative B would not occur around most known locations of special status plant species. However, due to the greater emphasis on multiple resource values under Alternative B direct and indirect adverse effects on unknown locations of special status plant species, such as Ute ladies'-tresses orchid, are anticipated to produce slightly fewer adverse effects on populations of special status plant species. Overall, Alternative B livestock grazing management would likely impact between five to ten percent of special status plant habitats and would therefore have moderate adverse effects on special status plant resources.

Special Designations

Areas of Critical Environmental Concern

Under Alternative B, designation of approximately 511,000 acres of ACECs in eight areas would provide additional protections for sensitive habitats and to known and undiscovered populations of special status plant species. Measures identified for the proposed ACECs that would directly benefit special status plant species include: (1) closing areas to or limiting motorized vehicle use; (2) closing areas to minerals leasing; (3) recommending withdrawal of areas from locatable minerals entry; (4) closing areas to salable minerals; (5) excluding ROW; and (6) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values. The eight ACECs contain five to ten percent of the special status plant habitats; therefore management actions for ACECs under Alternative B would have major beneficial effects on special status plant resources.

Scenic or National Back Country Byways

Increased road maintenance and human activity on byways would have adverse impacts to plant species habitat from dust, soil erosion, spread of invasive species, and unauthorized plant collection. Management actions associated with Alternative B will have minor adverse effects on special status plant resources.

Wild and Scenic Rivers

If Congress denies the nomination to designate the Middle Fork Powder River as a WSR, the river will be managed to maintain its natural characteristics, resulting in negligible beneficial effect to special status plant resources, as management would occur on less than one percent of special status plant habitat.

Wilderness Study Areas

Under Alternative B, ensuring protective management of WSAs would provide an additional 28,931 acres of protection for sensitive habitats and known and undiscovered population of special status plant species. Measures identified for the WSAs that would directly benefit special status plant species include: (1) closing the areas to minerals leasing; (2) recommending withdrawal of the areas from locatable minerals entry; (3) closing the areas to salable minerals; (4) excluding ROW; (5) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values; and potentially (6) prohibiting all motorized and mechanized equipment. The three WSAs contain five to ten percent of the special status plant habitats; therefore, management actions for WSAs under Alternative B would have moderate beneficial effects on special status plant species.

4.4.7.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to special status plant species due to its implementation.

Special Status Species – Plants

Alternative C management actions for special status plant species include prohibiting activities (surface disturbances, minerals exploration, motorized vehicle use, explosives and blasting, aerial application of herbicides, and use of fire suppression chemicals) in known populations of special status plant species. This approach would protect only known populations of special status plant species populations. Although this is a protective approach for special status plant species, it would not protect potential future populations and, absent the conservative approach under Alternative B, activities allowed in suitable habitat for these plant species could preclude proliferation of these special status plant species through future active management decisions.

Impacts from management of resources under Alternative C would, in most cases, be similar to those described for Alternative A and under the *Impacts Common to All Alternatives* section. Where impacts to special status plant species would vary in degree from impacts under Alternative A, further rationale is provided below.

Physical Resources

Air Quality

Under Alternative C, there would be no air quality modeling. Industrial projects would approach or exceed emissions standards, and no mitigation strategies would be examined. This would have indirect adverse effects on special status plant species. Plants are perhaps more sensitive to air pollutants than humans. In particular, acid rain has left areas barren or with severely damaged vegetation. Entering leaves of plants from the stomata during normal gas exchange, both ground-level ozone and reactive nitrogen can cause discoloration, damage, and loss of leaves, reducing photosynthesis by as much as 50 percent. Reactive nitrogen increasingly wafts into the atmosphere from exhaust pipes, power plants and factories, and from fields doused with ammonia-based fertilizer and from manure piles associated with cattle feedlots. As a result, biologically significant quantities of reactive nitrogen are now reaching the highest places. In the Colorado Rockies, reactive nitrogen has increased the metabolic activity of certain soil microbes and overturned once-stable communities of algae in high-altitude lakes. Some species such as native bunchgrasses and alpine bluebells are responding favorably. Others, however, appear to be losing ground, among them a slow-growing bog sedge. At lower elevations in the western United States, introduced grasses stoked by nitrogen are overwhelming many ecosystems (Nash 2009). Plants also become more vulnerable to attacks by pests, disease, and other environmental disasters. Consequently, the plant's ability to store food, grow, and reproduce is hindered. The effect would be moderate and adverse.

Soil

Under Alternative C, soils management actions would include allowing surface-disturbing activities on slopes equal to or greater than 25 percent and on soils with a severe erosion hazard, and allowing proposed activities on badlands, rocky outcrops, or on slopes susceptible to mass movement. This would affect 218,928 acres. Alternative C would not limit vehicular travel on saturated soils or require closure and reclamation of roads if they are heavily eroded, washed out, or if other access roads in better condition are available. All these actions would allow activities

on all soil types, regardless of any soil-limiting properties. These actions would not protect soil resources and would promote soil and water erosion, which would have an indirect, major adverse effect on special status plant species by reducing the health of the medium in which plants grow. Surface-disturbing activities would be permitted within greater than ten percent of special status plant habitats; therefore, management actions from soil under Alternative C would have major adverse effects on special status plant resources.

Water Resources

Watershed management actions that would allow surface disturbances within 500 feet of any natural or man-made water feature would have a direct adverse effect on special status plant species where these resources overlap, and on water quality in these sensitive sites. Additional project-specific allowances for on-channel reservoirs even though they could adversely affect natural flow regimes could indirectly adversely affect special status plant species communities by transitioning the plant species in those communities and providing an opportunity for invasive plant species to move into these sites. Surface-disturbing activities would be permitted within greater than ten percent of special status plant habitats; therefore, management actions for water under Alternative C would have major adverse effects on special status plant resources.

Cave and Karst Resources

Management actions under Alternative C for cave and karst resources include establishing project-specific buffers from significant cave entrances to minimize the effects of surface-disturbing activities in cave and karst areas. Implementation of a Cave Management Plan would directly benefit special status plant species because it would limit disturbance of the vegetative community from minerals development or by people. The area of protection would be just at the cave entrances. Alternative C would not restrict livestock grazing in areas with cave and karst resources. Although known populations of special status plant species would be avoided, this would have a direct adverse effect on special status plant species where cave and karst resources and populations of special status plant species are adjacent to each other. Surface-disturbing activities would be permitted within five to ten percent of special status plant habitats otherwise protected by cave and karst resources. Management actions for cave and karst resources under Alternative C would have a moderate adverse effect on special status plant species.

Mineral Resources

Locatable Minerals

At present, the Amsden Creek, Middle Fork Canyon, and Kerns game ranges are withdrawn from minerals location. Locatable minerals activities are restricted in the Fortification Creek, Gardner Mountain, and North Fork WSAs. Alternative C does not include new recommendations for withdrawals or restrictions. The existing withdrawals and restrictions were imposed for the protection and preservation of other resource values. Effects to SSS plants associated with locatable mineral management actions in Alternative C would be the same as those described in Alternative A.

Leasable Minerals – Coal

The management action listed under Alternative C is administrative, and will have no effect on special status plant resources.

Leasable Minerals – Fluids

Continuing to lease and allow development of federal oil and gas would result in disturbance adjacent to 34 known populations of special status plant species and 243,929 acres

of suitable habitat for such species. Most surface-disturbing activities would require successful reclamation. Native grasses and forbs would dominate reclaimed sites initially, and forbs and shrubs would return over a longer period. Erosion and decreased vegetative cover would occur from soil compaction and the channelization of surface runoff in ruts and road ditches. There is no anticipated disturbance from geothermal activities.

Alternative C does not include new recommendations for withdrawals or restrictions. The existing withdrawals and restrictions were imposed for the protection and preservation of other resource values. Under Alternative C, not protecting additional areas would have an adverse effect on special status plant species.

Leasable fluid mineral development would be permitted within greater than ten percent of special status plant habitats; therefore, management actions for fluid mineral under Alternative C would have major adverse effects on special status plant species.

Salable Minerals

Effects to SSS plants associated with salable mineral management actions in Alternative C would be the same as those described in Alternative A.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Alternative C management actions involving the application of full suppression regardless of other resource objectives would have a direct adverse effect on populations of special status plant species. The use of heavy equipment with few constraints would have a direct adverse effect on these vegetative communities over the short and long terms by increasing opportunities for water and soil erosion and invasive plant establishment. Alternative C fire and fuels management would have a minor adverse effect on special status plant species.

Biological Resources

Vegetation – Forests and Woodlands

The removal of trees would increase under Alternative C. This would open larger spaces in the forest, which would alter the habitats of most of the special status plant species in the planning area. Forests and woodlands contain greater than ten percent of special status plant habitats; therefore, the management actions for forests and woodlands under Alternative C would have major adverse effects on special status plant resources.

Vegetation – Grassland and Shrubland Communities

Under Alternative C, allowing desirable non-native plant species for initial reclamation activities would have an adverse effect on special status plant species. Although reclamation of any kind is generally beneficial to special status plant species, this action could promote the growth of non-native plant species that could out-compete these special status plant species. This type of reclamation is likely to occur adjacent to greater than ten percent of populations of special status plants; therefore, management actions for grassland and shrubland communities would have major adverse effects on special status plant resources.

Vegetation – Riparian/Wetland Resources

Under Alternative C, management actions for riparian and wetland communities would allow surface-disturbing and disruptive activities and apply standard lease terms for mineral leasing

within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains. This would have a direct adverse effect on the adjacent grassland and shrubland communities by promoting activities that would lead to erosion of soils and water. Restoring vegetation only on direct CBNG disturbance areas (e.g., dams and reservoirs) rather than on all CBNG-supported riparian and wetland systems would apply reclamation only to a very small number of the systems overall. The larger systems would be very susceptible to water-tolerant invasive species such as salt cedar and Canada thistle. Surface-disturbing activities would be permitted within greater than ten percent of special status plant habitats; therefore, the management actions for riparian/wetland resources under Alternative C would have major adverse effects on special status plant resources.

Invasive Species and Pest Management

Under Alternative C, restricting aerial application to only the use of pesticides would limit the application of pesticides to terrain accessible only by foot. This would mean only small acreages would be treated. This would have a short-term beneficial effect on special status plant species because it would be less likely that populations of these species would receive any pesticide application. However, adverse effects to these plant species would be likely over the long term by giving invasive species a competitive advantage over the native special status plant species. Annually treating only designated areas for cheatgrass would be ineffective, because only small, scattered treatments would occur; therefore, most of the cheatgrass would be unaffected. This would have an adverse effect on native special status plant species. Overall, Alternative C invasive species and pest management would have a minor beneficial effect on special status plant species.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Fish management actions under Alternative C include allowing surface-disturbing and disruptive activities within 0.25 mile of naturally occurring water bodies or WGFD Class 1 or 2 trout streams, but not within 500 feet of these areas. This management would not limit the number of activities and would apply a minimal project distance from streams. Disturbing soils and vegetation increases the potential for soil and water erosion and indirectly contributes to the decline in water quality over the long term. These areas also are very susceptible to hydrophilic invasive species such as Canada thistle and salt cedar that would out-compete special status plant species, essentially removing populations of these plant species communities. Surface-disturbing activities would be permitted in one to five percent of special status plant habitats; therefore, management actions for fish and special status fish resources under Alternative C would have minor adverse effects on special status plant resources.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

A number of wildlife management actions would be implemented on a project-specific basis under Alternative C. There would be no limitations on distance and timing for projects. There would be no prohibitions on surface disturbance and occupancy in or near big game or other wildlife areas. Traditional migration and travel corridors would be managed in coordination with other resources and there would be no effort to introduce or augment wildlife species. Not prohibiting or limiting surface-disturbing activities in designated areas and during designated periods would increase opportunities for soil and water, provide additional large-scale opportunities for invasive species to establish, decrease the ecological condition of communities of special status plant species and associated habitats, and augment fragmentation of these plant communities. This would have an indirect adverse effect on communities of special status plant species over the long term. Surface-disturbing activities would be permitted within greater than ten percent of special status plant habitats; therefore, management actions for wildlife and special status wildlife resources would have major adverse effects on special status plant resources.

Heritage and Visual Resources

Cultural Resources

Alternative C would allow surface disturbance in areas with historic properties, or within 5 miles of historic properties. This would adversely affect special status plant species by increasing opportunities for soil and water erosion, invasive species to become established, and for direct removal of special status plant species. Surface-disturbing activities would be permitted within greater than ten percent of special status plant habitats; therefore, management actions for cultural resources under Alternative C would have major adverse effects to special status plant resources.

Paleontological Resources

Management actions limiting the requirement for paleontological field surveys to all PFYC Class 4 and 5 formations potentially affected by proposed activities would affect 28,177 acres. Not restricting surface-disturbing activities would subject the vegetation for possible large scale surface disturbance. This would increase the opportunity for undocumented special status plant species to be directly removed. Alternative C would have adverse impacts to special status plant species. Conversely, though, by identifying paleontological casual collection areas, Alternative C effects could reduce the potential of trampling or eliminating vegetation and compacting soils throughout the footprint of the access and general casual use areas. The greater the distance from riparian areas, wetlands, sand dunes, and other such habitats containing special status plants are avoided, the lesser the potential for effects associated with this vegetation and soil disturbance. It is likely that one to five percent of special status plant habitats would be impacted; therefore, direct minor adverse effects to special status plant species would occur from paleontological management actions associated with Alternative C.

Visual Resources

VRM Class I and II areas could prohibit or limit some surface-disturbing activities and thereby protect potential special status plant communities. VRM Class III and IV areas have minor limitations. Managing VRI Class II as VRM Class III would manage more permissively, thus allowing more surface-disturbing activities to occur which would adversely affect special status plant species by increasing the opportunities for soil and water erosion and invasive species to get established; 167,334 acres would be managed as VRM Class III. Thirty-three special status plant species populations (greater than ten percent of all known populations) are contained in areas currently classified as VRM Class II. The effects of this management would be major and adverse.

Land Resources

Forest Products

Alternative C effects special status plant species from forest product management actions would be similar to effects under Alternative A, except management under Alternative C would increase adverse effects because the sale of forest products would no longer be limited to minor products, there would be no acreage limits, and the intent would be to maximize the removal of harvested products. Offering an greater array of products would intensify the adverse effects described for Alternative A. In addition, not fencing regeneration areas would subject special status plant species that would colonize these areas to grazing and potential removal. Alternative C management of forest products would increase the adverse effects from the moderate effects identified in Alternative A to major for Alternative C.

Lands and Realty

Under Alternative C, disposing of lands with agricultural potential, water, or important natural

resource values would likely reduce beneficial effects on special status plant species compared to Alternative A or B, which either considers these values on a project-specific basis or requires the retention of these lands based on these important values, respectively.

Renewable Energy

Alternative C would allow renewable-energy development in areas open to other forms of energy development (minerals leasing, locatable minerals, and salable minerals). This would have an adverse effect on special status plant species where areas with renewable-energy potential and populations of special status plant species overlap. Renewable energy would be permitted in less than one percent of special status plant habitats; therefore, management actions for renewable energy under Alternative C would have negligible adverse effects on special status plant resources.

Rights-of-Way and Corridors

Alternative C ROW and corridors management actions would greatly increase potential adverse effects on special status plant species. Management actions would not relocate proposed new roads and access routes to those already in existence and would not prohibit ROW on slopes equal to or greater than 25 percent or on highly erodible soils. Not limiting surface disturbance and not avoiding activities on slopes equal to or greater than would have an adverse effect on vegetation by increasing the potential for soil and water erosion. (See the *Soil* section above for a description of direct adverse effects on special status plant species from this management.)

Travel and Transportation Management

Effects to SSS plants from management actions associated with travel and transportation in Alternative C would be similar to those described in the *Rights-of-Way* section above. The area available for motorized recreation would have an adverse effect on vegetative resources, including special status plant species habitat.

Recreation

Under Alternative C, there could be adverse effects on special status plant species from management actions specific to recreation. Hiking to or occasional repeated use of remote camp sites could have direct effects on special status plant species. Plants could be trampled or crushed, and soil could be compacted or disturbed. Holders of Special Recreation Permits are required to follow all rules and regulations, therefore, should avoid camping at locations where the BLM has identified populations of special status plant species. Lands will be managed in accordance with other resource values, including surface disturbing activities and placement of recreational facilities, which should alleviate some impacts to special status plant species. Given the low level of recreation use on most BLM-administered lands in the planning area, and the scattered, infrequent locations of populations of special status plant species, these adverse effects would mostly be minor.

Lands with Wilderness Characteristics

Alternative C actions include managing areas with wilderness characteristics consistent with management for the surrounding areas; there would be no specific management objectives for these areas. Alternative C would result in no effect on special status plant species.

Livestock Grazing Management

Livestock grazing management actions under Alternative C include allowing increases in livestock stocking rates as a result of vegetative treatments and providing a minimum of two years rest following prescribed fire, wildfire (in lieu of an approved plan), and other vegetative treatments. These actions would compromise the health of vegetative communities, potentially

including special status plant species. Livestock are often attracted to new vegetation following vegetative treatments and fires. If not monitored, these sites can be over utilized, and increasing stocking rates could compound the issue. Two years of rest might not be sufficient to achieve preferred ecological condition and vegetation management goals. Grazing of young seedling plants would reduce their competitiveness toward more aggressive type plants, which often are invasive or less-preferred species. This could prevent the restoration of populations of special status plant species or spread of existing plant populations, or permanently change the vegetative composition of suitable habitat for special status plant species. By not allowing for a more natural landscape in areas important to special status plant species, Alternative C would have fewer beneficial effects on these species, although increases in adverse effects are not discernible. Alternative C also incorporates actions to adjust livestock grazing management to make livestock grazing the first priority. This measure would result in increased grazing pressure and trampling damage to special status plant species. The anticipated adverse effects on special status plant species from livestock grazing under Alternative C would likely increase in grazing allotments that contain suitable habitat for special status plant species. (See Alternative A for this overlap.) In addition, Alternative C would allow livestock salt or mineral supplements within 500 feet of water sources, riparian areas, and aspen stands. Overall, Alternative C livestock grazing management would have a major adverse effect on special status plant species.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways

Impacts to SSS plants associated with special designations management actions for ACECs and scenic or BCBs in Alternative C would be the same as those described in Alternative A.

Wild and Scenic Rivers

Under Alternative C, if Congress decides not to designate the Middle Fork Powder River as a WSR, then its free-flowing and natural characteristics will not be maintained. Increased surface disturbance near the river could impact flow regime, water quality, and riparian vegetation communities could occur on less than one percent of habitat important to special status plants, resulting in negligible adverse impacts.

Wilderness Study Areas

Effects to special status plant resources from management actions for WSAs in Alternative C will be the same as those described in Alternative A.

4.4.7.6. Alternative D

This section describes management actions under Alternative D, which employs a combination of resource conservation and resource use, and the likely impacts to special status plant species resources due to their implementation and potential impacts to special status plant species from those management actions.

Special Status Species – Plants

Similar to Alternative B, Alternative D management actions for special status plant species include prohibiting activities in known populations of special status plant species. Alternative D would allow aerial application of narrow-spectrum herbicides to protect habitat areas from invasive species encroachment. Use of fire suppression chemicals would be allowed consistent with the biology of the plant or where human safety or property is at risk. In addition, a CSU stipulation would be applied to mineral leases in SSS plant habitat, and livestock grazing

would be managed in a way to protect special status plants. Before the BLM approved any project or activity that could affect habitat for these species (as modeled by the WYNDD or the BLM), surveys for potential SSS plants would be performed. Through this management, there should be no adverse effects on existing populations of special status plant species. However, this approach would not protect future populations. Absent the conservative approach of Alternative B, activities allowed in suitable habitat for special status plant species could preclude proliferation of these species through future active management decisions. Overall, Alternative D would have a minor beneficial effect on special status plant species.

Impacts from management of resources under Alternative D would, in most cases, be similar to those described for Alternative A and under Impacts common to all alternatives. Where impacts to special status plant species would vary in degree from impacts under Alternative A, further rationale is provided below.

Physical Resources

Air Quality

Impacts to SSS plants associated with air quality management actions in Alternative D would be the same as those described in Alternative B.

Soil

Alternative D effects on special status plant species from soils management actions would be similar to impacts under Alternative B, except that Alternative D could allow activities by exception on 215,496 acres of highly erosive soils, 170,590 acres on slopes equal to or greater than 25 percent, 455,090 acres of soils with poor reclamation suitability and, although on a limited basis, on 218,928 acres of badlands, rock outcrops, and slopes susceptible to mass movement. In addition, applying a CSU stipulation to oil and gas leases could result in effects on special status plant species: 669,739 acres of highly erosive soils, 412,145 acres on slopes equal to or greater than 25 percent, 1,514,445 acres of soils with poor reclamation suitability and, although on a limited basis, on 685,950 acres of badlands, rock outcrops, and slopes susceptible to mass movement that could be associated with a federal mineral lease. For Alternative D effects to be the same as those under Alternative B, these exceptions would have to be evaluated for the presence of special status plant species or suitable habitat, and would be granted where there would be conflicts. CSU stipulations would overlap greater than ten percent of special status plant habitats; therefore, Alternative D soils management would have major beneficial effects on special status plant species.

Water Resources

Alternative D water management actions would allow surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams; would apply a CSU stipulation on oil and gas leases; and would evaluate unneeded reservoirs. There is no identified habitat for special status plant species habitat within the CSU areas. Under Alternative D, beneficial effects on special status plant species would be the same as under Alternative B, and would result from water management actions that encourage the use of alternative energy sources to power new water resource developments rather than overhead power or petroleum-based power and actions that manage riparian and upland areas to restore perennial flows or standing water and consider other resource values. Overall water management actions in this alternative will have a major beneficial effect on special status plant species.

Cave and Karst Resources

Under Alternative D, the types of effects associated with cave and karst resource management actions would, in general, be the same as effects under Alternative A, except that Alternative D would restrict livestock from cave entrances. This would decrease the potential for impacts caused by trampling or grazing of special status plant species. In addition, implementing a Cave Management Plan for the entire planning area would increase potential beneficial effects on special status plant species where cave and karst resources overlap such species. Cave and karst resources in the planning area overlap greater than ten percent of suitable habitat for special status plant species. Overall, Alternative D cave and karst management would have a major beneficial effect on special status plant species.

Mineral Resources

The amount of minerals extraction that would occur under this alternative would substantially increase land use intensity, and would result in a greater potential for loss or degradation of riparian and other habitats that support SSS plants. Alternative D would have a major adverse effect on special status plant species.

Locatable Minerals

Alternative D management actions for locatable minerals would have effects on special status plant species similar Alternative B, although Alternative D opens more area (4,720,586 acres) to locatable minerals entry. This would have a moderate adverse effect on special status plant species.

Leasable Minerals – Coal

The management action listed under Alternative D is administrative, and will have no effect on special status plant resources.

Leasable Minerals – Fluids

Alternative D effects on special status plant species from fluid minerals management would be the same as effects under Alternative C, with 3,314,254 acres open to oil and gas leasing. The areas open to fluid mineral development could affect greater than ten percent of special status plant habitats; therefore, management actions for fluid minerals under Alternative D would have major adverse effects to special status plant resources.

Salable Minerals

Alternative D effects on special status plant species from salable minerals management would be the same as effects under Alternative C, with 2,725,060 acres open to salable minerals disposal. The areas open to salable mineral development could affect greater than ten percent of special status plant habitats; therefore, management actions for salable minerals under Alternative D would have major adverse effects to special status plant resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative D, effects on special status plant species would be similar to the effects under Alternative B, except that Alternative D would increase beneficial effects through rehabilitating fire damage on an as-needed basis only. This could result in an increase in natural (re)occurrences of special status plant species.

Biological Resources

Allowing desirable non-native plant species for short-term reclamation activities and managing riparian and wetland systems capable of achieving DFC are actions included in Alternative D vegetation management. The persistence of desirable non-native plants could have more adverse effects on special status plants if proliferation of non-native plants caused loss of suitable habitat for SSS plants. In addition, under Alternative D, activities could be allowed by exception on greater than ten percent of habitat for special status plant species within 500 feet of riparian/wetland systems and aquatic habitats. For Alternative D effects to be the same as effects under Alternative B, these exceptions would have to be evaluated for the presence of special status plant species or suitable habitat, and would not be granted where there would be conflicts.

Vegetation – Forests and Woodlands

The types of effects to special status plant species from Alternative D would be the same beneficial effects as described in the Alternative C, *Forests and Woodlands* section.

Vegetation – Grassland and Shrubland Communities

Allowing use of desirable non-native plant species for short-term reclamation activities will result in better soil stabilization and reclamation success over the long-term. Following up with native plants will benefit special status plants species by decreasing the risk of competition with non-native species. Overall, management actions associated with Alternative D for grassland and shrubland communities will have major beneficial effects on special status plant species.

Vegetation – Riparian/Wetland Resources

Under Alternative D, both adverse and beneficial effects to special status plant species will occur. Allowing surface disturbance within 500 feet of riparian and wetland areas could result in adverse impacts to potential habitat for special status plant species; however, a CSU on fluid mineral leases and restoration of CBNG supported habitats according to ecological site potential will allow for management of DPCs and control over surface disturbing activities. Overall, management activities for riparian/wetland resources associated with this alternative will have a major beneficial effect on special status plant species.

Invasive Species and Pest Management

Effects to SSS plants associated with invasive species and pest management actions in Alternative D would be the same as those described in Alternative B.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Alternative D effects on special status plant species from fish management, including SSS fish, would be similar to effects under Alternative B. Under Alternative D, though, activities could be permitted by exception within greater than ten percent of suitable habitat for special status plant species within 0.25 mile of naturally occurring water bodies that contain native and desirable non-native fish species; therefore, management actions for fish and special status fish resources would have moderate beneficial effects on special status plant resources.

Fish and Wildlife Resources – Wildlife

Alternative D effects on special status plant species from wildlife management actions would be similar to those under Alternative B. Alternative D, though, could allow aboveground facilities by exception on the 75,175 acres of elk crucial winter range and calving areas that overlap currently identified SSS plant habitat, and could allow disturbance by exception on greater than ten percent of SSS plant habitat; therefore, management actions for wildlife under Alternative D would have

major beneficial effects on special status plant resources. For Alternative D effects to be the same as those under Alternative B, exceptions would have to be evaluated for the presence of special status plant species or suitable habitat, and would not be granted where there would be conflicts.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative D effects on special status plant species from wildlife management would be similar to those under Alternative B. Alternative D, though, could allow disturbance activities by exception on 6,156 acres of black-tailed prairie dog colonies and 176,636 acres of special status amphibian, reptile, and bat species habitat that overlaps currently identified habitat for special status plant species plant. For these effects to be the same as those under Alternative B, exceptions would have to be evaluated for the presence of special status plant species or suitable habitat, and would not be granted where there would be conflicts. In addition, under this alternative, the NSO stipulations for special status raptor species would increase or decrease compared to other alternatives because the buffers would be species specific; these raptor buffers overlap 17,417 acres of suitable habitat for special status plant species.

With its habitat removal allowances, compared to Alternative B, Alternative D would protect 56,516 fewer acres of suitable habitat for special status plant species present in areas with suitable nesting habitat for Greater Sage-Grouse and 13,016 fewer acres of suitable habitat for special status plant species present in areas of suitable winter habitat for Greater Sage-Grouse.

Overall, surface-disturbing activity restrictions for special status wildlife resources would conserve greater than ten percent of special status plant habitats; therefore, management actions for special status wildlife resources would have major beneficial effects on special status plant resources.

Heritage and Visual Resources

Cultural Resources

The types of effects under Alternative D cultural resources management would be the same as those under Alternative B, except that Alternative D would protect one to five percent of suitable habitat for special status plant species through cultural resources NSO restrictions and greater than ten percent through cultural resources CSU restriction. This would have a major beneficial effect on special status plant species.

Paleontological Resources

Effects to SSS plants associated with paleontological resource management actions in Alternative D would be the same as those described in Alternative B.

Visual Resources

Effects to SSS plants associated with VRM actions in Alternative D would be the same as those described in Alternative B.

Land Resources

Forest Products

Under Alternative D, short-term adverse effects on special status plant species and their habitats would be the same as under all other alternatives. However, Alternative D would allow harvest with no limit on area size managed within ecologically stable limits. Long-term beneficial effects would be similar to those under alternatives B and C. Under Alternative D, there would

be conflicts between the harvest of forest products and management five to ten percent of suitable habitat for special status plant species. This would have a minor adverse effect on special status plant species.

Lands and Realty

Impacts to SSS plants associated with lands and realty management actions in Alternative D would be the same as those described in Alternative B.

Renewable Energy

The types of effects associated with renewable energy management under Alternative D would be the same as those under Alternative B, except that Alternative D would exclude greater than ten percent of suitable habitat for special status plant species from renewable energy development and would manage greater than ten percent as ROW exclusion or avoidance areas. New communications sites, transmission lines, and ground facilities outside existing disturbance areas or ROW corridors could be allowed by exception. For these effects to be the same as those under Alternative B, exceptions would have to be evaluated for the presence of special status plant species or suitable habitat, and would not be granted where there would be conflicts.

Rights-of-Way and Corridors

Effects to SSS plants from management actions associated with ROWs in Alternative D would be the same as those described in the *Renewable Energy* and *Travel and Transportation Management* sections.

Travel and Transportation Management

Alternative D effects on special status plant species plants and their habitat from the management of transportation and access would be similar to Alternative B, except that Alternative D would allow motorized vehicle use in SSS habitat, but not within known populations. Travel would be restricted to designated roads and trails, consistent with other resource values. Motorized travel within special status plant habitat may reduce suitability through soil and water erosion, resulting in adverse impacts in over ten percent of habitat important to special status plants species. However, designating routes outside occupied habitat would reduce the effects to minor.

Recreation

The types of effects from Alternative D management of recreation would be the same as those under Alternative B. Alternative D would designate seven areas, three of which contain a total of one to five percent of suitable all habitat for special status plant species, as SRMAs. Therefore, management actions for recreation under Alternative D would have minor adverse effects on special status plant resources.

Lands with Wilderness Characteristics

The types and magnitude of effects to special status plant species from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for wilderness characteristics.

Livestock Grazing Management

Under Alternative D, the types of effects on special status plant species from management actions associated with livestock grazing management would be the same as those under Alternative B. Alternative D identifies areas that are incompatible to livestock grazing (recreation, steep slopes, etc.) that also coincides with five to ten percent of suitable habitat for special status plant species. Alternative D would also prohibit the placement of salt or mineral supplements on greater than ten percent of suitable habitat, which would avoid trampling damage. Unrestricted livestock

grazing could be permitted in greater than ten percent of special status plant habitats; therefore, management actions for livestock grazing management would have major adverse effects on special status plant resources.

Special Designations

Areas of Critical Environmental Concern

Under Alternative D, no ACECs are proposed that overlap with known SSS habitat, therefore management actions would have no effect. If special status plants are found within designated ACECs in the future, then management actions would be beneficial.

Scenic and Back Country Byways

Effects to special status plant species associated with scenic and BCBs management actions in Alternative D would be the same as those described in Alternative B.

Wild and Scenic Rivers

Effects to special status plant species associated with WSRs management actions in Alternative D would be the same as those described in Alternative B.

Wilderness Study Areas

Effects to SSS plants associated with WSA management actions in Alternative D would be the same as those described in Alternative B.

4.4.7.7. Cumulative Impacts

Cumulatively, adverse effects on Threatened, Endangered, Proposed, Candidate, and Sensitive species are expected in the planning area. There would be many cumulative short- and long-term disturbances to these species, which would stem from several sources. Included in the cumulative effects evaluated are the direct effects of oil and gas (CBNG and non-CBNG) extraction and development of new oil and gas wells on adjacent lands. Oil and gas development would occur on a mix of federal, state, private, and split estate lands. Additional activities that occur on all of these lands and contribute to cumulative effects on special status plant species in the planning area include coal mining; uranium mining; sand, gravel, and scoria mining; ranching; agriculture; construction of roads and railroads; recreation; and development of rural and urban housing.

The primary uses and management practices on lands adjacent to BLM-administered lands would have the greatest potential to affect special status plant populations and their habitats. Adjacent ownerships that have been converted to hayland or cropland or that are overgrazed provide little opportunity for populations of special status plant species to expand.

Dewatering of streams for irrigation and development of springs and headwaters of small streams for livestock watering alters the hydrologic cycle and contributes to a reduction in riparian and wetland habitat that supports special status riparian plants. Trampling of spring sources and stream banks by livestock and wildlife also contributes to lowered water tables and a diminution of wetland habitat. Loss of riparian and wetland habitat would likely result in population declines of species such as the Ute ladies'-tresses orchid.

4.4.8. Special Status Species – Fish

This section describes potential direct, indirect, short-term, and long-term effects on special status fish species under each alternative and whether those effects would be beneficial or adverse. The Yellowstone cutthroat trout is the only special status fish found in the planning area. [Map 28](#) shows the distribution of special status fish in the planning area.

Actions that contribute to the decline in special status fish abundance or range would result in adverse effects. Conversely, beneficial effects would result from actions that increase special status fish population numbers or viability, protect habitats, or reduce the risk of harm to these species in the planning area.

For purposes of this analysis, short-term impacts to special status fish species would result from activities that contribute to the decline in abundance or distribution of a species, but which recover within five years of after the activities. Long-term effects would require more than five years for recovery.

Surface-disturbing activities, water depletions, sedimentation, changes instream hydrology, increased sedimentation, changes in water quality, and introduction of exotic species (e.g., mussels or whirling disease) could affect special status fish. The primary means by which direct impacts to special status fish could occur are surface development (e.g., mining and urbanization), loss of sufficient upland and riparian vegetation that increases sedimentation, and discharge or runoff of poor-quality water. Indirect effects on SSS would result from actions that aid or compromise the protection of special status fish species. Indirect effects on potential habitats for special status fish species also could result from actions, such as those listed above, that change habitats in a way that makes them unsuitable.

Erosion can lead to increased turbidity and sedimentation, which can inhibit feeding and spawning success. Sedimentation can suffocate or starve bottom-dwelling insects, an important food source for fish. Developing eggs can be smothered in sediment, and newly hatched fry can be killed by sediment that prevents emergence from spawning gravels and interferes with respiration. Suspended sediments can inhibit respiration. Developing fish eggs and larvae need a constant supply of cold, oxygen-rich water that flows through the interstitial spaces instream gravels. Embedded sediments limit essential winter habitat used by juvenile fish for feeding and cover from predators. The filling of pools with sediment further limits overwintering sites for juvenile and adult fish.

A second, potentially major adverse impact to Yellowstone cutthroat trout is the introduction of diseases, such as whirling disease, and invasive species, such as mussels. Humans, vehicles, water haul trucks or aircraft, and livestock, can transport infected sediments or water. The effects of introduced species such as mussels or whirling disease can be major. Managing to protect against introduced species or disease is problematic. The only practical way to mitigate this issue is through outreach and education.

4.4.8.1. Methods and Assumptions

This section describes the methods and assumptions used in impact analysis. The assumptions and methods include the following:

- The analysis is on a watershed scale.

- Management actions that preclude or restrict development, including those not specifically aimed at conserving special status fish species, are assumed to benefit those species where populations overlap management action boundaries.
- The total amount of new surface disturbance allowed under each alternative is an index of potential impacts to special status fish. The success of reclamation measures would vary. It is assumed that BLM-applied reclamation would be successful in preventing impacts to special status fish.
- Surface-disturbing activities in special status fish habitat would result in adverse effects.
- Implementing all actions prescribed in USFWS Biological Opinions for Threatened or Endangered species would have a beneficial effect on sensitive fish species.

Significance Criteria

In addition to the scale of impacts listed in the beginning of this chapter, an adverse impact on fish species as a result of project actions would be considered potentially significant if there was: (1) substantial loss of the biological integrity and habitat function of aquatic ecosystems that would make species eligible for listing under the ESA; (2) decreased viability or increased removal of Threatened, Endangered, Proposed, or Candidate species, or adverse alteration of their critical habitats; and (3) substantial loss of habitat function or disruption of life history requirements of SSS that would preclude improvement of their status.

Management of **Air Quality, Forest Products, Lands with Wilderness Characteristics, Back Country Byways, Wild and Scenic Rivers, and Wilderness Study Areas** would have no effect on special status fish species and are not further addressed in the **Special Status Species – Fish** section.

4.4.8.2. Impacts Common to All Alternatives

Physical Resources

There would be beneficial effects on special status fish species from proper management of soil and water resources. Implementing mitigation measures to protect soils and water on a project-specific basis, particularly in riparian zones of watersheds, would reduce disturbance to fish habitats and help in the recovery of aquatic habitats from permitted uses. Improper management of soil and water resources can lead to increased sediment loads in affected watersheds.

Soil

Evaluating the effects on soil resources from a proposed surface-disturbing activity using NRCS Soil Survey data or onsite investigations would help in the application of mitigation measures, relocate the activity to a more suitable soil type, or deny the authorization. This management of soil resources would influence greater than 10 percent of the special status fish habitats in the planning area; therefore, management actions common to all alternatives for soil would have a major beneficial effect on special status fish resources.

Water Resources

Water resources management actions would beneficially affect special status fish by reducing sedimentation, increasing aquatic vegetation and macro-invertebrates through (1) providing an alternative or “off-source” water supply (e.g., piping water to troughs, tanks, or ponds) in

locations where BLM-authorized uses are fenced out of water sources; (2) installing flow-control devices on new and existing BLM-authorized water wells and spring developments and evaluating the need for additional flow-control devices on a project-specific basis; (3) managing water resources to meet the Wyoming Standards for Healthy Rangelands and achieve PFC; (4) take appropriate actions to improve the biological, chemical, and geomorphic conditions of streams adversely affected by BLM-authorized actions and permitted activities; and (5) design and manage land use and surface-disturbing activities to reduce channel and bank erosion and the associated loss of riparian habitats. All these actions influence greater than 10 percent of the special status fish habitats in the planning area and would have a major beneficial effect on special status fish resources.

Cave and Karst Resources

Management actions common to all alternatives for cave and karst include inventories of cave and karst resources. This would have no effect on special status fish resources.

Mineral Resources

Instream reaches where there is Yellowstone cutthroat trout habitat congruent with BLM-administered lands, mineral rights are held by the federal government. Most streams representing Yellowstone cutthroat trout habitat are administered by the USFS, with the BLM holding the federal mineral estate. In such situations, minerals development would require a permit from the USFS for surface disturbance and a permit from the BLM for the federal mineral. Mining on National Forest System lands could affect Yellowstone cutthroat trout and its habitat on BLM-administered lands.

In general, surface mining activities increase erosion and accelerate sediment production and input into nearby lakes and streams. Streams can be dewatered or rechanneled to accommodate surface mines. Surface mining operations also have the potential to increase pollution that could enter streams through runoff and disrupt subsurface and surface water flow patterns. Bridges, culverts, and low-flow crossings are integral features in road development associated with surface mining. If not properly designed, these features also can interfere with fish migrations to spawning, feeding, rearing, and overwintering sites. Proper placement of these structures is critical to minimizing impacts to fish.

Locatable Minerals

Leaving lands open to locatable minerals exploration and development could adversely affect Yellowstone cutthroat trout through increased sedimentation, removal of riparian vegetation, changes in stream channel morphology, and decreased water quality. Locatable minerals could occur within the drainages of one to five percent of the special status fish habitat in the planning area; therefore, the management actions common to all alternatives for locatable minerals would have a minor adverse effect on special status fish resources.

Leasable Minerals – Coal

Occupied stream segments are outside areas with the potential for coal development. Making federal coal lands identified as acceptable for further coal leasing consideration (BLM 2001a) in north central Sheridan County available for exploration could affect streams in the historic range for Yellowstone cutthroat trout, such as the Tongue River, Little Earley Creek, Youngs Creek, and Ash Creek. These waters are not occupied and currently do not have water temperatures conducive to trout populations. Yellowstone cutthroat trout could occupy these waters seasonally. If coal mining affected these stream segments, effects on Yellowstone

cutthroat trout would not rise to a population level. Overall, potential coal development could occur within greater than 10 percent of the special status fish habitats in the planning area; therefore, management actions common to all alternatives for coal would have major adverse effects on special status fish resources.

Leasable Minerals – Fluids

Surface disturbance from fluid minerals development in Yellowstone cutthroat trout drainages could increase sedimentation. Produced water from oil and gas wells could pollute streams if untreated water reaches them. Opening all oil and gas mineral estate to fluid minerals leasing could influence greater than 10 percent of the streams identified as special status fish habitat. Management actions common to all alternatives for fluid minerals would have major adverse effects on special status fish resources.

Salable Minerals

Opening all salable minerals exploration, unless the estate is specifically identified as administratively unavailable for minerals leasing during the planning period, could affect Yellowstone cutthroat trout if those minerals are discovered in western Sheridan County. At present, there are no identified minerals of these types that overlap populations of Yellowstone cutthroat trout. Salable mineral potential, though, does exist within one to five percent of the drainages identified as Yellowstone cutthroat trout habitat; therefore, the management actions common to all alternatives for salable minerals would have minor adverse effects on special status fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Fire affects fish populations through physical and chemical changes (increased siltation, altered water quality [dissolved oxygen, pH, suspended and dissolved solids, total hardness, turbidity], and water temperature changes). Nutrient flow changes that adversely affect aquatic insect production also would affect fish populations. Although there is limited BLM surface estate congruent with Yellowstone cutthroat trout streams, the threat of wildfire and prescribed fire occurs on all lands surrounding Yellowstone cutthroat trout streams, and could affect any populations in streams on BLM-administered lands.

The extent of surface erosion after a fire depends largely on the topography and soil types in the immediate area. Stream siltation can occur following fire. Siltation is a particular problem where severe burns occur on steep or moderate slopes, in riparian habitats, or where heavy equipment is used in suppression activities. There could be changes in water temperature in cold-water fisheries, such as Yellowstone cutthroat trout habitat, if shading vegetation is removed from the side of the stream. Fish will generally re-invade fire-affected areas rapidly from areas upstream of the affected area, surrounding watersheds, and mainstem rivers where migration is not limited. Fuels projects are designed and implemented in a non-emergency manner that minimizes impacts to aquatic resources.

Competent planning and implementation will minimize the effects of fuels treatments on special status fish. Prescribed fires in spring and fall are less likely to escape containment and are therefore less of a threat to riparian vegetation and less likely to contribute to erosion. To protect water quality and the diversity of habitats for fish, amphibians, and other aquatic organisms, standard operating procedures are in place to protect the PFC of riparian areas and stream characteristics.

The impacts of erosion from fire suppression would likely be localized, and could be minimized by rapid rehabilitation after the fire is under control, although improperly located bulldozer fire lines could greatly increase local stream sediment loads. Uncontrolled fires more than likely would create more erosion than the suppression activities. The use of certain types of fire retardant in or near fish-bearing streams would be a serious threat to these aquatic ecosystems. The by-products of the retardant can be toxic to fish and would result in fish kills.

Adhering to the National Wildland Fire Management Policy and current FMP for the WHPD, ensuring all prescribed-fire activities comply with Wyoming DEQ standards and rules, using a resource advisor and prohibiting the use of retardants or foam within 300 feet of surface water sources would reduce impacts to fish. Some runoff into occupied stream segments would be likely, which would kill individual fish, but population-level effects are not anticipated. Implementation of the BLM Emergency Stabilization and Burned Area Rehabilitation standards and rehabilitation of fire lines would reduce sedimentation from runoff. Landscape treatments to enhance fuels management and restore fire-adapted ecosystems could result in a short-term, adverse effect on fish and fisheries from sedimentation during fire treatments. Long-term effects from treatments would be beneficial because the threat of catastrophic wildfire would be reduced.

Overall, management actions common to all alternatives for planned and unplanned fire would have minor adverse effects on special status fish resources.

Biological Resources

Vegetation – Forests and Woodlands

No management actions common to all alternatives have been identified for forests and woodlands.

Vegetation – Grassland and Shrubland Communities

Managing vegetative communities in accordance with the Wyoming Standards for Healthy Rangelands, and siting facilities and related infrastructure, travel routes, recreational uses, mineral exploration and development sites, and ROW to reduce impacts to vegetative resources would keep sedimentation and channel modifications, and their resultant impacts to sensitive fish species, to a minor level. Maintaining sustainable forage levels for livestock and wildlife habitat would minimize sedimentation. The management actions common to all alternatives for grassland and shrubland communities would have minor beneficial effects on special status fish resources.

Vegetation – Riparian/Wetland Resources

Prioritizing and developing activity and implementation plans to manage riparian systems to be at or above, or continue to be improving toward PFC while achieving the Wyoming Standards for Healthy Rangelands would reduce sedimentation and channel modifications, and their resultant impacts to sensitive fish species. Managing riparian and wetland systems to enhance forage conditions and improve water quality to a succession stage appropriate for that system, including vertical and horizontal vegetative structure and composition, would also reduce sedimentation and channel modifications, and their resultant impacts to sensitive fish species. These management actions would influence greater than 10 percent of the special status fish habitat in the planning area. Management actions common to all alternatives for riparian/wetland resources would have major beneficial effects on special status fish resources.

Invasive Species and Pest Management

BLM weed and pest control work on public lands adjoining deeded and state lands could have

an adverse effect if chemical applications encounter occupied habitat. Proper use of chemicals, for example not applying them within 200 feet of fish-bearing water, would minimize this risk. Specific, careful and appropriate grasshopper and Mormon cricket treatments can prevent overuse, as well as management of invasive plant species, and thereby limit erosion, resulting in a beneficial effect. These actions should reduce impacts to all identified special status fish habitats. Management actions common to all alternatives for invasive species and pest management would have major beneficial effects on special status fish resources.

Fish and Wildlife Resources – Fish

Management actions common to all alternatives that are administrative processes (e.g., development and prioritization of plans; providing fisheries outreach and education; updating existing HMPs; and adherence to rules, regulations, and agreements such as MOUs) would have no effects on special status fish species. Managing barriers to fish passage in cooperation with the WGFD and other stakeholders would have a beneficial effect on sensitive fish species because these barriers can be used to allow Yellowstone cutthroat trout to move into new habitats or keep competitor fish, such as rainbow trout, out of cutthroat trout waters. Effects from managing activities that could affect native and desirable non-native fish species in collaboration with the WGFD and other stakeholders should benefit special status fish species.

Managing public access to fish-bearing waters or to protect crucial habitats could have major adverse effects. Future access routes would increase the likelihood of introducing whirling disease or invasive species into Yellowstone cutthroat trout waters. These impacts could be mitigated to minor through education programs for fishermen. Constructing new fences, even in accordance with the BLM Fencing Handbook, could reduce sedimentation by excluding livestock from riparian areas that support Yellowstone cutthroat trout. Management actions common to all alternatives support efforts to protect and improve riparian ecosystems. These actions include restoring fish habitats and managing harmful non-native riparian vegetation in river and stream systems important to fish species, and will have beneficial effects on Yellowstone cutthroat trout.

Management actions for fish would encompass all Yellowstone cutthroat trout habitats. Management actions for fish would have major beneficial effects on special status fish resources.

Fish and Wildlife Resources – Wildlife

Management actions common to all alternatives support efforts to protect and improve riparian ecosystems. These actions include restoring fish habitats and managing harmful non-native riparian vegetation in river and stream systems important to fish species, and would have beneficial effects on fish. Management actions common to all alternatives support efforts to protect and improve various ecosystems throughout the planning area. These actions include managing vegetative diversity, minimizing disturbances to springs and riparian zones, and improving riparian plant communities within one to five percent of the drainages identified as containing Yellowstone cutthroat trout habitat. Management actions Common to all Alternatives for wildlife would have minor beneficial effects on special status fish resources.

Special Status Species – Plants

Management actions common to all alternatives for special status plant species include allowing treatments that would benefit the plant species. Special status plant species occur along five to 10 percent of the special status fish habitats in the planning area. Treatments that improve the health of vegetation would also improve the health of the neighboring stream; therefore, management actions common to all alternatives for special status plant species would have moderate beneficial effects on special status fish resources.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Avoidance areas, whether for the application of broad-spectrum insecticides or to protect nesting bald eagles, would have a beneficial effect on Yellowstone cutthroat trout where these resources overlap. These avoidance areas encompass greater than 10 percent of identified Yellowstone cutthroat trout habitat. Management actions for special status wildlife species would have major beneficial effects on special status fish resources.

Heritage and Visual Resources**Cultural Resources**

Management actions include completion of site stabilization and long-term protection of significant sites. This would benefit fish through habitat conservation when the sites occur within close proximity to fish habitats. Currently, significant sites occur within greater than 10 percent of identified Yellowstone cutthroat trout habitat in the planning area. Management actions for cultural resources would have major beneficial effects on special status fish resources.

Paleontological Resources

Management actions common to all alternatives would have a negligible beneficial effect on special status fish resources by retaining public lands under the management of the BLM.

Visual Resources

Special status fish resources are not present in any WSAs or WSRs identified in the resource area. VRM Class IV areas have minor limitations on surface-disturbing activities. Managing visual resources would indirectly affect special status fish habitats, depending on the locations, types, and durations of approved projects. Beneficial effects under the management action common to all alternatives would occur on less than one percent of habitats important to special status fish species, and would therefore have negligible beneficial effects on special status fish resources.

Land Resources**Lands and Realty**

Lands and realty management actions common to all alternatives would have a negligible effect on special status fish species. Project-specific analyses of lands and realty actions, such as approval of R&PP permits, land use authorizations, land withdrawals, and land disposals require NEPA analysis, thereby identifying any conflicts in order to limit adverse effects on special status fish.

Renewable Energy

Management actions common to all alternatives for renewable energy are administrative and will have no effect on special status fish resources.

Rights-of-way and Corridors

Reasonable access could be provided for ROWs and corridors within the drainages of one to five percent of the Yellowstone cutthroat trout habitat in the planning area. ROWs cause habitat degradation through vegetation removal and trampling. Adverse effects to fish-bearing waters from ROWs would occur when these accesses cause increased sedimentation in the streams. Management actions common to all alternatives for ROWs and corridors would have minor adverse effects on special status fish resources.

Travel and Transportation Management

Negotiating with willing landowners for access across non-BLM-administered lands to isolated

public land parcels that have streams with Yellowstone cutthroat trout would increase the risk of spreading whirling disease or unwanted introduced species. Introduction of disease or unwanted species could have adverse effects on Yellowstone cutthroat trout. TTM could influence one to five percent of the streams identified as Yellowstone cutthroat trout habitat. Management actions common to all alternatives for TTM would have minor adverse effects on special status fish resources.

Recreation

Avoiding riparian habitat or developing and managing recreation sites, recreation facilities, and recreation access in a manner that minimizes impacts to riparian habitats, and prohibiting dispersed camping and commercial camps within 200 feet of surface water would benefit Yellowstone cutthroat trout.

Yellowstone cutthroat trout are pursued as a recreational game fish. At present, there is no public access to BLM-administered lands that have streams containing Yellowstone cutthroat trout. BLM access on the Tongue River at Welch Ranch is downstream from occupied habitat. It is possible Yellowstone cutthroat trout seasonally occupy that portion of the river, but there are no records of occupation. Recreational access to Yellowstone cutthroat trout in the Bighorn National Forest is common and could affect populations and habitat in streams on BLM-administered lands. Over-fishing would not occur on BLM-administered lands because of poor access to streams with Yellowstone cutthroat trout. Overall, these impacts are likely to occur in one to five percent of the identified Yellowstone cutthroat trout habitats. Management actions common to all alternatives for recreation would have minor beneficial effects on special status fish resources.

Livestock Grazing Management

Improper livestock grazing management could adversely impact stabilization of riparian vegetation, which can lead to stream instability and an associated loss of habitat complexity, and the loss of shading vegetation, which can lead to elevated stream temperatures, increased sediment delivery, and loss of stream channel complexity provided by fluvial processes and woody debris. The degree of adverse impact would depend on livestock grazing timing and intensity, site characteristics, and species habitat requirements. Livestock driveways impact wildlife habitats because they reduce vegetation and compact soils. Stock driveways and rests in riparian areas tend to concentrate high levels of livestock use that can cause degradation (e.g., near-complete removal of vegetation and soil compaction). Beneficial impacts of proper grazing include reducing competition by removing encroaching woody plant cover; hoof action that keeps topsoil loose, increases litter and precipitation penetration, and incorporates seeds into soil; nutrient recycling; removing wildfire fuels; and controlling invasive plant and weed species with properly timed grazing rotations and species (e.g., goats). There are 779,034 acres of BLM surface in grazing allotments in the planning area, which occur along one to five percent of the identified Yellowstone cutthroat trout habitat in the planning area. Management actions common to all alternatives for livestock grazing would have minor adverse effects on special status fish resources.

Special Designations

Areas of Critical Environmental Concern

Management actions common to all alternatives associated with ACECs would evaluate and mitigate adverse impacts to them. This would benefit the special status fish resources as the integrity of Welch Ranch would be maintained. Welch Ranch encompasses less than one percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions

common to all alternatives for ACECs would have negligible beneficial effects on special status fish resources.

Socioeconomic Resources

Social and Economic Conditions

Management actions common to all alternatives are administrative processes and will have no effect on special status fish resources. Impacts to social and economic resources will be quantified on a project-specific basis. Management actions that vary by alternative are also administrative; therefore, social and economic management actions will not be discussed further in this section.

Health and Safety

Management actions common to all alternatives are designed to control and mitigate threats to health and human safety and to the environment. Management actions designed to prevent accidental spills of hazardous materials or environmental contamination would have beneficial impacts to special status fish by protecting riparian and wetland areas and water quality across the resource area. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is a threat of accidents or spills. If there was a spill, mitigation and cleanup would rarely succeed in recovering a riparian or wetland area to its original condition over the short term; therefore, there would be localized long-term adverse impacts.

Only management actions in common to all alternatives are identified; therefore, health and safety will not be discussed further in this section.

4.4.8.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes management actions and potential impacts to sensitive species fish from implementing Alternative A. Current management allows the authorized officer to waive restrictions for surface disturbance activities, resulting in non-application of some restrictions in some locations.

Special Status Species – Fish

Currently, there are no management actions addressing the impacts of any action on special status fish resources. Impacts are evaluated on a project-specific basis. Without oversight on a programmatic level and specified criteria for evaluation and application of restrictions, special status fish are likely to experience adverse effects. The lack of management actions for special status fish under Alternative A would have major adverse effects on them.

Physical Resources

Soil

Under Alternative A, prohibiting surface-disturbing activities in areas of severe erosion hazard from March 1 through June 15, on slopes equal to or greater than 25 percent, and on soils with poor reclamation suitability would reduce but not prevent erosion and subsequent sedimentation. These prohibitions/restrictions, in general, would influence greater than 10 percent of the Yellowstone cutthroat trout habitats in the planning area and constitute a major beneficial effect on special status fish resources.

Water Resources

Under Alternative A, reservoir construction within historic Yellowstone cutthroat trout habitat would require site-specific analysis through BLM and EPA authorities. The potential for on-channel reservoirs in these locations is remote. If on-channel reservoirs were pursued in historic Yellowstone cutthroat trout habitat, effects likely would be adverse because such reservoirs would prevent fish passage.

Management of produced water from oil and gas development would not overlap with Yellowstone cutthroat trout habitat. Current prohibitions on placement of oil and gas wells and facilities prohibit these elements within 500 feet of streams. This prohibition protects Yellowstone cutthroat trout habitat from sedimentation reducing the adverse effects. These actions would influence greater than 10 percent of the identified Yellowstone cutthroat trout habitat. Management actions for water under Alternative A would have major beneficial effects on special status fish resources.

Cave and Karst Resources

There are no management actions for cave and karst resources under Alternative A.

Mineral Resources

Locatable Minerals

Under Alternative A, withdrawing the Amsden Creek (525 acres), Ed O. Taylor (approximately 3,896 acres), and Kerns (163 acres) game ranges from mineral locations and restricting locatable minerals activities in the Fortification Creek, Gardner Mountain, and North Fork WSAs (approximately 28,931 acres) would not alter the effects on Yellowstone cutthroat trout described in the *Common to All Alternatives* section. Locatable mineral exploration and development is currently permitted within one to five percent of the identified Yellowstone cutthroat trout habitat in the planning area. Management actions for locatable minerals under Alternative A would have minor adverse effects on special status fish species.

Leasable Minerals – Coal

The management action listed under Alternative A will have no effect on special status fish resources.

Leasable Minerals – Fluids

Under Alternative A, continuing to lease and allow development of federal oil and gas could adversely effect Yellowstone cutthroat trout. Current knowledge of the distribution of coalbeds harboring natural gas indicate that there would be no development in occupied Yellowstone cutthroat range. Fluid mineral exploration and development could occur, though, within greater than 10 percent of the identified Yellowstone cutthroat trout habitat in the planning area. Management actions for fluid minerals under Alternative A would have major adverse effects on special status fish resources.

Salable Minerals

Alternative A salable minerals management would not be likely to affect occupied Yellowstone cutthroat trout habitat. Most of the trout's occupied range is on National Forest System lands, and any action that could affect Yellowstone cutthroat trout would undergo a site-specific analysis of potential effects. Should salable minerals be developed in occupied Yellowstone cutthroat trout drainages, the effects could extend to the stream reach/population level. The entirety of identified habitat for this species, though is larger and salable mineral development could currently occur

within one to five percent of the identified habitat. Management actions for salable minerals under Alternative A would have minor adverse effects on special status fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire)

Limited suppression of wildfires on BLM-administered land where fire control is very difficult or extremely hazardous to firefighting personnel could allow stream-damaging fires in occupied Yellowstone cutthroat trout range. Suppressing unwanted wildland fires would prevent sedimentation from post-fire erosion. Use of fire retardant could adversely affect Yellowstone cutthroat trout if the chemicals reached occupied streams. Rehabilitating fire and suppression damage would minimize effects on Yellowstone cutthroat trout by decreasing runoff and sedimentation. Overall, Alternative A management of unplanned fires would have a minor adverse effect on special status fish species.

Planned Fire (Prescribed Fire)

Using prescribed fire to support vegetation and wildlife habitat objectives could have adverse or beneficial effects on Yellowstone cutthroat trout. Prescribed fire could increase runoff and sedimentation (an adverse effect) or could increase streamflows by removing invasive plants (a beneficial effect). Long term, the effects would be minor beneficial.

Biological Resources

Vegetation – Forests and Woodlands

Treatments including cutting, thinning, and prescribed burning may pose an adverse short-term impact on fish resources resulting from soil erosion and potential sedimentation in streams and rivers. However, improved forest health (vegetation composition, soil stability, decreased risk of wildfire) resulting from the treatments will have beneficial effects on special status fish resources over the long term. Management actions under this alternative would benefit over 10 percent of habitats important to special status fish species, making the effects major.

Vegetation – Grassland and Shrubland Communities

There are no management actions for grassland and shrubland communities under Alternative A.

Vegetation – Riparian/Wetland Resources

Prohibiting surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would benefit Yellowstone cutthroat trout by preserving the riparian and adjacent upland communities of all the identified Yellowstone cutthroat trout habitat in the planning area. Management actions for riparian/wetland resources under Alternative A would have major beneficial effects on special status fish resources.

Invasive Species and Pest Management

IPM, as currently practiced and when appropriately applied in the planning area, complies with restrictions on chemical labels that provide adequate buffers from fish-bearing water. Aggressive treatment of invasive plants, particularly riparian plants, could adversely affect Yellowstone cutthroat trout over the short term by increasing sedimentation and removing shade. Over the long term, these treatments would benefit the trout by replacing invasive plants with native species that generally require less water, and increasing streamflow.

Fish and Wildlife Resources – Fish

Cooperating with the WGFD to reintroduce native and desirable non-native fish in the planning area where there is potential habitat could benefit Yellowstone cutthroat trout. Due to the limited BLM surface in suitable Yellowstone cutthroat trout habitat, this beneficial effect would be minor.

Fish and Wildlife Resources – Wildlife

Prohibiting surface disturbance in the Kerns and Amsden Creek big game winter ranges, and elk crucial winter range would result in a benefit to Yellowstone cutthroat by reducing erosion and sedimentation; however, the ability to grant waivers and implementing seasonal restrictions for the ranges reduces this benefit. These restrictions for wildlife also conserve vegetation within greater than 10 percent of identified Yellowstone cutthroat trout habitat. Without oversight on a programmatic level and specified criteria for waiving these restrictions, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Special Status Species – Plants

There are no management actions for special status plants or special status fish under Alternative A.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Managing vegetation resources to comply with the ESA and BLM policy associated with management of habitat for special status wildlife species would have beneficial effects to special status fish species. Surface disturbance restrictions for Greater Sage-Grouse breeding grounds and raptors nests would have beneficial effects on fish. Protections afforded Threatened, Endangered, and sensitive species, such as oil and gas disturbance-free zones around bald eagle nests and roosts, would prevent surface disturbance and have beneficial effects on fish. Overall, these protection zones for special status wildlife habitats encompass five to 10 percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for special status wildlife species under Alternative A would have moderate beneficial effects on special status fish resources.

Heritage and Visual Resources**Cultural Resources**

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for cultural resources (habitat conservation). These restrictions would be beneficial to any fish habitats they encompass as they would reduce the risk of harm to the fish resource. All other management of cultural resources is considered on a project specific basis. Under Alternative A, cultural resource protection would encompass less than one percent of the special status fish-bearing streams in the planning area. Management actions for cultural resources under Alternative A would have negligible beneficial effects on special status fish resources.

Paleontological Resources

Under Alternative A, management of lands containing paleontological resources would be considered on a site-specific basis. In areas where mineral development was not allowed, water quality would remain unchanged, having a negligible beneficial effect on special status fish resources.

Visual Resources

Management of VRM Class I and II areas could prohibit or limit some surface-disturbing

activities and thereby protect special status fish habitats. VRM Class III and IV areas have minor limitations. Managing visual resources would indirectly affect fish habitats, depending on the locations, types, and durations of approved projects. Beneficial effects under the management actions associated with Alternative A would occur on over 10 percent of habitats important to special status fish resources, and would therefore have major effects.

Land Resources

Lands and Realty

Under Alternative A, land acquisitions or disposals should not affect Yellowstone cutthroat trout. Pursuing easements that would provide access to BLM-administered lands for recreation and administrative purposes could expose occupied Yellowstone cutthroat trout streams to whirling disease, mussels, or other introduced species and disease. This could result in a moderate adverse effect, but the probability of occurrence would be remote and therefore overall a minor impact.

Renewable Energy

There are no management actions for renewable energy under Alternative A.

Rights-of-Way and Corridors

No areas suitable for ROWs and corridors under Alternative A contain special status fish habitats.

Travel and Transportation Management

Under Alternative A, there would be indirect effects on special status fish species from travel management and OHV use. OHV use on and off designated trails has the potential to destroy vegetation, compact soils, and lead to soil erosion and ponded water. By designating areas where OHV use is limited to designated roads and trails, adverse effects on special status fish habitats can be reduced. In cases where motorized vehicle use is closed for only portions of the year, these closures would not be as great a benefit to special status fish species. Regardless of intensity of management, OHV use is still anticipated to have an adverse effect on one to five percent of special status fish habitats. Management actions for TTM under Alternative A would have minor adverse effects on special status fish resources.

Recreation

Under Alternative A, pursuing easements to provide access to BLM-administered lands for recreation and administrative purposes could expose occupied fish streams to whirling disease, zebra mussels, or other introduced species and disease, which would have a adverse effect on fish. Prohibiting surface disturbance and occupancy on slopes equal to or greater than 25 percent or more would minimize sedimentation. Areas where OHV use is limited to designated roads and trails would limit access to fisheries and reduce the potential for introduction of invasive species and disease. Recreational areas occur within less than one percent of the identified Yellowstone cutthroat trout habitats in the planning area. The overall management actions for recreation under Alternative A would have negligible beneficial effects on special status fish resources.

Livestock Grazing Management

Improper grazing management at Welch Ranch on the Tongue River could adversely affect Yellowstone cutthroat habitat potential. Under Alternative A, any permanent increases in the amount of forage produced are considered for wildlife and watershed protection before additional livestock use is allowed. This should have a beneficial effect on Yellowstone cutthroat trout. Currently, livestock grazing allotments contain one to five percent of the identified

Yellowstone cutthroat trout habitats in the planning area. Management actions for livestock grazing management under Alternative A would have minor beneficial effects on special status fish resources.

Special Designations

Areas of Critical Environmental Concern

There are no ACECs proposed under Alternative A.

4.4.8.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to special status fish species due to their implementation.

Special Status Species – Fish

The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for special status fish resources (habitat improvement and conservation). Under Alternative B, stream segments important to special status fish species would be improved or enhanced and surface-disturbing restrictions would be applied within 0.25 mile of water bodies containing special status fish species. These restrictions have major beneficial effects on special status fish resources.

Physical Resources

Soil, Water Resources, and Cave and Karst Resources

Alternative B would prohibit surface-disturbing activities or apply NSO stipulations to activities on badlands, rock outcrops, and slopes susceptible to mass movement, and prohibit prescribed fires on highly erodible soils; prohibit such activities as on-channel reservoirs, conversion of abandoned oil and gas wells to water supply wells, and activities within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated habitat; and prohibit activities in cave and karst areas. Under Alternative B, applying an NSO stipulation on soils with poor reclamation suitability, in badlands, on rocky outcrops, on slopes susceptible to mass movement, and on slopes equal to or greater than 25 percent would prevent sedimentation and have a beneficial effect on special status fish habitat. These soil types overlap greater than 10 percent of the identified Yellowstone cutthroat trout habitat in the planning area. Prohibiting surface-disturbing activities for the protection of water resources under Alternative B would conserve all the identified Yellowstone cutthroat trout habitat in the planning area. Prohibiting surface-disturbing activities for the protection of cave and karst resources under Alternative B would conserve vegetation in greater than 10 percent of the identified Yellowstone cutthroat trout habitat in the planning area. Overall, Alternative B management of soils, water, and cave and karst resources would result in major beneficial effects on special status fish resources.

Mineral Resources

Locatable Minerals and Leasable Minerals – Coal

The management action listed under Alternative B will have no effect on special status fish resources.

Leasable Minerals – Fluids

Under Alternative B, no fluid mineral exploration or development would occur in Yellowstone cutthroat trout habitats. Management actions for fluid minerals under Alternative B would have no effects on special status fish resources.

Salable Minerals

Alternative B limits the exploration and development of salable mineral resources by the making 661,345 acres closed or restricted to salable mineral exploration and development. Salable mineral development would be open on 129,431 acres of BLM surface that also contain greater than 10 percent of identified Yellowstone cutthroat trout habitats; therefore, management actions for salable minerals under Alternative B would have major adverse effects on special status fish resources.

Fire and Fuels Management**Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)**

Using full suppression in areas where fire is undesirable, monitoring fire behavior in areas where fire can be used as a management tool based on resource goals and objectives, limiting heavy equipment usage in areas, rehabilitating all fire-related damage, and use of wildland fire and other vegetative treatments to restore fire-adapted ecosystems and to reduce hazardous fuels would reduce sedimentation. This would have a minor beneficial effect on Yellowstone cutthroat trout habitats.

Biological Resources**Vegetation – Forest and Woodlands**

Using natural processes to manage forests and woodlands is a short-term beneficial impact to fish resources; however, managing forests and woodlands for old growth and climax vegetation communities may result in an increased risk of wildland fire which would result in unstable soil conditions and poor water quality having adverse impacts overall. Management actions for forests and woodlands under Alternative B would adversely impact over 10 percent of habitat important to special status fish. Overall, the offset of benefits from reduced disturbance and the dynamic nature of wildfire would reduce impacts to minor adverse.

Vegetation – Grassland and Shrubland Communities

The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for grassland and shrubland communities (habitat improvement). Under Alternative B, native plant species would be the only type authorized for reclamation activities. This would be beneficial to Yellowstone cutthroat trout habitats as it would promote natural reclamation and regeneration of vegetative communities in the drainages. Under Alternative B, native plant reclamation would occur within greater than 10 percent of the identified Yellowstone cutthroat trout habitat in the planning area. Management actions for grassland and shrubland communities would have major beneficial effects on special status fish resources.

Vegetation – Riparian/Wetland Resources

Prohibiting surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would benefit Yellowstone cutthroat trout by preserving the riparian and adjacent upland communities. Identifying and managing systems capable of achieving DFC could have a beneficial effect on Yellowstone cutthroat trout habitats. Prohibitions for water would encompass all identified Yellowstone cutthroat trout habitat in the planning area. Management

actions for riparian/wetland resources would have major beneficial effects on special status fish resources.

Invasive Species and Pest Management

Aerial application of pesticides and herbicides, if applied inappropriately, could expose occupied Yellowstone cutthroat trout populations to impaired water quality, this would have a moderately adverse effect. IPM, as currently practiced and when appropriately applied in the planning area, complies with restrictions on chemical labels that provide adequate buffers from fish-bearing water. Aggressive treatments of invasive plants, particularly riparian plants, could adversely affect Yellowstone cutthroat trout over the short term by increasing sedimentation and removing shade. Over the long term, these treatments would benefit the trout by replacing invasive plants with native species that generally require less water, and increasing streamflow.

Fish and Wildlife Resources – Fish

Alternative B management actions for fish would benefit Yellowstone cutthroat trout by cooperating with WGFD for stocking and stream restoration, managing riparian areas to improve fisheries and reach desired functional condition. Imposing a 0.25 mile no surface disturbance buffer around all fish-bearing waters would benefit Yellowstone cutthroat trout habitat by reducing erosion from development of federal minerals in all identified Yellowstone cutthroat trout habitat. Management actions for fish under Alternative B would have major beneficial effects on special status fish resources.

Fish and Wildlife Resources – Wildlife

The types of effects to special status fish from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for wildlife. Under Alternative B, though, NSOs prohibit or restrict surface disturbance within greater than 10 percent of identified Yellowstone cutthroat trout habitat; therefore, management actions for wildlife would have major beneficial effects on special status fish resources.

Special Status Species – Plants

Management actions for special status plants that restrict grazing, herbicides and surface disturbance would benefit special status fish. Restricting fire suppression could result in larger fires that would increase sedimentation and create an adverse impact. Prohibiting disturbance within a mile of Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River would be considered a benefit to special status fish by reducing sources of sedimentation. Overall, these actions would occur within five to 10 percent of the identified Yellowstone cutthroat trout habitat in the planning area. Management actions for special status plants under Alternative B would have moderate beneficial effects on special status fish resources.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Protections for identified raptor nests, Greater Sage-Grouse, and T&E species would have a beneficial effect on Yellowstone cutthroat trout. Prohibiting surface disturbance and occupancy within a biologic buffer for raptor nests would reduce erosion and subsequent sedimentation on lands over federal minerals, resulting in a beneficial impact. Prohibiting surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats, in identified 100-year floodplains, and within 500 feet of perennial waters would have a beneficial effect on Yellowstone cutthroat trout. Establishing a year-round disturbance-free zone of at least 0.5 mile for bald eagles on the Tongue River would be a beneficial effect when applied to the federal mineral estate. Overall, the prohibitions or restrictions for special status wildlife species occur within greater than 10 percent of the identified Yellowstone cutthroat trout habitat

in the planning area. Management actions for special status wildlife species would have major beneficial effects on special status fish resources.

Heritage and Visual Resources

Cultural Resources

Though the majority of impacts to cultural resources are analyzed on a project-specific basis within Alternative A, adverse impacts to special status fish species would be greatly reduced by prohibition of surface-disturbing activities for cultural resource protection in Alternative B. NSOs for cultural resources under Alternative B also conserve greater than 10 percent of special status fish habitats; therefore, management actions for cultural resources under Alternative B would have major beneficial effects on special status fish resources.

Paleontological Resources

Under Alternative B, areas with high quality paleontological resources do not overlap with fish habitat and management actions would have no effect on special status fish resources.

Visual Resources

Under Alternative B, management of VRM Class II areas could prohibit or limit some surface-disturbing activities and therefore protect special status fish habitats. VRM Class III and IV areas would have minor limitations. Alternative B visual resources management would benefit over 10 percent of habitats important to special status fish resources; therefore, VRM actions under Alternative B would have major beneficial effects on special status fish resources.

Land Resources

Lands and Realty

Approximately 120,722 acres of BLM-administered lands are identified for disposal (see Map 54). These areas have priority consideration for exchange, public sale, or transfer of jurisdiction to another agency, subject to disposal criteria. The six BLM-administered parcels that intersect Yellowstone cutthroat trout habitats account for 164 acres. Transferring these lands out of federal control would not directly affect Yellowstone cutthroat trout. However, future management actions could be less protective than federal management in less than one percent of identified Yellowstone cutthroat trout habitat. Management actions for lands and realty under Alternative B would have negligible adverse effects on special status fish resources.

Renewable Energy

No areas suitable for renewable energy under Alternative B contain special status fish habitats.

Rights-of-Way and Corridors

No areas suitable for ROWs and corridors under Alternative B contain special status fish habitats.

Travel and Transportation Management

Under Alternative B, closing areas with saturated soils, on slopes equal to or greater than 25 percent and in habitat for SSS to motorized vehicle use, including activities related to fire suppression and geophysical exploration, would reduce sedimentation. This would have a beneficial effect on Yellowstone cutthroat trout. Limiting travel to designated routes and allowing travel off designated routes only under a special use permit would reduce sedimentation. This would also have a beneficial effect on Yellowstone cutthroat trout. Allowing travel off designated

routes in areas limited to designated routes only under a special use permit would reduce sedimentation and pollution, and have a beneficial effect on special status fish. These actions would influence one to five percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for travel and transportation under Alternative B would have a minor beneficial effect on special status fish resources.

Recreation

Increasing recreation facilities under Alternative B could increase the risk of disease or invasive species colonizing Yellowstone cutthroat trout habitats. Limiting development of additional recreation facilities to SRMAs and other high-use areas would have a beneficial effect on fish by limiting fishing pressure and reducing the risk of establishing invasive aquatic species. SRMAs proposed in Alternative B encompass less than one percent of the identified Yellowstone cutthroat trout habitats in the planning area; therefore, management actions for recreation under Alternative B would have negligible beneficial effects on special status fish resources.

Livestock Grazing Management

Authorizing permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority and livestock grazing second; locating livestock salt or mineral supplements a minimum of 0.5 mile away from water sources, riparian areas, and aspen stands; and providing a minimum of two years rest from livestock grazing following prescribed fires and other vegetative treatments would have a minor beneficial effect on Yellowstone cutthroat trout.

Special Designations

Areas of Critical Environmental Concern

An ACEC designation at Welch Ranch on the Tongue River could have a minor adverse effect on that fishery. Additional human use could occur with ACEC designation, which would increase the potential for introduction of invasive aquatic species and illegal stocking, and the risk of fire in the riparian forest. These potential issues would be adequately mitigated through education. The designation would have indirect, long-term beneficial effects through public outreach and education regarding the rarity and value of prairie river riparian systems and would encompass less than one percent of the identified Yellowstone cutthroat trout habitats in the planning area; therefore, management actions for ACECs under Alternative B would have negligible beneficial effects on special status fish resources.

4.4.8.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to special status fish species due to its implementation.

Special Status Species – Fish

Restoring or improving important stream segments for fisheries habitat, only for special status fish species, would have a beneficial impact on them. Alternative C incorporates a smaller protective buffer, restricting surface-disturbing activities within 500 feet of any waters containing special status fish species. This would conserve habitats within all identified Yellowstone cutthroat trout habitats in the planning area. Management actions for special status fish species would have major beneficial effects on special status fish resources.

Physical Resources

Soil

Under Alternative C, allowing surface-disturbing activities on soils with a severe erosion hazard, slopes equal to or greater than 25 percent, soils with poor reclamation suitability, badlands, rock outcrops, and slopes susceptible to mass movement would increase sedimentation and adversely affect Yellowstone cutthroat trout if those activities take place in occupied Yellowstone cutthroat trout habitat. The approximately 260 acres (40 on South Fork Little Tongue, 180 on East and Middle Forks Pass Creek, and 40 in Red Gulch) of BLM-administered lands that drain into occupied Yellowstone cutthroat habitat are steep, with no roads or development. Allowing the use of prescribed fire on highly erodible soils could have an adverse effect if BLM-administered lands that drain into occupied Yellowstone cutthroat habitat (260 acres) were burned. Lack of soil restrictions would leave greater than 10 percent of the identified Yellowstone cutthroat trout habitats vulnerable to impacts from improper soil management. Management actions for soil under Alternative C would have major adverse effects on special status fish resources.

Water Resources

Allowing on-channel reservoirs would inhibit fish passage and have an adverse effect on Yellowstone cutthroat trout. Allowing surface-disturbing activities, or not applying an NSO stipulation to any mineral lease within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated riparian habitat would increase runoff and sedimentation in Yellowstone cutthroat habitat. This alternative would permit activities within greater than 10 percent of the identified Yellowstone cutthroat trout habitats in the planning area; therefore, management actions for water under Alternative C would have major adverse effects on special status fish resources.

Cave and Karst Resources

Under Alternative C, there would be no restrictions on activities in or around cave and karst resources. Greater than 10 percent of the identified Yellowstone cutthroat trout habitats in the planning area also contain cave and karst resources. Lack of conservation of cave and karst resources would have a major adverse effect on special status fish resources as it would increase the potential for increased runoff and sedimentation.

Mineral Resources**Locatable Minerals**

The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for locatable mineral resources (habitat loss and degradation). Alternative C would open 3,319,535 acres to locatable minerals exploration and development and withdraw 11,373 acres from locatable mineral exploration and development. Locatable mineral development could be permitted in one to five percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for locatable minerals under Alternative C would have minor adverse effects on special status fish resources.

Leasable Minerals – Coal

The management action listed under Alternative C will have no effect on special status fish resources.

Leasable Minerals – Fluids

The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for fluid mineral resources (habitat loss and degradation). Consistent with other resources values, Alternative C would open 539,499

acres for fluid minerals leasing and exploration subject to standard lease terms and conditions; 2,472,472 acres subject to moderate constraints; and 303,601 acres subject to major constraints. Fluid mineral exploration and development could be permitted in greater than 10 percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for fluid minerals under Alternative C would have major adverse effects on special status fish resources.

Salable Minerals

The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for salable mineral resources (habitat loss and degradation). Opening 3,290,908 acres to salable mineral exploration and development and closing 57,213 acres would cause an adverse impact where those areas open to salable minerals overlap identified Yellowstone cutthroat trout habitats. Salable mineral exploration and development could be permitted in five to 10 percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for salable minerals under Alternative C would have moderate adverse effects on special status fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Under Alternative C, use of full protection strategies and tactics, heavy equipment with few tactical constraints, and rehabilitating only suppression-related damage would increase sedimentation. This would have a minor adverse effect on Yellowstone cutthroat trout.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative C, forests and woodlands which occur near streams bearing special status fish would be managed similarly to Alternative B. No overlap occurs between important special status fish habitat and forest management areas identified under this alternative, and active management will not occur.

Vegetation – Grassland and Shrubland Communities

Under Alternative C, allowing non-native plant species, only if native species will not accomplish initial reclamation objectives, would provide another tool for achieving reclamation goals, but also would provide an opportunity for non-native species to cross pollinate with native species, out-compete native species for water and soil nutrients, and move outside the reclamation area and become an invasive species. Helping to achieve reclamation objectives would directly benefit surrounding plant communities. Overall, Alternative C management of grasslands and shrublands would have a major adverse effect on the riparian vegetation within the identified Yellowstone cutthroat trout habitats and, therefore, have a major adverse effect on special status fish resources.

Vegetation – Riparian/Wetland Resources

Allowing surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams could have an adverse effect on Yellowstone cutthroat trout by increasing sedimentation and decreasing water quality. Not identifying and managing systems capable of achieving DFC could have an adverse effect on Yellowstone cutthroat trout. Riparian/wetland areas contain all of the identified Yellowstone cutthroat trout habitats in the planning area; therefore management actions under Alternative C for riparian/wetland resources would have major adverse effects on special status fish resources.

Invasive Species and Pest Management

Aerial application of insecticides, if applied inappropriately, could expose occupied Yellowstone cutthroat trout populations to impaired water quality. This would have a moderate adverse effect on the trout.

Fish and Wildlife Resources – Fish

Alternative C management actions for fish would result in an adverse impact to Yellowstone cutthroat trout by allowing surface disturbance within 0.25 mile of fish-bearing waters, increasing erosion from development of federal minerals in all identified Yellowstone cutthroat trout habitats. Management actions under Alternative C for fish resources would have major adverse effects on special status fish resources.

Fish and Wildlife Resources – Wildlife

Allowing surface disturbance in the Kerns and Amsden Creek big game winter ranges, and elk crucial winter range would result in an adverse impact to Yellowstone cutthroat trout by increasing erosion and sedimentation. Seasonal wildlife restrictions would not prevent erosion from federal mineral development and could result in an adverse impact. Protections for identified big game ranges, raptor nests, and elk would have beneficial effects on greater than 10 percent of the identified Yellowstone cutthroat trout habitats that also support these species. Because protections for some wildlife species remain in place and would conserve identified Yellowstone cutthroat trout habitats under this alternative, overall, Alternative C wildlife management actions would still have a major beneficial effect on special status fish resources.

Special Status Species – Plants

No areas of known special status plant species populations contain special status fish habitats; therefore, management actions for special status plant species under Alternative C would have no effect on special status fish species.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Establishing a year-round disturbance-free zone of at least 0.5 mile around known bald eagle roosts on the Tongue River would be a beneficial effect when applied to the federal mineral estate. Allowing surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats, in identified 100-year floodplains, and within 500 feet of perennial waters would have an adverse effect on Yellowstone cutthroat trout. Because protections for some special status wildlife species remain in place and would conserve five to 10 percent of identified Yellowstone cutthroat trout habitats under this alternative, overall, Alternative C special status wildlife management actions would have a moderate beneficial effect on special status fish resources.

Heritage and Visual Resources**Cultural Resources**

No areas containing historic properties occur within special status fish habitats; therefore, management actions for cultural resources under Alternative C would have no effect on special status fish species.

Paleontological Resources

Under Alternative C, lands containing high quality paleontological resources do not overlap with fish habitat and management actions under this alternative would have no effect on special status fish resources.

Visual Resources

Under Alternative C, managing VRM Class II areas as VRM Class III would allow more surface-disturbing activities. This would reduce the beneficial effects of VRM on special status fish habitat by increasing opportunities for soil and water erosion and for invasive species to become established. Active management would not occur in habitats important to special status fish species; therefore, Alternative C management of visual resources would have no effect on special status fish resources.

Land Resources

Lands and Realty

Approximately 120,722 acres of BLM-administered lands are identified for disposal (see Map 54). These areas have priority consideration for exchange, public sale, or transfer of jurisdiction to another agency, subject to disposal criteria. The three BLM-administered parcels that intersect Yellowstone cutthroat trout occupancy account for 972 acres. Transferring these lands out of federal control would not directly affect Yellowstone cutthroat trout. However, future management actions could be less protective than federal management.

Renewable Energy

Allowing renewable-energy development anywhere in the planning area consistent with other resource values could have an adverse effect on special status fish if sedimentation occurs in identified Yellowstone cutthroat trout habitats. Renewable energy could be permitted under this alternative within five to 10 percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions under Alternative C would have moderate adverse effects on special status fish resources.

Rights-of-Way and Corridors

Allowing ROW on slopes equal to or greater than 25 percent and on highly erodible soils would have an adverse effect on special status fish from sedimentation. ROWs could be permitted, under this alternative, within five to 10 percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for ROWs and corridors under Alternative C would have moderate adverse effects on special status fish resources.

Travel and Transportation Management

Allowing motorized vehicle use in areas with saturated soils, on slopes equal to or greater than 25 percent, and in habitat for SSS consistent with travel management designations for those areas could increase sedimentation. This would have an adverse effect on one to five percent of identified Yellowstone cutthroat trout habitats. Management actions for TTM under Alternative C would have minor adverse effects on special status fish resources.

Recreation

Managing the entire planning area as the Buffalo ERMA and designating six SRMAs (totaling 30,570 acres) would have an adverse effect on fish through an increase in OHV use and resulting sedimentation. The six proposed SRMAs contain less than one percent of the identified Yellowstone cutthroat trout habitats in the planning area. The management within these areas would conserve habitats important to fish. Management actions for recreation under Alternative C, through designation of the six SRMAs, would have negligible beneficial effects on special status fish resources.

Livestock Grazing Management

Authorizing permanent increases in forage allocations to livestock grazing as the first priority; locating livestock salt or mineral supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands; not designating reserve common allotments; allowing increases in livestock stocking rates as a result of vegetative treatments; and providing a minimum of two growing seasons rest from livestock grazing, prescribed fires, and vegetative treatments would have a minor adverse effect on Yellowstone cutthroat trout by degrading the habitats and increasing potential for sedimentation.

Special Designations

Areas of Critical Environmental Concern

No ACECs are proposed under Alternative C, therefore, there would be no effect to fish resources.

4.4.8.6. Alternative D

This section describes management actions under Alternative D, the Proposed RMP.

Special Status Species – Fish

Alternative D impacts from special status fish management would be similar to those under Alternative B, except that Alternative D could allow activities by exception within a 0.25-mile CSU area around naturally occurring water bodies containing native and desirable non-native fish species. For the impacts to be the same as those under Alternative B, those exceptions would have to be evaluated for the presence of special status fish species or habitat suitability and would not be granted where there would be conflicts. Management actions under Alternative D would have major beneficial effects on special status fish resources.

Physical Resources

Soil

Alternative D would allow surface-disturbing activities on soils with a severe erosion hazard, slopes equal to or greater than 25 percent, soils with poor reclamation suitability, badlands, rock outcrops, and slopes susceptible to mass movement. This could increase sedimentation and adversely affect Yellowstone cutthroat trout if those activities took place in occupied Yellowstone cutthroat trout habitat without adequate reclamation plans. Alternative D would allow development within greater than 10 percent of the identified Yellowstone cutthroat trout habitats in the planning area, but projects must meet specific criteria before they are approved. However, the established criteria under Alternative D would work toward ensuring projects are capable of being reclaimed before they are approved. Overall, management actions for soil under Alternative D would have major adverse effects on special status fish resources.

Water Resources

Alternative D would allow on-channel reservoirs in occupied Yellowstone cutthroat trout streams, which would have an adverse effect on this sensitive species because such reservoirs could impede fish passage. Impacts from discharge of produced water into Yellowstone cutthroat trout habitat would depend on water quality, which is administered by the State of Wyoming and will not be allowed to diminish the water quality of a receiving stream. Allowing surface-disturbing activities, or not applying an NSO stipulation to any mineral lease, within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated riparian habitat could

increase runoff and sedimentation in all Yellowstone cutthroat trout habitat. Alternative D would allow development within greater than 10 percent of the identified Yellowstone cutthroat trout habitats in the planning area when resources objectives can be met. Overall, management actions for water under Alternative D would have major adverse effects on special status fish resources.

Cave and Karst Resources

The cave and karst resource areas identified in Alternative D do not encompass any identified Yellowstone cutthroat trout habitats, therefore, management actions for cave and karst resources under Alternative D would have no effect on special status fish resources.

Mineral Resources

Locatable Minerals

Alternative D effects on Yellowstone cutthroat trout from management of locatable minerals would be the same minor adverse effects as described under Alternative A.

Leasable Minerals – Coal

The management action listed under Alternative D will have no effect on special status fish resources.

Leasable Minerals – Fluids

Alternative D impacts associated with leasable fluid minerals management would be the same as under Alternative C, with 3,314,254 acres open to oil and gas leasing. Fluid mineral exploration and development would be permitted within greater than 10 percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for fluid minerals, under Alternative D would have major adverse effects on special status fish resources.

Salable Minerals

There is no identified conflict between salable mineral potential and Yellowstone cutthroat trout habitat. Yellowstone cutthroat trout habitat has been identified as closed to salable minerals exploration and development.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

The effects for fire and fuels management under Alternative D would be the same minor beneficial effects as those described under Alternative B.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative D, effects to special status fish would be similar to those identified under Alternative C.

Vegetation – Grassland and Shrubland Communities

Alternative D effects on special status fish resources from management of grassland and shrubland communities would be similar to effects under Alternative C, although Alternative D would place slightly more emphasis on multiple resource values than Alternative C. Allowing the use of non-native species for initial reclamation could have a beneficial effect on Yellowstone cutthroat trout through reduced sedimentation after surface disturbance. Desirable non-native

plant persistence could increase adverse impacts to special status fish resources if non-native proliferation causes loss of suitable riparian habitats along fish-bearing streams. Overall, management actions for grassland and shrubland communities would have major beneficial effects on special status fish species.

Vegetation – Riparian/Wetland Resources

Allowing surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams could have an adverse effect on special status fish by increasing sedimentation, changing hydrography, and decreasing water quality. Not identifying and managing systems capable of achieving DFC could also have an adverse effect on special status fish by allowing activities that impact riparian vegetation, resulting in increased water temperature and sedimentation. Impacts from the management of riparian/wetland resources will influence all of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for riparian/wetland resources under Alternative D would have major adverse effects on special status fish resources.

Invasive Species and Pest Management

Limiting aerial application to defined situations would protect Yellowstone cutthroat trout habitat and result in a minor beneficial effect.

Fish and Wildlife Resources – Fish

Alternative D management actions would consider fish and fish habitat in reservoir, riparian and wetland systems, and perennial water management. Alternative D would apply constraints on surface-disturbing and disruptive activities providing protection of vegetation, soils, and soil microbial activity from surface-disturbing activities within all of the identified Yellowstone cutthroat trout habitats in the planning area; therefore, the management actions for fish under Alternative D would have major beneficial effects on special status fish resources.

Fish and Wildlife Resources – Wildlife

Under Alternative D, prohibiting surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges could decrease sedimentation and invasive species establishment in the Tongue River which would have a beneficial effect on special status fish. Protections for identified big game ranges and raptor nests would have a beneficial effect on fish. Overall, the protective buffers for wildlife would conserve riparian vegetation within greater than 10 percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for wildlife under Alternative D would have major beneficial effects on special status fish resources.

Special Status Species – Plants

Allowing the placement of water developments and salt or mineral supplements in habitat for special status plant species would decrease water quality and increase sedimentation where these resources overlap. Managing to comply with the ESA and BLM policy associated with special status plant species would have a moderate benefit to fisheries management as their occupied habitat occurs in five to 10 percent of the identified Yellowstone cutthroat habitats in the planning area.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Under Alternative D, protections for raptor nests, Greater Sage-Grouse, and T&E species would have a beneficial effect on special status fish species. Establishing a year-round disturbance-free zone of at least 0.5 mile for riparian corridors (Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River) consistently used by bald eagles would have a beneficial effect

on special status fish species. Prohibiting surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats in identified 100-year floodplains and within 500 feet of perennial waters would have a beneficial effect on special status fish species. Protections for bald eagle and other raptor nests would have the greatest potential for reducing impacts to identified Yellowstone cutthroat habitats. Overall, protections for special status wildlife species would conserve vegetation within greater than 10 percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for special status wildlife species would have major beneficial effects on special status fish resources.

Heritage and Visual Resources

Cultural Resources

Alternative D impacts associated with cultural resources management would be the same as those under Alternative B, except Alternative D would protect 15,382 acres through cultural resources NSO restrictions and 613,601 acres through cultural resources CSU restrictions. These areas of prohibitions or restrictions would also conserve vegetation within greater than 10 percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for cultural resources would have major beneficial effects on special status fish resources.

Paleontological Resources

Under Alternative D, lands containing high quality or important paleontological resources do not overlap with fish habitat and management actions would have no effect to special status fish resources.

Visual Resources

Under Alternative D, effects to fish resources from management actions associated with VRM would be the same as the effects under Alternative B.

Land Resources

Lands and Realty

Proposed land disposals that could affect Yellowstone cutthroat trout total 164 acres (less than one percent of the identified Yellowstone cutthroat habitats). Disposing of these lands could result in fewer restrictions on surface disturbances. This could increase sedimentation and pesticide applications, which would result in reduced water quality and have a negligible adverse effect on Yellowstone cutthroat trout.

Renewable Energy

Under Alternative D, excluding renewable-energy development on 352,068 acres would have a beneficial effect on special status fish by avoiding sedimentation from construction. Renewable energy would be permitted within less than one percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for renewable energy under Alternative D would have negligible adverse effects on fish resources.

Rights-of-Way and Corridors

Avoiding ROW on slopes equal to or greater than 25 percent and on highly erodible soils would have a beneficial effect on special status fish. ROWs would be permitted within less than one percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for ROWs and corridors under Alternative D would have negligible adverse effects on special status fish resources.

Travel and Transportation Management

Alternative D impacts to special status fish from management of travel and transportation would be similar to those under Alternative C, except that one to five percent of the identified Yellowstone cutthroat habitats would be closed to motorized vehicle use. Allowing travel for dispersed camping and big-game retrieval up to 300 feet off designated routes if it would not damage resources would have an adverse effect on fisheries. Management actions for TTM would have minor adverse effects on special status fish resources.

Recreation

Allowing additional recreation facilities in areas where they are supported by recreational use and are consistent with other resource values could have an adverse effect on fish through increased fishing and the potential increasing the risk of disease or invasive species colonizing Yellowstone cutthroat trout habitats. Increased education would reduce these adverse impacts. Limiting motorized vehicle travel to designated roads and trails (other than within stock driveways) consistent with other resource values would have a beneficial effect on special status fish. Recreation management would occur within one to five percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for recreation under Alternative D would have minor adverse effects on special status fish resources.

Livestock Grazing Management

Authorizing increases in forage for watershed protection first, then for forage and habitat; locating livestock salt or mineral supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands; designating reserve common allotments; allowing increases in livestock stocking rates as a result of vegetative treatments; and providing a minimum of two growing seasons rest from livestock grazing, prescribed fires, and vegetative treatments (in lieu of an approved plan) would have a minor beneficial effect on Yellowstone cutthroat trout by improving the health of the stream system.

Special Designations

Areas of Critical Environmental Concern

An ACEC designation at Welch Ranch on the Tongue River could have an adverse effect on identified Yellowstone cutthroat habitats. Additional human use could occur with designation, which would increase the potential for introduction of invasive aquatic species and illegal stocking, and increase the risk of fire in the riparian forest. These potential issues would be mitigated through education. Designation would have beneficial effects through public outreach and education regarding the rarity and value of prairie river riparian systems. The proposed ACECs would encompass less than one percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for ACECs would have negligible beneficial effects on special status fish resources.

4.4.8.7. Cumulative Impacts

Cumulative impacts to special status fish species in the planning area would come from non-federal minerals development, non-BLM fire programs, and non-BLM-regulated recreation. In general, these actions can be grouped into actions that are apart from either BLM surface estate or BLM mineral estate. Most cold-water fisheries in the planning area are on BLM or USFS lands, and actions on USFS lands would be similar to BLM actions regarding protective measures. In forested habitats of the cold-water fisheries, the greatest threat to special status fish

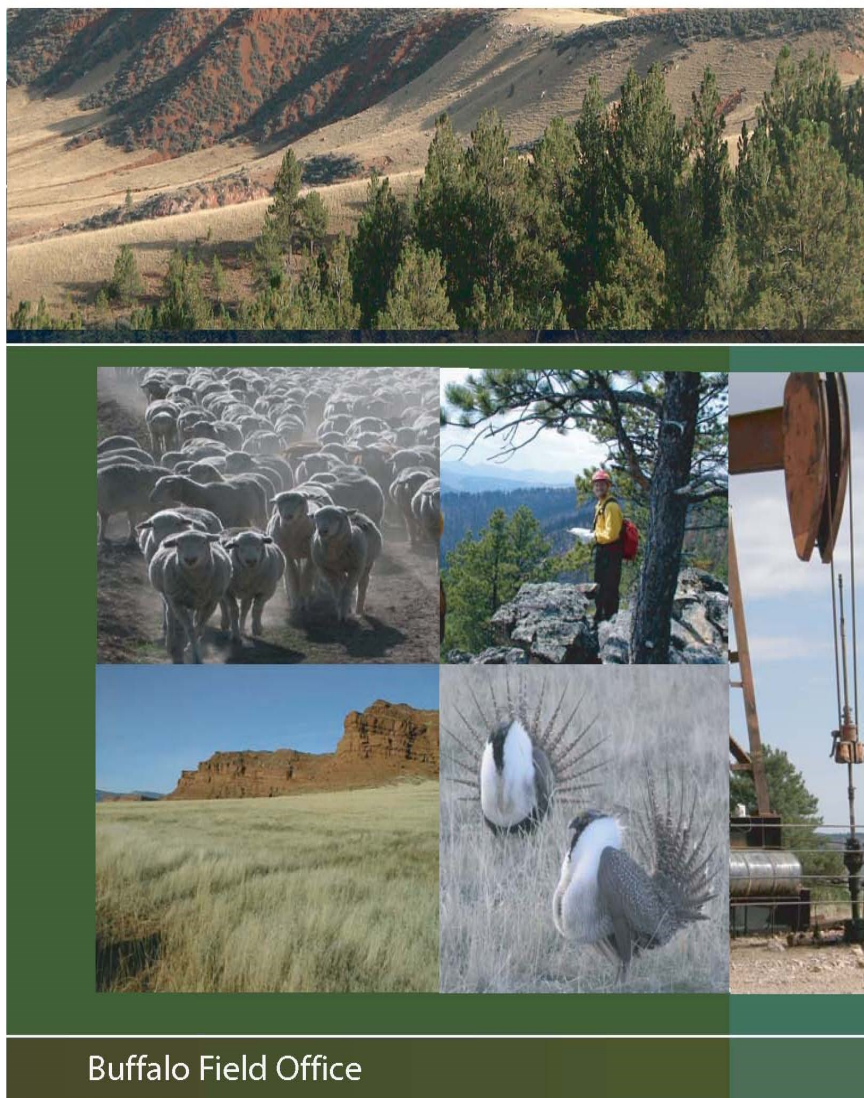
would be catastrophic fire and the resulting sedimentation and water temperature and chemistry changes. The Bighorn National Forest Plan addresses this threat with suppression efforts and forest health projects; however, the extent of diseased timber that could burn does represent a potential major adverse effect on fish.

Wind-energy projects on non-BLM-administered lands would not impact Yellowstone cutthroat trout.

Recreation off BLM surface would likely result in the transport and introduction of diseases and invasive species, which could have a major adverse effect on special status fish species.

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Proposed Resource Management Plan and Final Environmental Impact Statement for the Buffalo Field Office Planning Area



Buffalo Field Office

Volume 3 of 3
Chapters 4 (Section 4.4.9 to the end), 5, and 6,
Glossary, and Maps

May 2015



The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

Proposed Resource Management Plan and Final Environmental Impact Statement for the Buffalo Field Office Planning Area

Volume 3 of 3

Chapters 4 (Section 4.4.9 to the end), 5, and 6, Glossary, and Maps

**U.S. Department of the Interior
Bureau of Land Management
Buffalo Field Office, Wyoming**

May 2015

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Chapter 4. Environmental Consequences

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4.4.9. Special Status Species – Wildlife (including Greater Sage-Grouse)

Greater Sage-Grouse

This section describes the environmental consequences associated with the impacts to Greater Sage-Grouse and other special status wildlife species and their habitats from activities carried out in conformance with this plan, coupled with the mitigation of those activities. In addition, to help implement this Buffalo Proposed Plan, a Western Association of Fish and Wildlife Agencies (WAFWA) MZ I Regional Mitigation Strategy (per Appendix B (p. 1779)) will be developed within one year of the issuance of the ROD. The Regional Mitigation Strategy will elaborate on the components identified in Chapter 2 (avoidance, minimization, compensation, additionality, timeliness, and durability), and will be considered by the BLM for authorized land uses that may impact Greater Sage-Grouse and its habitat. The implementation of a Regional Mitigation Strategy will benefit Greater Sage-Grouse, the public, and land-users by providing a reduction in threats, increased public transparency and confidence, and a predictable permit process for land-use authorization applicants.

Populations of Greater Sage-Grouse fluctuate, sometimes widely, in response to natural factors such as cycles in the abundance of prey or extremes in seasonal weather such as severe winters. It can be difficult to determine whether effects on Greater Sage-Grouse result from any specific management action or from population changes caused by natural factors. Changes in stressors, (e.g., increased human presence and noise) on habitat components such as vegetation, water, soil, or air are the most likely to cause direct and indirect effects on Greater Sage-Grouse and their habitat.

Actions that remove, degrade, or fragment habitat for Greater Sage-Grouse are considered adverse. Beneficial effects result from actions that conserve or improve habitats, such as Greater Sage-Grouse nesting habitat.

Direct effects on Greater Sage-Grouse could result from the loss of habitats or Priority Habitat Management Area (PHMA) features such the lek area, or from the immediate loss of life. Human activities also can directly disturb Greater Sage-Grouse, potentially causing them to abandon a lek or their home range. Disturbance during sensitive periods (e.g., winter and nesting) is known to adversely affect Greater Sage-Grouse. Human activities such as OHV use, recreation, and noise from equipment associated with development and surface-disturbing activities affect Greater Sage-Grouse. These activities are considered to be particularly detrimental to nesting and lekking grouse.

Activities such as vegetative treatments; fire and fuels management; minerals exploration and extraction; construction and maintenance of roads and trails; and development of renewable resources can fragment or cause the loss of Greater Sage-Grouse habitats. Indirect effects on Greater Sage-Grouse can result from changes in habitat characteristics or quality. Various surface-disturbing activities and other actions that remove vegetation and disturb soil can affect habitat quality. Specific actions that change habitat in a way that would make it unsuitable for future habitation can cause indirect effects on Greater Sage-Grouse. Human disturbance from vehicular travel on roads, human activity at drill sites or wellheads, or any other activity not associated with the natural environment (including noise) can indirectly affect Greater Sage-Grouse not accustomed to such disturbances.

Disturbance affects range from short-term displacement and shifts in activities to long-term abandonment of home range. For purposes of this analysis, short-term effects on Greater Sage-Grouse would result from activities to which an individual immediately responds, but do not affect the population viability. For example, many disturbance effects are short-term because a Greater Sage-Grouse might temporarily abandon an area or nest but return immediately following the cessation of the disturbance, such as a passing OHV. Short-term construction can cause Greater Sage-Grouse to abandon a lek or nest, but is often is able to return to the area and successfully reproduce the following season.

Long-term effects on Greater Sage-Grouse are those that would affect the viability of the population. These effects include alteration of adequate habitats in either size or health (direct loss, fragmentation, or degradation) for any or all life requirements (e.g., seasonal habitats), and activities that would affect reproductive success (e.g., activities causing undue energy expenditure for prolonged periods, and removal of breeding grounds and nests). Human disturbance, whether intentional (e.g., harassment) or unintentional, results in increased energy cost to the alerted animals. Disturbed animals incur a physiological cost either through excitement (preparation for exertion) or locomotion. A fleeing or displaced animal incurs additional costs through loss of food intake and potential displacement to poorer (lower) quality habitat. If the disturbance becomes chronic or continuous, these costs can result in reduced animal fitness and reproductive potential. In addition, physical or psychological barriers lead to fragmentation of habitats, further limiting the availability of effective habitat. An area of intensive activity or construction becomes a barrier when animals cannot or will not cross it to access otherwise suitable habitat. These effects are especially problematic when they occur in limiting habitat components such as winter ranges and reproductive habitats (WGFD 2004).

Other Special Status Species Wildlife

Populations of special status wildlife species fluctuate in response to natural factors such as cycles in the abundance of prey or extremes in seasonal weather such as severe winters. It can be difficult to determine whether effects on special status wildlife species result from any specific management action or from population changes caused by natural factors. Changes in stressors, (e.g., increased human presence and noise) on habitat components such as vegetation, water, soil, or air are the most likely to cause direct and indirect effects on special status wildlife species. The Implementation Plan (Appendix B (p. 1779)) which includes the adaptive management and monitoring strategies will allow for management changes when determined necessary to reduce effects on SSS.

Actions that remove, degrade, or fragment habitat for special status wildlife species are considered adverse. Beneficial effects result from actions that conserve or improve habitats, such as raptor nest sites or eagle roosting habitat.

Direct effects on special status wildlife species could result from the loss of habitats or habitat features such as nest or roost sites, or from the immediate loss of life. Human activities also can directly disturb special status wildlife species, potentially causing them to abandon a nest, or their home range. Disturbance during sensitive periods (e.g., winter and nesting) is known to adversely affect special status wildlife species. Human activities such as OHV use, recreation, and noise from equipment associated with development and surface-disturbing activities affect some special status wildlife species. These activities are considered to be particularly detrimental to roosting and nesting raptors.

Activities such as vegetative treatments; fire and fuels management; minerals exploration and extraction; construction and maintenance of roads and trails; and development of renewable resources can fragment or cause the loss of habitats. Indirect effects on special status wildlife species can result from changes in habitat characteristics or quality. Various surface-disturbing activities and other actions that remove vegetation and disturb soil can affect habitat quality. Specific actions that change habitat in a way that would make it unsuitable for future habitation can cause indirect effects on special status wildlife. Human disturbance from vehicular travel on roads, human activity at drill sites or wellheads, or any other activity not associated with the natural environment (including noise) can indirectly affect special status wildlife species not accustomed to such disturbances.

Disturbance affects range from short-term displacement and shifts in activities to long-term abandonment of home range. For purposes of this analysis, short-term effects on special status wildlife species would result from activities to which an individual or species immediately responds, but do not affect the population viability of the species. For example, many disturbance effects are short-term because a species might temporarily abandon an area or nest but return immediately following the cessation of the disturbance, such as a passing OHV. Short-term construction can cause an animal to abandon an area or nest, but the species often is able to return to the area and successfully reproduce the following season.

Long-term effects on special status wildlife species are those that would affect the viability of the population. These effects include alteration of adequate habitats in either size or health (direct loss, fragmentation, or degradation) for any or all life requirements (e.g., seasonal habitats), and activities that would affect reproductive success (e.g., activities causing undue energy expenditure for prolonged periods, and removal of breeding grounds and nests). Human disturbance, whether intentional (e.g., harassment) or unintentional, results in increased energy cost to the alerted animals. Disturbed animals incur a physiological cost either through excitement (preparation for exertion) or locomotion. A fleeing or displaced animal incurs additional costs through loss of food intake and potential displacement to poorer (lower) quality habitat. If the disturbance becomes chronic or continuous, these costs can result in reduced animal fitness and reproductive potential. In addition, physical or psychological barriers lead to fragmentation of habitats, further limiting the availability of effective habitat. An area of intensive activity or construction becomes a barrier when animals cannot or will not cross it to access otherwise suitable habitat. These effects are especially problematic when they occur in limiting habitat components such as winter ranges and reproductive habitats (WGFD 2004).

4.4.9.1. Methods and Assumptions

This section describes the methods and assumptions used to analyze impacts to special status wildlife species. The assumptions and methods include:

- The area evaluated for possible effects on most special status wildlife species includes the entire area within the boundaries of the planning area.
- Effects on special status wildlife species are based primarily on potential effects on habitats managed by the BLM.
- The analysis of special status wildlife species in planning area watersheds focuses on changes in water quantity because that would be the primary indirect effect on watershed species from resource management actions. See the *Special Status Species – Fish* section for more detail on these analyses, and to the *Water* section for more information about effects on water quality and water quantity in the planning area.
- In areas with historic fire regimes, prescribed fire is used to manage vegetative communities and can result in short-term adverse effects and long-term beneficial effects on wildlife and wildlife habitats.
- Short- and long-term surface disturbance are assumed to occur in vegetative types, in proportion to the availability of these vegetative types, in the planning area. Affected acreages for vegetative types are not absolute, but provide a means for relative comparisons among alternatives.
- Precise quantitative estimates of effects generally are not possible because the exact locations of future actions are not known, population data for species status wildlife species are often lacking, or habitat types affected by activities cannot be predicted.
- Because of the migratory nature and relative mobility of some special status wildlife species, these species are affected by actions on non-BLM-administered land more than other species. In the case of migratory species, effects on winter and migration habitats could adversely affect the viability of some species. Winter and migration habitats are assumed to be at least as important to long-term viability of these species as breeding and nesting habitats.
- Actions that would adversely or beneficially affect one species would have similar effects to other species using the same habitats.
- In relation to buffers, “prohibit” means no activity or effects will be allowed during a specific period or in a designated habitat area unless specific biological exception conditions are met. Avoid means to follow guidance for avoidance when possible.
- For purposes of analysis, it is assumed that water use in the planning area could adversely affect surface water quantity in planning area watersheds. Water depletion analyses are based on the assumption that all water used for impoundments or drilling and completion of wells in the planning area would have contributed to the surface flows of the pertinent watershed.
- BLM-authorized activities associated with all resource and all resource use programs within Greater Sage-Grouse habitat would be subject to Greater Sage-Grouse required design features (RDFs) identified in Appendix D (p. 1863). For analysis purposes, it has been assumed that all applicable BMPs, recommended practices, conservation measures, and RDFs would be implemented during site-specific project planning where appropriate.
- Recommendations by the Northeast Wyoming Greater Sage-Grouse Working Group for improving and maintaining Greater Sage-Grouse habitats would be encouraged where appropriate.
- Management of sagebrush habitats would follow the BLM National Sage-Grouse Habitat Conservation Strategy (BLM 2005d). Using these guidelines, Greater Sage-Grouse would serve as an umbrella species for all sagebrush-dependent species. Measures to protect Greater Sage-Grouse will benefit all sagebrush-dependent species.

- All current Greater Sage-Grouse management guidance will be followed such as the BLM's Greater Sage-Grouse National Land Use Planning Strategy (IM-2012-044) and the BLM Wyoming's Greater Sage-Grouse Habitat Management Policy on Wyoming BLM Administered Public Lands Including the Federal Mineral Estate (IM WY-2012-019).
- The more sagebrush acreage protected, the greater the benefit to Greater Sage-Grouse and other sagebrush-dependent species.
- Prohibiting all non-beneficial ground disturbance and disruptive activities in Greater Sage-Grouse habitats would provide a higher level of protection for Greater Sage-Grouse than avoiding these activities.
- The BLM can minimize disturbance impacts to special status wildlife by limiting access to nesting, breeding, and brood-rearing sites. Surface disturbance can be controlled through three types of restrictions: (1) NSO for fluid minerals, which prohibits physical presence; (2) CSU, which limits surface use unless there is a documented plan for mitigation; and (3) TLS, which prohibits surface use during specified periods.
- Removing sagebrush habitat will have a long-term adverse effect on sagebrush-obligate species.
- Over the life of the plan, some species currently considered sensitive, or not formally included on the BLM sensitive species list, could be listed under the ESA. Some currently listed species could be delisted during the life of the plan. Most species delisted or downgraded from federally Proposed or Candidate status will be included on the BLM sensitive species list.
- Public concern for SSS will likely increase during the planning period due to increasing concerns over growth and development on habitats containing these species.
- The USFWS could designate additional wildlife species as T&E as additional data are collected and evaluated. These species would be managed in accordance with the ESA and as directed by decisions under the alternatives.
- All known SSS raptor nests from the GIS database maintained by the BLM BFO were used in the analysis. Buffers associated with raptor nests were analyzed in accordance with USFWS recommended spatial buffers to protect nesting raptors. Nests of unknown raptor species were analyzed as golden eagle nests when located in trees and as ferruginous hawk nests when located on the ground.

Significance Criteria

In addition to the scale of impacts listed in the beginning of this chapter, an adverse impact on special status wildlife species as a result of project actions would be considered potentially significant if there was: (1) substantial loss of the biological integrity and habitat function of ecosystems that would make species eligible for listing under the ESA; (2) decreased viability or increased removal of Threatened, Endangered, Proposed, or Candidate species, or adverse alteration of their critical habitats; and (3) substantial loss of habitat function or disruption of life history requirements of SSS that would preclude improvement of their status.

4.4.9.2. Impacts Common to All Alternatives

Special Status Species - Wildlife (including Greater Sage-Grouse)

Greater Sage-Grouse

Management actions common to all alternatives that could affect Greater Sage-Grouse include: (1) implementing measures in USFWS Biological Opinions for T&E species; (2) maintaining and restoring Greater Sage-Grouse habitats; and (3) establishing a 0.5-mile year-round

disturbance-free buffer zone for known bald eagle nests. These management actions would have beneficial effects on Greater Sage-Grouse as they conserve or improve habitats. The beneficial effects would be major as greater than ten percent of habitats important to Greater Sage-Grouse would be conserved or improved.

Other Special Status Species

Management actions common to all alternatives that could affect special status wildlife species include: (1) implementing measures in USFWS Biological Opinions for T&E species; (2) maintaining and restoring Greater Sage-Grouse habitats; and (3) establishing a 0.5-mile year-round disturbance-free buffer zone for known bald eagle nests. These management actions would have beneficial effects on special status wildlife species resources as they conserve or improve habitats. The beneficial effects would be major as greater than ten percent of habitats important to T&E Species, and bald eagles would be conserved or improved.

Physical Resources

Air Quality (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from management actions associated with Impacts Common to All Alternatives for air quality resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (reduced dust emissions, thereby improving habitats). The beneficial effects would be minor as this would improve habitat mostly along roads, likely only covering one to five percent of habitats important to special status wildlife species.

Soil (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from management actions associated with Impacts Common to All Alternatives for soil resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (impact avoidance, thereby conserving habitats). These beneficial effects would be moderate as reclamation, though beneficial, is not restoration and the adverse impacts to habitats would likely persist in large areas of disturbance.

Water Resources

Greater Sage-Grouse

The types of effects on Greater Sage-Grouse from management actions associated with Impacts Common to All Alternatives for water resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (protecting surface water from soil erosion and/or pollutants, thus conserving habitats). The effects would be major based on protection alone, but when adding the adverse effects of increased water on a naturally arid landscape which provides a vector for WNV. Taylor et al. (2012) proclaim WNV to be the single greatest threat to Greater Sage-Grouse in the planning area. Persistent low-level WNV mortality, combined with severe disease outbreaks, results in local and regional population declines (Naugle et al. 2004; Naugle et al. 2005). Eliminating mosquito breeding habitat from anthropogenic water sources is crucial for reducing impacts (Taylor et al. 2012). The effect on a WNV outbreak year alone can more than cut a population in half, which could lead to functional extinction within the planning area (Taylor et al. 2012). Due to WNV, the beneficial effects are reduced to a moderate level.

Providing an alternative or “off-source” water supply in locations where BLM-authorized uses are fenced out of water sources is of particular concern to Greater Sage-Grouse management.

Without direction for construction of water containment structures (e.g., troughs, tanks, or ponds) to eliminate habitat for mosquitoes, this management action could contribute to population declines. This management action would have a significant impact on Greater Sage-Grouse. The Greater Sage-Grouse populations in the planning area are at great risk as they are small, isolated, peripheral populations at lower elevations (warmer temperatures associated with lower elevations support WNV presence) experiencing large-scale increases in distribution of surface waters. A WNV outbreak year could reduce the area lek count by 60 percent (Taylor et al. 2012). Reducing the threat of WNV by reducing the number of new man-made water sources should remain a focus of future management. Therefore, supporting and encouraging water supply sources without mitigation to reduce or prevent WNV transmission will likely result in a loss of viability within the planning area, but will not jeopardize the continued existence of the species range-wide (Taylor et al. 2012; USFWS 2013a). This management action would have significant impact on Greater Sage-Grouse.

Other Special Status Species

The types of effects on special status wildlife species from management actions associated with Impacts Common to All Alternatives for water resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (protecting surface water from soil erosion and/or pollutants, thus conserving habitats).

Cave and Karst Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from management actions associated with impacts common to all alternatives for cave and karst resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (cave inventories, thus identification and conservation of bat habitats). The effects would be minor as only a small portion of one to five percent of all bat habitats in the planning area would be identified and conserved.

Mineral Resources

Locatable Minerals (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from locatable minerals resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (removal and/or fragmentation of habitat). The adverse impacts would be negligible for special status wildlife species as locatable minerals are limited within the planning area and less than one percent of SSS habitats are likely to be impacted by locatable mineral development.

Leasable Minerals – Coal

Greater Sage-Grouse

The types of effects on special status wildlife species from leasable coal minerals resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (removal and/or fragmentation of habitat). At the time an application for a new coal lease or lease modification is submitted to the BLM, the BLM will determine whether the lease application area is "unsuitable" for all or certain coal mining methods pursuant to 43 CFR 3461.5. No new coal leases applications are reasonably foreseeable within PHMA (core population areas and core population connectivity corridors). The adverse impacts would be minor for Greater Sage-Grouse as exploration and

development would be unlikely to occur within PHMA (core population areas and core population connectivity corridors).

Other Special Status Species

The types of effects on special status wildlife species from leasable coal minerals resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (removal and/or fragmentation of habitat). The adverse impacts would be major for special status wildlife species as exploration and development could occur on greater than ten percent of habitats important to more than half of the special status wildlife species in the planning area.

Leasable Minerals – Fluids

Greater Sage-Grouse

The types of effects on Greater Sage-Grouse from leasable fluid minerals resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (removal, degradation, and/or fragmentation of habitat). Forty-six percent (3,386,530 acres) of the planning area is BLM-administered fluid minerals of which 75 percent (2,544,512 acres) has been leased; the majority of which is held by production. Thus, the adverse impacts would be major for Greater Sage-Grouse as leasable fluid mineral potential exists within nearly half of all habitats.

CBNG activity has waned in recent years with the decline in natural gas prices. To date development is approximately half that predicted in the PRB Final EIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1937)). Interest in deep oil and gas resources within the planning area is increasing, with the anticipated spacing being less than with CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore deep development may be more compatible with Greater Sage-Grouse. Appendix D (p. 1863) contains lists of RDFs and discretionary BMPs to promote Greater Sage-Grouse conservation. BLM's High Plains District has also founded the PRB Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats.

Other Special Status Species - Wildlife

The types of effects on special status wildlife species from leasable fluid minerals resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (removal, degradation, and/or fragmentation of habitat). Forty-six percent (3,386,530 acres) of the planning area is BLM-administered fluid minerals of which 75% (2,544,512 acres) has been leased; the majority of which is held by production. Thus, the adverse impacts would be major for special status wildlife species as leasable fluid mineral potential exists within nearly half of all habitats for nearly every special status wildlife species (black-tailed prairie dogs, raptors, amphibians, reptiles, bats and migratory birds) in the planning area.

CBNG activity has waned in recent years with the decline in natural gas prices. To date development is approximately half that predicted in the PRB Final EIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1909)). Interest in deep oil and as resources within the planning area is increasing, with the anticipated spacing being less than with CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore deep development may be more compatible with SSS. Appendix D (p. 1863) contains lists of

RDFs and discretionary BMPs to promote Greater Sage-Grouse conservation; which would likely benefit other SSS as well. BLM's High Plains District has also founded the PRB Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats.

Salable Minerals (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from salable minerals resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (removal, degradation and/or fragmentation of habitat). The adverse impacts would be major for special status wildlife species as salable minerals are likely to occur within greater than ten percent of habitats important to nearly all special status wildlife species (nine percent of habitats important to Greater Sage-Grouse) in the planning area.

Fire and Fuels Management

Planned Fire (Prescribed Fire) (All species, including Greater Sage-Grouse)

Prescribed fire would be implemented to meet DPC and resource management objectives and would be planned on a landscape basis with multiple land owners involved. Effects on grassland and shrubland communities would be direct and long term. Fire helps maintain a mixture of vegetative types and age classes that provide habitat for a variety of special status wildlife species. Fire alters habitats and could improve habitat components for some species while degrading habitat for others. Over time, as vegetation recovers from fire disturbance, various species of special status wildlife species would benefit from various successional stages of vegetation. Herbivores are directly affected by the changes in vegetative cover and forage associated with fire, whereas predators respond to both changes in cover and abundance of prey. Due to the size of potential prescribed fire projects in the planning area, more than ten percent of habitats important to most special status wildlife species (Greater Sage-Grouse, bald eagles, herptiles, bats and migratory birds) in the planning area, these impacts would be major. The effects overall from prescribed fire are anticipated to improve habitats and thus be beneficial.

Unplanned Fire (Wildfire) (All species, including Greater Sage-Grouse)

In addition, fire near wetlands can consume dead grass and sedges, opening up dense marsh vegetation to maintain habitat. Burning also stimulates new shoots that have greater value as forage. Under the right conditions, fire can create new ponds or prevent old ponds from filling in with vegetation. Fire can have short-term adverse effects on special status wildlife species when it occurs during nesting or molting periods, or when it eliminates woody vegetative cover.

Shrub communities are maintained by periodic fires. In forested areas, fire creates openings in the forest and snags used for nesting, perching, and foraging. Fire can cause direct effects on birds when it occurs during the nesting season, killing nestlings and destroying nests. Raptors can benefit from fire due to increased populations of small mammals and birds in response to vegetative changes after fire. The timing of the benefit varies depending on the type of prey favored by the raptor. Over the short term, fires reduce cover available for prey species, making them more visible to raptors. Using fire as a habitat management tool in a sagebrush-steppe ecosystem can have adverse effects if it is improperly used, such as converting desirable shrub and perennial grass stands to annual grasses to maintaining annual grass communities. Hazardous fuels reduction and WUI projects are planned for beneficial results, and protective effects are direct and long term for the targeted vegetation. Effects from the fires also can be indirect and adverse over the short-term for non-targeted species in the same vegetative community. Due to the potential long-term degradation of large amounts of Greater Sage-Grouse habitat, but likely

scattered nature of effects to all other special status wildlife species in the planning area, the adverse effects of habitat removal from unplanned fire are likely to be moderate.

Biological Resources

Vegetation – Forests and Woodlands and Vegetation – Grassland and Shrubland Communities (All species, including Greater Sage-Grouse)

In addition to effects described in *Fish and Wildlife Resources – Wildlife* (reducing impacts to habitats), restoring disturbed sites, including split estate lands, in suitable habitat for special status wildlife species would increase suitable habitat and promote new and restore historic habitat. This has a major beneficial effect on special status wildlife species as greater than ten percent of Greater Sage-Grouse, raptor and migratory bird habitats would be affected.

Vegetation – Riparian/Wetland Resources (All species, including Greater Sage-Grouse)

Expanding and enhancing riparian/wetland systems would increase suitable habitat, promote new and restore historic habitat. This would have long-term minor to major beneficial effects on special status wildlife species that inhabit riparian and wetland ecosystems. There are 138,108 acres of suitable riparian habitat for special status wildlife species on split estate lands. Effects would typically be localized, but due to the overwhelming occurrence of riparian/wetland systems and special status wildlife species overlap, projected over the entire planning area (greater than ten percent for all special status wildlife species, except Greater Sage-Grouse), effects would be major beneficial.

Invasive Species and Pest Management (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from invasive species and pest management common to all alternatives would be the same adverse effects (treatment of wildlife food sources) and beneficial (improving vegetative community health) as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter. The overall effects on special status wildlife species, though, would be major adverse as grasshopper populations, one of the food sources of Greater Sage-Grouse young, would be directly targeted and reduced through treatment and WNV, despite management to mitigate its effects, is the wildcard that could lead to Greater Sage-Grouse functional extinction within the planning area.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from fish and SSS fish management common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (protection and improvement of riparian habitats). This has a major effect on special status wildlife species as greater than ten percent of habitats important to each of black-tailed prairie dogs, bald eagles, herptiles and bats within the planning area would be affected.

Fish and Wildlife Resources – Wildlife (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from wildlife management common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (maintaining and improving wildlife habitats). The effects would be major as habitats important to wildlife overlap habitats important for special status wildlife species by greater than ten percent.

Special Status Species – Plants (All species, including Greater Sage-Grouse)

Implementation of actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate and reasonable and prudent measures within biological opinions for T&E species at this point in time, includes surface-disturbing restrictions for Ute ladies'-tresses orchids and their habitats, along with guidelines to prevent alteration of stream flow near known populations. Management actions common to all alternatives also include allowing treatments within habitat for special status plant species and within known populations that are proven to benefit the species. These actions, including the prohibitions/restrictions encompass and therefore improve or conserve five to ten percent of habitats important to herptiles and bats (one to five percent of habitats important to Greater Sage-Grouse and less than one percent of habitats important to all other special status wildlife species); therefore, the management actions common to all alternatives would have moderate beneficial effects on special status wildlife resources.

Heritage and Visual Resources**Cultural Resources** (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from cultural resources management common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (protecting habitats by protecting cultural sites). This would have minor effects on special status wildlife species as cultural resources overlap one to five percent of habitats important to herptiles and/or bats and less than one percent of habitats important to all other special status wildlife species.

Paleontological Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from paleontological resources management common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (protecting habitats by protecting paleontological sites). This would have negligible effects on special status wildlife species as paleontological resources overlap less than one percent of habitats important to special status wildlife species.

Visual Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from visual resources management common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (prohibiting or limiting disturbance to habitats). Beneficial effects are negligible for special status wildlife species due to the minimal (less than one percent) overlap of the two resources.

Land Resources**Forest Products** (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from forest products resource management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat removal). Forest products resource areas overlap less than one percent of habitats important to special status wildlife species, therefore, impacts would be negligible.

Lands and Realty (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from lands and realty management actions common to all alternatives would be the same beneficial effects as described in the *Fish and*

Wildlife Resources – *Wildlife* section of this chapter (improved wildlife resource management ability through acquisition/exchange of lands). Lands with potential for acquisition overlap less than five percent of habitat important to any special status wildlife species so these beneficial effects would be minor.

Renewable Energy (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from renewable energy resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat removal and fragmentation). Renewable energy potential exists in greater than ten percent of habitats important to most special status wildlife species (less than ten percent for bald eagles), therefore effects would be major.

Rights-of-Way and Corridors (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from ROW and corridors management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, degradation, and fragmentation). ROW and corridors are likely to occur throughout greater than ten percent of habitats important to most special status wildlife species (less than ten percent for bald eagles), therefore effects would be major.

Travel and Transportation Management (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from TTM actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, degradation, and fragmentation). The effects from travel and transportation could occur on greater than ten percent of habitats important to black-tailed prairie dogs, Greater Sage-Grouse, bald eagles, and raptors, making these major effects.

Recreation (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from recreation management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, alteration, and degradation, and additional stressors). Recreational activities are likely to occur on less than ten percent of habitats important to special status wildlife species, so effects should be moderate.

Lands with Wilderness Characteristics (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from wilderness characteristics management actions common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Less than one percent of habitats important to special status wildlife species occur within areas with wilderness characteristics, so the effects would be negligible.

Livestock Grazing Management

Greater Sage-Grouse

In addition to the effects described in the *Fish and Wildlife Resources – Wildlife* section (habitat degradation or habitat improvements), late-season grazing can remove residual vegetation that would provide important nesting cover for Greater Sage-Grouse the following spring.

Livestock range improvements designed to alter grazing distribution and use of pastures, such as fences and water developments, would affect Greater Sage-Grouse. Placing mineral supplements

near Greater Sage-Grouse leks could degrade Greater Sage-Grouse nesting habitat. Livestock fences can create travel barriers, cause stress, and could lead to decreased reproductive success and death from entanglement.

Overall, livestock grazing management actions common to all alternatives would have negligible adverse effects on Greater Sage-Grouse.

Other Special Status Species

In addition to the effects described in the *Fish and Wildlife Resources – Wildlife* section (habitat degradation or habitat improvements), late-season grazing can remove residual vegetation that would provide important nesting cover for special status sagebrush obligates. Livestock grazing also can enhance forage and brood-rearing conditions for special status wildlife species. Special status wildlife could favor regrowth areas previously used by cattle because of the resulting increase in forage palatability.

Livestock range improvements designed to alter grazing distribution and use of pastures, such as fences and water developments, would affect SSS. Placing mineral supplements within sensitive habitats could degrade SSS habitat. Livestock fences can create travel barriers, cause stress, and could lead to decreased reproductive success and death from entanglement.

Overall, livestock grazing management actions common to all alternatives would have major adverse effects on special status wildlife species as allotments occur on greater than ten percent of habitats important to special status wildlife species (except bats).

Special Designations

Areas of Critical Environmental Concern (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from ACECs management actions common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). ACECs would encompass one to five percent of habitats important to Greater Sage-Grouse, therefore minor effects would occur.

Scenic or Back Country Byways (All species, including Greater Sage-Grouse)

Scenic or BCBs do not overlap any habitats important to special status wildlife species; therefore, no effects are anticipated.

Wild and Scenic Rivers (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from WSRs management actions common to all alternatives would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter.

Wilderness Study Areas (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from WSAs management actions common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). The WSAs are within less than one percent of habitats important to special status wildlife species so would therefore only have negligible effects.

Socioeconomic Resources

Social and Economic Conditions (All species, including Greater Sage-Grouse)

Management actions common to all alternatives are administrative processes and will have no effect on special status wildlife resources. Impacts to social and economic resources will be quantified on a project-specific basis. Management actions that vary by alternative are also administrative; therefore, social and economic management actions will not be discussed further in this section.

Health and Safety (All species, including Greater Sage-Grouse)

Management actions common to all alternatives are designed to control and mitigate threats to health and human safety and to the environment. Management actions designed to prevent accidental spills of hazardous materials or environmental contamination would have beneficial impacts to special status wildlife by protecting riparian and upland areas across the resource area. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is a threat of accidents or spills. If there was a spill, mitigation and cleanup would rarely succeed in recovering a riparian or upland area to its original condition over the short term; therefore, there would be localized long-term adverse impacts.

Management actions associated with health and safety are only identified in the *Impacts Common to All Alternatives* section; therefore, health and safety will not be discussed further in this section.

4.4.9.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. This section describes management actions and potential impacts to special status wildlife species from implementing Alternative A.

Special Status Species – Wildlife**Greater Sage-Grouse**

Seasonal restrictions on land uses would benefit Greater Sage-Grouse by preventing disturbance during critical breeding and nesting periods. This would have a long-term beneficial effect. Other long-term beneficial effects would result from restricting access roads, pipelines, and powerlines to designated corridors.

Greater Sage-Grouse also would benefit from prohibiting surface occupancy for oil and gas activities, restricting OHV activities in big-game winter ranges or elk calving areas, retaining sufficient escape and foraging habitat adjacent to timber cutting units, and exchanging or selling scattered parcels of public land so areas could be “blocked up” into manageable units. From past experience, it is estimated that restrictions on oil and gas exploration, ROW, and other surface-disturbing activities through special status wildlife species seasonal or NSO provisions are not likely. Under Alternative A, the authorized officer may waive prohibitions and restrictions without defined criteria; this has resulted in inconsistent application of management and has not been effective in protecting wildlife.

Estimated short- and long-term disturbance from BLM actions in the planning area are anticipated to result in loss, degradation, and fragmentation of sagebrush habitat. Alternative A does not provide specific guidance or management actions for the prevention of habitat loss and fragmentation. To minimize effects on sagebrush habitats and Greater Sage-Grouse, Alternative A would avoid surface disturbance or occupancy within 0.25 mile of occupied leks and avoid

surface-disturbing and disruptive activities in suitable nesting and early brood-rearing habitats within 2 miles of occupied leks.

Alternative A does not include surface disturbance restrictions for Greater Sage-Grouse winter habitats, requirements to reduce noise levels of equipment, or restrictions on high-profile structures in sagebrush-obligate habitats (which could fragment habitat because Greater Sage-Grouse avoid some high-profile structures). Alternative A restrictions on surface disturbance or occupancy and disruptive activities around occupied Greater Sage-Grouse leks should provide some benefit to Greater Sage-Grouse during sensitive periods; however, these restrictions might not be sufficient to maintain or improve Greater Sage-Grouse populations over the long term. Energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87 percent to 5 percent (Walker et al. 2007a). Alternative A does not provide any provisions for habitat restoration, a component essential to the repopulation of degraded habitats. Over the long term, projected surface-disturbing and disruptive activities under Alternative A would have a major adverse effect on Greater Sage-Grouse in the planning area, potentially including extirpation within development areas. Current restrictions and lease stipulations, and inconsistent application of impact minimization measures have led to substantial loss of the biological integrity and habitat function of ecosystems; decreased population viability; and substantial disruption of life history requirements of this SSS. This management has had and would continue to have significant impacts on Greater Sage-Grouse in the planning area.

Other Special Status Species

Seasonal restrictions on land uses would benefit special status wildlife species by preventing disturbance during critical winter, breeding, and nesting periods. This would have a long-term beneficial effect. Other long-term beneficial effects would result from restricting access roads, pipelines, and powerlines to designated corridors.

Special status wildlife species also would benefit from prohibiting surface occupancy for oil and gas activities, restricting OHV activities in big-game winter ranges or elk calving areas, retaining sufficient escape and foraging habitat adjacent to timber cutting units, and exchanging or selling scattered parcels of public land so areas could be “blocked up” into manageable units. From past experience, it is estimated that restrictions on oil and gas exploration, ROW, and other surface-disturbing activities through special status wildlife species seasonal or NSO provisions are not likely. Under Alternative A, the authorized officer may waive prohibitions and restrictions without defined criteria; this has resulted in inconsistent application of management and has not been effective in protecting wildlife.

Estimated short- and long-term disturbance from BLM actions in the planning area are anticipated to result in loss, degradation, and fragmentation of sagebrush habitat. Alternative A does not provide specific guidance or management actions for the prevention of habitat loss and fragmentation. To minimize effects on sagebrush habitats, Alternative A would avoid surface disturbance or occupancy within 0.25 mile of occupied Greater Sage-Grouse leks and avoid surface-disturbing and disruptive activities in suitable nesting and early brood-rearing habitats within 2 miles of occupied leks.

Similar to Greater Sage-Grouse, Brewer’s sparrow, sage sparrow, and sage thrasher depend on sagebrush habitats. These species can use other shrubland types, particularly during the non-breeding season. The loggerhead shrike uses a greater diversity of shrubland types, including sagebrush. Therefore, measures to protect Greater Sage-Grouse would benefit all sagebrush and shrubland species. Adverse effects on sagebrush habitats adversely affect these species.

Alternative A does not include surface disturbance restrictions for Greater Sage-Grouse winter habitats, requirements to reduce noise levels of equipment, or restrictions on high-profile structures in sagebrush-obligate habitats. Alternative A restrictions on surface disturbance or occupancy and disruptive activities around occupied Greater Sage-Grouse leks should provide some benefit to special status sagebrush obligates during sensitive periods. Alternative A does not provide any provisions for habitat restoration. Over the long term, projected surface-disturbing and disruptive activities under Alternative A could have a major adverse effect on special status sagebrush obligates in the planning area. Current restrictions and lease stipulations, and inconsistent application of impact minimization measures have led to substantial loss of the biological integrity and habitat function of ecosystems; decreased population viability; and substantial disruption of life history requirements of SSS. This management has had and would continue to have significant impacts on special status sagebrush obligates.

Many neotropical migrants breed and nest on BLM-administered lands and winter in the tropics (BLM 1992b). Although effects on these species in their winter habitat are not subject to BLM management, localized effects on breeding and nesting habitats from surface-disturbing activities are anticipated for neotropical migrants. These effects could include temporary and permanent loss of breeding and nesting habitats. Surface-disturbing activities and associated development would also fragment and degrade habitats for neotropical migrants.

Although there are no specific management actions for special status neotropical migrants that use riparian and wetland systems, these species are affected by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats. Riparian and wetland areas also provide late brood-rearing habitats for Greater Sage-Grouse; breeding and migratory stopover habitats for sensitive songbirds, waterbirds, shorebirds, and waterfowl; and breeding, foraging, and wintering habitat for bald eagles. Management and potential effects on riparian and wetland species under Alternative A would be similar to those described for migratory game birds (waterfowl) in the *Fish and Wildlife Resources – Wildlife* section of this chapter.

Nongame raptors are anticipated to be affected by surface-disturbing activities under Alternative A. The late winter, spring, and early summer periods, when courtship, nest construction, incubation, and early brooding periods occur, are considered more sensitive to disturbance because adult nongame raptors are more prone to abandon nests at these times (USFWS 2002). Constructing roads, powerlines, and other facilities can contribute to loss and fragmentation of raptor habitats and ultimately affect diversity and abundance of raptor populations (USFWS 2002). Surface disturbance would have localized adverse effects on raptor prey species by temporarily and permanently disturbing habitats for small mammals and birds. Under Alternative A, surface disturbance effects on raptors would be reduced by designated buffer zones around raptor nests. Under Alternative A, no activity or surface disturbance would be allowed within a biologic buffer from any active raptor nest from February 1 through July 31. The distances and dates for no disturbance can vary under Alternative A based on topography, species, season of use, and other pertinent factors. Under Alternative A, the BLM would protect approximately 1,195,815 acres surrounding known raptor nests.

Effects from surface-disturbing activities are anticipated for special status nongame mammals. Surface disturbance is anticipated to have localized adverse effects on special status nongame mammal habitats, including temporary and permanent loss of habitats. Fragmentation and degradation of habitats for special status nongame mammals is also anticipated from surface-disturbing activities and associated development. Under Alternative A, short- and long-term surface disturbance is expected for grassland habitats on BLM-administered land in

the planning area. Reductions in prairie dog populations could affect other grassland species associated with prairie dog towns, including mountain plover, burrowing owl, swift fox, and black-footed ferret. Because most suitable habitats for prairie dogs in the planning area are on private and state lands, there should be no measurable adverse effects on prairie dog populations from BLM actions under Alternative A.

Alternative A does not include specific management actions for bats, nor have bat habitats been delineated in the planning area. In general, forest and woodland special status nongame mammal species occupy similar habitats as forest and woodlands special status nongame neotropical migrants; therefore, effects on these two groups could be similar.

Under Alternative A, there are no specific management actions for special status neotropical migrants that utilize grassland. Short- and long-term surface disturbances to grassland habitats on BLM-administered land in the planning area are expected. Another grassland species, mountain plover, is often found in association with prairie dog towns because they tend to prefer nesting areas with sparse vegetative cover. The long-billed curlew also nests in areas with sparse vegetation. Therefore, these species would also be affected by management actions for black-tailed prairie dogs.

Although there are no specific management actions for reptiles and amphibians under Alternative A, these species would be affected by other biological resource management actions. Amphibians require riparian and wetland habitats. The effects of management actions on these habitat types are described throughout this section.

Physical Resources

Air Quality (All species, including Greater Sage-Grouse)

The types of effects from Alternative A would be the same as described in the *Impacts Common to All Alternatives* section for air quality. In Alternative A, though, these impacts would be analyzed on a project-specific basis. Without monitoring or oversight on a programmatic level, the beneficial effects can only be negligible. Air quality resource management actions under Alternative A would have negligible beneficial impacts on SSS wildlife.

Soil (All species, including Greater Sage-Grouse)

The types of effects from Alternative A would be the same as described in the *Impacts Common to All Alternatives* section for soil (dust emission reduction and vegetation health improvements). In Alternative A, management actions for soil are beneficial where habitats are conserved through prohibitions of surface-disturbing activities and/or surface occupancy, both of which occur on greater than ten percent of habitats important to bald eagles, Greater Sage-Grouse, and herptiles. Within Alternative A, the impacts to soil resources are analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Water Resources (All species, including Greater Sage-Grouse)

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for water (protecting, restoring, developing and improving water sources used by wildlife). Management actions for water in Alternative A are beneficial when habitats are conserved through prohibitions to surface disturbance, which occurs on greater than ten percent of habitats important to bald eagles and habitats important to herptiles, making these beneficial effects major. Within Alternative A, the impacts to water resources are

analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only minor.

Cave and Karst Resources (All species, including Greater Sage-Grouse)

The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for cave and karst resources (inventory and protection of habitats). Without monitoring or oversight on a programmatic level, the beneficial effects can only be negligible. Cave and karst resource management actions under Alternative A would have negligible beneficial impacts on SSS wildlife.

Mineral Resources

Locatable Minerals (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat fragmentation, degradation and loss). Less than one percent of habitats important to special status wildlife species (herptiles and bats) will be affected by locatable mineral development in Alternative A, making the effects negligible.

Leasable Minerals – Coal (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss).

Leasable Minerals – Fluids

Greater Sage-Grouse

Fluid minerals have been leased and developed and would continue to be leased and developed within fifty percent of the Greater Sage-Grouse habitat in the planning area. Energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87 percent to 5 percent (Walker et al. 2007a). Constraints on oil and gas leases, thus far, have not been strong enough to prevent the decline in populations of this species resulting from habitat loss, degradation and fragmentation caused by its development. Continuing to lease and allow development on this scale would cause substantial loss of the biological integrity and habitat function of ecosystems. This management has had and would continue to have significant impacts on Greater Sage-Grouse in the planning area, potentially including extirpation within energy development areas.

Other Special Status Species

The types of effects on special status wildlife species would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and fragmentation). Under Alternative A, fluid resources could be developed on greater than ten percent of all special status wildlife species, making the adverse effects major.

Salable Minerals (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Greater than ten percent of habitats important to nearly all special status wildlife species (less for Greater Sage-Grouse) would be affected by salable mineral activities, making these adverse effects major.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Greater Sage-Grouse

Alternative A would manage wildland fire for areas where fire is not desirable or can be used as a management tool, and could implement prescribed fire to reduce hazardous fuels and meet fire and fuels management objectives. Nelle et al. (2000) concluded that burning did not benefit Greater Sage-Grouse nesting or brood-rearing habitats and adversely affected nesting habitats due to the extensive time it takes for sagebrush canopy to recover. Because Greater Sage-Grouse hens show fidelity for nesting areas, catastrophic wildland fires that remove large tracts of sagebrush could be detrimental to Greater Sage-Grouse populations. Holloran et al. (2005) recommended limiting prescribed fire that could adversely affect dense sagebrush stands with adequate herbaceous vegetation. Fire and fuels management under Alternative A would promote a natural fire regime and could limit the potential for catastrophic fire, which would benefit Greater Sage-Grouse.

Overall, short-term effects from fire will be adverse based on habitat loss and degradation. Wildfires are estimated to burn 27,596 acres (3.5%) and planned fires are anticipated for 14,000 acres (1.8%) of BLM surface during the life of the plan, a minor effect.

Other Special Status Species

The types of effects on special status wildlife species from Alternative A fire and fuels management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter. In addition, Alternative A would manage wildland fire for areas where fire is not desirable or can be used as a management tool, and could implement prescribed fire to reduce hazardous fuels and meet fire and fuels management objectives. Holloran et al. (2005) recommended limiting prescribed fire that could adversely affect dense sagebrush stands with adequate herbaceous vegetation. Fire and fuels management under Alternative A would promote a natural fire regime and could limit the potential for catastrophic fire, which would benefit special status wildlife species.

Overall, short-term effects from fire will be adverse based on habitat loss and degradation. Wildfires are estimated to burn 27,596 acres (3.5%) and planned fires are anticipated for 14,000 acres (1.8%) of BLM surface during the life of the plan, a minor effect.

Biological Resources

Vegetation – Forests and Woodlands (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A forests and woodlands management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and also habitat improvements). Within Alternative A, the impacts from forest and woodland resource projects are analyzed on a project specific basis. Forests and woodlands are less than one percent of habitats important to special status wildlife species, so beneficial effects are negligible to special status wildlife species overall.

Vegetation – Grassland and Shrubland Communities (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A grassland and shrubland communities management would be the same as described in the *Fish and Wildlife*

Resources – Wildlife section of this chapter (habitat improvement). Due to the lack of specific management actions for grassland and shrubland communities in Alternative A, beneficial effects are likely to be only negligible.

Vegetation – Riparian/Wetland Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A riparian/wetland resource management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat restoration and improvements). Greater than ten percent of habitats important to many special status wildlife species (black-tailed prairie dog colonies, bald eagles, and herptiles) occur in riparian and wetland areas, therefore, the beneficial effects should be major effects.

Invasive Species and Pest Management (All species, including Greater Sage-Grouse)

Infestations of invasive species are spread sporadically throughout the planning area. Weeds contribute to the loss of rangeland productivity, increased soil erosion, reduced water quantity and quality, reduced species diversity, and loss of wildlife habitats. The BLM uses an integrated weed management program that involves grazing, fire management, and chemical, mechanical, and biological controls, and treats various weed species each year. Despite these efforts, the spread of invasive species is anticipated to degrade sagebrush habitats over the long term. Although the extent of sagebrush habitat degradation from the spread of invasive species and other weeds is not known for the planning area, there is a potential for these species to substantially affect Greater Sage-Grouse habitats in the future. Therefore, the anticipated continued expansion and spread of invasive species under Alternative A would adversely affect special status wildlife habitats. Though habitats are not likely to be entirely replaced by invasive species, all habitats would potentially be altered, and the effects are likely to be moderate.

Fish and Wildlife Resources – Fish (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A fish management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvements). Greater than ten percent of habitats important to many special status wildlife species (black-tailed prairie dogs, bald eagles, herptiles, and bats) occur within fish habitat corridors. Within Alternative A, the impacts to fish resources are analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Fish and Wildlife Resources – Wildlife (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A wildlife management would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). General wildlife habitats and those important to SSS wildlife are intertwined. Greater than ten percent of habitats important to special status wildlife species would be impacted by wildlife management actions, therefore the effects would be major.

Special Status Species – Plants (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A SSS plant management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter. Due to the general locations of the special status plants in the planning area, the effects from them are likely to only impact herptiles and bats on a moderate scale and all other special status wildlife species by less than one percent.

Special Status Species – Fish (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A SSS fish management

would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation and restoration). The adverse effects would be minor for most SSS wildlife. The lack of protections under Alternative A would likely have a greater adverse effect on bald eagles due to the amount of overlap of suitable habitats for these species, greater than ten percent. Therefore, management actions for special status fish species in Alternative A would have minor adverse effects on special status wildlife species.

Heritage and Visual Resources

Cultural Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A cultural resources management would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). At most, cultural resources encompass greater than one percent, but less than five percent of habitats important to herptiles and bats and less for all other special status wildlife species, therefore, the effects from cultural management actions in Alternative A would have minor beneficial effects. Within Alternative A, the impacts to cultural resources are analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that beneficial effects would be reduced by half, reducing the minor beneficial effects negligible.

Paleontological Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A paleontological resources management would be the same beneficial effects as described in the paleontological resources paragraph within the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Paleontological resources are present in the planning area in less than one percent of habitats important to Greater Sage-Grouse (less than one percent of habitats important to migratory birds); therefore, the management actions for paleontological resources under Alternative A will have negligible beneficial effects of special status wildlife species in the planning area.

Visual Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A visual resources management would be the same beneficial effects as described in the visual resources paragraph within the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). At most, VRM of VRM Class I and II areas encompass less than one percent of habitats important to migratory birds only, therefore, the effects from VRM actions in Alternative A would have negligible beneficial effects.

Land Resources

Forest Products (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A land resources management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation and loss). Forest products occur on less than one percent of habitats important to special status wildlife species. Therefore, the adverse effects would be negligible.

Lands and Realty (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A land resources management would be the same as described in the *Fish and Wildlife Resources – Wildlife*

section of this chapter (habitat fragmentation from land disposal or habitat improvement for land acquisition). Land tenure adjustments are identified in Alternative A within one to five percent of habitat important to all special status wildlife species in the planning area. The potential impacts from disposing of SSS habitat outweighs the benefits of potential acquisitions; therefore, the overall effect of land and realty management actions are minor adverse.

Renewable Energy (All species, including Greater Sage-Grouse)

Wind-energy facilities can be a source of mortality for raptors if raptors collide with wind turbine blades. High mortality could result if wind towers are placed along a migration path or in nesting territories. Raptors, other birds, and bats sometimes collide with tall wind-energy and utility infrastructures, including guy wires used for stabilization. Wind-energy facilities also could be a source of habitat loss and fragmentation, and human disturbance from construction and maintenance activities. Alternative A does not include decisions regarding wind-energy development. Large wind-energy fields also involve surface disturbance, which could permanently change the habitat structure of the special status wildlife species inhabitants.

The area of greatest potential for wind energy within the planning area is within five to ten percent of habitat important to bald eagles, making the adverse effects moderate. With a lack of decision, renewable energy would be examined on a project-specific basis. This would increase the probability that these adverse effects might occur.

Rights-of-Way and Corridors

Greater Sage-Grouse

Continued authorization of ROW grants and location of transmission lines and transportation facilities within corridor areas, to the extent feasible have severely impacted Greater Sage-Grouse habitats. There are currently no restrictions on the placement of these facilities. ROWs and corridors have fragmented Greater Sage-Grouse habitats within the planning area to the point of substantial loss of the biological integrity and habitat function of ecosystems. These management actions, under Alternative A, have had and would continue to have a significant impact on Greater Sage-Grouse.

Other Special Status Species

The types of effects on special status wildlife species from Alternative A ROW and corridors management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and fragmentation). ROWs and corridors are currently proposed within greater than ten percent of habitats important to all special status wildlife species, making these adverse effects major.

Travel and Transportation Management (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A TTM would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, fragmentation and degradation). Travel and transportation is currently allowed within greater than ten percent of habitats important to almost all special status wildlife species in the planning area, though in less than one percent for herptiles and bats. Major adverse effects would occur on special status wildlife species from management actions for TTM under Alternative A.

Recreation (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative A recreation management

would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Designated recreation areas under Alternative A occur within five to ten percent of black-tailed prairie dog colonies, making the effects moderate.

Lands with Wilderness Characteristics (All species, including Greater Sage-Grouse)

Alternative A does not include decisions for the protection of lands with wilderness characteristics, which would allow surface-disturbing activities in these areas. This would have a negligible adverse effect on wildlife.

Livestock Grazing Management

Greater Sage-Grouse

By altering habitat components necessary for Greater Sage-Grouse habitat, livestock grazing can affect the suitability and extent of Greater Sage-Grouse habitats in the planning area. Holloran et al. (2005) documented that annual grazing in Greater Sage-Grouse nesting habitats could adversely affect the next year's nesting success. Under Alternative A, the BLM manages to maintain Category M allotments. Adams et al. (2004) identify grazing intensity and timing and duration of grazing as the most important factors in maintaining herbaceous cover for Greater Sage-Grouse. The current focus of management and monitoring does not emphasize the protective cover of vegetation and litter that Greater Sage-Grouse and other ground nesting birds require. Therefore, livestock grazing management under Alternative A would not improve the quality or quantity of habitat for the Greater Sage-Grouse, and will have minor adverse effects on special status wildlife resources.

Other Special Status Species

By altering habitat components necessary for special status wildlife habitats, livestock grazing can affect the suitability and extent of special status wildlife habitats in the planning area. Under Alternative A, the BLM manages to maintain Category M allotments. Adams et al. (2004) identify grazing intensity and timing and duration of grazing as the most important factors in maintaining herbaceous cover for special status sagebrush obligates. The current focus of management and monitoring does not emphasize the protective cover of vegetation and litter that Greater Sage-Grouse and other ground nesting birds require. Therefore, livestock grazing management under Alternative A will have minor adverse effects on special status wildlife resources.

Special Designations

Areas of Critical Environmental Concern (All species, including Greater Sage-Grouse)

Under Alternative A, the types of impacts to special status wildlife species from management actions for special designations would be the same adverse effects as described under *Impacts Common to All Alternatives*, except that the additional 65,461 acres within the three WSAs would be open to oil and gas development. These three areas contain less than one percent of the habitats important to special status wildlife species in the planning area. Therefore, the adverse effects to special status wildlife species from management actions for ACECs in Alternative A would be negligible.

Scenic or Back Country Byways, Wild and Scenic Rivers, and Wilderness Study

Areas (All species, including Greater Sage-Grouse)

No scenic or BCBs, WSRs, or WSAs are proposed in Alternative A. There will be no effect to special status wildlife species habitats from them in this alternative.

4.4.9.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to special status wildlife species due to their implementation.

Special Status Species – Wildlife

Greater Sage-Grouse

Alternative B management actions for special status wildlife species include modifying existing fences that prevent Greater Sage-Grouse movement; applying prohibitions on surface occupancy, surface-disturbing and disruptive activities in various habitats for Greater Sage-Grouse movement; requiring burial of all new low-voltage powerlines and installation of perch-inhibiting devices on aboveground powerlines. This approach would allow for the greatest protective measures for Greater Sage-Grouse and their associated habitats and would greatly increase the potential for future management decisions to expand the proliferation of this species through active management where habitats important to special status wildlife species occur and BLM has the authority to actively manage them (Table 4.58, “Habitats Important to Special Status Wildlife Species on Each of the BLM-administered Land Types” (p. 1261)).

Under Alternative B, estimated short- and long-term surface disturbance from BLM actions in the planning area would result in less loss, degradation, and fragmentation of sagebrush habitats. In addition, Alternative B includes specific management actions for protection from habitat fragmentation (including sagebrush habitats) on BLM-administered lands. To minimize effects on sagebrush habitats and the Greater Sage-Grouse, Alternative B prohibits rather than avoids surface disturbance or occupancy to protect associated nesting and early brood-rearing habitats. Alternative B would protect Greater Sage-Grouse winter habitat and implement practices to minimize the effects of continuous noise on species that rely on aural cues for breeding. In addition, Alternative B would manage sagebrush communities to enhance or maintain these communities, which would benefit Greater Sage-Grouse by reducing habitat fragmentation. Alternative B would also require that new low-voltage utility lines be buried, and anti-perch devices be installed on new high-voltage utility lines, which would result in relatively little increase in predation on Greater Sage-Grouse from raptors and corvids (e.g., crows and ravens).

Alternative B would prohibit surface-disturbing activities within 4 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks and winter concentration areas, and prohibit disruptive activities within the 4 mile area and outside the 4-mile buffer in nesting and brood-rearing habitat from March 1 to July 15 and winter habitat and concentration areas from November 15 to March 14. A CSU would be placed on all projects that would allow no more than 3% total surface disturbance per 640 acres. In addition, restoration of Greater Sage-Grouse habitat would become priority for all surface-disturbing activities on BLM surface within modeled nesting, brood-rearing, or winter habitat.

Over the long term, restricting surface disturbance or occupancy around Greater Sage-Grouse leks and within Greater Sage-Grouse habitats, combined with the proactive management action to enhance and restore large, contiguous blocks of sagebrush habitat, would protect sagebrush habitats and have beneficial effects on Greater Sage-Grouse.

Other Special Status Species

Alternative B management actions for special status wildlife species include modifying existing fences that prevent special status wildlife species movement; applying prohibitions

on surface occupancy, surface-disturbing and disruptive activities in various habitats for special status wildlife species (e.g., riparian corridors consistently used by bald eagles, biologic buffers around raptor nests, and amphibian and reptile habitats); requiring burial of all new low-voltage powerlines and installation of perch-inhibiting devices on aboveground powerlines; and prohibiting surface disturbance in prairie dog colonies. This approach would allow for the greatest protective measures for special status wildlife species and their associated habitats and would greatly increase the potential for future management decisions to expand the proliferation of these species through active management where habitats important to special status wildlife species occur and BLM has the authority to actively manage them (Table 4.40, “Habitats Important to Special Status Wildlife Species on Each of the BLM-administered Land Types” (p. 1253)).

Table 4.40. Habitats Important to Special Status Wildlife Species on Each of the BLM-administered Land Types

Surface	Prairie Dog Colonies	Greater Sage-Grouse Winter Habitat	Within 0.5 Mile of Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River	Within 1.5 Miles of Special Status Species Raptor Nests	Amphibian and Reptile Habitat
BLM (acres)	6,156	289,327	12,937	113,784	176,636
Federal Mineral (acres)	47,702	2,165,107	58,902	2,023,118	1,217,959
Source: BLM 2012f					
BLM Bureau of Land Management					

Special status wildlife species would benefit from conscientious management of physical resources and biological resources. Under Alternative B, the BLM would manage all riparian areas toward mid to late successional stage vegetation that would benefit riparian and wetland species. Under this alternative, there would be greater restrictions on surface disturbance in riparian and wetland areas because this type of disturbance would not be allowed within 0.25 mile of riparian and wetland areas new permanent facilities would not be allowed in these areas. Alternative B actions also would protect and enhance riparian and wetland habitats through more restrictive management of livestock by locating salt and/or mineral blocks a minimum of 0.5 mile from water sources, riparian areas, and aspens stands. These actions would ultimately result in riparian systems with increased plant species and structural diversity throughout the planning area, with benefits for riparian and wetland species. Actions pertaining to water and riparian and wetland habitats also would benefit migratory game birds. The buffer around riparian areas, wetland areas, perennial streams, and 100-year floodplains where surface disturbance cannot occur would be larger under Alternative B. These areas would be closed rather than avoided, which would benefit migratory game birds. In addition, Alternative B management would reduce channel erosion, bank erosion, and channel incision, and restore damaged wetlands.

Under Alternative B, estimated short- and long-term surface disturbance from BLM actions in the planning area would result in less loss, degradation, and fragmentation of sagebrush habitats. In addition, Alternative B includes specific management actions for protection from habitat fragmentation (including sagebrush habitats) on BLM-administered lands. To minimize effects on sagebrush habitats, Alternative B prohibits rather than avoids surface disturbance or occupancy. Alternative B would manage sagebrush communities to enhance or maintain these communities, which would benefit special status sagebrush obligates by reducing habitat fragmentation.

Restrictions around raptor nests would be more extensive under Alternative B (1.5 miles), which would result in fewer direct effects on nesting raptors. Seasonal restrictions vary based on the species of raptor. Alternative B also would manage sagebrush, aspen, and mountain shrub communities in large, contiguous blocks and maintain connections among these communities. In addition, Alternative B would protect riparian areas, restrict placement of salt and/or mineral blocks, and increase control of invasive plant species. These actions would benefit birds and small mammals that comprise raptor prey in the planning area.

Under Alternative B, grassland habitats would be affected by short- and long-term surface disturbances. Surface disturbance and habitat fragmentation under Alternative B would affect special status nongame mammal species.

Alternative B would designate an NSO for black-tailed prairie dog colonies (approximately 47,702 acres). The goal of this NSO is to ensure a long-term, self-sustaining population of prairie dogs in the planning area. The associated potential increases in prairie dog populations under Alternative B would benefit species associated with prairie dog towns, including mountain plover, burrowing owl, swift fox, and black-footed ferret.

Potential effects on the northern leopard frog and spotted frog would be commensurate with effects on riparian and wetland habitats. The adverse effects under Alternative B would be similar to those for special status neotropical migrants that use riparian and wetland habitats.

Effects from conservative management of resources under Alternative B would, in some cases, be similar to those described for Alternative A and *Impacts Common to All Alternatives*. Where effects on special status wildlife species would vary in degree from effects described for Alternative A; further rationale is provided below.

Physical Resources

Air Quality (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of air quality resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Air quality resources occur throughout all habitats important to special status wildlife species, therefore, the beneficial effects would be major.

Soil (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of soil resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Management actions for soil resources in Alternative B will occur within greater than ten percent of all habitats important to special status wildlife species. Beneficial effects from soil and habitat conservation would be major.

Water Resources

Greater Sage-Grouse

Under Alternative B, riparian and uplands in historically perennial systems would be managed to restore perennial flows or standing water. Restoration of areas of standing water would encourage creation of mosquito habitats. Increasing mosquito habitats increases the potential threat of WNV outbreaks in Greater Sage-Grouse. The single greatest threat to Greater Sage-Grouse in

the planning area is WNV (Taylor et al. 2012). Persistent low-level WNV mortality, combined with severe disease outbreaks, results in local and regional population declines (Naugle et al. 2004; Naugle et al. 2005). Eliminating mosquito breeding habitat from anthropogenic water sources is crucial for reducing impacts (Taylor et al. 2012). Without direction for construction of water containment structures (e.g., troughs, tanks, or ponds) to eliminate habitat for mosquitoes, this management action could contribute to population declines. The Greater Sage-Grouse populations in the planning area are at great risk as they are small, isolated, peripheral populations at lower elevations (warmer temperatures associated with lower elevations support WNV presence) experiencing large-scale increases in distribution of surface waters. A WNV outbreak year could reduce the area lek count by 60 percent (Taylor et al. 2012). Supporting and encouraging water supply sources without mitigation to reduce or prevent WNV transmission will likely result in a loss of viability within the planning area, but will not jeopardize the continued existence of the species range-wide (Taylor et al. 2012; USFWS 2013a). This management action, under Alternative B would have significant impacts to Greater Sage-Grouse.

Other Special Status Species

The types of effects on special status wildlife species from Alternative B management of water resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Water resources overlap greater than ten percent of habitats important to special status wildlife species, therefore beneficial effects would be major.

Under Alternative B, riparian and uplands in historically perennial systems would be managed to restore perennial flows or standing water. Restoration of areas of standing water would encourage creation of mosquito habitats. Increasing mosquito habitats increases the potential threat of WNV to susceptible SSS such as raptors.

Cave and Karst Resources (All species, including Greater Sage-Grouse)

In addition to the types of effects described in the *Fish and Wildlife Resources – Wildlife* section of this chapter, bats using caves for roosting, maternity colonies, or hibernation could be affected by surface-disturbing activities near caves, cliffs, or other rock features. More cave habitats are expected to be protected under Alternative B. Human activity in caves would be managed through Cave Management Plans, developed considering direction described in WO IM 2010–181, which would reduce threats to bats from WNS. Five to ten percent of habitats important to bald eagles, herptiles, and bats in the planning area occur within identified cave and karst areas. The beneficial effects of cave and karst management would be minor.

Mineral Resources

Locatable Minerals (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of locatable mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss degradation and fragmentation). Under Alternative B, locatable minerals will occur within less than one percent of habitats important to special status wildlife species. Adverse impacts will be negligible.

Leasable Minerals – Coal (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of leasable coal mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter.

Leasable Minerals – Fluids

Greater Sage-Grouse

Under Alternative B, within 4 miles of Greater Sage-Grouse leks and winter concentration areas are closed to leasing. Forty-six percent (3,386,530 acres) of the planning area is BLM-administered fluid minerals of which 75 percent (2,544,512 acres) has been leased; the majority of which is held by production. Thus, Greater Sage-Grouse may continue to experience population-level impacts, but there will also be areas unavailable for fluid minerals leasing, particularly southeast of Buffalo that could provide secure habitat (Map 14). Disturbed habitat on BLM surface are required to be restored to functional sagebrush ecosystems. Management actions for leasable fluid mineral resources would have a significant impact on Greater Sage-Grouse.

CBNG activity has waned in recent years with the decline in natural gas prices. To date, development is approximately half that predicted in the PRB Final EIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1937)). Interest in deep oil and gas resources within the planning area is increasing, with the anticipated spacing being less than with CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore, deep development may be more compatible with Greater Sage-Grouse. The BFO has incorporated multiple conservation measures to reduce the population's vulnerability, such as habitat restoration to promote the recovery of disturbed habitats and water management measures to reduce WNV transmission. Appendix D (p. 1863) contains lists of RDFs and discretionary BMPs to promote Greater Sage-Grouse conservation. BLM's High Plains District has also founded the PRB Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats for the Greater Sage-Grouse.

Other Special Status Species

The types of effects on special status wildlife species from Alternative B management of leasable fluid mineral resources would generally be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter.

Forty-six percent (3,386,530 acres) of the planning area is BLM-administered fluid minerals of which 75 percent (2,544,512 acres) has been leased; the majority of which is held by production. Disturbed habitat on BLM surface are required to be restored to functional sagebrush ecosystems which would benefit special status sagebrush obligates.

CBNG activity has waned in recent years with the decline in natural gas prices. To date, development is approximately half that predicted in the PRB Final EIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1937)). Interest in deep oil and gas resources within the planning area is increasing, with the anticipated spacing being less than with CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore, deep development may be more compatible with SSS. The BFO has incorporated multiple conservation measures, such as sagebrush restoration to promote the recovery of disturbed habitats and water management measures to reduce WNV transmission. Appendix D (p. 1863) contains lists of BMPs to promote SSS conservation. BLM's High Plains District has also founded the PRB Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats.

Salable Minerals (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of salable mineral resources would be the same adverse effects as described in the *Fish and Wildlife*

Resources – Wildlife section of this chapter (habitat loss and degradation). Under Alternative B, salable mineral extraction is permitted within greater than ten percent of habitats important to all special status wildlife species within the planning area, except raptors (one to five percent). Salable mineral management actions in Alternative B will have major adverse effects on special status wildlife species.

Fire and Fuels Management

Planned Fire (Prescribed Fire)

Greater Sage-Grouse

Under Alternative B, wildland fire and other vegetation treatments would be used to restore fire-adapted ecosystems and reduce hazardous fuels. A fire mosaic of burned and unburned areas can be detrimental to Greater Sage-Grouse. Wyoming big sagebrush, the dominate component of Greater Sage-Grouse habitat in the planning area, requires 50–120 years or more recovery time after fire. Evidence suggests that particularly in Wyoming big sagebrush, a program of prescribed burning is unwarranted or inadvisable if maintaining and restoring sagebrush landscapes and sagebrush-dependent species is the goal (Baker 2006). Wildland fire use in Greater Sage-Grouse habitats would cause substantial loss of the biological integrity and habitat function of ecosystems. Under Alternative B, management actions for planned fire would have a significant impact on Greater Sage-Grouse. Planned fires are anticipated within greater than ten percent of habitats important to Greater Sage-Grouse; therefore, the management actions for planned fire will have major adverse effects on Greater Sage-Grouse in the planning area.

Other Special Status Species

The types of effects on special status wildlife species from Alternative B planned fire management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Planned fires are anticipated within greater than ten percent of habitats important to bald eagles, herptiles, and bats (five to ten percent of habitats important to black-tailed prairie dogs, raptors, and migratory birds); therefore, the management actions for planned fire will have major adverse effects on special status wildlife species in the planning area.

Under Alternative B, wildland fire and other vegetation treatments would be used to restore fire-adapted ecosystems and reduce hazardous fuels. A fire mosaic of burned and unburned areas can be detrimental to sagebrush obligates. Wyoming big sagebrush, the dominate component of sagebrush habitat in the planning area, requires 50–120 years or more recovery time after fire. Evidence suggests that particularly in Wyoming big sagebrush, a program of prescribed burning is unwarranted or inadvisable if maintaining and restoring sagebrush landscapes and sagebrush-dependent species is the goal (Baker 2006). Wildland fire use in sagebrush habitats would cause substantial loss of the biological integrity and habitat function of ecosystems. Under Alternative B, management actions for planned fire would have a significant impact on special status sagebrush obligates.

Unplanned Fire (Wildfire) (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B unplanned fire management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Unplanned fires cannot be pinpointed for occurrence, but it is likely, given the amount, general location of habitats, and

general fire history, that Greater Sage-Grouse and migratory bird habitats will be moderately and adversely affected over the life of this plan by unplanned fire ignitions. Other habitats important to special status wildlife species may also incur the adverse effects of fire, but the likelihood of occurrence makes the effects to these habitats negligible. Overall effects from unplanned fire on SSS wildlife would balance to minor adverse.

Biological Resources

Vegetation – Forests and Woodlands (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of forests and woodlands would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Forests and woodlands overlap greater than ten percent of habitats important to migratory birds, including raptors (five to ten percent of habitats important to herptiles and bats, less than one percent of habitats important to Greater Sage-Grouse and bald eagles and no overlap of black-tailed prairie dog colonies), therefore, conservation of forest and woodlands would have overall major beneficial effects on special status wildlife species in the planning area.

Vegetation – Grassland and Shrubland Communities (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of grassland and shrubland communities would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Conservation of grassland and shrubland communities provide conservation of greater than ten percent of habitats important to Greater Sage-Grouse, raptors, and migratory birds (five to ten percent of habitats important to herptiles and bats, and less than one percent of habitats important to bald eagles and black-tailed prairie dogs), therefore, management actions for grassland and shrubland communities in Alternative B would have major beneficial effects on special status wildlife species in the planning area.

Vegetation – Riparian/Wetland Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of riparian/wetland resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvement). Riparian and wetland community improvements would affect greater than ten percent of habitats important to all special status wildlife species within the planning area, except Greater Sage-Grouse (five to ten percent). Management actions for riparian/wetland resources under Alternative B would have major beneficial effects on special status wildlife species overall.

Invasive Species and Pest Management (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of invasive species and pests would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Invasive species and pest management is expected to occur within five to ten percent of habitats important to Greater Sage-Grouse and black-tailed prairie dogs (one to five percent of habitats important to herptiles, bats, and migratory birds, and less than one percent of habitats important to raptors and bald eagles), therefore management actions under Alternative B for invasive species and pest management would have minor adverse effects on special status wildlife species.

Fish and Wildlife Resources – Fish (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of fish would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvements). Habitats for fish occur within greater than ten percent of habitats important to all special status wildlife species, except Greater Sage-Grouse. Improvements to fish habitats will have major beneficial effects on special status wildlife species in the planning area.

Fish and Wildlife Resources – Wildlife (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of wildlife would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation and improvement). Habitats important to general wildlife and special status wildlife species are intertwined throughout the planning area. Greater than ten percent of habitats important to special status wildlife species would experience beneficial effects from management actions related to wildlife under Alternative B, making them major.

Special Status Species – Plants (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of SSS plants would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). SSS plant habitats are present within one to five percent of habitats important to Greater Sage-Grouse, herptiles, and bats (less than one percent of habitats important to black-tailed prairie dogs, bald eagles, raptors, and migratory birds), therefore, protection of habitats for SSS plant habitats in the planning area will have minor effects on special status wildlife species.

Special Status Species – Fish (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of SSS fish would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Special status fish species habitat occurs within greater than ten percent of habitats important to bald eagles, (less than five percent for all other special status wildlife species in the planning area) therefore, habitat improvements to special status fish species habitat would have major beneficial effects to special status wildlife species.

Heritage and Visual Resources**Cultural Resources** (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of cultural resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Protective buffer for the cultural resources encompass greater than ten percent of habitats important to black-tailed prairie dogs, Greater Sage-Grouse, raptors, and migratory birds (five to ten percent of habitats important to bald eagles, herptiles, and bats), therefore, management actions for cultural resources under Alternative B would have major beneficial effects on special status wildlife species in the planning area.

Paleontological Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of paleontological resources would be the same beneficial effects as described in the paleontological resources Alternative B paragraph in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Protective buffer for the cultural resources encompass less than one percent of habitats important to all special status wildlife species in the planning area. The

beneficial effects from management actions for paleontological resources under Alternative B would be negligible.

Visual Resources (All species, including Greater Sage-Grouse)

Under Alternative B, the beneficial effects of prohibiting or limiting surface-disturbing activities in VRM Class II would occur on less than one percent of habitats important to migratory birds only. Management actions for visual resources under Alternative B would have negligible beneficial effects on special status wildlife species.

Land Resources

Forest Products (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of forest products resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss). Adverse effects are lessened under Alternative B due to limits of acreage and wildlife-coordinated product removal, but the effects remain adverse. Forest products are harvested within less than one percent of all habitats important to special status wildlife species, making the adverse effects negligible.

Lands and Realty (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of lands and realty would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Lands available to retention and acquisition contain less than five percent of habitats important to special status wildlife species, making the beneficial effects minor.

Renewable Energy (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of renewable energy resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Surface occupancy prohibitions for renewable energy under Alternative B would occur on greater than ten percent of habitats important to special status wildlife species. These prohibitions (all species, including Greater Sage-Grouse) would have major beneficial effects on special status wildlife species in the planning area.

Rights-of-Way and Corridors (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of ROW and corridors would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Surface occupancy prohibitions for ROWs and corridor management under Alternative B would occur on greater than ten percent of habitats important to special status wildlife species. These prohibitions would have major beneficial effects on special status wildlife species in the planning area.

Travel and Transportation Management (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of transportation and access would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation), only increased. Under Alternative B, areas within habitat for SSS would be closed to motorized vehicle use. Limiting motorized vehicle use to designated routes and closing areas to motorized vehicle use would decrease adverse effects to special status wildlife species where occurrence may not have been

determined. Allowing any other travel in other areas limited to designated routes only under a special use permit would also decrease adverse effects on special status wildlife species and their associated habitats, because holders of Special Recreation Permits are instructed to follow all rules and regulations and should therefore, avoid locations where the BLM has identified important special status wildlife species habitats. OHV use under Alternative B would be restricted. Restrictions on OHV use under Alternative B result in fewer potential effects (disturbances) to Greater Sage-Grouse. Effects to special status wildlife species from TTM would be major.

Recreation (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative B management of recreation would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Permit holders would be instructed to avoid locations where the BLM has identified important wildlife habitats. Recreational areas overlap five to ten percent of habitats important to black-tailed prairie dogs (one to five percent of habitats important to Greater Sage-Grouse and less than one percent of habitat important to all other special status wildlife species in the planning area); therefore, effects to special status wildlife species under Alternative B for recreation would be beneficial and moderate.

Lands with Wilderness Characteristics (All species, including Greater Sage-Grouse)

The types of effects special status wildlife species from Alternative B management of wilderness characteristics would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Lands with wilderness characteristics are located within less than one percent of habitats important to special status wildlife species. Management actions for wilderness characteristics would have negligible beneficial effects on special status wildlife species in the planning area.

Livestock Grazing Management (All species, including Greater Sage-Grouse)

The types of effects to special status wildlife species from Alternative B management of livestock grazing would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Livestock grazing is permitted in greater than ten percent of habitats important to bald eagles, raptors, and herptiles (five to ten percent of habitats important to black-tailed prairie dogs and migratory birds and one to five percent of habitats important to Greater Sage-Grouse), therefore, the management actions for livestock grazing management under Alternative B would have major beneficial effect on special status wildlife species in the planning area.

Special Designations

Areas of Critical Environmental Concern (All species, including Greater Sage-Grouse)

Under Alternative B, designating approximately 511,000 acres as eight ACECs would provide additional protections to sensitive habitats.

Measures identified for the proposed ACECs that would directly benefit special status wildlife species and their associated habitat include (1) closing or limiting the areas to motorized vehicle use; (2) closing the areas to minerals leasing; (3) recommending withdrawal to locatable minerals entry; (4) closing the areas to salable minerals; (5) excluding ROW; and (6) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values. These seven areas contain one to five percent of habitats important to Greater Sage-Grouse (less than one percent of habitats important to all other special status wildlife species in the planning area),

therefore, the management actions in Alternative B for ACECs would have minor beneficial effects on special status wildlife species in the planning area.

Scenic or Back Country Byways (All species, including Greater Sage-Grouse)

Scenic or BCBs do not occur within habitats important to special status wildlife species; therefore, there would be no effect.

Wild and Scenic Rivers (All species, including Greater Sage-Grouse)

WSRs do not occur within habitats important to special status wildlife species; therefore, there would be no effect.

Wilderness Study Areas (All species, including Greater Sage-Grouse)

Under Alternative B, altered management of the three areas proposed to Congress as WSAs would provide an additional 28,931 acres of protection for sensitive habitats.

Measures identified for the previously WSAs that would directly benefit special status wildlife species and their associated habitat include (1) closing the areas to minerals leasing; (2) recommending withdrawal to locatable minerals entry; (3) closing the areas to salable minerals; (4) excluding ROW; (5) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values; and potentially (6) prohibiting the use of all motorized and mechanized equipment. These areas encompass less than one percent of habitats important to all special status wildlife species. Overall, the management actions in Alternative B for WSAs would have negligible beneficial effects on special status wildlife species in the planning area.

4.4.9.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to special status wildlife species due to its implementation.

Special Status Species – Wildlife

Greater Sage-Grouse

Alternative C management actions for special status wildlife species would not modify existing fences; not apply greater restrictions on surface-disturbing and disruptive activities in various special status wildlife species habitats (e.g., Greater Sage-Grouse seasonal habitats); and not require that low-voltage powerlines be buried or perch-inhibiting devices be installed on aboveground powerlines.. Activities allowed in suitable Greater Sage-Grouse habitat could preclude the potential for future management decisions to expand this species through active management.

Management under Alternative C would allow disturbance to sagebrush habitats. Alternative C would manage vegetative resources to comply with the ESA. Alternative C would apply avoidance buffers to Greater Sage-Grouse leks and nesting and early brood-rearing habitat, and winter concentration areas. Alternative C protections and mitigation measures to address surface-disturbing activities would be similar to Alternative A. Overall, because surface disturbance and habitat loss, degradation, and fragmentation would be similar under Alternative C and Alternative A, the associated adverse effects on Greater Sage-Grouse also would be similar. In particular, applying standard lease terms, allowing renewable energy in Greater Sage-Grouse nesting, brood-rearing, and winter habitats, and leasing fluid minerals regardless of Greater Sage-Grouse habitat concerns are management actions that would cause substantial loss of the

biological integrity and habitat function of ecosystems potentially resulting in extirpation within developed areas. Under Alternative C, the management actions for special status wildlife species would have significant impacts to Greater Sage-Grouse.

Other Special Status Species

Alternative C management actions for special status wildlife species would not modify existing fences that prevent special status wildlife species movement; not apply greater restrictions on surface-disturbing and disruptive activities in various special status wildlife species habitats (e.g., riparian corridors consistently used by bald eagles, biologic buffers for raptor nests, and amphibian and reptile habitats); not require that low-voltage powerlines be buried or perch-inhibiting devices be installed on aboveground powerlines; and not prohibit surface disturbance in prairie dog colonies. This approach allows only for the protection of nesting raptors during incubation periods. Alternative C would not protect any special status wildlife species and activities allowed in suitable habitat could preclude the potential for future management decisions to expand or maintain the proliferation of these species through active management.

The effects of Alternative C management would, in most cases, be similar to effects described for Alternative A and under *Impacts Common to All Alternatives*. Where effects on special status wildlife species would vary in degree from those under Alternative A, further rationale is provided below.

Management under Alternative C would allow disturbance to sagebrush habitats. Alternative C would manage vegetative resources to comply with the ESA. Alternative C protections and mitigation measures to address surface-disturbing activities would be similar to Alternative A. Overall, because surface disturbance and habitat loss, degradation, and fragmentation would be similar under Alternative C and Alternative A, the associated adverse effects on SSS also would be similar. In particular, applying standard lease terms, allowing renewable energy in SSS habitats, and leasing fluid minerals regardless of SSS habitat concerns are management actions for special status wildlife species that would cause substantial loss of the biological integrity and habitat function of ecosystems potentially resulting in extirpation within developed areas. Under Alternative C, the management actions for special status wildlife species would have significant impacts.

The adverse effects under Alternative C would be similar to those described for special status neotropical migrants that use riparian and wetland habitats.

Alternative C would likely not protect raptor habitat through smaller buffers and shorter timing restrictions. Lack of protection would cause substantial loss of habitat function or disruption of life history requirements of SSS that would preclude improvement of their status. Under Alternative C, management actions for special status wildlife species would have significant impacts to raptors.

Potential effects on the northern leopard frog and spotted frog would be commensurate with effects on riparian and wetland habitats. Lack of protection would cause substantial loss of habitat function or disruption of life history requirements of SSS that would preclude improvement of their status. Under Alternative C, management actions for special status wildlife species would have significant impacts to BLM sensitive species amphibians and bats.

Physical Resources

Air Quality (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of air quality resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). The adverse effects of no air quality monitoring, though they will occur in every habitat important to special status wildlife species, are, in general, moderate as they cause degradation to habitat quality, but not entire vegetation loss.

Soil (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of soil resources would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Soil resources could be lost from greater than ten percent of habitats important to special status wildlife species under Alternative C. Management actions for soils under Alternative C would have major adverse effects on special status wildlife species in the planning area.

Water Resources**Greater Sage-Grouse**

Through the lack of protection of water resources, one to five percent of habitats important to Greater Sage-Grouse would be adversely impacted. The single greatest threat to Greater Sage-Grouse in the planning area is WNV (Taylor et al. 2012). Persistent low-level WNV mortality, combined with severe disease outbreaks, results in local and regional population declines (Naugle et al. 2004; Naugle et al. 2005). Eliminating mosquito breeding habitat from anthropogenic water sources is crucial for reducing impacts (Taylor et al. 2012). Management actions to authorize activities associated with the surface discharge of produced water from development of federal minerals and maintaining existing water supply sources and drilling new water supply wells, developing new seeps and springs, and constructing new reservoirs would increase opportunities for WNV to persist in the planning area. Without direction for construction of water containment structures (e.g., troughs, tanks, or ponds) to eliminate habitat for mosquitoes, this management action could contribute to population declines. The Greater Sage-Grouse populations in the planning area are at great risk as they are small, isolated, peripheral populations at lower elevations (warmer temperatures associated with lower elevations support WNV presence) experiencing large-scale increases in distribution of surface waters. A WNV outbreak year could reduce the area lek count by 60 percent (Taylor et al. 2012). Reducing the threat of WNV by reducing the number of new man-made water sources should remain a focus of future management. Therefore, supporting and encouraging water supply sources without mitigation to reduce or prevent WNV transmission will likely result in a loss of viability within the planning area, but will not jeopardize the continued existence of the species range-wide (Taylor et al. 2012; USFWS 2013a). This management action would have a significant impact on Greater Sage-Grouse.

Other Special Status Species

The types of effects on special status wildlife species from Alternative C management of water resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Through the lack of protection of water resources, greater than ten percent of habitats important to bald eagles, herptiles, and bats (five to ten percent of habitats important to black-tailed prairie dogs and raptors and one to five percent of habitats important to migratory birds) would be adversely impacted.

Overall, management actions for water in Alternative C would have major adverse effects on special status wildlife species in the planning area.

Cave and Karst Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of cave and karst resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Human activity in caves would be managed through Cave Management Plans, developed considering direction described in WO IM 2010-181, which would reduce threats to bats from WNS. Cave and karst resources in Alternative C would impact one to five percent of habitats important to herptiles and bats (less than one percent of habitats important to all other special status wildlife species); therefore, management actions for cave and karst resources under Alternative C would have minor adverse effects to special status wildlife species.

Mineral Resources

Locatable Minerals (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of locatable mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss). Under Alternative C, locatable resources would be permitted in less than one percent of habitats important to special status wildlife species. The adverse effects would be negligible.

Leasable Minerals – Coal (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of leasable coal mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter.

Leasable Minerals – Fluids

Greater Sage-Grouse

Fluid minerals could be leased and developed within one hundred percent of the Greater Sage-Grouse habitat in the planning area. Leasing fluid minerals and allowing development on this scale could cause substantial loss of the biological integrity and habitat function of ecosystems, potentially resulting in extirpation within oil and gas fields. Energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87 percent to 5 percent (Walker et al. 2007a). This management has had and would continue to have significant impacts on Greater Sage-Grouse in the planning area.

Other Special Status Species

The types of effects on special status wildlife species from Alternative C management of leasable fluid mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter. Under Alternative C, fluid resource development would be permitted in greater than ten percent of all habitats important to special status wildlife species in the planning area. The adverse effects would be major.

Salable Minerals (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of salable mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Under Alternative

C, salable fluid resource development could be permitted in greater than ten percent of habitats important to all special status wildlife species in the planning area, except Greater Sage-Grouse (five to ten percent). The adverse effects would be major.

Fire and Fuels Management

Planned Fire (Prescribed Fire) and Unplanned Fire

Greater Sage-Grouse

Alternative C management would adversely affect greater than ten percent of habitats important to Greater Sage-Grouse; therefore, management actions for planned fire management would be major adverse. Unplanned fires cannot be pinpointed for occurrence, but it is likely, given the amount, general location of habitats, and general fire history, that Greater Sage-Grouse habitats will be moderately and adversely affected over the life of this plan by unplanned fire ignitions.

Under Alternative C, wildland fire and other vegetation treatments would be used to restore fire-adapted ecosystems, enhance forage for commodity production, and reduce hazardous fuels and heavy equipment would be utilized with few constraints. A fire mosaic of burned and unburned areas can be detrimental to sagebrush obligates such as Greater Sage-Grouse. Wyoming big sagebrush, the dominant component of Greater Sage-Grouse habitat in the planning area, requires 50 to 120 years or more recovery time after fire. Evidence suggests that particularly in Wyoming big sagebrush, a program of prescribed burning is unwarranted or inadvisable if maintaining and restoring sagebrush landscapes and sagebrush-dependent species is the goal (Baker 2006). Wildland fire use in Greater Sage-Grouse habitats could cause substantial loss of the biological integrity and habitat function of ecosystems. Under Alternative C, management actions for planned fire would have a significant impact on Greater Sage-Grouse.

Other Special Status Species

Alternative C management would not restore a natural fire regime to fire-adapted ecosystems in the planning area; all wildland fires would be suppressed under Alternative C. Alternative C would preclude the use of prescribed fire and wildland fire to meet fire and fuels management objectives. These actions could increase hazardous fuels, thereby increasing the risk of catastrophic fire. This management would adversely affect greater than ten percent of habitats important to bald eagles, herptiles, bats, and migratory birds (five to ten percent of habitats important to black-tailed prairie dogs and raptors); therefore, management actions for planned fire management would be major adverse. Unplanned fires cannot be pinpointed for occurrence, but it is likely, given the amount, general location of habitats, and general fire history, that migratory bird habitats will be moderately and adversely affected over the life of this plan by unplanned fire ignitions. All other habitats important to special status wildlife species may also incur the adverse effects of fire, but the likelihood of occurrence makes the effects to these habitats negligible.

Under Alternative C, wildland fire and other vegetation treatments would be used to restore fire-adapted ecosystems, enhance forage for commodity production, and reduce hazardous fuels and heavy equipment would be utilized with few constraints. A fire mosaic of burned and unburned areas can be detrimental to sagebrush obligates. Wyoming big sagebrush, requires 50 to 120 years or more recovery time after fire. Evidence suggests that particularly in Wyoming big sagebrush, a program of prescribed burning is unwarranted or inadvisable if maintaining and restoring sagebrush landscapes and sagebrush-dependent species is the goal (Baker 2006). Wildland fire use in sagebrush habitats could cause substantial loss of the biological integrity and

habitat function of ecosystems. Under Alternative C, management actions for planned fire would have a significant impact on special status sagebrush obligates.

Biological Resources

Vegetation – Forests and Woodlands (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of biological resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss). Less than one percent of habitats important to special status wildlife species would be affected by management of forest and woodland communities in Alternative C.

Vegetation – Grassland and Shrubland Communities (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of biological resources would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Though grasslands and shrublands occur throughout greater than ten percent of habitats important to special status wildlife species, the adverse impacts are likely to only occur to less than one percent of those communities; therefore, the adverse effects are likely to be negligible.

Vegetation – Riparian/Wetland Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of biological resources would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Adverse effects from management actions for riparian/wetland resources could occur in greater than ten percent of habitats important to black-tailed prairie dogs, bald eagles, herptiles, and bats (five to ten percent of habitats important to Greater Sage-Grouse and migratory birds, and less than one percent of habitats important to raptors); therefore, these adverse effects would be major.

Invasive Species and Pest Management (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of biological resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Invasive species and pest management under Alternative C could occur within five to ten percent of habitats important to black-tailed prairie dogs, Greater Sage-Grouse, herptiles, and bats (one to five percent of habitats important to migratory birds, and less than one percent of habitats important to bald eagles and raptors); therefore, management actions under Alternative C would have moderate adverse effects on special status wildlife species in the planning area.

Fish and Wildlife Resources – Fish (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of biological resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Greater than ten percent of habitats important to black-tailed prairie dogs, bald eagles, herptiles, and bats (five to ten percent of habitats important to Greater Sage-Grouse and one to five percent of habitats important to raptors and migratory birds) occur in fish habitats that would be left unprotected under Alternative C. Overall, management actions for fish under Alternative C would have major adverse effect on special status wildlife species in the planning area.

Fish and Wildlife Resources – Wildlife (All species, including Greater Sage-Grouse)

Under Alternative C, adverse effects on special status wildlife species would be reduced through prohibiting surface-disturbing activities for the protection of any other resource. This would have a major beneficial effect on habitats for special status wildlife species where these resources overlap. Avoidance areas for other resources would, by nature, be avoidance areas for important habitats for special status wildlife species. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed. Though some protections for habitats important to special status wildlife species are present in Alternative C, the overwhelming lack of protections for most special status wildlife species in the planning area make the overall effects adverse and major.

Special Status Species – Plants and Fish (All species, including Greater Sage-Grouse)

Under Alternative C, prohibitions on surface-disturbing activities for the protection of special status plant, fish, and wildlife species would reduce adverse impacts to all wildlife. Avoidance areas for other resources would, by nature, be NSO areas for important wildlife habitats. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed. Surface-disturbing prohibitions for special status plant species would also conserve five to ten percent of habitats important to herptiles and bats (one to five percent of habitats important to Greater Sage-Grouse, and less than one percent of prairie dog colonies or habitats important to bald eagles and raptors); therefore, management actions for special status plant species under Alternative C would have moderate beneficial effects on special status wildlife resources. Prohibitions for special status fish species would also conserve greater than ten percent of habitats important to bald eagles (one to five percent of habitats important to Greater Sage-Grouse, herptiles and bats and less than one percent of prairie dog colonies and habitats important to migratory birds); therefore, management actions for special status fish species would have major beneficial effects on wildlife resources.

Heritage and Visual Resources**Cultural Resources** (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of cultural resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Under Alternative C, greater than ten percent of habitats important to black-tailed prairie dogs (one to five percent of habitats important to herptiles and bats and less than one percent of habitats for all other special status wildlife species) would be protected from the much smaller protective buffers around cultural sites in Alternative C, therefore, management actions for cultural resources would have major beneficial effects on special status wildlife species in the planning area.

Paleontological Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of paleontological resources would be the same beneficial effects as described in the paleontological resources Alternative C discussion within the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Under Alternative C, less than one percent of all habitats important to SSS in the planning area would be protected by disturbance-free buffers around paleontological resources. This would have only negligible beneficial effects.

Visual Resources (All species, including Greater Sage-Grouse)

VRM under Alternative C would have no effect on special status wildlife species as no proactive management would take place.

Land Resources

Forest Products (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of forest product resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss). Under Alternative C, forest product harvest is permitted on less than one percent of habitats important to special status wildlife species. The adverse effects would be negligible.

Lands and Realty (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of lands and realty would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and fragmentation). Disposal of lands important to natural resources could mean the disposal of one to five percent of habitats important to the majority of the special status wildlife species in the planning area, except raptors (less than one percent). Management actions for lands and realty under Alternative C would have minor adverse effects on special status wildlife species in the planning area.

Renewable Energy

Greater Sage-Grouse

Authorization of renewable-energy projects, such as wind energy, on 134,875 acres in the planning area under Alternative C could impact one hundred percent of the Greater Sage-Grouse habitats. Renewable energy projects within Greater Sage-Grouse habitats would create substantial loss of the biological integrity and habitat function of ecosystems. These management actions, under Alternative C, would have a significant impact on Greater Sage-Grouse.

Other Special Status Species

The types of effects on special status wildlife species from Alternative C management of renewable-energy resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Under Alternative C, renewable-energy facilities would be permitted in greater than ten percent of the majority of habitats important to special status wildlife species (five to ten percent for bald eagles and migratory birds). Management actions for renewable energy under Alternative C would have major adverse effects on special status wildlife species in the planning area.

Rights-of-Way and Corridors

Greater Sage-Grouse

Under Alternative C, 725,842 acres would be open for authorization of ROW grants and location of transmission lines and transportation facilities consistent with other resource values that would have severe impacts on Greater Sage-Grouse habitats. There would be no restrictions on the placement of these facilities. ROW and corridors would fragment Greater Sage-Grouse habitats within the planning area to the point of substantial loss of the biological integrity and habitat function of ecosystems. These management actions, under Alternative C, would have a significant impact on Greater Sage-Grouse.

Other Special Status Species

The types of effects on special status wildlife species from Alternative C management of ROW and corridors would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and fragmentation). Under Alternative C, ROW and corridors would be permitted in greater than ten percent of habitats important to nearly all special status wildlife species (five to ten percent for bald eagles). Management actions for ROW and corridors under Alternative C would have major adverse effects on special status wildlife species in the planning area.

Under Alternative C, 725,842 acres would be open for authorization of ROW grants and location of transmission lines and transportation facilities consistent with other resource values that would have severe impacts on many SSS. There would be no restrictions on the placement of these facilities. ROW and corridors could fragment habitats within the planning area to the point of substantial loss of the biological integrity and habitat function of ecosystems. These management actions, under Alternative C, would have a significant impact on many SSS.

Travel and Transportation Management (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of travel and transportation would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and fragmentation). Travel and transportation activities could occur in greater than ten percent of habitats important to Greater Sage-Grouse, bald eagles, raptors, and migratory birds (less than one percent of habitats important to black-tailed prairie dogs, herptiles, and bats); therefore, TTM under Alternative C would have major adverse effects on special status wildlife species.

Recreation (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of recreation would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Recreation areas occur in five to ten percent of habitats important to black-tailed prairie dogs (less than one percent of habitats important to all other special status wildlife species in the planning area); therefore, management actions for recreation under Alternative C would have moderate adverse effects on special status wildlife species in the planning area.

Lands with Wilderness Characteristics (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of wilderness characteristics would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Lands with wilderness characteristics contain less than one percent of habitats important to special status wildlife species. Beneficial effects from management actions for lands with wilderness characteristics under Alternative C would be negligible.

Livestock Grazing Management (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative C management of livestock grazing would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Grazing allotments contain greater than ten percent of all habitats important to special status wildlife species, except bats. Management actions for livestock grazing management would have major adverse effects on special status wildlife species in the planning area.

Special Designations (All species, including Greater Sage-Grouse)

The effects on special status wildlife species from Alternative C management of special designations would be the same as Alternative A.

4.4.9.6. Alternative D

This section describes management actions and potential impacts to special status wildlife species under Alternative D, which generally allows resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and emphasizes moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the **Proposed RMP**.

Special Status Species – Wildlife

Greater Sage-Grouse

The Governor of Wyoming issued an EO on August 1, 2008, mandating special management for all state lands in Greater Sage-Grouse Core Population Areas. Core Population Areas are important breeding areas for Greater Sage-Grouse in Wyoming, as identified by the Wyoming Governor's Sage-Grouse Implementation Team. In addition to identifying Core Population Area, the team also recommended placing stipulations on development activities to ensure that existing habitat function is maintained within those areas. Accordingly, the EO prescribes special consideration for Greater Sage-Grouse, including authorization of new activities only when the project proponent can identify that the activity will not cause declines in Greater Sage-Grouse populations in the Core Population Area. These protections would apply to approximately 80 percent of the total estimated Greater Sage-Grouse breeding population in the state. In February 2010, the Wyoming State Legislature adopted a joint resolution endorsing Wyoming's Core Area Strategy as outlined in Governor's EO 2008-2 (USFWS 2010). The Governor signed EO 2010-4 on August 18, 2010 to replace 2008-2. On June 2, 2011, Governor Matthew Mead issued Governor's EO 2011-5 to continue consideration of Greater Sage-Grouse conservation needs in the State of Wyoming. BLM Wyoming has adopted Wyoming's approach for projects under its authority.

Alternative D includes this strategy for the planning area. These protections will apply to less than 15 percent of all Greater Sage-Grouse nesting habitats, and accounts for less than 29 percent of the total estimated Greater Sage-Grouse breeding population in the planning area. Due to the size, shapes, and locations of these areas in the planning area, the influence of development has already adversely impacted the 103 remaining active leks inside Core Population Areas (Taylor et al. 2012). Fluid minerals would be leased dependent upon lease location and habitat suitability. Disturbed habitats would be restored on BLM surface within priority habitat and recommended for BLM surface within general habitat.

The use of adaptive management to maintain Greater Sage-Grouse Core Area Populations in accordance with the State of Wyoming's Population Objectives would provide additional protection to sage-grouse populations within core and connectivity habitat if population numbers fell below the target objectives. Monitoring associated with the adaptive management would ensure that if populations were to decline, issues could be identified and corrective management could be implemented to protect and enhance existing population numbers.

Current activities have created substantial loss of the biological integrity and habitat function of ecosystems. Loss of population viability of Greater Sage-Grouse could occur within the planning area, though the continued existence of the species range-wide will not be in jeopardy. Absent a WNV outbreak year, the lower 95 percent confidence limit on the population count is 3,147 males, suggesting that immediate extirpation of the northeast Wyoming population is unlikely if all environmental conditions for Greater Sage-Grouse other than energy development, remain favorable (Taylor et al. 2012). Management actions under Alternative D for special status wildlife species would have significant impacts to Greater Sage-Grouse.

CBNG activity has waned in recent years with the decline in natural gas prices. To date development is approximately half that predicted in the PRB Final EIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1937)). Interest in deep oil and gas resources within the planning area is increasing, with the anticipated spacing being less than with CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore deep development may be more compatible with Greater Sage-Grouse. The BFO has incorporated multiple conservation measures to reduce the population's vulnerability, such as habitat restoration to promote the recovery of disturbed habitats and water management measures to reduce WNV transmission. Appendix D (p. 1863) contains lists of RDFs and discretionary BMPs to promote Greater Sage-Grouse conservation. BLM's High Plains District has also founded the PRB Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats for the Greater Sage-Grouse.

Other Special Status Species

Alternative D management actions for special status wildlife species would have effects similar to those described for Alternative B; however, Alternative D would allow the following by exception:

- Surface-disturbing and disruptive activities within active black-tailed prairie dog colonies.
- Surface-disturbing and disruptive activities in areas where there are special status amphibian, reptile, and bat species.

Under Alternative D, special status raptors would receive less protection than Alternative B due to the use of USFWS recommended species specific spatial buffers, none of which extend to 1.5 miles.

CBNG activity has waned in recent years with the decline in natural gas prices. To date development is approximately half that predicted in the PRB Final EIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1937)). Interest in deep oil and gas resources within the planning area is increasing, with the anticipated spacing being less than with CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore deep development may be more compatible with some SSS. The BFO has incorporated multiple conservation measures, such as habitat restoration to promote the recovery of disturbed habitats and water management measures to reduce WNV transmission. Appendix D (p. 1863) contains lists of BMPs to promote some SSS conservation. BLM's High Plains District has also founded the PRB Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats.

Physical Resources

Air Quality (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative D management of air quality would be the same as the effects under Alternative B.

Soil (All species, including Greater Sage-Grouse)

Effects on special status wildlife species from Alternative D management of soils would be similar to those under Alternative B. However, Alternative D could allow activities by exception on 215,496 acres of highly erosive soils, 170,590 acres on slopes equal to or greater than 25 percent, 455,090 acres of soils with poor reclamation suitability, and, although on a limited basis, on 218,928 acres of badlands, rock outcrops, and slopes susceptible to mass movement. In addition, Alternative D would apply a CSU stipulation to oil and gas leases; this could have adverse effects on special status wildlife species on an additional 669,739 acres of highly erosive soils, 412,145 acres on slopes equal to or greater than 25 percent, 1,514,445 acres of soils with poor reclamation suitability, and, although on a limited basis, on 685,950 acres of badlands, rock outcrops, and slopes susceptible to mass movement that could be associated with federal mineral leases. For the impacts to be the same as those under Alternative B, these exceptions would have to be evaluated for site-specific effects on special status wildlife species and would not be granted where there would be conflicts. This is especially important and could have the greatest effect on special status amphibian, reptile, and bat species. The CSU would have beneficial effects on greater than ten percent of habitats important to black-tailed prairie dog colonies, Greater Sage-Grouse, bald eagles, special status raptor species, and where special status amphibian, reptile, and bat species could occur. The management actions under Alternative D for soil would have major beneficial effects on special status wildlife species.

Water Resources**Greater Sage-Grouse**

Alternative D could allow activities by exception within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams, including applying a CSU stipulation to oil and gas leases and evaluating unneeded reservoirs. The CSU would have beneficial effects on one to five percent of habitats important to Greater Sage-Grouse.

The single greatest threat to Greater Sage-Grouse in the planning area is WNV (Taylor et al. 2012). Under Alternative D, riparian and uplands would be managed to restore perennial flows or standing water. Restoration of areas of standing water would encourage creation of mosquito habitats. Increasing mosquito habitats increases the potential threat of WNV outbreaks in Greater Sage-Grouse. Persistent low-level WNV mortality, combined with severe disease outbreaks, results in local and regional population declines (Naugle et al. 2004; Naugle et al. 2005). Eliminating mosquito breeding habitat from anthropogenic water sources is crucial for reducing impacts (Taylor et al. 2012). Without direction for construction of water containment structures (e.g., troughs, tanks, or ponds) to eliminate habitat for mosquitoes, this management action could contribute to population declines. The Greater Sage-Grouse populations in the planning area are at great risk as they are small, isolated, peripheral populations at lower elevations (warmer temperatures associated with lower elevations support WNV presence) experiencing large-scale increases in distribution of surface waters. A WNV outbreak year could reduce the area lek count by 60 percent (Taylor et al. 2012). Reducing the threat of WNV by reducing the number of new man-made water sources should remain a focus of future management. Therefore, supporting and encouraging water supply sources without mitigation to reduce or prevent WNV transmission will likely result in a loss of viability within the planning area, but will not jeopardize the continued

existence of the species range-wide (Taylor et al. 2012; USFWS 2013a). This management action would have a significant impact on Greater Sage-Grouse.

Other Special Status Species

Alternative D could allow activities by exception within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams, including applying a CSU stipulation to oil and gas leases and evaluating unneeded reservoirs. The CSU would have beneficial effects on the following areas currently identified as important to special status wildlife species: greater than ten percent of habitats important to bald eagles, special status raptor species, and areas where special status amphibian, reptile, and bat species could occur (ten percent of habitats important to black-tailed prairie dogs); therefore, management actions under Alternative D for water will have major beneficial effects on special status wildlife species.

Cave and Karst Resources (All species, including Greater Sage-Grouse)

Alternative D effects on special status wildlife species from management of cave and karst resources would, in general, be the same as effects under Alternative A. In addition, implementing a Cave Management Plan for the entire planning area under Alternative D would increase potential beneficial effects on special status wildlife species where these resources overlap. This is especially important and could have the greatest beneficial effect on special status amphibian, reptile, and bat species. Human activity in caves would be managed through Cave Management Plans, developed considering direction described in WO IM 2010-181, which would reduce threats to bats from WNS. Cave and karst resources in the planning area would have beneficial effects on one to five percent of habitats important to bald eagles and where special status amphibian, reptile, and bat species could occur (less than one percent of habitats important to Greater Sage-Grouse and special status raptor species); therefore, management actions under Alternative D will be minor.

Mineral Resources

Locatable Minerals (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative D management of locatable mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Under Alternative D, locatable resources would be permitted in less than one percent of habitats important to special status wildlife species. The adverse effects would be negligible.

Leasable Minerals – Coal (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative D management of leasable coal mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter.

Leasable Minerals – Fluids

Greater Sage-Grouse

Under Alternative D, leasable fluid resources would be permitted in greater than ten percent of habitats important to Greater Sage-Grouse. Forty-six percent (3,386,530 acres) of the planning area is BLM-administered fluid minerals of which 75 percent (2,544,512 acres) has been leased; the majority of which is held by production. The amount of leasable fluid minerals extraction that could occur under this alternative would result in greater loss and degradation of habitats that support various special status wildlife species, in particular, those that require continuous habitat

on a landscape scale, such as Greater Sage-Grouse. Fluid minerals could be developed within one hundred percent of the Greater Sage-Grouse habitat in the planning area. Leasing fluid minerals and allowing development on this scale would cause substantial loss of the biological integrity and habitat function of ecosystems. Absent a WNV outbreak year, the lower 95 percent confidence limit on the population count is 3,147 males, suggesting that immediate extirpation of the northeast Wyoming population is unlikely if all environmental conditions for Greater Sage-Grouse other than energy development, remain favorable (Taylor et al. 2012). This management has had and would continue to have, significant impacts on Greater Sage-Grouse in the planning area.

CBNG activity has waned in recent years with the decline in natural gas prices. To date, development is approximately half that predicted in the PRB Final EIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1937)). Interest in deep oil and gas resources within the planning area is increasing, with the anticipated spacing being less than with CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore, deep development may be more compatible with Greater Sage-Grouse. The BFO has incorporated multiple conservation measures to reduce the population's vulnerability, such as habitat restoration to promote the recovery of disturbed habitats and water management measures to reduce WNV transmission. Appendix D (p. 1863) contains lists of RDFs and discretionary BMPs to promote Greater Sage-Grouse conservation. BLM's High Plains District has also founded the PRB Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats for the Greater Sage-Grouse.

Other Special Status Species

The types of effects on special status wildlife species from Alternative D management of leasable fluid mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, degradation, and fragmentation). Under Alternative D, leasable fluid resources would be permitted in greater than ten percent of habitats important to black-tailed prairie dogs, raptors, herptiles, bats, and migratory birds; and five to ten percent of habitats important to bald eagles. Overall, the adverse effects would be major.

Forty-six percent (3,386,530 acres) of the planning area is BLM-administered fluid minerals of which 75 percent (2,544,512 acres) has been leased; the majority of which is held by production. The amount of leasable fluid minerals extraction that could occur under this alternative would result in greater loss and degradation of habitats that support various special status wildlife species, in particular, those that require continuous habitat on a landscape scale. Leasing fluid minerals and allowing development on this scale would cause substantial loss of the biological integrity and habitat function of ecosystems. This management would have, significant impacts to some SSS within the planning area.

CBNG activity has waned in recent years with the decline in natural gas prices. To date, development is approximately half that predicted in the PRB Final EIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1937)). Interest in deep oil and gas resources within the planning area is increasing, with the anticipated spacing being less than with CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore, deep development may be more compatible with SSS. The BFO has incorporated multiple conservation measures such as habitat restoration to promote the recovery of disturbed habitats. Appendix D (p. 1863) contains lists of BMPs to promote SSS conservation. BLM's High Plains District has also founded the PRB Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats.

Salable Minerals (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative D management of salable mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Under Alternative D, salable mineral resources would be permitted in greater than ten percent of habitats important to all special status wildlife species. The adverse effects would be major. The amount of salable minerals extraction that could occur under this alternative would create a substantial increase in land use intensity, and would result in greater potential for loss or degradation of habitats that support bald eagles and migratory birds.

Fire and Fuels Management**Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)** (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative D planned fire management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Wildfires are estimated to burn 27,596 acres (3.5%) and planned fires are anticipated for 14,000 acres (1.8%) of BLM surface during the life of the plan, a minor effect.

Biological Resources**Vegetation – Forests and Woodlands** (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative D management of forests and woodlands resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvement). Beneficial effects from management actions for forest and woodland resources could occur in five to ten percent of habitats important to herptiles and bats (less than one percent of habitats important to black-tailed prairie dogs, bald eagles, raptors, Greater Sage-Grouse and migratory birds); therefore, these beneficial effects would be moderate.

Vegetation – Grassland and Shrubland Communities (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative D management of grassland and shrubland communities would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvement). Beneficial effects from management actions for grassland and shrubland communities would occur in less than one percent of habitats important to all special status wildlife species. Overall these beneficial effects would be negligible.

Vegetation – Riparian/Wetland Resources**Greater Sage-Grouse**

Greater than ten percent of habitats within Greater Sage-Grouse General Habitat Management Area (GHMA) (outside Priority Habitat Areas) is within 500 feet of riparian/wetland systems and aquatic habitats; also within 500 feet of riparian/wetland systems and aquatic habitats is one to five percent of nesting habitat in PHMA (Core Population Areas and Core Population Connectivity Corridors), winter habitat in PHMA, and within 0.6 mile of leks inside PHMA,

therefore, the management actions for riparian/wetland resources would have major beneficial effects on special status wildlife species in the planning area.

Other Special Status Species

The types of effects on special status wildlife species from Alternative D management would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvement). Within 500 feet of riparian/wetland systems and aquatic habitats occurs greater than ten percent of habitats important to black-tailed prairie dogs, bald eagles, special status raptor species, and areas where special status amphibian, reptile, and bat species could occur, therefore, the management actions for riparian/wetland resources would have major beneficial effects on special status wildlife species in the planning area.

Invasive Species and Pest Management (All species, including Greater Sage-Grouse)

The effects on special status wildlife species from Alternative D management of invasive species and pests would be the same as Alternative A.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Greater Sage-Grouse

The 0.25-mile CSU areas for naturally occurring water bodies that contain native and desirable non-native fish species contains greater than ten percent of areas within 0.25 mile of GHMA Greater Sage-Grouse leks (outside Core Population Areas) and PHMA (Core Population Connectivity Corridors), (five to ten percent of habitats important to Greater Sage-Grouse [nesting habitat in PHMA and winter habitat in PHMA], one to five percent of areas within 0.6 mile of Greater Sage-Grouse leks inside PHMA; therefore the management actions under Alternative D would have major beneficial effects on Greater Sage-Grouse.

Other Special Status Species

The effects on special status wildlife species from Alternative D management of special status fish species would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter, although to a varying degree. The 0.25-mile CSU areas for naturally occurring water bodies that contain native and desirable non-native fish species contains greater than ten percent of habitats important to bald eagles, and areas where special status amphibian, reptile, and bat species could occur and habitat important to special status raptor species, and less than one percent of black-tailed prairie dog colonies; therefore the management actions under Alternative D would have major beneficial effects on special status wildlife species.

Fish and Wildlife Resources – Wildlife

Greater Sage-Grouse

Under Alternative D, effects on Greater Sage-Grouse from wildlife management would be similar to those under Alternative B. However, Alternative D could allow development by exception where it meets Greater Sage-Grouse management goals and objectives. For the impacts to be the same as those under Alternative B, these exceptions would have to be evaluated for the presence of Greater Sage-Grouse or suitable habitat, and would not be granted where there would be conflicts.

Other Special Status Species

Under Alternative D, effects on special status wildlife species from wildlife management would be similar to those under Alternative B. However, Alternative D could allow above ground facilities by exception on the 75,175 acres of elk crucial winter range and calving

areas, and could allow disturbance by exception on 1,195,815 acres of biological buffer zones around nests of raptor species of conservation concern. For the impacts to be the same as those under Alternative B, these exceptions would have to be evaluated for the presence of special status wildlife species or suitable habitat, and would not be granted where there would be conflicts. Alternative D also would allow the following by exception:

- Surface disturbance and disruptive activities throughout the entire life of the project during seasons important to wildlife.
- Aboveground distribution powerlines
- Fluid minerals production and not piping by-products out of crucial elk winter range and calving areas
- Aboveground facility development in elk crucial winter range and calving areas
- Surface disturbance and occupancy within USFWS-recommended biologic buffer zones around active nests of raptor species of conservation concern.

In addition, activities in elk seasonal ranges would be limited to removing or altering no more than 15 percent of the existing security habitat. Alternative D includes 9,587 acres of travel corridor avoidance; Alternative D would retain only identified priority travel corridors. Alternative D would increase surface-disturbing prohibitions around plains sharp-tailed grouse leks, 3,601 acres, because the alternative would increase the size of protective buffers to 0.25 mile of the perimeter of these leks. Table 4.41, “Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Areas Important To Wildlife” (p. 1278) lists the amount of overlap between areas important to wildlife and areas currently identified as important to special status wildlife species wildlife.

Table 4.41. Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Areas Important To Wildlife

Important Wildlife Areas	Special Status Species Habitat							
	Black-tailed prairie dog colonies	Nesting habitat within Greater Sage-Grouse Priority Habitat Area	Winter habitat within Greater Sage-Grouse Priority Habitat Area	Within 0.6 mile of leks within Greater Sage-Grouse Priority Habitat Area	Within 0.25 mile of leks within Greater Sage-Grouse general habitat	Within 0.5 mile of riparian corridors consistently used by bald eagles	Within US-FWS recommended buffers around nests of special status species raptors	Within areas where special status amphibian, reptile, and bat species may occur
WGFD big game HMAs	0	433 / 0.06%	35 / 0.004%	0	0	740 / 0.3%	0	12,692 / 0.4%
Crucial big game ranges	328 / 0.3%	14,213 / 2%	3,119 / 0.4%	1,514 / 2%	0	3,410 / 1%	1,409 / 0.4%	204,820 / 6%
Priority travel corridors for big game	0	94 / 0.01%	238 / 0.03%	142 / 0.2%	0	2,918 / 1%	22 / 0.006%	68,935 / 2%
Elk security habitat	1,257 / 1%	3,650 / 0.5%	2,908 / 0.4%	18 / 0.02%	260 / 0.9%	5,982 / 3%	3,772 / 1%	446,467 / 13%

Important Wildlife Areas	Special Status Species Habitat							
	Black-tailed prairie dog colonies	Nesting habitat within Greater Sage-Grouse Priority Habitat Area	Winter habitat within Greater Sage-Grouse Priority Habitat Area	Within 0.6 mile of leks within Greater Sage-Grouse Priority Habitat Area	Within 0.25 mile of leks within Greater Sage-Grouse general habitat	Within 0.5 mile of riparian corridors consistently used by bald eagles	Within US-FWS recommended buffers around nests of special status species raptors	Within areas where special status amphibian, reptile, and bat species may occur
Proposed Fortification Creek elk WHMA	0	0	0	0	0	200 / 0.08%	0	13,393 / 0.4%
0.25 mile of plains sharp-tailed grouse leks	262 / 0.3%	2,382 / 0.3%	3,077 / 0.4%	1,126 / 1%	24 / 0.04%	90 / 0.04%	911 / 0.2%	4,540 / 0.1%
USFWS recommended biologic buffer zones for raptor nests	54,902 / 53%	132,783 / 19%	163,770 / 20%	16,871 / 21%	10,893 / 37%	127,722 / 54%	852,022 / 100%	984,893 / 28%
Source: BLM 2012f Note: Percentages in table represent the percent of the special status species habitat (columns) that overlaps important wildlife areas (rows). % percent HMA Habitat Management Area USFWS U.S. Fish and Wildlife Service WGFD Wyoming Game and Fish Department WHMA Wilderness Habitat Management Area								

Special Status Species – Plants (All species, including Greater Sage-Grouse)

Under Alternative D, effects on special status wildlife species from management of special status plant species would be the same as those under Alternative C, although Alternative D would place a CSU stipulation on mineral leases to require surveys before disturbance activities could be allowed.

Heritage and Visual Resources

Cultural Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative D management of cultural resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Table 4.42, “Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Cultural and Paleontological Resource Restrictions” (p. 1280) lists cultural and paleontological resources restrictions overlap of areas currently identified as important to special status wildlife species. Overall, the beneficial effects would be major.

Paleontological Resources (All species, including Greater Sage-Grouse)

The types of effects on special status wildlife species from Alternative D management of

paleontological resources would be the same beneficial effects as described in the cultural resources Alternative D discussion within the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Table 4.42, “Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Cultural and Paleontological Resource Restrictions” (p. 1280) lists cultural and paleontological resources restrictions overlap of areas currently identified as important to special status wildlife species.

Table 4.42. Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Cultural and Paleontological Resource Restrictions

Cultural and Paleontological Restriction Areas	Special Status Species Habitat							
	Black-tailed prairie dog colonies	Greater Sage-Grouse nesting habitat within Priority Habitat Area	Greater Sage-Grouse winter habitat within Priority Habitat Area	Within 0.6 mile of Priority Habitat Area Greater Sage-Grouse leks	Within 0.25 mile of Greater Sage-Grouse leks within general habitat	Within 0.5 mile of riparian corridors consistently used by bald eagles	Within US-FWS recommended buffers around nests of special status species raptors	Within areas where special status amphibian, reptile, and bat species may occur
Cultural NSOs	1,286 / 1%	2,602 / 0.4%	5,729 / 0.7%	18 / 0.02%	82 / 0.3%	1,247 / 0.5%	2,959 / 0.8%	16,081 / 0.5%
Cultural CSUs	15,934 / 15%	103,730 / 15%	118,183 / 14%	7,751 / 10%	3,121 / 11%	11,741 / 5%	66,423 / 17%	347,290 / 10%
Paleontological NSOs	0	357 / 0.05%	622 / 0.08%	0	0	0	0	427 / 0.01%

Source: BLM 2012f

Note: Percentages in table represent the percent of the special status species habitat (columns) that overlaps cultural and paleontological restriction areas (rows).

CSU Controlled Surface Use

NSO No Surface Occupancy

USFWS U.S. Fish and Wildlife Service

Visual Resources (All species, including Greater Sage-Grouse)

Under Alternative D, effects to special status wildlife resources from management actions associated with VRM would be the same as the effects under Alternative B.

Land Resources

Forest Products (All species, including Greater Sage-Grouse)

The effects on special status wildlife species from Alternative D management of forest products would be the same adverse and beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and habitat improvements), although to a varying degree. Under Alternative D, conflicts between the harvest of forest products and management of suitable habitat for special status wildlife species could occur in less than one percent of habitats important to all special status wildlife species in the planning area.

Lands and Realty (All species, including Greater Sage-Grouse)

The effects on special status wildlife species from Alternative D management of lands and realty would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvements). Lands available for tenure adjustments occur in one percent to

five percent of all special status wildlife species, except raptors (less than one percent). The beneficial effects would be minor.

Renewable Energy and Rights-of-Way and Corridors

Greater Sage-Grouse

Renewable-energy development and ROW exclusion or avoidance areas contain greater than ten percent of Greater Sage-Grouse PHMA (Core Population Areas and Core Population Connectivity Corridors), and GHMA (outside Core Population Areas and Core Population Connectivity Corridors) within 0.25 mile of GHMA Greater Sage-Grouse leks; therefore, management actions under Alternative D for renewable energy and for ROW and corridors would have major adverse effects on Greater Sage-Grouse.

Authorization of renewable-energy projects, such as wind energy, on 75,240 acres in the planning area under Alternative C could impact twenty percent of the Greater Sage-Grouse habitats. Renewable-energy projects within Greater Sage-Grouse habitats would create substantial loss of the biological integrity and habitat function of ecosystems. These management actions, under Alternative D, would have a significant impact on Greater Sage-Grouse.

Under Alternative D, 381,176 acres would be open for authorization of ROW grants and location of transmission lines and transportation facilities within corridors when resource objectives can be met, would have impacts on twenty percent of Greater Sage-Grouse habitats in the planning area. ROW and corridors would fragment Greater Sage-Grouse habitats within the planning area to the point of substantial loss of the biological integrity and habitat function of ecosystems. These management actions, under Alternative D, would have a significant impact on Greater Sage-Grouse.

Other Special Status Species

The effects on special status wildlife species from Alternative D management of renewable energy and ROW corridors would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, degradation and fragmentation), although to a varying degree. Renewable-energy development and ROW exclusion or avoidance areas contain greater than ten percent of black-tailed prairie dog colonies, habitats important to special status raptor species, and habitats where special status amphibian, reptile, and bat species could occur (five to ten percent of habitats important to bald eagles); therefore, management actions under Alternative D for renewable energy and for ROW and corridors would have major adverse effects on special status wildlife species.

Travel and Transportation Management (All species, including Greater Sage-Grouse)

The effects on special status wildlife species from Alternative D management of transportation and access would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, degradation and fragmentation), although to a varying degree. Areas closed to motorized vehicle use under Alternative D include less than one percent of habitats important to all special status wildlife species in the planning area. This means that travel and transportation access would be permitted in greater than ten percent of habitats important to all special status wildlife species in the planning area. The adverse effects would be major.

Recreation (All species, including Greater Sage-Grouse)

The effects on special status wildlife species from Alternative D recreation management would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter, although to a varying degree. Table 4.43, “Acres within the Planning Area that

are Important to Special Status Wildlife Species and Overlap with Special Designations and Controlled Surface Use Areas” (p. 1282) lists the areas of overlap of special designations and CSU with areas currently identified as important to special status wildlife species. Management actions under Alternative D for recreation would have moderate beneficial effects on special status wildlife species in the planning area.

Table 4.43. Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Special Designations and Controlled Surface Use Areas

Special Designations and CSU Areas	Special Status Species Habitat						
	Black-tailed prairie dog colonies	Greater Sage-Grouse Nesting habitat in Priority Habitat Area	Greater Sage-Grouse Winter habitat in Priority Habitat Area	Within 0.6 mile of Greater Sage-Grouse leks in Priority Habitat Area	Within 0.5 mile of riparian corridors consistently used by bald eagles	Within US-FWS recommended buffers around nests of special status species raptors	Within areas where special status amphibian, reptile, and bat species may occur
Burnt Hollow	0	4,008 / 0.6%	4,193 / 0.5%	196 / 0.2%	0	0	2,702 / 0.08%
Dry Creek Petrified Tree	0	2,120 / 0.3%	1,611 / 0.2%	565 / 0.7%	0	0	681 / 0.02%
Middle Fork Canyon	0	93,162 / 0.4%	315 / 0.04%	21 / 0.03%	0	0	2,310 / 0.07%
Mosier Gulch	0	0	0	0	535 / 0.2%	0	768 / 0.02%
Welch Ranch	37 / 0.04%	669 / 0.09%	900 / 0.1%		750 / 0.3%	48 / 0.01%	758 / 0.02%
Weston Hills	0	170 / 0.02%	184 / 0.02%	0	0	0	1,734 / 0.05%
Hole-in-the-Wall	0	7,048 / 1%	4,301 / 0.5%	3,034 / 4%	0	0	1,648 / 0.05%
Source: BLM 2012f							
Note: Percentages in table represent the percent of the special status species habitat (columns) that overlaps special designations and CSUs (rows).							
% percent							
CSU Controlled Surface Use							
USFWS U.S. Fish and Wildlife Service							

Lands with Wilderness Characteristics (All species, including Greater Sage-Grouse)

The effects on special status wildlife species from Alternative D lands with wilderness characteristics management would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Lands with wilderness characteristics contain less than one percent of habitats important to special status wildlife species. Beneficial effects from management actions for lands with wilderness characteristics under Alternative D would be negligible.

Livestock Grazing Management (All species, including Greater Sage-Grouse)

The effects on special status wildlife species from Alternative D livestock grazing management would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation), although to a varying degree. Under Alternative D, areas have been identified as incompatible with livestock grazing due to recreation designation,

steep slopes, etc. These areas contain less than one percent of all habitats important to special status wildlife species.

In addition, Alternative D would prohibit the placement of salt or mineral supplements in greater than ten percent of habitats important to bald eagles, special status raptor species, and areas where special status amphibian, reptile, and bat species could occur (five to ten percent of black-tailed prairie dog colonies and one to ten percent of habitats important to Greater Sage-Grouse); thereby avoiding trampling damage to habitat. Overall, the management actions for livestock grazing in Alternative D, in particular maintaining habitat in accordance with BLM Wyoming's Healthy Rangeland standards, will have major beneficial effects on special status wildlife species in the planning area.

Special Designations

Areas of Critical Environmental Concern (All species, including Greater Sage-Grouse)

The effects on special status wildlife species from Alternative D ACEC management would be the same beneficial effects as Alternative B except that only the Pumpkin Buttes (1,731 acres) and Welch Ranch (1,116 acres) would be designated as ACECs.

Scenic or Back Country Byways and Wild and Scenic Rivers (All species, including Greater Sage-Grouse)

Management actions for scenic and BCBs and for WSRs would have no effect on special status wildlife species in the planning area.

Wilderness Study Areas (All species, including Greater Sage-Grouse)

The effects on special status wildlife species from Alternative D management of WSAs would be the same as Alternative B.

4.4.9.7. Cumulative Impacts

Cumulative impacts result from actions on adjoining ownerships that affect habitat availability and levels of disturbance. The greatest factor influencing special status wildlife species in the planning area is scattered land ownership. Because most of the species of concern are wide ranging, activities on adjoining ownerships could compromise or enhance management efforts on public lands.

Although only minor amounts of sagebrush treatment are proposed on public lands, continued modification of sagebrush on other ownerships would cumulatively reduce the availability and quality of that habitat. Cumulative effects on riparian habitats are much more localized and site-specific due to the scattered land ownership on most streams, although improper livestock grazing and upland vegetative treatments on all ownerships could lead to riparian habitat concerns. Management changes implemented on BLM-administered lands to improve riparian conditions also could improve conditions on lands of other ownerships if the same management is applied to those lands. If some uses are restricted or eliminated on BLM-administered lands, it could cause increased use on adjacent ownerships, which would lead to degradation of the riparian conditions on those lands.

Implementing any of the alternatives would contribute to cumulative adverse effects to the Threatened, Endangered, Proposed, Candidate, and sensitive species in the planning area. Cumulative short- and long-term disturbances to these species are many and stem from several

sources. Included in the cumulative effects evaluated are the direct effects of oil and gas (CBNG and non-CBNG) extraction, and development of new oil and gas wells on adjacent lands. Oil and gas development would occur on a mix of federal, state, private, and split estate lands. Additional activities that contribute to cumulative effects in the planning area include coal mining; uranium mining; sand, gravel, and scoria mining; ranching; agriculture; construction of roads and railroads; and development of rural and urban housing.

In particular, the cumulative effects on Greater Sage-Grouse from current, proposed, and future activities such as gas and minerals exploration and development, agriculture, and urban development could include increased mortality, especially from collisions with vehicles and powerlines and increased raptor predation; displacement and harassment; physical degradation or destruction of leks and reproduction areas (nesting and brood-rearing areas); and habitat fragmentation. Surface coal mining and sagebrush treatment have reduced the availability of sagebrush habitats in the planning area. Conversion of native habitats to agriculture has decreased in recent years, but has already permanently reduced availability of Greater Sage-Grouse habitat.

Garton et al. (2011) reported a minimum male count for the PRB population at 3,042 and projected a high probability (86.2%) of falling below 200 males by 2107. The BFO contracted the USGS to analyze the Greater Sage-Grouse population viability within the Buffalo planning area implementing Wyoming EO 2011-5 and Wyoming State Office IM 2012-019, Wyoming's Core Population Area strategy. The USGS concluded that the potential may still exist to maintain a population inside the BFO's Core Population Area, but further development in and around them will compromise their remaining value (Taylor et al. 2012). The remaining population would be vulnerable to extirpation by catastrophic events such as a WNV outbreak. The expanding threat of energy development across the PRB, along with its associated risk of WNV transmission, have resulted in a downward population trend and make this overall an at risk population (USFWS 2013a).

The BFO has incorporated multiple conservation measures to reduce the population's vulnerability, such as habitat restoration to promote the recovery of disturbed habitats and water management measures to reduce WNV transmission. Appendix D (p. 1863) contains lists of RDFs and discretionary BMPs to promote Greater Sage-Grouse conservation. BLM's High Plains District has also founded the PRB Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats for the Greater Sage-Grouse.

The Wyoming strategy is a statewide strategy, designed to conserve Greater Sage-Grouse viability at the state scale. Although the Buffalo planning area Greater Sage-Grouse population viability remains vulnerable, the application of the Wyoming strategy to federal (BLM, USFS) and state actions assures long-term population viability within Wyoming. The Wyoming Basin population is considered to be at low risk, as state-designated Core Population Areas adequately capture redundancy and representation for this large population (USFWS 2013a). Similarly, the BLM's management commitments throughout MZ I assure long-term population viability along the eastern edge of Greater Sage-Grouse range. Garton et al. (2011) predicted an 11.1 percent chance that MZ I will fall below 200 males by 2037, and a 24.0 percent chance it would fall below 200 males by 2107. After MZs II and IV, this zone contains some of the highest connected network of Greater Sage-Grouse leks in the range (Knick and Hanser 2011).

4.4.9.8. Comparison of Threats to Greater Sage-Grouse within the Buffalo Planning Area

The major threat to Greater Sage-Grouse habitats in populations occurring across WAFWA MZs 1 is energy development, primarily oil and gas development and supporting infrastructure (USFWS 2013a). Table 4.44, “Comparison of Threats to Greater Sage-Grouse within the Buffalo Planning Area by Alternative” (p. 1285) presents a comparison of alleviated threats to Greater Sage-Grouse.

Table 4.44. Comparison of Threats to Greater Sage-Grouse within the Buffalo Planning Area by Alternative

Resource/Resource Use	Alternative A	Alternative B	Alternative C	Alternative D
Energy Development (Widespread)				
Unleased Fluid Minerals				
Acres closed to fluid mineral leasing	2,346,307 Includes Pennaco v. DOI (2004). 30,520 acres administratively closed to fluid mineral leasing.	2,612,920 No new leases within 4.0 miles of Greater Sage-Grouse leks.	30,520 No new areas would be closed.	72,276 No new areas would be closed to leasing for Greater Sage-Grouse conservation. No surface occupancy within priority habitat (0.6 mile).
Leased Fluid Minerals				
Acres open to mineral leasing with Major constraints (Prohibition on surface disturbance NSO more than 40 acres in size or more than 0.25 mile in width or VRM class I)	85,548 No grouse specific NSOs.	642,232 NSO within 4.0 miles of leks.	303,601 NSO within 0.25 mile of leks.	556,592 NSO within 0.6 miles of priority habitat leks and 0.25 mile of general habitat leks.
Acres open to mineral leasing with Moderate constraints (CSU more than 40 acres in size or more than 0.25 mile in width, NSO less than 40 acres in size or less than 0.25 mile in width, TLS lasting more than 60 days but less than 6 months, avoidance of 200 meters or more, or VRM class II)	782,501 Nesting TLS within 2.0 miles of leks for 3.5 months.	124,467 Nesting TLS within 4.0 miles of leks for 3.5 months.	2,472,472 Nesting TLS within 2.0 miles of leks for 3.5 months.	2,516,826 Nesting TLS within priority habitat for 3.5 months.
Acres open to mineral leasing with Standard lease terms	146,126	1,225	539,499	3,314,254

Resource/Resource Use	Alternative A	Alternative B	Alternative C	Alternative D
Foreseeable Development: Federal CBNG wells	903	101	5,280	2,721
Foreseeable Development: Federal conventional wells	1,828	7	1,990	1,773
Renewable Energy				
Acres where Renewable Energy Excluded	N/A	730,530 Prohibited within 4.0 miles of leks.	28,551	352,068 Exclusion areas for historic properties and southern Big Horn Mountains.
Acres where Renewable Energy Avoided	N/A	45,441 Disturbance subject to 1 location and 3% disturbance per square mile.	618,676	374,518 PHMA classified as avoidance. In addition, core population areas are subject to a limit of on average 1 mineral location per square mile; and disturbance is subject to a 5% disturbance cap within Core Population Areas and Core Population Connectivity Corridors.
Foreseeable Development: Wind-Energy MET Towers	20 sites/20,000 acres	5 sites/5,000 acres	20 sites/40,000 acres	30 sites/75,000 acres
Mining (Widespread)				
Solid Leasables – Coal				
Acres Available to Coal Exploration and Leasing (acres)	715,388	715,388	715,388	715,388
Foreseeable Development: new leases and acres mined	28 leases/106,400 acres	28 leases/106,400 acres	28 leases/106,400 acres	28 leases/106,400 acres
Locatable Minerals				
Additional Acres Recommended for Withdrawal (Closure) from Mineral Entry	0	687,813 Recommend for withdrawal within 4.0 miles of leks.	0	115,614 Withdrawal recommendations for other resources.
Foreseeable Development: Locatable Minerals (numbers of POOs and acres disturbed)	4 POOs/554 acres	4 POOs/277 acres	11 POOs/1,455 acres	9 POOs/1,252 acres
Salable Minerals/Mineral Materials				

Resource/Resource Use	Alternative A	Alternative B	Alternative C	Alternative D
Acres Closed to Salable Minerals/Mineral Materials	28,873 WSAs closed.	3,218,690 Closed within 4.0 miles of leks.	57,213 Closures for WSAs and other resources.	623,061 Closures for WSAs and other resources.
Foreseeable Development of Salable Minerals (numbers of operations and acres disturbed)	61 operations/530 acres	27 operations/114 acres	240 operations/2,090 acres	137 operations/1,193 acres
Infrastructure (Widespread)				
Acres where ROW excluded	N/A	706,556 Exclude ROWs within 4.0 miles of leks.	28,554	79,777
Acres where ROW avoided	N/A	56,857 Disturbance subject to 1 location and 3% disturbance per square mile.	27,706	321,149 Disturbance subject to 5% disturbance cap within priority habitat and 1 location per square mile within core population area.
Foreseeable Development: Powerlines (number/miles/acreage)	740 rights-of-way 1,000 miles 4,916 acres	500 rights-of-way 425 miles 2,458 acres	1,500 rights-of-way 1,200 miles 7,374 acres	740 rights-of-way 1,000 miles 4,916 acres
Foreseeable Development: Roads (number/miles/acreage)	1,100 rights-of-way 1,725 miles 18,550 acres	550 rights-of-way 575 miles 9,275 acres	1,650 rights-of-way 2,300 miles 27,825 acres	1,100 rights-of-way 1,725 miles 18,550 acres
Livestock Grazing (Widespread)				
Areas closed to livestock grazing (acres)	10,000 Manage in accordance with Wyoming Standards for Healthy Rangelands.	467,897 Grazing leases not renewed within 4.0 miles of leks.	4,583 Manage in accordance with Wyoming Standards for Healthy Rangelands.	9,992 Manage in accordance with Wyoming Standards for Healthy Rangelands.
Recreation (Widespread)				
Acres Closed to Motorized Vehicle Use	3,650 Closure for other resources.	625,854 Closure for other resources.	28,931 Closure for other resources.	37,389 Closure for other resources.
Acres Seasonally Closed to Motorized Vehicle Use	37,646	18,259	6,839	18,259
Acres Limited to Designated Routes for Motorized Vehicle Use	737,166	137,126	723,497	661,726
Invasive Species (Widespread)				

Resource/Resource Use	Alternative A	Alternative B	Alternative C	Alternative D
Invasive species control	Control in cooperation with counties. Treat annual bromes on project specific basis.	Prevent invasion from non-federal lands. Treat annual bromes throughout planning area.	Prevent spread from public lands to non-federal lands. Prioritize areas for annual brome treatment.	Prevent invasion from non-federal lands. Prioritize areas for annual brome treatment.
Acres of Foreseeable Invasive Species Control (not associated with surface disturbances)	8,000	15,000	10,000	12,000
Conifer Invasion (Localized)				
Conifer management	Remove conifers where they have encroached upon Greater Sage-Grouse habitat.			
Fire (Localized)				
Suppression priority areas	Prevent spread into high value resources.	Protect sensitive resources including within 4.0 miles of leks.	Suppress fire across planning area.	Protect sensitive resources including priority habitat.
Acres of Foreseeable prescribed fire treatments	14,000	3,500	42,000	14,000
Sagebrush Elimination (Localized)				
There is no resource program in an RMP for addressing this threat to Greater Sage-Grouse and its habitat. In general, minimizing vegetation disturbance is recommended for proposed activities. Sagebrush conversion/elimination is not permitted on public lands.				
Urbanization (Localized)				
There is no resource program in an RMP for addressing this threat to Greater Sage-Grouse and its habitat, not within BLM authority.				
BLM Bureau of Land Management CSU Controlled Surface Use DOI Department of the Interior N/A Not Applicable NSO No Surface Occupancy POO Plan of Operation TLS Timing Limitation Stipulation RMP Resource Management Plan ROW right-of-way WSA Wilderness Study Area				

4.4.9.9. Greater Sage-Grouse Cumulative Effects Analysis for the Buffalo Planning Area

This cumulative effects analysis discloses the long-term effects on Greater Sage-Grouse from implementing each RMP/EIS alternative, in conjunction with other past, present, and reasonably foreseeable future actions. In accordance with CEQ guidance, cumulative effects need to be analyzed in terms of the specific resource and ecosystem being affected (Council on Environmental Quality 1997). As discussed in Chapter 1, the purpose for the proposed federal action is to identify and incorporate appropriate conservation measures to conserve, enhance, and restore Greater Sage-Grouse habitat by reducing, eliminating, or minimizing threats to Greater Sage-Grouse habitat. The WAFWA delineated seven sage-grouse MZs based on populations within floristic provinces (Stiver et al. 2006). Therefore, the cumulative effects analysis study area extends beyond the BFO planning area boundary and consists of WAFWA MZ I.

The analysis of BLM and USFS actions in MZ I is focused on Greater Sage-Grouse habitat within the MZ and is primarily based on MZ-wide datasets development by the BLM National Operations Center. Where quantitative data are not available, analysis is qualitative. This analysis includes past, present and reasonably foreseeable future actions are for all land ownerships in the MZ, and evaluates the impacts of the Buffalo RMP, by alternative, when added to those actions. The analysis of nonfederal actions is qualitative and includes a review and analysis of the following:

- State plans
- Coordination with states and agencies during consistency reviews
- Additional data from non-BLM-administered lands

The following diagram shows the boundaries of the WAFWA MZs and the BLM and National Forest System planning areas. The BFO planning area has a relatively small influence in the context of MZ I, because it contains relatively few PHMA or GHMA (1,319,100 acres of PHMA out of 12,506,500 total in MZ I; and 4,668,400 acres of GHMA out of 28,417,600 total in MZ I). As a result, actions in the Buffalo RMP/EIS may have less cumulative impact on Greater Sage-Grouse than those in larger planning areas in MZ I. Section 4.4.9.9.2, “Assumptions” (p. 1292) describes the methods used for this Cumulative Effects Assessment. Section 4.4.9.9.2, “Assumptions” (p. 1292) lists assumptions used in the analysis. Section 4.4.9.9.3, “Existing Conditions in WAFWA MZ I and the Buffalo RMP Planning Area” (p. 1292) describes existing conditions in MZ I and in the Buffalo RMP planning area. Section 4.4.9.9.4, “Regional Efforts to Manage Threats to Greater Sage-Grouse” (p. 1296) discusses present and reasonably foreseeable future federal, state, tribal, and private efforts to conserve Greater Sage-Grouse in MZ I. Section 4.4.9.9.5, “Relevant Cumulative Actions” (p. 1301) lists relevant cumulative actions in MZ I. Section 4.4.9.9.6, “Threats to Greater Sage-Grouse in Management Zone I” (p. 1302) analyzes threats to Greater Sage-Grouse in MZ I and discusses the potential cumulative effects resulting from each threat for each alternative. Section 4.4.9.9.7, “Conclusions” (p. 1331) determines the cumulative effects on Greater Sage-Grouse as a result of implementing each alternative in the Buffalo RMP, in combination with other private, local, regional, state, and federal past, present, and reasonably foreseeable future actions in MZ I.

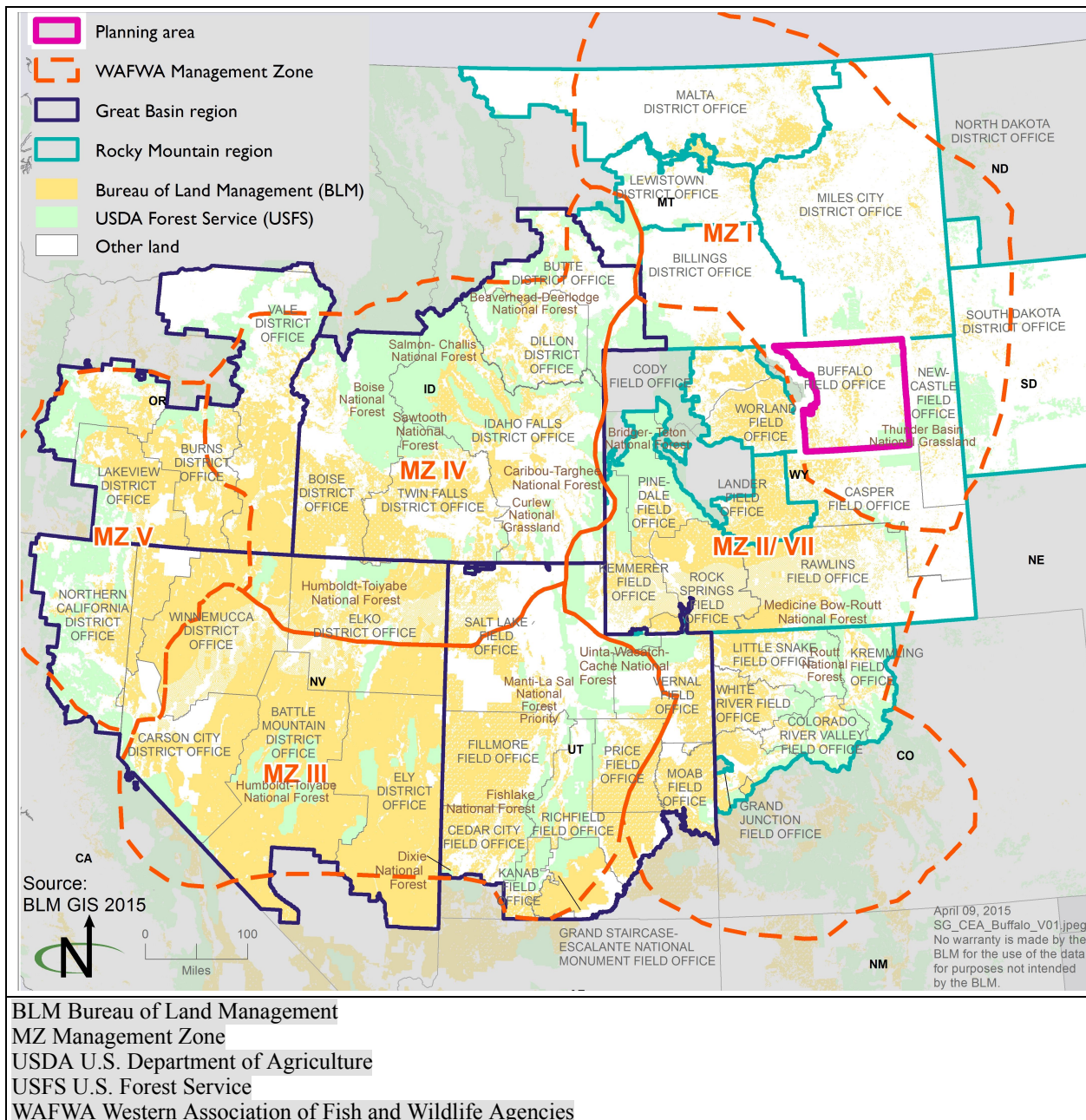


Figure 4.10. WAFWA Management Zones

4.4.9.9.1. Methods

The cumulative effects analysis uses the following methods:

- Data from the USGS publication Summary of Science, Activities, Programs, and Policies That Influence the Range-Wide Conservation of Greater Sage-Grouse (Manier et al. 2013) establishes the baseline environmental condition against which the alternatives and other past, present, and reasonably foreseeable future actions are compared. Data from this publication are presented in terms of priority and general habitat.

- The USFWS's 12-Month Findings for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered (USFWS 2010) and the USFWS publication Conservation Objectives: Final Report (i.e., the COT report; USFWS 2013) were reviewed to identify the primary threats facing Greater Sage-Grouse in each WAFWA MZ. Table 2 of the COT report lists threats to Greater Sage-Grouse that are present and widespread in each population in the MZ.
- For MZ I the list of threats that are directly or indirectly affected by BLM actions are energy development/mining, infrastructure, grazing, conversion to agriculture, fire, spread of weeds, and recreation (USFWS 2013). Two other threats listed in the COT report, sagebrush eradication and isolation/small population size, affect Greater Sage-Grouse populations in MZ I.
- Sagebrush eradication is a component of many threats. Isolation/small population size is not analyzed separately, because no management actions directly address this threat. These two threats are discussed as a component of other threats and in the conclusions. Not all the threats discussed in this section represent major threats to Greater Sage-Grouse in each planning area in the MZ, but each poses a present and widespread threat to at least one population.
- Predation was not included as a threat in the final COT report and was not identified by USFWS as a significant threat to Greater Sage-Grouse populations (USFWS 2010). Predation is a natural occurrence that may be enhanced by human habitat modifications such as construction of infrastructure that may increase opportunities for nesting and perching or increase exposure of Greater Sage-Grouse nests. In such altered habitats, predators may exert an undue influence on Greater Sage-Grouse populations. Predation is discussed in this cumulative effects analysis in the context of these other threats.
- Each threat is analyzed, and a brief conclusion for each threat is provided.
 - The BLM National Operations Center compiled MZ-wide datasets for quantifiable actions in all proposed BLM RMP/EISs in MZ I. These datasets provide a means by which to quantify cumulative impacts from direct impacts of the threats identified in the COT report.
 - PHMA and GHMA were developed to protect the best habitat and highest population density of Greater Sage-Grouse. Although Alternative A does not designate PHMA or GHMA, spatial GIS data were clipped to these boundaries to allow for a consistent comparison across all alternatives.
 - Data and information were gathered from other federal, state, and local agencies and tribal governments, where available, and were used to inform the analysis of cumulative impacts on Greater Sage-Grouse from each of the threats in MZ I.
 - The tables in this cumulative analysis display the number of acres across the entire MZ and the percentage of those acres that are located within the Buffalo planning area. To calculate the total number of acres in the MZ, the number of acres in the other BLM and USFS proposed plans across MZ I are added to the number of acres in the applicable Buffalo RMP alternative. For example, the totally number of acres for Alternative A includes all of the other proposed plans in MZ I plus Buffalo RMP Alternative B.
- A discussion is provided for each alternative in Section 4.4.9.9.7, "Conclusions" (p. 1331). Each alternative considers the cumulative impacts on Greater Sage-Grouse from each of the threats. It also considers whether those threats can be ameliorated by implementing that particular alternative in conjunction with past, present, and reasonably foreseeable non-BLM actions in MZ I.
- The list of relevant cumulative actions in Section 4.4.9.9.5, "Relevant Cumulative Actions" (p. 1301) was derived from each proposed BLM RMP in MZ I to provide an overview of the ongoing and proposed land uses there.

- Baseline data that are consistent across planning areas and that analyze cumulative effects for each alternative, including the No Action Alternative and Proposed Plan, are used in this analysis.
- This analysis uses the most recent information available. For purposes of this analysis, the BLM has determined that the Proposed Plans for the other ongoing Greater Sage-Grouse planning efforts in MZ I are reasonably foreseeable future actions.

4.4.9.2. Assumptions

This cumulative analysis uses the same assumptions and indicators as those established for the analysis of direct and indirect effects on Greater Sage-Grouse in Section 4.4.9, *Special Status Species – Wildlife*. In addition, the following assumptions have been made:

- The timeframe for this analysis is 20 years.
- The cumulative effects analysis area extends beyond the planning area and encompasses all of WAFWA MZ I; the quantitative impact analysis focuses on impacts across the MZ. The MZ is the appropriate geographic scope for this analysis because it encompasses areas with similar floristic conditions containing important Greater Sage-Grouse habitat.
- The magnitude of each threat would vary geographically and may have more or less impact on Greater Sage-Grouse in some parts of the MZ, depending on such factors as climate, land use patterns, and topography.
- A management action or alternative would contribute a net conservation gain to Greater Sage-Grouse if there is an actual benefit or gain above baseline conditions. Baseline conditions are defined as the pre-existing condition of a defined area and/or resource that can be quantified by an appropriate metric(s). During environmental reviews, the baseline is considered the affected environment that exists at the time of the review's initiation, and is used to compare predictions of the effects of the proposed action or a reasonable range of alternatives.
- The cumulative effects analysis quantitatively analyzes impacts on Greater Sage-Grouse and their habitat in the MZ. Impacts on habitat are likely to correspond to impacts on populations within the MZ I, since reductions or alterations in habitat could affect reproductive success through reductions in available forage or nest sites. Human activity could cause disturbance to the birds, preventing them from mating or successfully rearing offspring. Human activities also could increase opportunities for predation, disease, or other stressors (Connelly et al. 2004; USFWS 2010; Manier et al. 2013).

4.4.9.3. Existing Conditions in WAFWA MZ I and the Buffalo RMP Planning Area

This section summarizes existing conditions and past and present actions for the Buffalo RMP planning area (provided in more detail in Chapter 3) and for MZ I as a whole. Reasonably foreseeable future actions are discussed in Section 4.4.9.5, “Relevant Cumulative Actions” (p. 1301).

Greater Sage-Grouse Habitat and Populations

MZ I consists of four Greater Sage-Grouse populations: the Dakotas, Northern Montana, PRB, and Yellowstone Watershed (Garton et al. 2011). The Buffalo RMP planning area includes most of the PRB Greater Sage-Grouse population. MZ I contains some of the highest-connected networks of Greater Sage-Grouse leks in the range (Knick and Hanser 2011); however, it also contains less productive sagebrush, similar to areas where Greater Sage-Grouse have been extirpated (Wisdom

et al. 2011). Sagebrush cover is naturally limited due to the dominant presence of grassland ecosystems. In combination with agricultural pressure and energy production in the PRB and extensive infrastructure, including power lines, fences, and roads (USFWS 2010), this results in substantial habitat limitations for Greater Sage-Grouse populations.

In MZ I, state and private lands account for approximately 35 million acres of Greater Sage-Grouse habitat (approximately 75 percent of habitat), with BLM-administered and other federal land accounting for only 25 percent of surface estate (Manier et al. 2013, p. 118). Private lands and other federal lands with BLM subsurface estate identified as PHMA in the DEIS should be treated as PHMA for management of Greater Sage-Grouse.

Table 4.45, “Management Jurisdiction in MZ I by Acres of Priority and General Habitats” (p. 1293) provides a breakdown of landownership and acres of Greater Sage-Grouse habitat in MZ I. As the table shows, approximately 26 percent of PHMA and 13 percent of GHMA is on BLM-administered lands. In the Buffalo RMP planning area, there are approximately 6 million acres of Greater Sage-Grouse habitat, including approximately 750,000 acres (12 percent) on BLM-administered lands. The remaining 5.2 million acres (88 percent) of Greater Sage-Grouse habitat comprise private, local, state, and other federal and tribal lands.

The percentage of BLM-administered surface estate in the planning area is low. Even so, BLM fluid mineral estate, including surface and split estate lands, covers 46 percent of the planning area (approximately 3,390,000 acres), 75 percent of which has been leased. However, due to the patchwork distribution of land ownership, the conservation results obtained on any ownership are limited unless conservation actions are enacted across ownership boundaries.

Table 4.45. Management Jurisdiction in MZ I by Acres of Priority and General Habitats

	Total Surface Area (Acres)	Priority Habitat (Acres)	General Habitat (Acres)	Non-habitat (Acres)
MZ I	84,110,800 (100%)	11,636,400 (14%)	34,663,000 (41%)	37,811,400 (45%)
BLM	8,325,300 (10%)	2,994,300 (26%)	4,524,900 (13%)	806,100 (10%)
U.S. Forest Service	4,532,500 (5%)	292,400 (3%)	515,300 (1%)	3,724,800 (82%)
Tribal and other federal	5,458,500 (6%)	219,700 (2%)	2,427,700 (7%)	2,811,100 (51%)
Private	54,998,900 (65%)	7,132,500 (61%)	24,682,800 (71%)	23,183,600 (42%)
State	5,421,400 (6%)	995,600 (9%)	2,498,400 (7%)	1,927,400 (36%)
Other	5,374,100 (6%)	1,900 (<1%)	13,900 (<1%)	5,358,300 (99%)
Source: Manier et al. 2013, p. 118				
% percent				
< less than				
BLM Bureau of Land Management				
MZ Management Zone				

Planning Area Habitat Conditions

Sagebrush is the most dominant shrubland type in the Buffalo RMP planning area, found primarily on the open plains but also in mountain settings. It is dominated by Wyoming big sagebrush, mountain big sagebrush, mountain mahogany, and greasewood. Wyoming big sagebrush tends to grow in the low to mid elevations on the drier sites, while mountain big sagebrush occurs in upper elevations in moister conditions, such as in the southern Big Horn Mountains.

The PRB is near the eastern edge of the Greater Sage-Grouse range. Vegetation communities in the planning area are intermingled, because they represent a transition between the intermountain basin sagebrush communities to the west and the prairie communities to the east. Sagebrush coverage in the PRB is estimated to be 35 percent, with an average patch being less than 300 acres (Leu and Rowland 2005). The PRB patch size has decreased by more than 63 percent in the past forty years, from 820-acre patches and an overall coverage of 41 percent in 1964 (Leu and Rowland 2005).

As a result of past and ongoing human activities in the planning area, substantial areas of Greater Sage-Grouse habitat have been altered from their natural conditions. For example, 46 percent of the planning area (3,387,000 acres) is BLM-administered fluid mineral estate, 75 percent of which (2,545,000 acres) has been leased; most of the leases have been developed and are in production. Much of the nonfederal minerals have also been developed. Human disturbances in the Buffalo planning area include agriculture, mining, roads, urban areas, oil and gas well pads, compressor sites, and other ancillary facilities.

Changes in land use and land development are the primary causes of habitat loss, while habitat degradation is a complicated interaction among many factors, including drought, improper livestock grazing, changes in natural fire regimes, and invasive plant species (Fischer et al. 1996; Pyle and Crawford 1996; Beck and Mitchell 2000; Nelle et al. 2000).

The Greater Sage-Grouse population in northeast Wyoming has decreased by more than 80 percent since 2001 due to intense coal-bed natural gas development; more than 30,000 wells were drilled over a short period, accompanied by thousands of water impoundments, new roads, and power lines. The Greater Sage-Grouse population also has dropped due to WNV outbreaks, leading to state and federal efforts to improve Greater Sage-Grouse conservation. The BFO conducted a viability analysis for Greater Sage-Grouse that was published in 2012 (Taylor et al. 2012). The viability analysis does not anticipate full recovery of Greater Sage-Grouse in the PRB, though conditions may have improved since its publication). The COT report considers this population at risk of extirpation (USFWS 2013).

Buffalo RMP Alternatives

The Buffalo RMP/EIS evaluates the following four alternatives:

- Alternative A, current management (the No Action Alternative)
- Alternative B, which emphasizes conservation of physical, biological, heritage, and visual resources, with constraints on resource uses on BLM-administered lands
- Alternative C, which emphasizes resource uses by limiting conservation measures afforded to physical, biological, heritage, and visual resources on BLM-administered lands
- The Proposed Plan, which generally allows resource use if the activity can be conducted in a manner that conserves physical, biological, heritage, and visual resources

Alternatives A and C manage Greater Sage-Grouse with a localized lek-centered approach, whereas Alternative B manages Greater Sage-Grouse at a landscape scale with much larger buffers. The Proposed Plan manages Greater Sage-Grouse consistent with Wyoming's Core Population Area Strategy codified in EO 2011-5 (Section 4.4.9.9.4, "Regional Efforts to Manage Threats to Greater Sage-Grouse" (p. 1296), below). Not all of these alternatives use a priority and general habitat management (PHMA and GHMA) area approach. However, for comparison purposes in the data tables in Section 4.4.9.9.5, "Relevant Cumulative Actions" (p. 1301), all

alternatives represent the Wyoming-designated PHMA and GHMA for both the planning area and for MZ I as a whole.

PHMA includes the State of Wyoming-designated Core Population Areas (Core Areas) and the Core Population Connectivity Corridors (Connectivity Corridors).

The BLM has incorporated management of Sagebrush Focal Areas into its proposed management approach for Greater Sage-Grouse. Sagebrush Focal Areas are a subset of PHMA and represent recognized “strongholds” for the species that have been noted and referenced by the conservation community identified as having the highest densities of the species and other criteria important for the persistence of the species (Ashe 2014). Those portions of Sagebrush Focal Areas on BLM-administered lands would be petitioned for withdrawal from mineral entry, subject to an NSO stipulation with no exceptions, modifications, or waivers, and are prioritized for management and conservation actions, including, but not limited to, review of livestock grazing permits/leases. There is one Sagebrush Focal Area comprising 1,807,600 acres in MZ I, in Montana.

Population Trends in Management Zone I

Greater Sage-Grouse has been extirpated from almost half of its original range in MZ I; populations continue to decline by 2 to 4 percent annually (Manier et al. 2013). The MZ I Greater Sage-Grouse population was estimated to be 14,814 males in 2007, having declined 17 percent in the number of males per lek since 1965. The number of leks declined by 22 percent over the same period (Manier et al. 2013). Lek counts indicate a 67 percent drop in MZ I from 2007 to 2013 (Garton et al. 2015).

Wyoming data suggest a cyclical pattern, with population lows in 1995, 2002, and 2013, and peaks in 2000 and 2006. Actual trends are difficult to discern due to the smaller survey before 2007, meaning the number and proportion of active to inactive leks is unknown. Since 2007, the number of active leks has remained stable (approximately 1,100 active leks), but the number of males per active lek has declined by more than half, from 42 to 17. In northeast Wyoming, the decreasing number of active leks since 2007 suggests a population decline in that area that is greater than that indicated by the average lek size. Similar population trends are suggested at both state and local scales (Christiansen 2013). The PRB population dropped 76 percent from 2007 to 2013, to 1,651 males (Garton et al. 2015).

Similarly, in Montana, the Greater Sage-Grouse population changes cyclically. The Greater Sage-Grouse population declined sharply from 1991 to 1996, before increasing through 2000 (Montana Sage Grouse Work Group 2005). The population is thought to be down 33 percent from historic levels. Between 2004 and 2013, the average number of displaying males per lek in a given year in Montana ranged from 7 to 19 (Greater Sage-Grouse Habitat Conservation Strategy 2014). Northern Montana population dropped 54 percent to 1,667 males in 2013, while the Yellowstone Watershed population dropped 65 percent to 3,045 males (Garton et al. 2015)

In the Dakotas, Greater Sage-Grouse numbered approximately 300 male birds in 2013, a drop of 72 percent from 2007 (Garton et al. 2015). Although North and South Dakota populations remain connected to populations in Montana, their small size, situation on the edge of Greater Sage-Grouse range, and ongoing threats place them at high risk (Manier et al. 2013, p. 127; USFWS 2013).

4.4.9.9.4. Regional Efforts to Manage Threats to Greater Sage-Grouse

Across the Greater Sage-Grouse range, other BLM and National Forest System sub-regions are undergoing RMP revision or amendment processes similar to this one for the BFO. The Final EIS associated with each of these efforts has identified a Proposed Plan that meets the purpose and need of conserving, enhancing, and/or restoring Greater Sage-Grouse habitat by reducing, eliminating, or minimizing threats. The management actions from the various Proposed Plans will cumulatively decrease the threat of Greater Sage-Grouse habitat loss and will limit fragmentation throughout the range. Key actions present in many of the Proposed Plans include changes in land use allocations, a mitigation framework, an adaptive management strategy, anthropogenic disturbance cap, and protective management actions in priority and general habitat areas.

In addition, there are several regional efforts to manage threats to Greater Sage-Grouse in MZ I. These efforts may have a greater ability to alleviate threats to Greater Sage-Grouse than BLM actions. This is because state and private lands account for approximately 35 million acres (approximately 75 percent) of Greater Sage-Grouse habitat in MZ I (Manier et al. 2013, p. 118).

Wyoming Statewide Efforts

Wyoming has established Core Population Areas to help delineate landscape planning units by distinguishing areas of high biological value. These areas are based on the locations of breeding areas and are intended to help balance Greater Sage-Grouse habitat requirements with demand for energy development (Doherty et al. 2011).

In 2000, the Wyoming Sage-Grouse Working Group (WSGWG) was formed to develop a statewide strategy for Greater Sage-Grouse conservation. This group prepared the Wyoming Greater Sage-Grouse Conservation Plan (WSGWG 2003) to provide coordinated management and direction across the state. In 2004, local Greater Sage-Grouse working groups were formed to develop and implement local conservation plans. Eight local working groups around Wyoming have completed conservation plans, many of which prioritize addressing past, present, and reasonably foreseeable threats at state and local levels, and prescribe management actions for private landowners to improve Greater Sage-Grouse conservation at the local scale, consistent with the overall Wyoming Core Strategy. The Buffalo RMP planning area is part of the Northeast Wyoming local working group, in which the BLM participates. The Northeast Wyoming Sage-Grouse Conservation Plan was completed in 2006 and was updated in 2014 (Northeast Wyoming Sage-grouse Working Group 2014). The local and regional working group plans would assist in Greater Sage-Grouse conservation through monitoring, public awareness, and voluntary protective actions on private land.

Umbrella Candidate Conservation Agreement with Assurances for Wyoming Ranch Management. Candidate Conservation Agreements with Assurances are voluntary conservation agreements between the USFWS and one or more federal or private partners (e.g., the ranchers). In return for managing lands to benefit Greater Sage-Grouse, landowners receive assurances against additional regulatory requirements should Greater Sage-Grouse be listed under the ESA. Within Wyoming, the USFWS and Wyoming Governor's Office in conjunction with the BLM, NRCS, USFS, and other agencies, have developed an umbrella Candidate Conservation Agreement with Assurances for range management activities. Enrolled landowners are expected to comply with grazing specific conservation measures including but not limited to: avoid (or rotationally utilize) known nesting and brood-rearing habitat as a location for activities that concentrate livestock such as stock tank placement branding and roundup; place salt or mineral supplements in sites minimizing

impacts to Greater Sage-Grouse habitat; and within 24 months develop and implement a written grazing management plan to maintain or enhance the existing plant community as suitable Greater Sage-Grouse habitat (USFWS et al. 2013).

Wyoming Executive Order. Wyoming Governor Matt Mead issued an EO on June 2, 2011, that complemented and replaced several EOs issued by his predecessor. The 2011 Wyoming EO articulates Wyoming's Core Population Area Strategy (Core Area Strategy) as an approach to balancing Greater Sage-Grouse conservation and development. It also provides an approach to mitigating human disturbances to Greater Sage-Grouse.

The Wyoming EO applies to state trust lands starting in 2008. These trust lands cover almost 23 percent of Greater Sage-Grouse habitat and benefit approximately 80 percent of the estimated breeding population in the state (USFWS 2010). All proposed activities are evaluated through a density/disturbance calculation tool to determine if the project would exceed recommended density/disturbance thresholds. Additionally, the order has stipulations to be included in permits, with varying restrictions depending on whether the proposed development activity occurs within or outside delineated Core Population Areas (Wyoming EO, June 2, 2011).

In Core Areas, there is a 0.6-mile NSO buffer around occupied leks and restrictions on activities in breeding and winter concentration habitat. Wyoming's Industrial Siting Council, which permits large development projects on all lands in the state, is subject to the terms of the EO. This buffer provides protection for males during lekking season and acts in coordination with the density disturbance cap. The combination of protections could offer Greater Sage-Grouse considerable regulatory protection when large wind energy and other development projects are being considered in Wyoming (USFWS 2010; Manier et al. 2013).

Statewide modeling of trends under the Core Area Strategy suggests that with effective enforcement statewide, the strategy could reduce population losses by 9 to 15 percent across Wyoming. Moreover, the number of Core Areas predicted to maintain 75 percent of their current populations could increase from 20 to 25 under long-term scenarios (Copeland et al. 2013). Combining the Core Area Strategy with \$250 million in target conservation easements (provided willing landowners and funding are available) could reduce population declines by another 9 to 11 percent (Copeland et al. 2013).

For the Buffalo RMP planning area, however, the Core Area Strategy may be less protective than in other areas, because much development in Greater Sage-Grouse habitat has already occurred and populations are already in decline. As stated in the Viability Analysis for Conservation of Greater Sage-Grouse Populations for the BFO (Taylor et al. 2012), Core Areas in northeastern Wyoming were delineated only after widespread development had already occurred in Greater Sage-Grouse habitat, leaving few options for conserving populations in this region.

Core Population Areas in northeastern Wyoming exclude approximately 72 percent of peak male Greater Sage-Grouse lek attendance in the Buffalo RMP planning area (BLM 2012k). Core Population Areas in Wyoming also incorporate connectivity corridors (Wyoming Executive Order 2011). These are areas Greater Sage-Grouse use to maintain connectivity between habitat areas (Manier et al. 2013). Connectivity reduces isolation, thereby increasing viability of a population and reducing vulnerability to disease, drought, or other events that may result in extirpation.

Montana Statewide Efforts

The Montana Department of Fish, Wildlife and Parks is tasked with implementing the range-wide WAFWA Sage-Grouse Strategy (Stiver et al. 2006) in Montana. The WAFWA Sage-Grouse Strategy outlines a plan for monitoring, research, outreach, and funding for conservation projects for Greater Sage-Grouse. A basic premise of the WAFWA Sage-Grouse Strategy is that additional conservation capacity must be developed at all local, state, federal, and range-wide levels for both the short term (3 to 5 years) and for the long term (10 years or more) to ensure Greater Sage-Grouse conservation.

In addition, the Montana Department of Fish, Wildlife and Parks's Montana Management Plan and Conservation Strategy for Sage-Grouse was initiated in 2005 to protect, maintain, and restore Greater Sage-Grouse habitat. The plan ranks threats to the species across the state and provides an overall strategy for public and private cooperation in conservation actions, but was not regulatory. In 2013, the governor established the Greater Sage-Grouse Habitat Conservation Advisory Council to provide recommendations on policies and actions to advance the conservation agenda for Greater Sage-Grouse in Montana and provide regulatory authority for conservation actions. The council provided these recommendations in January 2014. The governor subsequently issued an EO on September 9, 2014 (State of Montana 2014), based on the council recommendations that provided the direction for Greater Sage-Grouse conservation in Montana.

Montana Executive Order. The Montana governor issued an EO on September 9, 2014 (State of Montana 2014), based on the council recommendations that provided the direction for Greater Sage-Grouse conservation in Montana. Stipulations for development in the EO and Montana Management Plan and Conservation Strategy for Sage-Grouse include but are not limited to:

- A 0.6-mile NSO buffer around the perimeter of active leks for new activities.
- Locating new overhead power lines and communication towers a minimum of 0.6 mile from the perimeter of active leks.
- A minimum 2.0-mile buffer from active lek perimeters for main roads and 0.6-mile buffer for facility site access roads.
- A 5 percent limit on anthropogenic surface disturbance within the Density and Disturbance Calculation Tool examination area (based upon suitable habitat).
- As authorized by permitting agency or agencies, activities (production, maintenance, and emergency activity exempted), will typically be prohibited from March 15 through July 15 outside of the NSO perimeter of an active lek and within 2 miles of that perimeter in Core Population Areas where breeding, nesting, and early brood-rearing habitat is present.

The approach of the Montana EO/Montana Management Plan and Conservation Strategy for Greater Sage-Grouse is similar to the Wyoming EO. Montana's plan will apply a disturbance cap in core habitat and will limit well density and apply timing limitations. The 0.6-mile buffer would protect males in the vicinity of leks during the breeding season; the density limits and disturbance cap would protect Greater Sage-Grouse during nesting, brood-rearing, and winter concentration activities. The timing restrictions would reduce the potential for displacement or disruption during the breeding season.

North and South Dakota Statewide Efforts

The South Dakota Department of Game, Fish and Parks published its Sage-Grouse Management Plan in 2014 (South Dakota Wildlife Division 2014). While the plan does not address disturbance caps or impose restrictions that are required, it is designed to provide biological information about Greater Sage-Grouse, identify factors that influence sage-grouse in South Dakota, and guide future management direction and actions by establishing objectives to:

- Maintain or increase/improve the existing status and range of sage/steppe habitat in South Dakota.
- Use results from lek counts and inference from past hunting seasons to guide recommendations for the annual hunting season.
- Annually monitor sage-grouse population status and distribution.
- Use results from lek counts and inference from past hunting seasons to guide recommendations for the annual hunting season.
- Develop a public outreach and educational plan that informs the public, landowners, stakeholders, and wildlife/conservation agencies on sage grouse management and the issues of highest concern.
- Support local, interstate and interagency sage-grouse research projects and collaborative conservation planning efforts.
- Document disease outbreaks and develop management responses.

The North Dakota Game and Fish Department has developed its Management Plan and Conservation Strategies for Greater Sage-Grouse in North Dakota (Robinson 2014). The purpose of the plan is in part to meet the objectives outlined in the COT report (USFWS 2013), which include:

- Stop population declines and habitat loss.
- Implement targeted habitat management and restoration.
- Develop and implement Greater Sage-Grouse conservation strategies and associated actions and regulatory mechanisms.
- Develop and implement proactive, voluntary conservation actions.
- Develop and implement monitoring plans to track success of conservation strategies.
- Prioritize, fund, and implement research to address existing uncertainties.

Similar to the South Dakota plan, the North Dakota plan does not address disturbance caps or impose required restrictions but instead is intended to provide biological information on Greater Sage-Grouse in North Dakota and be used as the conservation framework to minimize impacts to Greater Sage-Grouse in North Dakota across all land ownerships.

Powder River Basin Restoration Program

The PRB Restoration Program is a collaborative partnership to restore and enhance Greater Sage-Grouse habitat on a landscape level in the PRB. The basin encompasses 13,493,840 acres in northeast Wyoming and southeast Montana. Surface ownership is composed of approximately 70 percent private lands, 14 percent BLM-administered lands (including 8 percent in Wyoming and 6 percent in Montana), 8 percent National Forest System lands, and 8 percent States of Wyoming and Montana lands. Split-estate mineral ownership is 50 to 60 percent federal (BLM 2015).

The PRB Restoration Program is focusing on areas affected by the federal oil and gas development that has occurred over the past decade in the PRB in northeastern Wyoming. Its objectives are restoring or enhancing disturbed previously suitable habitat to suitable habitat for sagebrush obligate species, primarily Greater Sage-Grouse. This includes multiple sites affected by coal bed natural gas abandonment reclamation efforts, wildfires, and noxious and invasive plants. Priority will be given to those areas recognized as priority habitats (e.g., Core Population Areas and connectivity corridors).

Habitat objectives are meeting the needs for nesting, brood-rearing, and late brood-rearing. The program would contribute to efforts focused on the management and control of mosquitoes

carrying WNV and would include funding, labor, treatment locations, and other needs as determined.

Additionally, efforts would be coordinated to reduce fuels in and near Greater Sage-Grouse habitat to enhance sagebrush stands, support restoration efforts, and reduce the risk of high-severity wildfire. Pine stands and juniper woodlands would be managed for structural diversity and to reduce fuels, especially near PHMA, human developments, and recreation areas.

Natural Resources Conservation Service Sage Grouse Initiative

The NRCS's Sage-Grouse Initiative is working with private landowners in 11 western states to improve habitat for Greater Sage-Grouse (Manier et al. 2013). With approximately 31 percent of all sagebrush habitats across the range in private ownership (Stiver 2011, p. 39), and over 65 percent in MZ I (Manier et al. 2013, p. 118), a unique opportunity exists for the NRCS to benefit Greater Sage-Grouse and to ensure the persistence of large and intact rangelands through long-term contracts and conservation easements (USFWS 2010, p.5). In the Buffalo RMP planning area, local conservation districts, such as the Lake DeSmet Conservation District, have been very active in Greater Sage-Grouse conservation.

Participation in the Sage-Grouse Initiative program is voluntary, but willing participants enter into binding contracts to ensure that conservation practices that enhance Greater Sage-Grouse habitat, such as fence marking, protecting riparian areas, and maintaining vegetation in nesting areas, are implemented. Participating landowners are bound by a contract (usually 3 to 5 years) to implement, in consultation with NRCS staff, conservation practices if they wish to receive the financial incentives offered by the Sage-Grouse Initiative. These financial incentives generally take the form of payments to offset costs of implementing conservation practices and easements or rental payments for long-term conservation.

While potentially effective at conserving Greater Sage-Grouse populations and habitat on private lands, incentive-based conservation programs that fund the Sage-Grouse Initiative generally require reauthorization from Congress under subsequent farm bills, meaning future funding is not guaranteed.

As of 2015, Sage-Grouse Initiative has secured conservation easements on over 455,000 acres across the Greater Sage-Grouse range (NRCS 2015), with the largest percentage of easements occurring in Wyoming (approximately 200,000 acres). In MZ I, Sage-Grouse Initiative has thus far secured conservation easements on 65,881 acres that maintain intact sagebrush-grassland habitat. It has also accomplished the following:

- Established over 1,370,000 acres where grazing management promotes Greater Sage-Grouse habitat and sustainable ranching
- Removed conifers encroaching on 181 acres of Greater Sage-Grouse habitat
- Seeded over 7,500 acres with native plants
- Marked or moved 350 miles of high-risk fences in Greater Sage-Grouse territory

Other Regional Efforts

The USFS is preparing a plan to manage nearly 96,000 acres of Greater Sage-Grouse habitat in the Dakota Prairie National Grassland. The plan is not yet available for review but is likely to propose similar protections for Greater Sage-Grouse on its lands as are included in the BLM RMPs.

In addition, tribes, counties, and local working groups are playing a critical role in promoting Greater Sage-Grouse conservation at the local level. Individual conservation plans have been prepared by most local working groups to develop and implement strategies to improve or maintain Greater Sage-Grouse habitat and reduce or mitigate threats on the local level. The proposed conservation actions and recommendations in these plans are voluntary actions for private landowners. Local working group projects have included monitoring, research, and mapping habitat areas, as well as public outreach efforts such as landowner education and collaboration with federal, state, and other local entities. These efforts provide a net conservation gain to Greater Sage-Grouse through increased monitoring and public awareness.

A programmatic EIS by the Western Area Power Administration (WAPA) and the USFWS for the entire upper Great Plains will focus future wind energy developments in specific corridors outside of Greater Sage-Grouse core habitat (WAPA 2013). In accordance with Section 7 of the ESA, preparation of the programmatic EIS has involved consultation between cooperating entities and the USFWS and preparation of a programmatic Biological Assessment to ensure that the action will not jeopardize the continued existence of any federally-listed species, including the federal candidate Greater Sage-Grouse. At the time of this RMPA specific conservation measures for protecting Greater Sage-Grouse and its habitat under the programmatic EIS are not developed.

Some local working group conservation plans recommend restricting resource uses as well. For example, the Bates Hole/Shirley Basin Conservation Plan (Bates Hole/Shirley Basin Sage-grouse Working Group 2007) recommends that areas within 3.4 miles of an occupied Greater Sage-Grouse lek not be leased for oil and gas development unless mitigation plans have been developed, approved, and funded. Local working group Greater Sage-Grouse conservation plans in MZ I include the following:

- Bates Hole/Shirley Basin (Bates Hole/Shirley Basin Sage-grouse Conservation Plan; 2007)
- Big Horn Basin (Sage-Grouse Conservation Plan for the Big Horn Basin, Wyoming; 2007)
- Northeast Wyoming (PRB) (Northeast Wyoming Sage-grouse Conservation Plan; 2014)
- Glasgow (A Summary of Conservation Activities of the Glasgow, MT Sage-Grouse Local Working Group; 2011)
- Miles City/Forsyth (Miles City Sage-Grouse Local Working Group Action Plan 2011-2014)
- Central Montana Organized Conservation District (no local conservation plan)
- North Dakota (no local conservation plan)
- South Dakota (no local conservation plan)

4.4.9.9.5. Relevant Cumulative Actions

This cumulative effects analysis considers the incremental impact of the Buffalo Proposed Plan and alternatives in combination with other past, present, and reasonably foreseeable future federal and non-federal actions on lands in MZ I. Where these actions occur within Greater Sage-Grouse habitat, they would cumulatively add to the impacts of BLM- and USFS-authorized activities set for in the Buffalo Proposed Plan. In addition to the conservation efforts described above, relevant reasonably foreseeable future cumulative actions occurring on federal, private, or mixed land ownerships in MZ I are described in Appendix G (p. 1937) of the Buffalo Proposed RMP/Final EIS and in the North Dakota, South Dakota, Miles City, Lewistown, HiLine, Billings, and 9-Plan Planning Area RMPs.

The following list includes past, present, and reasonably foreseeable future actions in MZ I that when added to the Proposed Plan and alternatives for the Buffalo RMP could cumulatively affect

Greater Sage-Grouse (see Table 4.57, “Reasonably Foreseeable Future Actions in Management Zone I Likely to Impact Greater Sage-Grouse Habitat” (p. 1337) for more detail):

- PRB oil and gas leases in Campbell, Johnson, and Sheridan Counties, Wyoming
- Surface coal mining and coal leasing in PRB, Wyoming
- Carter Master Leasing Plan for Oil and Gas, Carter County, Montana
- Greater Crossbow Oil and Gas Exploration and Development Project in Campbell and Converse Counties, Wyoming
- Converse County Oil and Gas Development, Converse County, Wyoming
- Increased oil and gas production surrounding the established fields in the southern Williston Basin
- Nichols Ranch/Hank Unit Uranium In-situ Recovery Mining Project, Johnson and Campbell Counties, Wyoming
- Proposed uranium mining in Newcastle, Wyoming and in South Dakota
- Western Area Power Administration Upper Great Plains Wind Energy Programmatic Draft EIS
- Bentonite mining in northeast Wyoming and in Carter County, Montana
- Keystone XL Pipeline, Montana and South Dakota
- Conversion of lands to agricultural and urban development
- Conifer removal projects throughout MZ I

4.4.9.6. Threats to Greater Sage-Grouse in Management Zone I

In its COT report the USFWS identifies energy development, infrastructure, grazing, conversion to agriculture, fire, spread of weeds, and recreation as the present and widespread threats facing Greater Sage-Grouse in MZ I (USFWS 2013). These threats impact Greater Sage-Grouse mainly by fragmenting and degrading their habitat. The loss of sagebrush steppe across the West approaches or exceeds 50 percent in some areas. It is a primary factor in long-term declines in Greater Sage-Grouse abundance across its historical range (USFWS 2010).

Habitat fragmentation reduces connectivity of populations and increases the likelihood of extirpation from random events such as drought or outbreak of WNV. Furthermore, climate change is likely to affect habitat availability to some degree by decreasing summer flows and limiting growth of grasses and forbs, thereby limiting water and food supply (BLM 2012j). Sensitive species such as Greater Sage-Grouse, which are already stressed by declining habitat, increased development, and other factors, could experience additional pressures as a result of climate change.

Each COT report threat considered present and widespread in at least one population in MZ I is discussed below. For more detail on the nature and type of effects and the direct and indirect impacts on Greater Sage-Grouse in the planning area, see Section 4.4.9, “Special Status Species – Wildlife (including Greater Sage-Grouse)” (p. 1229) of the Buffalo Proposed RMP/Final EIS. The quantitative impact analysis focuses on impacts in MZ I, with planning area acres provided for context.

Energy Development and Mining

The COT report states that energy development should be designed to ensure that it will not impinge on stable or increasing Greater Sage-Grouse population trends. For mining, the COT objective is to maintain stable to increasing Greater Sage-Grouse populations and no net loss of Greater Sage-Grouse habitats in areas affected by mining (USFWS 2013). In the energy development areas of MZ I, population trends are not stable or increasing; for this reason,

objectives in the planning area are intended to reduce losses, provide a net conservation gain, and sustain a viable Greater Sage-Grouse population, though at a lower level than historical populations (Taylor et al. 2012).

There are approximately 1,004,400 acres of Greater Sage-Grouse habitat in MZ I where energy and mineral development, including oil and gas, coal leasing, mineral materials, and nonenergy leasable minerals, is occurring. There are approximately 33,264,000 acres indirectly influenced by energy development (Manier et al. 2013, pp. 55-71). No geothermal energy development or nonenergy leasable mineral development is presently occurring in MZ I, and no data were available for nonenergy leasable minerals. Impacts from these activities would be similar to other types of mining and energy development. However, since these resources are not present in the MZ, restrictions related to the development of these resources have no impact on Greater Sage-Grouse populations.

Oil and Gas

Nature and Type of Effects. As discussed in Chapter 4, oil and gas development impacts Greater Sage-Grouse and sagebrush habitats through direct disturbance and habitat loss from well pads, access construction, seismic surveys, roads, power lines, and pipeline corridors. Indirect disturbances result from noise, gaseous emissions, changes in water availability and quality, and human presence. These factors could cumulatively or individually lead to habitat fragmentation in the long term (Connelly et al. 2004; Holloran 2005).

Oil and gas development results in direct loss of habitat from well pad and road construction as well as direct mortality from vehicle strikes and disturbance from noise. Oil and gas development also indirectly impacts Greater Sage-Grouse through the species' avoidance of infrastructure due to increased noise and vehicle traffic associated with development. This development can also impact Greater Sage-Grouse survival or reproductive success. Other indirect effects include habitat quality changes, predator communities, and disease dynamics (Naugle et al. 2011).

Several studies from the Great Plains and Wyoming Basin have shown that breeding Greater Sage-Grouse populations are affected at oil and gas well densities commonly permitted in Montana and Wyoming (Naugle et al. 2011). Doherty et al. (2010) found that although impacts were indiscernible at densities of less than one well per square mile, lek losses in parts of MZ I were two to five times greater in areas with development above this threshold. They also found that the abundance (number) of males per lek at the remaining leks declined by approximately 30 to 80 percent. These and other studies demonstrate that both direct and indirect impacts result from the impacts of energy development and geophysical exploration in Greater Sage-Grouse habitat.

Several studies have quantified the distance from leks at which impacts of development become negligible. The studies also assessed the efficacy of BLM NSO stipulations for leasing and development within 0.25 mile of a lek (Holloran 2005; Walker et al. 2007a). Walker et al. (2007a) found that in the PRB buffer sizes of 0.25, 0.5, 0.6, and 1.0 mile resulted in an estimated lek persistence (the ability of leks to remain on the landscape) of approximately 5, 10, 15, and 30 percent, respectively; conversely, lek persistence in areas without oil and gas development averaged approximately 85 percent.

Naugle et al. (2011) reported that impacts of energy development had been documented at distances greater than 3.5 miles from the lek in MZ I. Holloran (2005) found impacts on abundance at a distance between 3 and 4 miles in western Wyoming. However, Naugle et al. (2011) also stated that impacts on leks caused by energy development were most severe near the lek.

Naugle et al. (2011) also found that impacts from energy development often extirpate leks in gas fields. Doherty (2008) documented that lek losses increased and male abundance decreased as well density increased in the PRB. Lek extirpation in areas with 8 wells per section (40 to 100 wells total) within 2 miles of the lek was 5 times more likely to occur than in areas with no wells within 2 miles. Male attendance at the remaining leks in these areas declined approximately 20 to 60 percent (Doherty 2008).

Much oil and gas development previously occurred on private lands with minimal mitigation efforts, but restrictions are now in place to protect Greater Sage-Grouse habitat under the Wyoming and Montana EOs (though the Montana EO still requires funding for implementation). Earlier research had demonstrated that 0.25-mile NSO lease stipulations were insufficient to conserve breeding Greater Sage-Grouse populations in a typical landscape in portions of the planning area (Walker et al. 2007a), when nearly 80 percent of the area within approximately 2 miles of leks remained open to full-scale development.

Lyon and Anderson (2003) reported that oil and gas development influenced the rate of nest initiation of Greater Sage-Grouse in excess of approximately 2 miles of construction activities. Greater Sage-Grouse numbers on leks within approximately 1 mile of natural gas compressor stations in Campbell County, Wyoming, were consistently lower than numbers on leks unaffected by this noise disturbance (Braun et al. 2002). Holloran and Anderson (2005) reported that lek activity decreased downwind of drilling activities, suggesting that noise caused measurable impacts.

In addition to activities directly associated with oil and gas development, road traffic also generates noise. Knick et al. (2003) indicated that there were no active Greater Sage-Grouse leks within approximately 1 mile of Interstate 80 across southern Wyoming; only 9 leks were known to occur between approximately 1 and 2.5 miles of Interstate 80.

For the BFO, of 411 known leks, only 4 are within 1 mile of Interstate 90, and 41 are within 1 and 4 miles of Interstate 90. The remaining 366 leks were more than 4 miles from the highway.

Conditions in the Planning Area and in MZ I. Energy development is a widespread threat to Greater Sage-Grouse in the Buffalo RMP planning area and the neighboring areas of PRB, Bowdoin Field, and Williston Basin. The patchwork landownership pattern in MZ I means that many energy extraction facilities are near property boundaries and may affect Greater Sage-Grouse and its habitat on adjacent lands. Nearly 16 percent of Greater Sage-Grouse habitat in MZ I is within 1.8 miles of oil and gas wells, a distance at which ecological impacts are likely to occur (Knick et al. 2011). Oil and natural gas development-related wells indirectly influence 60 percent of PHMA and GHMA across MZ I, occurring to a distance of 12 miles from the development. Private surface lands account for 65 percent of wells in PHMA and 72 percent in GHMA in MZ I (Manier et al. 2013). Thus, conservation actions on private land are likely to have a greater potential to ameliorate the effects of oil and gas development on Greater Sage-Grouse habitat than any other single land management entity.

Although oil and gas activities have a disproportionately greater effect on private lands, regulatory mechanisms on both federal surface and split-estate lands in MZ I are influential. Federal actions on split-estate lands with federal subsurface minerals will require mitigation (see Appendix D (p. 1863)) for impacts on Greater Sage-Grouse habitat occurring on private surface lands that would not be required on lands with both privately held surface and subsurface.

From 2001 to 2005, Greater Sage-Grouse populations declined by 82 percent within the expansive coal bed natural gas fields in northeast Wyoming (Walker et al. 2007a). This reduced the options for delineating large and intact Core Areas containing an abundance of high-quality Greater Sage-Grouse habitats. As of 2008, federal oil and gas leases covered approximately 2,533,975 acres in the Buffalo RMP planning area (BLM 2008a). This was less widespread than in other parts of MZ I.

Oil and gas development has emerged as a range-wide issue in conservation because areas being developed contain large Greater Sage-Grouse populations (Connelly et al. 2004) and other sagebrush obligate species (Knick et al. 2003).

The exploration and development of coal bed natural gas has been the largest fluid mineral development in the Buffalo RMP planning area. There have been approximately 21,000 coal bed natural gas wells drilled from 1998 to 2010 in the PRB. This has fragmented Greater Sage-Grouse habitat throughout that area. Development has included construction of well sites and other facilities, including metering buildings, compressor stations, and pumping stations; roads to access well sites, pipelines to transport product and waste water, power lines to bring electrical power to the wells, and other infrastructure; and water-holding impoundments to hold the produced water, as the wells must be de-watered to reduce pressure before the natural gas is released.

Hundreds of miles of pipelines have been constructed to transport coal bed natural gas from development site to delivery point. Other pipelines include those for gathering, transportation, and distribution and lines used to transport produced water to discharge points.

With a well life of approximately 12 years, many of the coal bed natural gas wells that were originally drilled are depleted and ready for abandonment. Native vegetation over most buried pipelines has reclaimed its composition. Utility roads and overhead power lines continue to fragment thousands of acres of Greater Sage-Grouse habitat on private, federal, and state lands (BLM 2013b).

Existing leases on BLM-administered land in Greater Sage-Grouse habitat remain valid. There is a potential for future development based on locations of geologic fields distributed extensively across eastern portions of Greater Sage-Grouse range (Manier et al. 2013). This development is subject to future COAs on plans for development in Greater Sage-Grouse habitat. These COAs will provide a net conservation gain to Greater Sage-Grouse compared to the No Action Alternative, under which these COAs would not apply.

The Dakotas population in MZ I is heavily influenced by oil and gas development; oil and gas developments are scattered throughout the Yellowstone Watershed (USFWS 2013, p. 63). The PRB contains substantial energy resources, including oil, natural gas, and coal bed natural gas (USFWS 2013, pp. 64-65); conversely, the northern Montana population has little energy development. Coal bed methane wells typically last 12 to 18 years, while oil and gas wells may last 20 to 100 years in production (Connelly et al. 2004). Most coal bed natural gas drilling in the PRB has concluded, and current and future oil and gas development is anticipated to impact Greater Sage-Grouse less due to horizontal drilling technology.

In the Buffalo RMP planning area, coal bed natural gas fields are largely played out; therefore, the level of activity on existing leases in the planning area is likely to remain relatively stable. While traditional oil and gas drilling is declining, horizontal drilling is increasing south of Interstate 90 and may spread as far north as the Montana border (see Buffalo RMP Appendix G (p. 1937) for more details regarding the specific reasonably foreseeable future actions in Oil and Gas).

Impact Analysis. Table 4.46, “Acres Open* and Closed to Fluid Mineral Leasing in Greater Sage-Grouse Habitat in MZ I” (p. 1306) and Table 4.47, “Acres with NSO and CSU/TL Stipulations in Greater Sage-Grouse Habitat in MZ I” (p. 1306) provide a quantitative summary of present fluid mineral leasing conditions on BLM-administered lands under the Buffalo Proposed RMP/Final EIS alternatives and across MZ I, and an analysis of past, present, and RFAs in MZ I (see Table 4.57, “Reasonably Foreseeable Future Actions in Management Zone I Likely to Impact Greater Sage-Grouse Habitat” (p. 1337)). As stated in the assumptions, the tables are limited to BLM-administered lands and reflect the conditions assuming implementation of the Proposed Plans of the other planning areas in MZ I. Tables displaying fluid mineral acreage include the federal mineral estate and not just BLM-administered surface acres.

Table 4.46. Acres Open* and Closed to Fluid Mineral Leasing in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open* to Fluid Mineral Leasing				
Alternative A	31,000	100%	2,553,000	5%
Alternative B	0	0%	2,424,000	0%
Alternative C	0	0%	2,943,000	18%
Proposed Plan	0	0%	2,642,000	8%
Closed to Fluid Mineral Leasing				
Alternative A	436,000	64%	2,148,000	95%
Alternative B	2,394,000	93%	548,000	80%
Alternative C	157,000	0%	142,000	21%
Proposed Plan	184,000	15%	157,000	29%
Source: BLM 2015				
*Open with standard lease terms and conditions. This table displays the acres of PHMA and GHMA open and closed to fluid mineral leasing in MZ I; it also displays the percentage of those acres that are found within the planning area.				
% percent				
GHMA General Habitat Management Area				
MZ Management Zone				
PHMA Priority Habitat Management Area				

Table 4.47. Acres with NSO and CSU/TL Stipulations in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
NSO Stipulations				
Alternative A	3,577,000	1%	858,000	7%
Alternative B	3,558,000	0%	1,306,000	39%
Alternative C	3,557,000	0%	1,105,000	28%
Proposed Plan	3,626,000	2%	1,281,000	38%
CSU/TL Stipulations				
Alternative A	1,318,000	14%	3,927,000	14%
Alternative B	1,134,000	0%	3,484,000	3%
Alternative C	1,134,000	0%	5,811,000	42%

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Proposed Plan	1,707,000	34%	5,251,000	36%
Source: BLM 2015				
*This table displays the acres of PHMA and GHMA with NSO Stipulations and CSU/TL Stipulations in MZ I; it also displays the percentage of those acres that are found within the planning area.				
% percent				
CSU Controlled Surface Use				
GHMA General Habitat Management Area				
MZ Management Zone				
NSO No Surface Occupancy				
PHMA Priority Habitat Management Area				
TL Timing Limitation				

As shown in Table 4.46, “Acres Open* and Closed to Fluid Mineral Leasing in Greater Sage-Grouse Habitat in MZ I” (p. 1306) and Table 4.47, “Acres with NSO and CSU/TL Stipulations in Greater Sage-Grouse Habitat in MZ I” (p. 1306), fluid mineral closures and stipulations within the Buffalo RMP planning area exert limited influence due to their small acreage compared to the broader MZ. However, closing PHMA and GHMA to leasing, establishing 0.6-mile lek buffers in accordance with the Wyoming EO, applying the disturbance cap, and implementing NSO and CSU/TL stipulations within the planning area would help to reduce the threat of oil and gas development within the greater MZ.

The Proposed Plan would provide the greatest protection to Greater Sage-Grouse in the MZ, by placing the most acres under NSO and CSU/TL stipulation in PHMA and GHMA than any other alternative. This provision would reduce well density and impacts associated with construction and operation. The extensive fluid mineral leasing closures and stipulations under this alternative could affect pending oil and gas development projects. One example is the Greater Crossbow Exploration and Development Project, which proposes to develop 1,500 wells over 10 years. Alternative B would protect the most Greater Sage-Grouse habitat from energy development by closing the most acres to leasing and adding restrictive stipulations, compared to current management (Alternative A). Increasing habitat protections would improve the conditions for Greater Sage-Grouse survival and successful reproduction.

All the action alternatives would manage more acres as open to oil and gas leasing in GHMA, but Alternative B would be the most protective of Greater Sage-Grouse habitat from closure to new fluid mineral leasing. Under Alternative C, substantially more acreage in GHMA would be open to leasing compared to current management, but this alternative would also apply CSU/TL stipulations on more acres than other alternatives.

Under current management (Alternative A) the most acres are closed to leasing because of a court order covering the PRB. All three action alternatives would reopen the PRB to leasing. Alternative C would have similar restrictions on energy development to Alternative A but more acreage open, and would not improve protection for Greater Sage-Grouse habitat or conditions for breeding or winter survival of populations.

Under the Proposed Plan, 0 percent of PHMA and 8 percent of GHMA would be open to fluid mineral leasing in MZ I. This level of protection is much more than provided under Alternative A (No Action Alternative). For GHMA, the Proposed Plan would have more acreage open to drilling, but greatly increased levels of NSO and CSU/TL protection. In the Sagebrush Focal

Area in Montana, habitat would be subject to NSO without waiver or exception. The Buffalo Proposed RMP/Final EIS Mitigation Guidelines in Appendix D (p. 1863) would help protect unfragmented habitats, minimize habitat loss and fragmentation, and maintain conditions to meet Greater Sage-Grouse life history needs in the vicinity of drilling operations. For example, remote telemetry (e.g., monitoring oil and gas operations) would be used to reduce vehicle traffic, disturbance areas would be kept to a minimum, and vegetation would be removed only when necessary.

Implementing any alternative under the Buffalo RMP would not affect pending or future oil and gas development projects outside of the planning area. For example, the Converse County Oil and Gas Project proposes to drill approximately 5,000 oil and natural gas wells in an area encompassing 1.5 million acres (including Greater Sage-Grouse core habitat) in MZ I. However, the NSO buffer and the disturbance caps under the Wyoming and Montana EOs would reduce the threat to Greater Sage-Grouse from oil and gas development on nonfederal lands in MZ I.

The effect of the alternatives and other conservation actions in the MZ (most notably the Montana and Wyoming EOs) could be synergistic meaning the effects of the actions together is greater than the sum of their individual effects. For example, applying buffers in PHMA and on state and private land would effectively conserve larger blocks of land than if these actions occurred individually. This would provide a landscape-scale net conservation benefit, especially in areas where little development has occurred to date.

Development pressure for fluid mineral resources in the Dakotas, PRB, and Yellowstone Watershed is likely to continue; however, future drilling technologies are expected to impact Greater Sage-Grouse less than coal bed natural gas development has in the past decade. The application of major stipulations and closing areas to leasing would greatly reduce impacts to Greater Sage-Grouse on federal mineral estate and the application of lek buffers and disturbance limitations would further reduce impacts on Greater Sage-Grouse populations.

Reasonably foreseeable oil and gas development is widespread in the MZ. When the impacts of the Buffalo RMP are added to these actions, the impact would be a net conservation gain under the Proposed Plan, due in large part to implementation of NSO stipulations, anthropogenic disturbance caps, and adaptive management that would minimize future disturbances to Greater Sage-Grouse populations and habitats.

Coal

Nature and Type of Effects. Past and current coal extraction has been and continues to be a major mining activity in MZ I. Approximately 3 percent of BLM-administered PHMA in MZ I and 8 percent of GHMA is influenced by coal mining (Manier et al. 2013). Surface mining accounts for about 67 percent of production in the United States; large mines can cover many square miles. Coal mining and the use of coal to produce electricity has environmental impacts. These include soil erosion, dust, noise, water pollution, acid-mine drainage, and air emissions, in addition to impacts on wildlife in the area. Burning coal releases toxic fumes and particulate matter into the atmosphere and contributes to climate change (Manier et al. 2013, pp. 69-71).

Conditions in the Planning Area and in MZ I. The PRB in Wyoming and Montana contains some of the largest accumulations of low-sulfur sub-bituminous coal in the world. It is the nation's largest coal-producing region, and coal from the region is shipped nationwide. As described in Chapter 3, most PRB coal production comes from the Buffalo RMP planning area. Extensive

leasing of coal has occurred over the last decade in prime Greater Sage-Grouse habitat in the planning area.

Coal forecasts for the PRB through 2020 indicate that total production is expected to grow at an annual rate of 2 to 3 percent. The preliminary work for the 2030 forecast indicates a slower rate of increase in the PRB of 0.25 to 2 percent. This is based on reduced coal demand, new natural gas discoveries, and possible regulation of GHGs. By 2030 the BLM expects PRB coal production to be between 500 and 700 million tons annually, though more recent projections indicate lower coal demand because of increased supply of natural gas.

Coal surface leases indirectly influence 3 percent of PHMA and 8 percent of GHMA across MZ I. Coal is estimated to impact habitat to a distance of 12 miles from the direct impact area (Manier et al. 2013). Approximately 68 percent of coal leases in PHMA and 82 percent in GHMA occur on private lands in MZ I but may contain federal mineral estate (Manier et al. 2013). Protective stipulations would be of particular benefit on privately owned surface and subsurface lands where the BLM's protective regulatory mechanisms would not apply.

Impact Analysis. Because there are significant coal resources in the planning area, coal leasing decisions under the Buffalo RMP would have a major influence within the greater MZ. Acres of coal leasing allocations would vary by only a small amount between alternatives: Alternative B would designate few acres of Greater Sage-Grouse habitat as suitable within MZ I, while Alternative C would designate the largest acreage as suitable, compared to current management. However, the Proposed Plan would assess coal lease applications for suitability, with PHMA considered essential habitat for Greater Sage-Grouse. The RFD scenario for the BFO suggests that the development of coal resources in the planning area would not vary considerably across alternatives. However, according to coal management for the Proposed Plan, at the time an application for a new coal lease or lease modification is submitted to the BLM, the BLM will determine whether the lease application area is "unsuitable" for coal mining, pursuant to 43 CFR 3461.5. PHMA is considered essential habitat for maintaining Greater Sage-Grouse for purposes of the suitability criteria for coal. Furthermore, areas considered suitable for leasing would not necessarily be leased; the actual amount of leasing depends on factors such as price and regulatory safeguards. PHMA contains no leases.

Major coal leasing and development areas extend beyond the Buffalo RMP planning area; however, coal management in the Buffalo RMP will have a relatively greater impact on Greater Sage-Grouse habitat than management from other BLM field offices or other management entities.

Coal development that requires state agency review or approval would be subject to the permitting process and stipulations for development in Greater Sage-Grouse Core Areas under the Wyoming and Montana EOs, as well as BLM review under the Proposed Plan. There are no coal leases in WY Core Areas; however there are some core areas in MT with existing coal leases and mines.

Coal resources would continue to be developed in MZ I outside of the planning area. However, new coal lease applications in Greater Sage-Grouse Core Areas would be subject to the unsuitability criteria set forth in the BLM's regulations at 43 CFR Part 3461.5. In accordance with those regulations, special conditions could be required, as identified during the leasing process, to protect Greater Sage-Grouse habitat. The regulatory requirements for unsuitability in combination with BLM planning efforts and state plans would help reduce the threat from coal extraction and would provide a net conservation gain to Greater Sage-Grouse populations in MZ I.

Mineral Materials

Nature and Type of Effects. Development of surface mines (for sand, gravel, and other common mineral materials found in MZ I) may negatively impact Greater Sage-Grouse numbers and disrupt the habitat and life-cycle of the species, similar to other types of mining activities (Braun 1998; Manier et al. 2013).

Conditions in the Planning Area and in MZ I. Salable mineral materials disposal sites in PHMA and GHMA are widespread throughout MZ I. They are primarily located in northeast Wyoming, and in far southeast Montana. There are 65,000 acres of mining and mineral materials disposal sites (not including minerals mined as energy sources) on BLM-administered surface land in MZ I. There are 122,900 acres across all landownership types. Indirect effects are estimated to 1.5 miles out from the direct effects area (Manier et al. 2013).

The mineral materials currently being developed for commercial purposes in the Buffalo RMP planning area are aggregate (sand, gravel, and riprap), scoria, building stone, and decorative stone. The Buffalo RMP planning area has the greatest number of mineral material sales and free-use permits of any field office in Wyoming.

Across MZ I, PHMA and GHMA are most affected by mining and mineral materials disposal sites on private land surface. Greater Sage-Grouse may be directly impacted, being in the path of development; however, indirect impacts on habitat affect a much wider population of birds. In total, 53 percent of PHMA and 80 percent of GHMA influenced by the indirect impact of mining and mineral materials disposal sites are on private land. This does not include minerals mined as energy sources. Mining and mineral materials disposal sites on BLM-administered surface land, by comparison, indirectly affect 38 percent of PHMA and 11 percent of GHMA (Manier et al. 2013).

Impact Analysis. As shown in Table 4.48, “Acres Open and Closed to Mineral Material Disposal in Greater Sage-Grouse Habitat in MZ I” (p. 1310), acres of PHMA closed to mineral material disposal are similar between current management and the Proposed Plan, while Alternatives B and C both reduce the number of acres open to mineral material disposal. In GHMA, Alternative B would reduce the number of acres open to mineral material disposal the most, while open acreage is similar across the MZ under Alternatives A, C, and D (the Proposed Plan).

Under Alternative B in the Buffalo planning area, all PHMA would be closed to mineral material disposal, which would constitute most of the closed acreage in MZ I. Closures or restrictions on mineral material development in the planning area would reduce the effects on Greater Sage-Grouse from mineral material development on BLM-administered surface and split-estate lands in MZ I. However, these actions may shift development onto nonfederal lands, with potentially greater impact on Greater Sage-Grouse habitats and populations because protective stipulations and permit requirements would not apply.

Table 4.48. Acres Open and Closed to Mineral Material Disposal in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open to Mineral Material Disposal				
Alternative A	1,787,000	29%	9,036,000	30%
Alternative B	1,275,000	0%	6,470,000	2%
Alternative C	1,274,000	0%	9,557,000	34%
Proposed Plan	1,845,000	31%	8,421,000	25%

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Closed to Mineral Material Disposal				
Alternative A	3,769,000	0%	242,000	27%
Alternative B	5,997,000	37%	1,093,000	84%
Alternative C	3,769,000	0%	234,000	24%
Proposed Plan	3,865,000	2%	700,000	75%
Source: BLM 2015				
This table displays the acres of PHMA and GHMA open and closed to mineral material disposal in MZ I; it also displays the percentage of those acres that are found within the planning area.				
% percent				
GHMA General Habitat Management Area				
MZ Management Zone				
PHMA Priority Habitat Management Area				

According to the Buffalo RFD, the development of mineral materials in the Buffalo RMP planning area would disturb the fewest acres of Greater Sage-Grouse habitat under Alternative B, while the most acres would be disturbed under Alternative C. The Proposed Plan would disturb more acres than under current management. Mineral material extraction would directly affect Greater Sage-Grouse, including loss of habitat, disturbance, and displacement. The most pronounced impacts on Greater Sage-Grouse populations would be under Alternative C. As described above, these impacts would include disrupting the habitat and life-cycle of the species, similar to other types of mining activities (Braun 1998; Manier et al. 2013).

Alternative B provides the most protection to Greater Sage-Grouse habitat in MZ I from mineral material disposal in PHMA and GHMA. Acres of PHMA and GHMA open to mineral material disposal in MZ I would be similar under Alternative C to current management (Alternative A). In conjunction with past, present, and reasonably foreseeable future actions that restrict mineral material disposal in Greater Sage-Grouse habitat, these two alternatives would only marginally increase protection of Greater Sage-Grouse habitat over baseline conditions.

The Proposed Plan represents a slight increase in the acreage of PHMA open to mineral material disposal. It slightly decreases the acreage of GHMA open to disposal, compared to Alternative A and represents a more than 100 percent increase in acres of GHMA closed to disposal, compared to Alternative A. The Proposed Plan would also apply protective stipulations and limits under the disturbance cap. Under all alternatives, BMPs and RDFs outlined in Appendix B (p. 1779) would help minimize the impacts on Greater Sage-Grouse from mineral development on federal land.

Under the Wyoming and Montana EOs, authorizations of new mineral material disposal sites that require state agency review or approval would be subject to the Greater Sage-Grouse permitting process. They also would be subject to stipulations for development in Greater Sage-Grouse Core Areas. These stipulations would be of particular benefit on privately owned surface and subsurface lands, where BLM protective regulatory mechanisms do not apply.

Overall, the combination of BLM management actions for mineral materials development in the Proposed Plan for the Buffalo RMP, Wyoming and Montana state actions, and planned restoration activities would preserve more habitat from disturbance than current management, reduce disturbance to birds, and provide a net conservation benefit to Greater Sage-Grouse in MZ I.

Locatable Minerals

Nature and Type of Effects. Locatable minerals include gold, silver, uranium, and bentonite. Activities associated with locatable mineral development, such as stockpiling topsoil and extracting and transporting material, would cause mortality and nest disruption. These actions also would reduce the functionality of the surrounding habitat with noise and light disturbance, resulting in lost and degraded Greater Sage-Grouse habitat.

As with fluid mineral development, reclamation practices may help to reduce long-term impacts on Greater Sage-Grouse and their habitat. Although past mining efforts have not emphasized restoration of disturbed areas to near pre-disturbance conditions, recent efforts have been directed toward restoring functional habitat. Future reclamation should be focused on restoring habitats capable of supporting viable Greater Sage-Grouse populations. Even with effective restoration, restored areas may not support Greater Sage-Grouse populations at the same level as prior to disturbance.

Conditions in the Planning Area and in MZ I. The primary locatable minerals in commercially viable quantities in the Buffalo RMP planning area and other parts of MZ I are sodium bentonite, gypsum, and uranium. Other locatable minerals are known to exist in the planning area, but they are currently uneconomical to produce. Most current and forecasted extraction activities are for sodium bentonite (2 active mines, 1 pending authorization, and 47 active mining claims in the planning area), but uranium is also being mined in MZ I. The Nichols Ranch/Hank Unit Uranium in-situ Recovery Mining Project is pending authorization (see Table 4.57, “Reasonably Foreseeable Future Actions in Management Zone I Likely to Impact Greater Sage-Grouse Habitat” (p. 1337)). In the event of a price increase, uranium mining activity would likely increase in Greater Sage-Grouse habitat.

Impact Analysis. As shown in Table 4.49, “Acres Open and Recommended for Withdrawal from Locatable Mineral Entry in Greater Sage-Grouse Habitat in MZ I” (p. 1312) locatable minerals development on BLM-administered land represents a relatively small influence, compared to the broader MZ. However, withdrawals in the planning area would still influence the threat on a MZ-wide scale.

Table 4.49. Acres Open and Recommended for Withdrawal from Locatable Mineral Entry in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open to Locatable Mineral Entry				
Alternative A	3,949,000	13%	7,401,000	37%
Alternative B	5,201,000	34%	5,543,000	16%
Alternative C	3,441,000	0%	7,881,000	41%
Proposed Plan	4,080,000	16%	7,190,000	35%
Recommended for Withdrawal from Locatable Mineral Entry				
Alternative A	1,062,000	0%	59,000	0%
Alternative B	1,527,000	30%	210,000	71%
Alternative C	1,062,000	0%	87,000	32%

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Proposed Plan	1,085,000	2%	118,000	50%
Source: BLM 2015				
This table displays the acres of PHMA and GHMA open to mineral entry and recommended for withdrawal from locatable mineral entry in MZ I; it also displays the percentage of those acres that are found within the planning area.				
% percent				
GHMA General Habitat Management Area				
MZ Management Zone				
PHMA Priority Habitat Management Area				

Under Alternative B, more acreage would be open to locatable mineral entry in PHMA, but less acreage would be open in GHMA, compared to current management. Alternative B would have the most acreage of all the alternatives recommended for withdrawal in both PHMA and GHMA and would restrict future locatable mineral operations more than under the other alternatives if the Secretary chose to withdraw these areas; thus it could provide more protections from locatable mineral development should the withdrawal occur; however conservation benefits for Greater Sage-Grouse would be limited because of the limited areas where these resources occur in Greater Sage-Grouse habitat.

Alternative C does not recommend withdrawal of any additional acres of Greater Sage-Grouse habitat from locatable mineral development. Sodium bentonite extraction and other forms of locatable mineral mining would continue to affect Greater Sage-Grouse through disturbance, habitat loss, and habitat degradation. Though PHMA acreage open to locatable mineral entry would be slightly reduced, GHMA acreage would be increased, and overall Alternative C would not provide a net conservation gain to Greater Sage-Grouse.

Under the Proposed Plan, approximately the same amount of acreage in PHMA and GHMA would remain open to locatable mineral entry as Alternative A. However, there would be a slight increase in the PHMA acreage recommended for withdrawal, and nearly double the GHMA acreage recommended for withdrawal across MZ I. All acreage in Sagebrush Focal Areas would be recommended for withdrawal as well, providing a net conservation gain to Greater Sage-Grouse populations by reducing disturbance to birds from human activity and habitat fragmentation from mining.

Under all alternatives, RDFs outlined in Appendix B (p. 1779) would help minimize the impacts on Greater Sage-Grouse from locatable mineral development on federal land. Clustering operations and facilities as closely as possible and placing new infrastructure in already disturbed locations would reduce impacts on sagebrush habitats.

The disturbance cap in the Proposed Plan would not block locatable mineral entry projects, but any locatable mineral entry would be considered as disturbance under the cap. Overall, the measures in the Proposed Plan would help alleviate the threat, and in light of state plans, other BLM planning efforts, and other past, present, and reasonably foreseeable future actions, provide a net conservation gain to Greater Sage-Grouse throughout MZ I.

Nonenergy Leasable Minerals

Nonenergy leasable minerals are materials such as sulfates, silicates, and trona (sodium carbonate). Impacts on Greater Sage-Grouse are similar to those from other types of mining.

Conditions in the Planning Area and in MZ I. Existing leases for nonenergy leasable minerals represent a relatively small threat spatially (Manier et al. 2013). Nonenergy leasable minerals are known to occur in the Buffalo RMP planning area but not in commercially viable quantities. Therefore, implementing any of the alternatives would not reduce the threat in MZ I.

Impact Analysis. Table 4.50, “Acres Open and Closed to Nonenergy Leasable Mineral Leasing in Greater Sage-Grouse Habitat in MZ I” (p. 1314) shows the results by alternative.

Table 4.50. Acres Open and Closed to Nonenergy Leasable Mineral Leasing in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open to Nonenergy Leasing				
Alternative A	1,805,000	29%	6,212,000	43%
Alternative B	1,288,000	0%	3,669,000	3%
Alternative C	1,287,000	0%	6,762,000	47%
Proposed Plan	2,049,000	37%	6,491,000	45%
Closed to Nonenergy Leasing				
Alternative A	2,468,000	0%	233,000	38%
Alternative B	4,702,000	48%	1,059,000	86%
Alternative C	2,468,000	0%	201,000	0%
Proposed Plan	2,564,000	4%	670,000	79%
Source: BLM 2015				
This table displays the acres of PHMA and GHMA open and closed to nonenergy leasing in MZ I; it also displays the percentage of those acres that are found within the planning area.				
% percent				
GHMA General Habitat Management Area				
MZ Management Zone				
PHMA Priority Habitat Management Area				

For MZ I, Alternatives B and C would reduce the acreage of PHMA and GHMA open to nonenergy leasing, compared to current management (Alternative A). Alternative B would also increase the acreage closed to nonenergy leasing. Alternative C has approximately the same acreage closed to leasing as Alternative A. The Proposed Plan increases acreage open to nonenergy leasing in PHMA and GHMA. However, it also slightly increases acreage closed to nonenergy leasing in PHMA and more than doubles closed acreage in GHMA, compared to current management. Precluding nonenergy leasable development in more acres of PHMA or GHMA would reduce habitat disturbance and fragmentation if nonenergy mineral extraction were to occur in Greater Sage-Grouse habitat in the future. The Proposed Plan would also apply a disturbance cap, and mitigation for any damage in Greater Sage-Grouse habitat.

In combination with the disturbance cap applied under state plans and BLM actions in other RMP planning areas in MZ I, the Proposed Plan represents an improvement in Greater Sage-Grouse habitat protections in MZ I, and in combination with other past, present, and reasonably foreseeable future actions, would provide a net conservation gain to Greater Sage-Grouse.

Infrastructure

The USFWS (2013) considers energy development and associated infrastructure the largest threats to Greater Sage-Grouse in MZ I. The COT report objective is to avoid development of

infrastructure in Greater Sage-Grouse PHMA. However, in the PRB, considerable infrastructure has already been constructed in Greater Sage-Grouse habitat, making it necessary to focus Greater Sage-Grouse management on minimizing impacts of infrastructure.

Rights-of-Way

Nature and Type of Effects. As discussed in Chapter 4, power lines can directly affect Greater Sage-Grouse by posing a collision and electrocution hazard. They also can indirectly decrease lek attendance and recruitment by providing perches and nesting habitat for potential avian predators such as golden eagles and ravens (Connelly et al. 2004). In addition, power lines and pipelines often extend for many miles. The ground disturbance associated with construction, as well as vehicle and human presence on maintenance roads, may introduce or spread invasive weeds over large areas, degrading habitat. Impacts from roads may include direct habitat loss from road construction and direct mortality from collisions with vehicles. Roads may also facilitate predator movements, spread invasive plants, and increase human disturbance from noise and traffic (Forman and Alexander 1998).

Conditions in the Planning Area and in MZ I. Infrastructure such as ROWs and associated facilities and urbanization is widespread throughout MZ I. In some locations, infrastructure development has affected Greater Sage-Grouse habitat. Development of roads, fences, and utility corridors has also contributed to habitat loss and fragmentation in portions of MZ I. The best available estimates suggest about 16 percent of MZ I is within approximately 4 miles of urban development (Knick et al. 2011). Impacts of infrastructure development in MZ I are primarily related to highways, roads, power lines, and communication towers, with nearly 90 percent of MZ I within 4 miles of a road, 30 percent within 4 miles of a power line, and 4 percent within 4 miles of a communication tower (Knick et al. 2011). In the planning area, most ROWs on BLM-administered lands are associated with oil and gas development, electrical transmission, irrigation ditches, and communications.

Although not representative of all infrastructure ROWs, transmission lines greater than 115 kilovolts (kV) indirectly influence 29 percent of PHMA and 46 percent of GHMA across MZ I. Indirect effects are assumed to occur to a radius of 4 miles (Manier et al. 2013). Approximately 68 percent of transmission lines in PHMA and 73 percent in GHMA are on private lands across Greater Sage-Grouse habitats in MZ I (Manier et al. 2013). Therefore, conservation actions on private lands are likely to have a greater potential to affect transmission line ROWs in Greater Sage-Grouse habitat than any other land management entity. Designating ROW exclusion and avoidance areas in PHMA and GHMA on BLM-administered lands could reduce the threat on these lands; however, the scattered federal landownership encourages routing infrastructure around federal lands, often increasing its length and impact. ROW avoidance and exclusion areas on BLM-administered lands could increase this tendency.

Impact Analysis. Table 4.51, “Acres of Rights-of-Way Designations in Greater Sage-Grouse Habitat in MZ I” (p. 1316) lists the areas of ROW avoidance and exclusion in Greater Sage-Grouse habitat in the Buffalo RMP planning area and in MZ I by alternative. Table 4.52, “Acres of Proposed Utility Corridors in Greater Sage-Grouse Habitat in MZ I” (p. 1316) lists acres of PHMA and GHMA in proposed utility corridors.

Table 4.51. Acres of Rights-of-Way Designations in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open to Rights-of-Way				
Alternative A	117,000	96%	1,264,000	52%
Alternative B	5,000	0%	628,000	3%
Alternative C	5,000	0%	1,321,000	54%
Proposed Plan	5,000	0%	932,000	34%
Rights-of-Way Exclusion				
Alternative A	93,000	0%	78,000	0%
Alternative B	559,000	84%	308,000	75%
Alternative C	93,000	0%	106,000	26%
Proposed Plan	119,000	22%	149,000	47%
Rights-of-Way Avoidance				
Alternative A	3,337,000	0%	2,126,000	0%
Alternative B	3,337,000	0%	2,177,000	2%
Alternative C	3,337,000	0%	2,154,000	1%
Proposed Plan	3,449,000	3%	2,363,000	10%
Source: BLM 2015				
This table displays the acres of PHMA and GHMA within rights-of-way designations in MZ I; it also displays the percentage of those acres that are found within the planning area.				
% percent				
GHMA General Habitat Management Area				
MZ Management Zone				
PHMA Priority Habitat Management Area				

Table 4.52. Acres of Proposed Utility Corridors in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Proposed Utility Corridor				
Alternative A	11,000	0%	77,000	0%
Alternative B	182,000	94%	187,000	59%
Alternative C	11,000	0%	77,000	0%
Proposed Plan	14,000	21%	105,000	27%
Source: BLM 2015				
This table displays the acres of PHMA and GHMA within existing and proposed utility corridors in MZ I; it also displays the percentage of those acres that are found within the planning area.				
% percent				
GHMA General Habitat Management Area				
MZ Management Zone				
PHMA Priority Habitat Management Area				

Alternative A (current management) has the most acres open to ROW development in PHMA. Across MZ I, the action alternatives all close all but 5,000 acres of PHMA to ROWs. For GHMA, Alternative B and the Proposed Plan reduce the number of open acres the most and Alternative C has similar open acreage to Alternative A. Alternative B would have five times more acreage in exclusion areas in PHMA in MZ I compared to current management, while the Proposed Plan would increase exclusion areas in PHMA by approximately 25 percent over current management.

Alternative C would have no increase in PHMA, but a small increase in GHMA. Alternative B proposes the largest acreage of ROW exclusion areas in both PHMA and GHMA, but the Proposed Plan has the most acreage in ROW avoidance areas.

Exclusion and avoidance areas are designed to minimize disturbance to Greater Sage-Grouse populations by limiting the siting of roads that can increase bird mortality, habitat avoidance, and habitat fragmentation, and the location of tall structures that can increase predation, particularly nest predation (Connelly et al. 2004). These impacts would be most prevalent under Alternative A because there would be the most acres open to ROWs in PHMA.

The Proposed Plan relies more on ROW avoidance than exclusion to protect Greater Sage-Grouse habitat. This approach preserves management flexibility in situations where landownership is mixed. Flexibility is also preserved in areas where rerouting ROWs across nonfederal land may result in a longer route, increasing disturbance of Greater Sage-Grouse leks, nests, and brood-rearing and wintering areas more than direct routing across federal land. Because of this flexibility, the Proposed Plan provides the greatest net conservation gain to Greater Sage-Grouse in the Buffalo RMP planning area.

The numbers of ROW authorizations are anticipated to grow in MZ I. Increasing populations, continued energy development, and new communication sites drive the need for new ROWs on BLM-administered lands and those lands not under BLM administration.

New ROW authorizations that require state agency review or approval would be subject to the permitting process and development restrictions, including the disturbance cap, in Greater Sage-Grouse Core Areas under the Wyoming and Montana EOs, as discussed in Section 4.4.9.9.4, “Regional Efforts to Manage Threats to Greater Sage-Grouse” (p. 1296). These stipulations would benefit Greater Sage-Grouse in Core Areas (although excluding many of the Greater Sage-Grouse in the PRB) by encouraging ROW development outside of Core Habitat Areas, restricting surface occupancy within 0.6 mile of occupied leks, prohibiting power lines greater than 115 kV outside of designated corridors, and locating new roads used to transport products or waste over 1.9 miles from occupied leks. These provisions would reduce disturbance to Greater Sage-Grouse populations from human traffic, noise, and increased predation associated with tall structures.

The effect of the alternatives and other conservation actions in the MZ (most notably the Montana and Wyoming EOs) could be synergistic. By implementing restrictions on infrastructure in PHMA and on state and private lands together, the cumulative beneficial effect on Greater Sage-Grouse would be greater than the sum of their individual effects because protections would be applied more consistently across the landscape. This is especially important in areas of mixed land ownership patterns where complementary protections can benefit leks, early brood rearing habitat, or other important areas that do not follow geopolitical boundaries.

In combination with these past, present, and reasonably foreseeable future actions and other BLM proposed plans in MZ I, the Buffalo RMP Proposed Plan would provide the greatest net conservation gain to Greater Sage-Grouse in MZ I. It would accomplish this by providing the flexibility to site ROWs with the least impact on Greater Sage-Grouse habitat, preserving larger blocks of unfragmented habitat for Greater Sage-Grouse populations.

Renewable Energy

Nature and Type of Effects. Impacts on Greater Sage-Grouse from renewable energy development, such as that for wind and solar power, are similar to those from nonrenewable

energy development. Additional concerns associated with wind energy developments are rotor blade noise, structure avoidance, and mortality caused by collisions with turbines (Connelly et al. 2004).

Conditions in the Planning Area and in MZ I. There have been no formal inquiries associated with renewable energy development in the Buffalo RMP planning area. Solar energy has very low potential, while wind energy development is a growing presence in MZ I. However, few of the higher potential areas for wind energy in the planning area are in Greater Sage-Grouse habitat.

Wind turbines indirectly influence 1 percent of PHMA and GHMA across MZ I. Private lands account for 72 percent of wind turbines affecting Greater Sage-Grouse in PHMA and 87 percent in GHMA in MZ I (Manier et al. 2013). Therefore, actions on private land are likely to have a greater potential to reduce the effects of wind energy development than federal actions. Projects that require state agency review or approval would be subject to Wyoming or Montana EO permitting processes. This would encourage wind energy development outside of Core Habitat Areas.

A programmatic EIS by the WAPA and the Department of Energy for the entire upper Great Plains will focus future wind energy developments in specific corridors outside of Greater Sage-Grouse Core Habitat Areas (WAPA 2013).

Impact Analysis. Table 4.53, “Acres of Wind Energy Management Designations in Greater Sage-Grouse Habitat in MZ I” (p. 1318) lists areas of wind energy ROWs by alternative.

Table 4.53. Acres of Wind Energy Management Designations in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open to Wind Rights-of-Way*				
Alternative A	114,000	98%	1,255,000	53%
Alternative B	2,000	0%	607,000	1%
Alternative C	2,000	0%	1,311,000	54%
Proposed Plan	2,000	0%	655,000	8%
Wind Rights-of-Way Exclusion				
Alternative A	2,725,000	0%	203,000	0%
Alternative B	3,191,000	15%	458,000	56%
Alternative C	2,725,000	0%	231,000	12%
Proposed Plan	2,793,000	3%	479,000	58%
Wind Rights-of-Way Avoidance				
Alternative A	707,000	0%	1,986,000	0%
Alternative B	707,000	0%	2,024,000	2%
Alternative C	707,000	0%	2,013,000	1%
Proposed Plan	776,000	9%	2,285,000	13%

Source: BLM 2015

This table displays the acres of PHMA and GHMA within wind energy management designations in MZ I; it also displays the percentage of those acres that are found within the planning area.

% percent

GHMA General Habitat Management Area

MZ Management Zone

PHMA Priority Habitat Management Area

In the Buffalo RMP planning area, the action alternatives would all close almost all acreage in PHMA to wind energy development. Avoidance areas for renewable energy in Greater Sage-Grouse habitat would be similar under all alternatives. Across MZ I, Proposed Plans in all other BLM planning areas have PHMA as exclusion areas for wind energy. In GHMA, Alternative C would maintain the open acreage of current management; Alternatives B and D would reduce it compared to Alternative A. The Proposed Plan would also increase acreage open to wind ROW in GHMA slightly over current management. Expanding avoidance areas would reduce habitat fragmentation and disturbance to Greater Sage-Grouse populations from noise, traffic, and increased predation.

Although no formal inquiries associated with renewable energy development have occurred in the planning area, there is moderate wind potential in the planning area and across MZ I.

Impacts would be minimized on BLM-administered land across all alternatives by adhering to the wildlife protection provisions of the Wind Energy Development Programmatic EIS (BLM 2005c). Implementation of wind energy avoidance in PHMA in the Buffalo RMP Proposed Plan, in combination with the disturbance caps under the state plans, exclusion of wind development in PHMA and avoidance in GHMA in all other BLM planning areas in the MZ, the protections in the WAPA EIS, and other past, present, and reasonably foreseeable future actions, would provide a net conservation gain to Greater Sage-Grouse in MZ I.

Grazing

Nature and Type of Effects. The remaining sagebrush habitats in MZ I are mostly managed as grazing lands for domestic livestock. Domestic livestock function similarly to the native keystone species bison in the MZ through grazing and management actions related to grazing, by serving as the predominant large herbivore in the ecosystem. Grazing actions do not preclude wildlife and vegetation, but they do influence ecological pathways and species persistence (Bock et al. 1993).

Livestock can influence habitat by modifying plant biomass, plant height and cover, and plant species composition. As a result, livestock grazing could cause changes in habitat that alter species abundance and composition in Greater Sage-Grouse insect prey important to young Greater Sage-Grouse chicks. Changes in plant composition could occur in varying degrees and could change vegetative structure, affecting cover for nesting birds. Grazing could also alter fire regimes (Davies et al. 2010).

Improper livestock grazing management can compact soils, alter nutrient levels, trample vegetation and disturb Greater Sage-Grouse, potentially negatively affecting Greater Sage-Grouse recruitment. Improper cattle and sheep grazing can also reduce invertebrate prey for Greater Sage-Grouse or increase their exposure to predators (Beck and Mitchell 2000, pp. 998-1,000; Knick 2011; Coates 2007, pp. 28-33). Excessive grazing in riparian areas can destabilize streams and riverbanks, cause the loss of riparian shade, and increase sediment and nutrient loads in the aquatic ecosystem (George et al. 2011). Stock watering tanks can contribute to stream and aquifer dewatering and may concentrate livestock movement and congregation in sensitive areas (Vance and Stagliano 2007).

Even periodic overgrazing can damage range resources over the long term. Grazing often exacerbates drought effects when stocking levels are not quickly reduced to match the limited forage production. Excessive grazing can eliminate perennial grasses and lead to expansion of invasive species such as cheatgrass or Japanese brome (Reisner et al. 2013). The degree to which grazing affects habitat depends on several factors, such as the types of grasses being

grazed, the amount of moisture in any given year, the number of animals grazing in an area, the time of grazing, and the grazing system used.

However, grazing can be used to reduce fuel load and reduce the risk of wildfire (Connelly et al. 2004, p. 7, 28-30). Under certain conditions, grazing can reduce the spread of invasive grasses, if applied early in the season before the grasses have dried (Strand and Launchbaugh 2013). Light to moderate grazing does not appear to affect perennial grasses, which are important to nest cover (Strand and Launchbaugh 2013).

Much of the landscape in MZ I is adapted to withstand grazing disturbance, having been grazed by bison before the West was settled (Knick et al. 2011). Since the passage of the 1934 Taylor Grazing Act, range conditions on BLM-administered lands have generally improved due to improved grazing management practices, decreased livestock numbers, and decreased duration of grazing.

In addition, the BLM has applied Standards for Rangeland Health since 1997. The purpose of this practice is to enhance sustainable livestock grazing and wildlife habitat, while protecting watersheds and riparian ecosystems.

Although livestock grazing is the most widespread land use across the sagebrush biome, it exerts a more limited influence on soils and vegetation than land uses that remove or fragment habitat (e.g., mineral extraction or infrastructure development). Greater Sage-Grouse are able to coexist with grazing animals when properly managed. Thus, reducing AUMs or acres open to grazing would not necessarily restore high-quality Greater Sage-Grouse habitat.

Livestock grazing could reduce the suitability of breeding and brood-rearing habitat for Greater Sage-Grouse populations (USFWS 2010). In areas where livestock use was not well managed, invasive forbs may rise in prevalence. Reducing grass height in Greater Sage-Grouse nesting and brood-rearing areas may negatively impact nesting success. However, grazing is only one component of grass height, which is also influenced by soil and weather conditions. For BLM-administered lands, Standards for Rangeland Health require the BLM to ensure that the environment contains all of the necessary components to support viable populations of sensitive, threatened, and endangered species in a given area relative to site potential. The BLM WO IM 2009-018 requires that land health considerations, such as vegetation cover for Greater Sage-Grouse, are primary considerations for prioritizing the processing of grazing authorizations.

Improperly designed or located range improvements could result in livestock overusing important Greater Sage-Grouse areas. For example, improper spring development may change vegetative composition of an area important to broods.

Allowing spring developments along ephemeral streams and wetlands would decrease Greater Sage-Grouse habitat. Springs, seeps, and wetland areas are vitally important to Greater Sage-Grouse broods; therefore, allowing spring developments could reduce resources for Greater Sage-Grouse.

Conditions in the Planning Area and in MZ I. Livestock grazing is the dominant agricultural use in the Great Plains. It is widespread on many land types, including federal and private, across MZ I. Remaining sagebrush habitats in MZ I are mostly managed as grazing lands for domestic livestock. Much of the landscape in MZ I is adapted to grazing, having been grazed by bison before the West was settled. The effects of grazing on sagebrush habitats in this MZ are much

different than effects noted in the Great Basin since the landscape throughout MZ I is adapted to withstand grazing disturbance (Knick et al. 2011).

Literature suggests that moderate grazing is compatible with Greater Sage-Grouse habitat (Strand and Launchbaugh 2013); Thus, closing acres to grazing may not itself benefit or harm Greater Sage-Grouse, but the fences needed to separate BLM lands from other ownerships and close them to grazing would have direct impacts through increased mortality of Greater Sage-Grouse. Possibly equally or more beneficial is restricting range improvements in Greater Sage-Grouse habitat, limiting fencing, and effectively implementing range health standards on grazing allotments in Greater Sage-Grouse habitat.

The COT report objectives for livestock grazing are to manage grazing in a manner consistent with local ecological conditions. This management would maintain or restore healthy sagebrush shrub and native perennial grass and forb communities and conserve essential habitat components for Greater Sage-Grouse. Restoration to meet these standards and adequate monitoring would be required. The COT report also states that land managers should avoid or reduce the impact of range management structures on Greater Sage-Grouse habitat.

Perhaps the most pervasive change associated with grazing management in Greater Sage-Grouse habitats throughout MZ I is the construction of fencing and water developments (Knick et al. 2011). Barbed wire fences contribute to direct mortality through fence collisions (Stevens et al. 2011); water developments may contribute to the increased occurrence of WNV (Walker and Naugle 2011). Fencing is common throughout MZ I; water developments are particularly prevalent in the north-central portion of MZ I, making that area especially susceptible to WNV outbreaks.

Impact Analysis. The BLM manages livestock grazing on 782,102 acres in the planning area under 427 grazing leases. Table 4.54, “Acres Available and Unavailable to Livestock Grazing in Greater Sage-Grouse Habitat in MZ I” (p. 1321) lists the acres of PHMA and GHMA available and unavailable for grazing, by alternative.

Table 4.54. Acres Available and Unavailable to Livestock Grazing in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Available to Livestock Grazing				
Alternative A	3,548,000	3%	3,432,000	19%
Alternative B	3,441,000	0%	3,079,000	9%
Alternative C	3,441,000	0%	3,540,000	21%
Proposed Plan	3,573,000	4%	3,407,000	18%
Unavailable to Livestock Grazing				
Alternative A	0	0%	1,000	0%
Alternative B	461,000	10%	1,000	0%
Alternative C	0	0%	1,000	0%

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Proposed Plan	3,000	67%	8,000	88%
Source: BLM 2015				
This table displays the acres of PHMA and GHMA available and unavailable to livestock grazing in MZ I; it also displays the percentage of those acres that are found within the planning area.				
% percent				
GHMA General Habitat Management Area				
MZ Management Zone				
PHMA Priority Habitat Management Area				

Acres open to livestock grazing in PHMA and GHMA are similar across all alternatives. Acres closed to livestock grazing would be greatest under Alternative B, which closes PHMA to grazing. In addition, under Alternative B the BLM would not renew grazing leases within 4 miles of leks; therefore, this would result in more restrictive grazing conditions. This would benefit Greater Sage-Grouse by maintaining nesting cover for protection and forage; however, the increased need for fencing to exclude grazing animals on BLM lands could also harm Greater Sage-Grouse by increasing the likelihood of predation and collision.

Alternative C has similar management to Alternative A, so current impacts would continue. The Proposed Plan modestly increases acreage closed to grazing over current management, thereby reducing the possibility for impacts to Greater Sage-Grouse directly related to grazing, but may moderately increase mortality of there is increased fencing associated with the closure. In addition, new grazing guidance under the Proposed Plans would prioritize review of grazing permits in Sagebrush Focal Areas, followed by PHMA outside of Sagebrush Focal Areas (there are no Sagebrush Focal Areas in the Buffalo RMP planning area). Permits and leases may be modified for protection of riparian areas and wet meadows and may include enhanced monitoring and field checks.

Although the acres closed to livestock grazing are similar under Alternatives A and D, under the Proposed Plan, permit review in PHMA and management and monitoring would emphasize achievement of the Wyoming Standards for Rangeland Health. The Proposed Plan also includes restrictions on placing salt or mineral supplements near leks, which would limit trampling damage to habitat in accordance with the COT report objectives.

Because most grazed land in Greater Sage-Grouse habitat in MZ I is privately owned, restrictions on grazing on BLM-administered land may have limited direct effect on population-wide nesting success. areas. However, the construction of fences to enforce the closure of BLM-administered lands to grazing could have a substantial direct effect on Greater Sage-Grouse survival. However, if BLM-administered lands were made unavailable for livestock grazing, as under Alternative B, this could increase grazing pressure on adjacent private lands. Loss of federal grazing permits would pose a threat of indirect adverse effects, including potential conversion of private grazing lands to agriculture, if the loss of federal grazing rights made ranching less economically viable.

Conversion to agriculture is the major threat in the eastern Greater Sage-Grouse range in MZ I, including the Dakotas and Montana. In these areas agricultural conversion is profitable, and patchwork ownership boundaries increase the likelihood of habitat fragmentation. While BLM management may preserve habitat on federal lands, if interspersed private lands are tilled, the

entire landscape may be lost as Greater Sage-Grouse habitat regardless of BLM conservation actions.

The most protective grazing management the BLM can implement for Greater Sage-Grouse habitat is to maintain and improve habitat quality through the implementation of the Rangeland Health Standards on current allotments and by keeping BLM land available for grazing to assist in the maintenance of ranching as a viable land use in sage-grouse habitats.

In the future, temperature increases resulting from climate change may increase crop yields, encouraging conversion of lands not previously used for agriculture. Thus, the most protective grazing management the BLM can implement for Greater Sage-Grouse habitat is to maintain and improve habitat quality through the implementation of the Rangeland Health Standards on current allotments and by keeping BLM land available for grazing to assist in the maintenance of ranching as a viable land use in sage-grouse habitats.

Since 2010, Sage-Grouse Initiative has enhanced rangeland health through rotational grazing systems, re-vegetating former rangeland with sagebrush and perennial grasses and control of invasive weeds. On privately-owned lands, Sage-Grouse Initiative has developed a prescribed grazing approach that balances forage availability with livestock demand. This system allows for adjustments to timing, frequency, and duration of grazing, ensuring rangelands are managed sustainably to provide continued ecological function of sagebrush-steppe. A primary focus of the prescribed grazing approach is maintenance of key plant species, such as deep-rooted perennial grasses that have been shown to be essential for ecological resistance to invasive annual grasses (Reisner et al. 2013, pp. 1047-1048). These actions help to alleviate the adverse impacts associated with improper grazing practices outlined above under Nature and Type of Effects. Within MZ I, Sage-Grouse Initiative has implemented 1,370,269 acres of prescribed grazing systems. This program is likely the largest and most impactful program on private lands within MZ I. Because of its focus on priority areas for conservation, which often overlap PHMA, the Sage-Grouse Initiative's past, present, and reasonably foreseeable work has had and likely will continue to have a cumulative beneficial impact on Greater Sage-Grouse.

In combination with NRCS actions under the Sage-Grouse Initiative, including fence marking, implementation of sustainable grazing management plans, conservation easements, state efforts to maintain ranchland, and other past, present, and reasonably foreseeable future actions, BLM management actions in the Proposed Plan would provide a net conservation gain to Greater Sage-Grouse.

Spread of Weeds

Nature and Type of Effects. As discussed in Chapter 4, invasive weeds alter plant community structure and composition, productivity, nutrient cycling, and hydrology. Invasive weeds also may cause declines in native plant populations, including sagebrush habitat, through such factors as competitive exclusion and niche displacement. Invasive plants reduce and may eliminate vegetation that Greater Sage-Grouse use for food and cover. Invasive weeds fragment existing Greater Sage-Grouse habitat and reduce habitat quality by competitively excluding vegetation essential to Greater Sage-Grouse. Invasive weeds can also create long-term changes in ecosystem processes, such as fire cycles and other disturbance regimes that persist even after an invasive plant is removed (Connelly et al. 2004).

Roads and recreation can promote the spread of invasive weeds through vehicular traffic. Weed infestations can further exacerbate the fragmentation effects of roadways. Irrigation water has

also supported the conversion of native plant communities to hayfields, pasture, and cropland, thus fragmenting sagebrush habitats. Excessive grazing in these habitats can lead to the demise of the most common perennial grasses in this system and an abundance of invasive species such as cheatgrass or Japanese brome (Reisner et al. 2013).

Conditions in the Planning Area and in MZ I. Spread of invasive plants is less prevalent in MZ I and in the planning area due to its cooler, wetter climate compared to Greater Sage-Grouse habitat farther west. Drier, hotter summers promote the spread of cheatgrass and other invasives which establish more slowly in MZ I.

Although cheatgrass does occur, past fire history and research has repeatedly demonstrated a healthy northern mixed-grass prairie plant community is resilient to cheatgrass expansion. Haferkamp (2001) studying annual bromes, including cheatgrass in eastern Montana, concluded there would be no ecological shift of northern mixed-grass prairies toward annual grass dominance. Instead, he concluded the amount and abundance of annual bromes occurring on Northern Great Plains rangeland is cyclic, depending on seedbank, temperature, amount and distribution of precipitation. Expansion of annual bromes in mixed-grass prairie communities is buffered by two long-lived perennial grasses (western wheatgrass and blue grama), where grazing management maintains healthy native mixed-grass prairie vegetation (Haferkamp 2001). Vermiere et al. (2011) studied effects of fire on perennial and annual grasses (including cheatgrass) and found increased production of western wheatgrass and decreased annual grass production following summer fire in the northern mixed-grass prairie. Climate Change research also suggests there would not be a cheatgrass invasion into the Northern Great Plains. Modeling illustrates the median precipitation change scenario (used to identify the most likely future climate change) depicts no increase in cheatgrass climatic habitat within the planning area (Bradley 2009).

The BLM currently manages weed infestations through integrated weed management, including biological, chemical, mechanical, manual, and educational methods. It is guided by the 1991 and 2007 RODs for Vegetation Treatment on BLM Lands in Thirteen Western States (BLM 1991a) and by the 2007 Programmatic Environmental Report (BLM 2007h). Weeds are managed in cooperation with county governments and represent a landscape-level approach across management jurisdictions.

Impact Analysis. Increased activity such as surface disturbance, motorized transportation, and animal and human activity would increase the chance for invasive plants to establish and spread.

Increases in mineral facilities under Alternative C and the Proposed Plan could increase the presence and spread of invasive weeds. Management actions that limit activity near Greater Sage-Grouse habitat and leks would reduce the chance of invasive species spreading and establishing. For example, to reduce disturbance, Alternative B requires livestock supplements be placed a minimum of 0.5 mile from defined sensitive sites (500 feet under Alternative C and the Proposed Plan). The COT report objective for invasive species is to maintain and restore healthy native sagebrush plant communities.

Invasive species on BLM-administered lands would be controlled under all alternatives. This would provide a net conservation benefit to Greater Sage-Grouse by restoring degraded sagebrush habitat and increasing native forbs, thus improving nest cover and food supply.

Relevant cumulative actions that result in surface-disturbing activities would increase the potential for the spread of invasive weeds on both land administered by the BLM and land that it does not administer. Projects subject to the general stipulations outlined in the Wyoming and

Montana EOs are required to control noxious and invasive weed species and to use native seed mixes during reclamation processes. These stipulations would benefit Greater Sage-Grouse Core Habitat Areas. They would accomplish this by limiting the spread or establishment of invasive species, particularly on lands that lack BLM protective regulatory mechanisms.

These stipulations, in combination with state and county noxious weed regulations and other past, present and reasonably foreseeable future actions would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I under the Proposed Plan and the other project alternatives.

Conversion to Agriculture

Nature and Type of Effects. Converting sagebrush habitat to agricultural use, causes direct loss of habitat available for Greater Sage-Grouse. Habitat loss also decreases the connectivity between seasonal habitats, increasing population isolation and fragmentation. Fragmentation then increases the probability for decline of the population, reduced genetic diversity, and extirpation from stochastic events (Knick and Hanser 2011).

In addition to reducing the land area available to support Greater Sage-Grouse, habitat loss and fragmentation likely to exacerbate the effects of other naturally occurring and anthropogenic disturbances and could directly and indirectly increase the likelihood of certain disturbances on the landscape.

Conversion of native habitats to cropland has eliminated or fragmented sagebrush on private lands in areas with deep fertile soils or irrigation potential. Sagebrush remaining in these areas has been limited to the agricultural edge or to relatively unproductive environments.

Biofuel production and high prices for small grains has increased the conversion to cropland of native grasslands or lands formerly enrolled in the Conservation Reserve Program. This conversion of private lands further emphasizes the importance of BLM-administered lands and associated private grazing lands in maintaining large blocks of native grassland and shrubland habitats suitable for Greater Sage-Grouse. Converting native grasslands to agricultural lands not only results in a direct loss of habitats for native wildlife, it fragments remaining habitat.

Conditions in the Planning Area and in MZ I. Across the Great Plains nearly 60 percent of native habitats have been lost to agricultural conversion (Samson et al. 2004) and conversion of sagebrush habitats is the most pervasive and extensive change to the sagebrush ecosystems in MZ I. Cropland currently covers nearly 19 percent of MZ I and influences approximately 50 to 80 percent of sagebrush in MZ I (Knick et al. 2011).

Regional assessments estimate that 7.2 percent of PHMA and GHMA in MZ I are directly influenced by agricultural development. These same assessments estimate that over 99 percent of PHMA and GHMA in MZ I are within approximately 4 miles of agricultural land (Manier et al. 2013). Much of the direct habitat loss from conversion to agriculture has occurred in the northwestern and northeastern portions of MZ I, in Montana and the Dakotas (Knick et al. 2011).

Impact Analysis. The BLM does not convert public lands to agriculture. As such, the only direct authority it has over conversion to agriculture is by retaining or disposing of lands in the realty program. Lands retained under BLM management will not be converted to agriculture.

Disposing of lands could increase the likelihood they will be converted to agriculture, depending on their location and new management authority.

As shown below in Table 4.55, “Acres Identified for Retention and Disposal in Greater Sage-Grouse Habitat in MZ I” (p. 1326), acreages identified for retention vary little in the planning area or in MZ I among the alternatives.

Table 4.55. Acres Identified for Retention and Disposal in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Acres Identified for Retention				
Alternative A	3,527,000	3%	10,159,000	6%
Alternative B	3,819,000	10%	9,867,000	3%
Alternative C	3,435,000	0%	10,251,000	6%
Proposed Plan	3,572,000	4%	3,279,000	17%
Acres Identified for Disposal				
Alternative A	20,000	100%	179,000	53%
Alternative B	83,000	100%	116,000	28%
Alternative C	0	0%	199,000	58%
Proposed Plan	0	0%	165,000	48%
Source: BLM 2015				
This table displays the acres of PHMA and GHMA identified for retention and disposal in MZ I; it also displays the percentage of those acres that are found within the planning area.				
% percent				
GHMA General Habitat Management Area				
MZ Management Zone				
PHMA Priority Habitat Management Area				

BLM land tenure adjustments could result in Greater Sage-Grouse habitat being converted to agriculture use under Alternative A or B. The Proposed Plan would retain lands identified for disposal with Greater Sage-Grouse habitat. However, land tenure adjustments require site-specific NEPA analysis, and land sales must meet the disposal criteria under applicable law. BLM land tenure adjustments are not anticipated to be a significant contributing element to the threat of agricultural conversion.

Lands identified for disposal in MZ I are typically small isolated parcels that are difficult to manage and do not represent suitable Greater Sage-Grouse habitat. Parcels determined to have Greater Sage-Grouse habitat value would not likely meet the disposal criteria, unless disposal was seen to have a net conservation benefit. Studies of agricultural conversion risk on grasslands have shown a high probability of grassland plots being converted to cropland under current economic and climatic conditions (Rashford et al. 2013). The recent federal Farm Bill tried to discourage converting prairie to cropland by denying crop insurance for such conversions. Nevertheless, if corn and other crop prices remain high, the economic incentive to convert parcels to cropland in Greater Sage-Grouse habitat areas will continue and will potentially increase. Once converted to cropland, acreage is permanently lost as habitat for Greater Sage-Grouse. Fragmentation of habitat from piecemeal conversions of rangeland to tilled cropland can increase disturbance over a large area and cause adjacent areas to become unusable or poor-quality Greater Sage-Grouse habitat.

The BLM has no management authority over private land conversions, but management actions on BLM lands may influence the potential for conversion on adjacent private lands (see grazing section above) The loss of habitat on private lands will reduce the effectiveness of conservation

actions on adjacent BLM-administered lands because the effects of conversion extend onto adjacent lands and this effect increases as a greater percentage of a landscape is converted from sagebrush habitats to other land uses.

Cumulative impacts vary relatively little across alternatives, and BLM management may have little impact on alleviating this threat. Restrictions on grazing on federal land could increase agricultural pressure on adjacent private lands. If the loss of federal grazing rights makes ranching economically unviable, the potential conversion of private grazing lands to agriculture would increase. However, the Proposed Plan does not substantially increase acreage unavailable to grazing.

The COT report objectives for converting land to agriculture are to avoid further loss of sagebrush habitat for agricultural activities (both plant and animal production) and to prioritize restoration. In areas where taking agricultural lands out of production has benefited Greater Sage-Grouse, the programs supporting these actions should be targeted and continued (USFWS 2013). In accordance with this objective, the NRCS's Sage-Grouse Initiative program focuses on maintaining ranchland that provides habitat for Greater Sage-Grouse.

This voluntary program provides private landowners with monetary incentives to protect Greater Sage-Grouse habitat, often through conservation easements. As a result, private land containing Greater Sage-Grouse habitat is protected from conversion to agriculture or other development for the life of the conservation agreement. Conservation easements and other conservation incentives on private lands, such as restoration of water features and fence marking, can enhance the ability of landscapes with mixed ownerships to support Greater Sage-Grouse seasonal habitats. As of 2014, Sage-Grouse Initiative has secured conservation easements on 65,881 acres within MZ I and marked or removed 350 miles of fence (NRCS 2015). These efforts, in conjunction with BLM management and other past, present and reasonably foreseeable future actions, would provide a net conservation gain to Greater Sage-Grouse in MZ I.

Fire

Nature and Type of Effects. Sagebrush killed by wildfire often requires many years to recover, especially after large fires. Contiguous old-growth sagebrush sites are at high fire risk, as are large blocks of contiguous dead sagebrush and sagebrush sites with a substantial cheatgrass understory. Before recovering, these sites are of limited use to Greater Sage-Grouse, except along the edges and in unburned islands.

Because of its widespread impact on habitat, fire has been identified as a primary factor associated with Greater Sage-Grouse population declines, particularly in the Great Basin. Depending on the species of sagebrush and the size of a burn, a return to a full pre-burn community cover can take from 25 to 120 years (Baker 2011). In addition, fires can reduce invertebrate food sources and may facilitate the spread of invasive weeds. However, cheatgrass establishment after fires in MZ I is not currently a concern because resistance to widespread conversion to cheatgrass after fire is generally high throughout MZ I.

BLM management to prevent or control wildfires can also affect Greater Sage-Grouse and habitat. Increased human activity and noise associated with fire suppression in areas occupied by Greater Sage-Grouse could affect nesting, breeding, and foraging behavior. Important habitats could be altered because of the use of heavy equipment, hand tools, and noise.

In addition, suppression may initially result in higher rates of conifer encroachment in some areas. In the initial stages of encroachment, fuel loadings remain consistent with the sagebrush understory. As conifer encroachment advances, fire return intervals are altered by decreasing understory abundance. The depleted understory causes the stands to become resistant to low-intensity wildfires; over years, the accumulating conifer loads contribute to larger-scale wildfires and confound control efforts due to extreme fire behavior.

Conditions in the Planning Area and in MZ I. Fire risk is generally low across MZ I, with 17 percent of PHMA and GHMA having high risk for fire; however, isolated areas, especially in central Montana, South Dakota, the border between Montana and Wyoming, and eastern Wyoming, are identified as having high fire risk. The risk of fire across other parts of this region needs better documentation (Manier et al. 2013).

In the planning area, fire data from 1990 to 2007 indicates 89 fires burned approximately 150,000 acres, with an average of 8,300 acres burned per year. Unplanned fires affected mixed grass prairie and sagebrush habitats more than any other vegetation type (BLM 2007d).

Impact Analysis. Management actions in the BFO that emphasize wildfire suppression in Greater Sage-Grouse habitat would benefit the species by limiting habitat loss in the event of wildfire. For example, Alternative B includes measures that prioritize suppression within four miles of leks, and the Proposed Plan would prioritize suppression within PHMA. Alternative C would expand the use of prescribed fire compared to current management (Alternative A). Alternative B and the Proposed Plan would restrict the use of prescribed fire in Greater Sage-Grouse habitat. This is in accordance with the COT report objective to retain and restore healthy native sagebrush plant communities within the range of Greater Sage-Grouse.

Recognition of the importance of sagebrush habitat during interagency wildfire response would benefit Greater Sage-Grouse populations in the event of an unplanned fire. The Wyoming and Montana EOs emphasize fire suppression in Core Population Areas, while recognizing other suppression priorities may take precedence. This would benefit Greater Sage-Grouse habitat during wildfire planning and response, particularly on lands not administered by the BLM.

WAFWA's guidance on fire and fuels management for Greater Sage-Grouse conservation (WAFWA 2014) promotes coordination among local fire response agencies similar to a "natural disaster" response; it emphasizes the importance of fuel breaks and the need to incorporate Greater Sage-Grouse habitat objectives in fire management, as well as the use of grazing as a fuel reduction tool.

On the local level, the Northeast Wyoming Sage Grouse Conservation Plan (2014) recommends coordinating with county fire agencies and landowners to develop and implement wildfire suppression guidelines that address Greater Sage-Grouse habitat health and management. However, the conservation plan does not identify a funding source for this action.

The Interagency Standards for Fire and Fire Aviation Operations "Red Book" includes a BMP for Greater Sage-Grouse habitat conservation for wildlife and fuels management (BLM 2013e). This document is a supplemental policy or guidance for the BLM, the USFS, and the USFWS. This BMP would benefit the Greater Sage-Grouse during interagency wildland fire operations. It would do this by using spatial habitat data and predictive services to prioritize and pre-position firefighting resources in important habitat areas. The coordination of federal, state, and local fire prevention actions, changes in fire management, and other past, present, and reasonably foreseeable future actions would provide a net conservation gain to Greater Sage-Grouse in MZ I.

Recreation

Nature and Type of Effects. Recreation such as camping, bicycling, wildlife viewing, horseback riding, fishing, and hunting can be dispersed, concentrated (e.g., OHV use and developed campsites), or permitted (e.g., BLM Special Recreation Permit). The BLM also manages SRMAs, where recreation is a primary resource management consideration.

Recreation on federally administered lands that use the extensive network of double-track and single-track routes have an impact on sagebrush and Greater Sage-Grouse. Ecological impacts of roads and motorized trails are mortality due to collisions; behavior modifications due to noise, activity, and habitat loss; alteration of physical environment; nutrient leaching; erosion; invasive plants spread; increased use; and alteration by humans due to accessibility (Knick et al. 2011). Recreation activities can degrade Greater Sage-Grouse habitat through direct impacts on vegetation and soils, introduction or spread of invasive species, and habitat fragmentation. This occurs in areas of concentrated use, trailheads, staging areas, and routes and trails.

Motorized activities, including OHV use, are expected to have a larger footprint on the landscape. They are anticipated to have the greatest level of impact due to noise levels, compared to nonmotorized uses such as hiking or equestrian use. Cross-country motorized travel, which is permitted in designated areas on BLM-administered lands but not on National Forest System lands, would increase the potential for soil compaction, loss of perennial grasses and forbs, and reduced sagebrush canopy cover. Losses in sagebrush canopy could be the result of repeated, high-frequency, cross-country OHV use over long periods. In addition, the chances of wildfire are increased during the summer, when fire dangers are high and recreation is at its highest.

Dispersed uses expand the human footprint. Closing areas to recreation and reclaiming unused, minimally used, or redundant roads in and around sagebrush habitats during seasonal use by Greater Sage-Grouse may reduce the footprint and presumably impacts on wildlife. Restricting access to important habitat areas during seasonal use (lekking, nesting, brood-rearing, and wintering) may decrease the impacts associated with humans. However, access restriction will not eliminate other impacts, such as invasive plant spread, predator movements, cover loss, and erosion (Manier et al. 2013).

Conditions in the Planning Area and in MZ I. Historically low in the Great Plains, human population densities have increased 666 percent since 1920 (Knick et al. 2011). With expanding population comes greater human impacts (Leu et al. 2008), with many people moving to the Great Plains region because of access to public lands (Hansen et al. 2005).

In the planning area, the pattern of landownership, with limited BLM-administered surface land, makes the area less accessible or desirable for recreation. Nonetheless, approximately 30,000 recreational visits occur annually in the planning area (BLM 2013l). Recreation demands are anticipated to rise across MZ I in recreationally desirable areas.

The COT report objectives for recreation are to maintain healthy native sagebrush communities, based on local ecological conditions, and to manage direct and indirect human disturbance (including noise) to avoid interruption of normal Greater Sage-Grouse behavior (USFWS 2013). Limits on road use under the action alternatives and limits on OHVs would help meet these objectives.

In the Buffalo RMP planning area, travel management planning is underway to determine specific routes that would be available for or closed to motorized vehicle use.

Impact Analysis. Table 4.56, “Acres of Travel Management Designations in Greater Sage-Grouse Habitat in MZ I” (p. 1330) shows acres of travel management designations in Greater Sage-Grouse habitat in MZ I, where data are available.

Table 4.56. Acres of Travel Management Designations in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open				
Alternative A	111,000	100%	651,000	100%
Alternative B	0	0%	0	0%
Alternative C	0	0%	0	0%
Proposed Plan	0	0%	0	0%
Limited				
Alternative A	3,427,000	0%	2,801,000	0%
Alternative B	3,744,000	8%	2,946,000	5%
Alternative C	3,427,000	0%	3,517,000	20%
Proposed Plan	3,563,000	4%	3,394,000	17%
Closed				
Alternative A	5,000	20%	8,000	25%
Alternative B	154,000	97%	158,000	97%
Alternative C	4,000	0%	34,000	82%
Proposed Plan	5,000	48%	40,000	88%
Source: BLM 2015				
This table displays the acres of PHMA and GHMA within travel management designations of open, limited, and closed in MZ I; it also displays the percentage of those acres that are found within the planning area.				
% percent				
GHMA General Habitat Management Area				
MZ Management Zone				
PHMA Priority Habitat Management Area				

As shown in Table 4.56, “Acres of Travel Management Designations in Greater Sage-Grouse Habitat in MZ I” (p. 1330), acres closed to motorized vehicles would be greatest under Alternative B, compared to current management (Alternative A); Alternative C and the Proposed Plan are comparable to current management. As a result of travel management planning, disturbance to birds and habitat impacts on Greater Sage-Grouse from recreational motorized vehicle use would be greatest under Alternative A; impacts would be reduced most under Alternative B. Acres limited to existing routes are similar under all alternatives.

SRMAs would be designated under Alternatives B and C and the Proposed Plan, with the greatest number of SRMAs under Alternative B. SRMAs allow the BLM to more effectively manage areas for group recreation and minimize disturbance to Greater Sage-Grouse populations. The Proposed Plan would provide a balanced approach, emphasizing recreational use and protecting natural resources.

Implementation of the action alternatives described above, in concert with travel management planning on BLM-administered lands within MZ I, the disturbance caps applied under state plans, and other past, present, and reasonably foreseeable future actions would help reduce the threats from recreation and travel on Greater Sage-Grouse habitats and would provide a net conservation benefit to Greater Sage-Grouse populations in MZ I.

4.4.9.7. Conclusions

In addition to BLM management in the Buffalo RMP planning area and other planning areas in MZ I—North Dakota, South Dakota, Miles City, Lewistown, HiLine, and parts of Billings and Wyoming—Greater Sage-Grouse in MZ I will also be impacted by management and conservation at state, regional, tribal, and local levels. This analysis takes into account each alternative in the Buffalo RMP in conjunction with state and private initiatives, and past and present actions at the federal, state, and local levels. The analysis assumes that the Proposed Plans would be implemented in the other BLM RMP planning areas in MZ I.

Some of the most important past and present actions benefitting Greater Sage-Grouse populations on private land in MZ I are the conservation easements and grazing management programs coordinated by the NRCS Sage-Grouse Initiative with private ranchers. In only a few years, Sage-Grouse Initiative has recorded easements on over 65,000 acres in MZ I and established Greater Sage-Grouse-friendly grazing systems on over 1,300,000 acres (NRCS 2015). Sage-Grouse Initiative has also worked with landowners to increase fence marking, seeding of native vegetation, and conifer removal to improve Greater Sage-Grouse habitat quality. Future private conservation efforts enacted through Sage-Grouse Initiative is expected to provide further benefits to Greater Sage-Grouse habitat.

Ranchers in Wyoming are also using Candidate Conservation Agreement with Assurances with the USFWS. Under these instruments, the ranchers voluntarily agree to manage lands to reduce threats to Greater Sage-Grouse in exchange for a guarantee that they will not be subject to additional regulations should the species become listed. While ranchers have used these agreements across Greater Sage-Grouse range, thus far the agreements have been applied to only a small number of ranches in Wyoming and Montana.

These private land conservation efforts complement BLM management on federal lands to provide Greater Sage-Grouse conservation across larger landscapes.

As discussed in Section 4.4.9.4, “Regional Efforts to Manage Threats to Greater Sage-Grouse” (p. 1296), both Wyoming and Montana have adopted regulatory statewide plans to promote Greater Sage-Grouse conservation. Wyoming’s plan implements a Core Population Area Strategy with well density limitations, timing restrictions, and a uniform 5 percent disturbance cap across all landownership types. These measures would improve Greater Sage-Grouse population levels if effectively enforced (Copeland et al. 2013). The limitations on timing and density of energy development along with the disturbance cap, and BLM management on lands with federal mineral estate, would act in concert to promote Greater Sage-Grouse conservation and reduce the impacts from energy development on leks, breeding habitat, and wintering habitat. In the Montana plan, a 5 percent limit on anthropogenic disturbance is applied within the Density and Disturbance Calculation Tool examination area (based upon occupied leks within any given Core population area).

However, for the portion of northeast Wyoming in MZ I the state strategy is less effective. This is because the Core Areas were delineated after considerable Greater Sage-Grouse habitat had already been disturbed (Taylor et al. 2012). Montana’s plan, published in September 2014, promotes a statewide conservation strategy on private and state lands. It also calls for a 5 percent disturbance cap for Greater Sage-Grouse habitat, limits well density, and imposes timing restrictions, similar to the approach in Wyoming. Together, these measures would reduce

habitat loss as well as direct disturbance, injury, or mortality of Greater Sage-Grouse populations associated with anthropogenic disturbance across the MZ if effectively enforced.

North Dakota and South Dakota have non-regulatory plans in place to assist with sage-grouse conservation. These plans will not regulate activities permitted by the state but these states contain smaller populations of Greater Sage-Grouse on the edge of the range reducing the overall impact to sage-grouse in MZ I of not having state regulatory plans in the Dakotas.

Habitat restoration is also important for sustaining Greater Sage-Grouse populations. The PRB Greater Sage-Grouse population has declined due to widespread energy development. The population viability analysis concluded that Greater Sage-Grouse are likely to survive energy development, while the impact of WNV is potentially greater and could cause entire populations to die. The current situation is likely better than the population viability analysis, COT report, and other reports concluded because neither the population viability analysis nor the COT report accounted for Connectivity Corridors (they only accounted for the effect of managing Core Population Areas). These analyses were based on a high CBNG potential that has since dropped to less than 25 percent of earlier projections.

The PRB Restoration Program reasonably foresees large-scale habitat restoration; as drill sites go out of production, they would be reclaimed and restored to pre-disturbance conditions. While not all restored habitat is successfully reoccupied by Greater Sage-Grouse, the PRB Restoration Program considers that as energy development ceases and locations are restored to habitat, Greater Sage-Grouse in nearby habitats may recolonize restored areas successively. Greater Sage-Grouse are not anticipated to return to the area in pre-disturbance numbers. However, restoration in areas next to core habitat and extant populations and connectivity habitat will expand the available breeding and wintering habitat for Greater Sage-Grouse, reasonably foreseeing a net conservation gain to the species.

The COT report states that the PRB Greater Sage-Grouse population is at risk of extirpation from development of the vast energy resources in the region. Another risk is WNV, which is difficult to control and particularly dangerous in populations already depleted by habitat fragmentation and loss (USFWS 2013). The population viability analysis for PRB reached similar conclusions (Taylor et al. 2012). However, as described in this analysis, the threat from energy development can be effectively managed by coordinated action from BLM RMP amendments and revisions and state actions, including disturbance caps to limit loss of Greater Sage-Grouse habitat and to protect leks with buffers.

PHMA and GHMA were developed to protect the best habitat and highest population density of Greater Sage-Grouse. BLM restrictions on energy development and associated infrastructure in these habitat areas, and permit requirements for development of federal mineral estate, would help reduce loss and disturbance of Greater Sage-Grouse populations. Under the Proposed Plan, for lands that are already leased, BLM can apply COAs as provisions of drilling permit issuance or renewal. Areas that have already been developed have reduced available Greater Sage-Grouse habitat, but restoration is in progress.

The more challenging threat to Greater Sage-Grouse to manage in MZ I is the conversion of private lands to agriculture. As described above, these conversions are attractive to ranchers as crop prices increase and climate conditions support more tillage. Once tilled, Greater Sage-Grouse habitat is not only lost on the tilled land, but surrounding habitat areas become fragmented and less hospitable to birds. BLM management cannot restrict tillage on private lands, and state governments have limited control over this action but management actions on BLM

lands and state land policies may influence the potential for conversion on adjacent private lands. Conversion to agriculture is primarily influenced indirectly by promoting sustainable grazing and voluntary efforts for conservation, such as the NRCS Sage-Grouse Initiative program's conservation easements.

Alternative A: Current Management

Under Alternative A, current management would continue on BLM-administered lands in the Buffalo RMP planning area. Several protective measures would not be implemented; for example, the BLM would not designate PHMA or GHMA and would not manage any additional ROW avoidance or exclusion areas. Appropriate and allowable uses and restrictions with regard to such activities as mineral leasing and development, recreation, utility corridors, and livestock grazing would also remain unchanged.

Management prescriptions to protect Greater Sage-Grouse currently in place include measures such as requiring anti-perching devices on new power lines within 0.5 mile of occupied Greater Sage-Grouse leks and nesting habitat, and restricting surface disturbance and occupancy within a 0.25-mile radius of the perimeter of occupied (or undetermined) Greater Sage-Grouse leks.

Under current management, despite a court order in place since 2004 barring new leasing in the PRB, widespread energy development has degraded Greater Sage-Grouse habitat in the PRB and GRST populations have declined substantially. The Greater Sage-Grouse viability analysis recently conducted for the Buffalo RMP planning area indicated that the Greater Sage-Grouse populations in northeast Wyoming could be at risk of extirpation from the combined effect of development and WNV (Taylor et al. 2012). However, future drilling in the PRB is expected to have less impact on Greater Sage-Grouse. This may reduce the risk, in conjunction with a planned increase in restoration and continued implementation of the state Core Population Area Strategy.

In the rest of MZ I, other BLM RMP planning efforts would implement their Proposed Plans to improve protection of Greater Sage-Grouse and their habitat. In addition, Greater Sage-Grouse conservation strategies would be implemented on state and private lands. As a result, the lack of protections under the Buffalo RMP Alternative A would be offset to an extent by more protective management elsewhere in MZ I. In the Buffalo RMP planning area, though, continuation of current management would do little to reduce the threats from energy development, mining, and infrastructure on Greater Sage-Grouse wintering and breeding grounds; the Buffalo RMP planning area would likely serve as sink habitat for the MZ-wide population of Greater Sage-Grouse. Although current management actions, including the temporary BLM Greater Sage-Grouse IMs, provide a limited array of conservation measures that are intended to avoid continued degradation of Greater Sage-Grouse habitat in MZ I, they would not be subject to the same development restrictions in Greater Sage-Grouse habitat under the No Action Alternative as they would under the action alternatives. Thus, the No Action Alternative would not meet the goals and objectives in this plan to identify and incorporate conservation measures for Greater Sage-Grouse and would not meet the COT report objectives for present and widespread threats to Greater Sage-Grouse.

Alternative B

Alternative B emphasizes protecting natural resources and is the most restrictive alternative for development within Greater Sage-Grouse habitat. In conjunction with NRCS and state initiatives on private land, several aspects of BLM management under Alternative B would benefit Greater Sage-Grouse conservation at a landscape level. These include increasing lek buffers to 4.0 miles,

imposing winter timing limitations and winter habitat restrictions, and protecting brood-rearing habitat.

Alternative B is also the most restrictive in terms of motorized vehicle use and mineral development; for example, all coal lands outside high development potential areas would be closed and development of leased fluid minerals would be restricted within 4.0 miles of leks.

Alternative B would create the most special designations for resource protection, including for Greater Sage-Grouse. Land disposals and acquisitions would focus on maintaining sagebrush acreage and connectivity. Greater Sage-Grouse habitat objectives would be considered in grazing management in PHMA, and fires would be suppressed in sagebrush areas. Alternative B would site transmission lines in locations that minimize impacts on Greater Sage-Grouse. Lines within 4.0 miles of leks would be managed as ROW exclusion areas.

Implementing these protective measures on BLM-administered lands within the Buffalo RMP planning area would help preserve Greater Sage-Grouse habitat but risks pushing development onto adjacent lands with less restrictive management. Greater Sage-Grouse in MZ I would benefit most in states where nonfederal lands have similarly restrictive measures such as in Core Areas in Wyoming and Montana (though Core Areas do not cover all existing Greater Sage-Grouse populations). North and South Dakota do not have similar orders protecting Greater Sage-Grouse on nonfederal lands; thus, controls on BLM-administered land could displace development onto private land but not reduce overall impacts on Greater Sage-Grouse.

As described above, Alternative B would meet the objectives laid out in the COT report for fire, invasive plants, range management, recreation, and infrastructure. It would address, though may not meet, the COT objectives for energy and mining, because the Greater Sage-Grouse population in the Buffalo RMP planning area is not stable or increasing due to prior disturbances. Under Alternative B, the Greater Sage-Grouse populations across the MZ would retain more of their range and distribution than under current management.

Alternative B would minimize agricultural conversion by retaining lands providing Greater Sage-Grouse habitat. It may result in more indirect impacts from potential conversions of private land providing Greater Sage-Grouse habitat. However, this loss may be limited by the NRCS Sage-Grouse Initiative program, which is helping landowners obtain conservation easements for ranchland providing Greater Sage-Grouse habitat.

Alternative C

Alternative C emphasizes resource development and intensive management practices but with limited restrictions for conservation or Greater Sage-Grouse protection. It is the least restrictive alternative for motorized vehicle use and energy development. Alternative C applies less stringent restrictions on surface-disturbing activities to protect wildlife. It would open all federal coal lands to exploration but would add timing limitations to Greater Sage-Grouse winter concentration areas.

Alternative C's management approach for Greater Sage-Grouse is modestly more protective than current management (Alternative A). COT objectives for energy development, infrastructure, mining, range management, fire, and invasive plants would likely be met in other areas of MZ I due to implementation of other planning areas' Proposed Plans and other conservation efforts on state and private lands. However, within the Buffalo RMP planning area, the limited protective measures would not meet the goals and objectives to identify and incorporate conservation

measures for Greater Sage-Grouse and would not meet the COT report objectives. This could put Greater Sage-Grouse populations in the PRB at risk of further decline.

Proposed Plan

The Proposed Plan emphasizes sustainable development with constraints on resource uses to protect Greater Sage-Grouse and other natural resources. Greater Sage-Grouse protective measures, such as NSO stipulations, would be implemented in and outside of priority habitat.

Under the Proposed Plan, the BLM would improve Greater Sage-Grouse habitat protection over current management. The Proposed Plan would also apply moderate resource constraints, such as CSU and TL stipulations, and would increase constraints on resource uses within a 0.6-mile buffer around leks in Greater Sage-Grouse priority habitat. The 0.6-mile buffer would protect males during the breeding season, while density and disturbance limits would protect nesting females and late brood-rearing habitat.

These provisions would protect Greater Sage-Grouse more than current management and would complement protections on other lands. The Proposed Plan would maintain flexibility for land managers in areas with mixed public and private ownership. In such locations, strict restrictions on development on federal lands could result in more widespread development on private lands, without reducing overall impacts on sagebrush habitat. Flexible management has the potential to minimize impacts on Greater Sage-Grouse populations, for example by permitting a shorter transmission line route through Greater Sage-Grouse habitat across both public and private land.

In conjunction with state and regional planning efforts, implementation of disturbance caps in Greater Sage-Grouse priority habitat, conservation easements on private lands, and implementation of the Proposed Plans for other BLM field offices in MZ I, the Proposed Plan for the Buffalo RMP would meet the goals and objectives for Greater Sage-Grouse in this plan and the objectives laid out in the COT report for fire, invasive plants, range management, recreation, and infrastructure. The Proposed Plan would address, though may not meet, the COT objectives for energy and mining, because the population in the Buffalo RMP planning area is not stable or increasing due to prior disturbances to habitat. Managing ROW exclusion and avoidance areas would help meet the COT objective for infrastructure by limiting ROW development, and would also help to meet the COT objectives for invasive plant species by reducing disturbances that promote the spread of weeds. Implementation of state conservation plans would help meet COT objectives on non- BLM-administered land. Applying a 5 percent disturbance limit under WY and MT Greater Sage-Grouse EOs would reduce disturbance from energy, mining and infrastructure. Removal of encroaching trees near occupied leks and important habitats (e.g., nesting, and wintering) would reduce the rate of conifer incursion and help maintain healthy sagebrush plant communities. The Proposed Plan would minimize agricultural conversion, to the extent that this is within BLM authority. Conversion would be minimized by retaining lands providing Greater Sage-Grouse habitat and by working in conjunction with NRCS efforts to retain private rangeland providing continuous Greater Sage-Grouse habitat and connectivity between habitats. However, converting private lands to agriculture would remain a risk to Greater Sage-Grouse in MZ I under all alternatives.

The Proposed Plan would minimize habitat loss by providing management flexibility to collocate ROWs and maintain grazing permits.

Overall, under the Proposed Plan, future projects in PHMA would be subject to additional restrictions to protect Greater Sage-Grouse that would not be implemented under Alternative A.

This would protect important habitat with the greatest densities of Greater Sage-Grouse over the 20-year analysis period. Thus, Greater Sage-Grouse would experience a net conservation gain under the Proposed Plan.

Summary

Overall, Greater Sage-Grouse populations across MZ I face pressures from energy development, conversion to agriculture, and such stressors as disease, drought, predation, and fire. These threats are magnified under the pressure of habitat fragmentation and the isolation of small populations in the Dakotas, on the eastern edge of the species' range. Private lands being converted to agriculture is also a particularly worrisome threat in this region. Tillage is increasing in Greater Sage-Grouse habitat because of the economic incentive of high crop prices and the patchwork pattern of landownership between federal and private lands that reduces habitat connectivity.

Because widespread habitat fragmentation and degradation have already occurred in northeastern Wyoming, Greater Sage-Grouse in MZ I will depend on a combination of federal conservation actions and development restrictions, private conservation easements, and state disturbance limits to maintain viable habitat in PHMA and GHMA and to sustain Greater Sage-Grouse populations against present and widespread threats. Maintenance of habitat connectivity for sub-populations of Greater Sage-Grouse will protect against losses from disease and wildfire. Either Alternative B or the Proposed Plan would best promote these goals in the Buffalo RMP planning area. These alternatives would be most likely to stabilize Greater Sage-Grouse populations, maintain leks, improve nesting success, and reduce predation in the PRB and throughout MZ I.

Reasonably foreseeable management efforts for control of energy development, mining, infrastructure, grazing, conversion to agriculture, fire, spread of weeds, and recreation are projected to increase through increased coordination of federal, state, and local actions and the implementation of other BLM and USFS Land Use Plan Amendments in MZ I. When the impacts of the Buffalo RMP are added to these actions, this would result in a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I. Though smaller, fringe populations may continue to decline across MZ I in the next twenty years, implementing Alternative B or the Proposed Plan, in combination with the Proposed Plans for other BLM planning areas, development restrictions in the Wyoming and Montana state plans, increased land protections via the NRSC Sage-Grouse Initiative, and local and regional habitat restoration efforts, would effectively conserve the region-wide population of Greater Sage-Grouse in MZ I.

4.4.9.9.8. MZ-Wide Reasonably Foreseeable Future Actions Summary Table

Table 4.57, "Reasonably Foreseeable Future Actions in Management Zone I Likely to Impact Greater Sage-Grouse Habitat" (p. 1337) includes a selection of some of the larger projects from the reasonably foreseeable future actions tables in the RMPAs/Land Use Plan Amendments for MZ I. The full tables can be found in each EIS within the MZ.

Table 4.57. Reasonably Foreseeable Future Actions in Management Zone I Likely to Impact Greater Sage-Grouse Habitat

MZ	Planning Area	Greater Sage-Grouse Population(s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
Energy and Mining						
I	Buffalo	Powder River Basin, Wyoming Basin	Greater Crossbow Oil and Gas Exploration and Development Project	Campbell and Converse Counties, Wyoming	Proposed development of 1,500 new oil and gas wells over 110,000 acres of split estate mixed surface ownership lands. There are no BLM surface lands within the proposed development area; however, approximately 62 percent of the mineral estate is managed by the BLM. ¹	Proposed
I	9-Plan	Powder River Basin, Wyoming Basin	Converse County Oil and Gas	Converse County, Wyoming	Proposed development of up to 5,000 new oil and gas wells in northern Converse County, Wyoming. The proposed development area encompasses roughly 1.5 million acres of split estate mixed surface ownership lands, and includes all or parts of three different Greater Sage-Grouse Core Areas. ²	Proposed
I	Buffalo	Powder River Basin	Buffalo Oil and Gas Leases	Campbell, Johnson, Sheridan Counties, Wyoming	As of 2008, federal oil and gas leases covered approximately 2,533,975 acres in the Buffalo planning area. ³	Ongoing
I	Miles City	Dakotas	Carter Master Leasing Plan (MLP)	Carter County, Montana	Proposed development of up to 119 oil and gas wells and associated infrastructure. 71 percent of oil and gas estate in MLP Area is comprised of federal mineral estate. ⁴	Proposed
I	Miles City	Northern Montana, Yellowstone Watershed	Big Dry RMP Area	13 counties, northeast Montana	Surface coal leasing in the Fort Union Coal Region. 1,674,500 acres of high and moderate development potential (847,379 federal acres) in the RMP area. ⁵	Ongoing
I	Miles City	Dakotas, Yellowstone Watershed, Powder River Basin	Surface coal leasing	Southeast Montana	Surface coal leasing in the Powder River Resource area. Lease proposals pending with the BLM comprise 2,242 acres and include the following mines: Spring Creek (1,772 acres), Rosebud (160 acres), Decker (310 acres). ^{3, 6, 7, 8}	Ongoing and proposed

MZ	Planning Area	Greater Sage-Grouse Population(s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
I	Buffalo	Powder River Basin	Powder River Basin Coal Mines	Campbell County, Wyoming	13 operating mines in planning area, and two proposed mines; all are surface coal mines, covering 162,336 federal acres in the Buffalo planning area. ⁶	Ongoing and proposed
I	Miles City	Dakotas	Pending Bentonite expansion	Carter County, Montana	Increase in permitted area by 2,050 acres, of which, 1,649 acres would be federal (BLM-administered) and 401 acres would represent private ownership. ⁵	Proposed
I	Buffalo	Powder River Basin	Black Hills Bentonite (Mayoworth Area Mine and Peterson Draw/Willow Creek-Posey Creek/Tisdale-Wall Creek Areas Mine)	Johnson County, Wyoming	Currently, there are 2 authorized active open-pit bentonite mines, 1 mine pending authorization, and 47 active bentonite mining claims in the Buffalo planning area on federal lands (both federal surface/federal minerals and split estate) ⁸	Ongoing and proposed
I	Buffalo	Powder River Basin	Nichols Ranch/Hank Unit Uranium in-situ Recovery Mining Project	Johnson County, and Campbell County, Wyoming	Pending authorization for a proposed 2,250-acre in-situ uranium recover mine, which includes 303 acres of BLM-administered surface lands. Seven occupied leks occur within 2 miles of the Hank Unit. ⁹	Proposed
I	HiLine, Lewistown, Billings, Miles City, North Dakota, South Dakota	Northern Montana, Yellowstone Watershed, Belt Mountains, Powder River Basin, Dakotas	WAPA Upper Great Plains Wind Energy Programmatic EIS	Montana, North and South Dakota, other Great Plains states	Programmatic EIS will identify environmental impacts, mitigation strategies, and review procedures for future wind-energy proposals in the upper great plains region. ¹⁰	Proposed
Rights-of-Way						
I	HiLine, Miles City, South Dakota	Northern Montana, Yellowstone Watershed, Dakotas	Keystone XL Pipeline	Montana, South Dakota, other states	285-mile ROW in Montana and South Dakota, of which 45 miles may occur on BLM-administered lands. ¹¹	Proposed

MZ	Planning Area	Greater Sage-Grouse Population(s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
I	Miles City	Yellowstone Watershed	Tongue River Railroad Project	Colstrip to Decker, Montana	Construction and operation of a 42-mile railroad between Miles City and Colstrip, Montana. ¹²	Proposed
¹ Greater Crossbow Oil and Gas EIS: http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA.Par.24843.File.dat/hot_sheet.pdf . ² Convers County Oil and Gas Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/cfo/Converse_County_Oil_and_Gas.html . ³ Buffalo Oil and Gas Leases: http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo/docs.html . ⁴ Carter Master Leasing Plan – Miles City RFD, Minerals Appendix of DEIS. P. MIN-164-165: http://www.blm.gov/mt/st/en/fo/miles_city_field_office/rmp/draft_rmp.html . ⁵ Miles City RFD, Minerals Appendix of DEIS. P. MIN-165-173: http://www.blm.gov/mt/st/en/fo/miles_city_field_office/rmp/draft_rmp.html . ⁶ Powder River RMP Area – Miles City RFD, Minerals Appendix of DEIS. P. MIN-173-188, and Powder River Resource Area RMP (BLM 1984) (http://www.blm.gov/mt/st/en/prog/planning/powder_river.html). ⁷ Spring Creek, Rosebud, Decker Mines – Miles City RFD, Minerals Appendix of DEIS. P. MIN-192. ⁸ Buffalo Revised Final Mineral Report: http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/planning/rmps/buffalo/docs.Par.90169.File.dat/RevisedFinalMineralReport_Part1.pdf . ⁹ Nichols Ranch/Hank Unit Uranium in-situ Recovery Mining Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/bfo/nichols-ranch.html . ¹⁰ Upper Great Plains Wind Energy PEIS: http://plainswindeis.anl.gov/documents/dpeis/index.cfm.. ¹¹ Keystone XL Pipeline: http://keystonepipeline-xl.state.gov/finalseis/index.htm . ¹² Tongue River Railroad EIS: http://www.tonguerivereis.com/ .						
BLM Bureau of Land Management EIS Environmental Impact Statement MZ Management Zone MLP Master Leasing Plan RMP Resource Management Plan ROW right-of-way WAPA Western Area Power Administration						

4.5. Heritage and Visual Resources

4.5.1. Cultural Resources

Any action that reduces a threat to any of the characteristics which make a cultural resource significant will have a beneficial effect. Any action that results in surface disturbance has the potential to adversely affect cultural resources. Physical effects on cultural resources are typically long term and cannot be reversed. Inventory is required before the BFO authorizes most surface-disturbing activities, regardless of surface ownership. Inventory associated with Section 106 compliance can contribute data relating to site locations, but does not necessarily advance archeological and historic knowledge due to the reactionary nature of the investigations. The BFO will resolve adverse effects to historic properties that may result from authorized uses with methods such as project redesign or data recovery. Adverse effects on the setting of historic properties can be resolved by project redesign with the goal of reducing the visual contrast created by the project. Effects on the settings of historic properties are typically long term due to the time necessary to revegetate disturbed surfaces. Some adverse effects on cultural resources such as TCPs cannot be mitigated, potentially resulting in the denial of certain proposals. Cultural resources will deteriorate through natural agents, unauthorized collection, and vandalism. A risk

of unauthorized collection or vandalism of cultural resources results from casual use activities (such as dispersed recreational activity or OHV use).

4.5.1.1. Methods and Assumptions

The following methods were used to analyze effects on cultural resources:

- The area of analysis is the entire planning area.
- The analysis focuses on data available in 2009, which is assumed to accurately represent the types of resources in the planning area in the future.
- The analysis is primarily qualitative since only 13.8 percent of the planning area is inventoried for cultural resources.

Assumptions

The following analytical assumptions were made, based on available inventory data:

- All surface-disturbing activities must involve inventory with avoidance or mitigation of historic properties.
- Any alternative that results in surface disturbance could lead to inadvertent effects on cultural resources.
- Some cultural resources, especially buried cultural resources, are difficult to locate during inventory and could be inadvertently affected by surface-disturbing activities.
- Throughout the planning area, there is a predicted cultural resource density of 1 site per 172 acres.
- Throughout the planning area, typically 12.6 percent of all cultural resources are historic properties (sites eligible for or listed on the *National Register of Historic Places* [NRHP]).
- The southern Big Horn Mountains have a higher density of cultural resources and unique historic properties, such as rock art and rock shelters.

The following terms are used to define the extent of the environmental consequences:

- Major beneficial – The action would make the protection, preservation, or enhancement of a cultural resource(s) a priority.
- Moderate beneficial – The action would benefit cultural resources by eliminating immediate threats to historic properties, sacred sites, and TCPs from federal authorizations, deterioration through natural agents, unauthorized collection, and vandalism.
- Minor beneficial – The action would benefit cultural resources by reducing immediate threats to historic properties, sacred sites, and TCPs from federal authorizations, deterioration through natural agents, unauthorized collection, and vandalism.
- Negligible beneficial – The effect on the resource would be beneficial, but barely detectable. No historic properties would be affected.
- Negligible adverse – The effect on the resource would be adverse, but barely detectable. No historic properties would be adversely affected.
- Minor adverse – The effect on the resource would be slight but detectable; there would be a small change in the resource. Some cultural resources could be affected, but fewer than 10 historic properties would be adversely affected and effects would be mitigated. There would be a slight chance for unanticipated adverse effects on historic properties.
- Moderate adverse – The effect on the resource would be readily apparent; there would be a measurable change in the resource. Between 11 and 25 historic properties would be adversely affected, although most effects would be mitigated. There would be a moderate chance for unanticipated adverse effects to historic properties.

- Major adverse – The effect on the resource would be obvious; there would be a highly noticeable, long-term, or permanent measurable change in the resource. More than 26 historic properties would be adversely affected, although most effects would be mitigated. TCPs or sacred sites would be adversely affected without adequate mitigation. There would be a high likelihood of unanticipated adverse effects to historic properties.

Significance Criteria

The following are significance criteria for effects on cultural resources:

- Resource management actions would reduce or eliminate the opportunity to avoid or mitigate adverse effects to historic properties.
- Resource management actions would increase the likelihood of natural or man-made effects on cultural resources.
- Resource management actions would reduce or eliminate the opportunity for Native Americans to access sacred sites or TCPs.

4.5.1.2. Impacts Common to All Alternatives

Cultural

Site stabilization and long-term protections would eliminate immediate threats resulting in a benefit cultural resources. Government-to-government relationships with Native American tribes should benefit cultural resources as sites important to tribes are identified and protected.

Physical Resources

Surface disturbance associated with physical resources management actions has the potential to impact cultural resources.

Air Quality

Managing to prevent or restrict particulate air pollution (especially suppressing dust) would reduce immediate threats to the integrity of the setting of certain historic properties such as TCPs or historic trails. Maintaining good air quality could help preserve rock art, which can be adversely affected by atmospheric pollutants.

Soil

Mitigation or stabilization of erosive soils could result in inadvertent adverse effects on buried cultural resources during implementation, but when completed, would preserve intact buried cultural resources by preventing or reducing the immediate threat of erosion.

Water Resources

Water management actions common to all alternatives include managing surface-disturbing activities to prevent degradation of water quality, including reducing channel and bank erosion, and managing water to meet Wyoming Standards for Healthy Rangeland. This would be applied across the entire planning area and would have a minor beneficial effect on cultural resources as the immediate threat of erosion is reduced.

Cave and Karst Resources

Performing cave inventories and significance determinations can identify significant cultural resources. The presence of significant archeological resources must be considered when determining the significance of cave resources. This would have a beneficial effect on cultural

resources as immediate threats to historic properties would be eliminated through cave protection measures. The level of effect would be minor as significant caves are likely to be limited to the Big Horn Mountains portion of the planning area.

Mineral Resources

Minerals development that would involve surface-disturbing activities has the potential to adversely affect cultural resources. Inventories in response to proposals for development, and avoidance or mitigation, can minimize impacts to historic properties. Inventory could adversely affect sites if a discovery inadvertently results in unauthorized collection or vandalism. There can be inadvertent effects if buried sites are not identified through a surface inventory. Effects on historic properties can take place through data recovery. However, when data recovery is completed, aside from destroying part of the site, it limits or diminishes potential opportunities for future research and interpretation. In some cases it may be difficult to mitigate effects on historic properties especially when considering Native American religious or traditional use sites. It is difficult or impossible to mitigate direct adverse effects on **TCPs** such as Pumpkin Buttes.

Locatable Minerals

BLM surface overlaying federal mineral estate is available for potential locatable minerals exploration and development (777,310 acres) unless it is formally withdrawn. Foreseeable locatable minerals development is anticipated to affect a maximum of 1,455 acres, with potential effects to one historic property. However, uranium development is foreseeable on or near the Pumpkin Buttes TCP, which could result in adverse physical effects and effects on setting that may be impossible to mitigate. This would be a major adverse effect.

Leasable Minerals – Coal

Similar to locatable minerals, the potential acreage available for coal leasing is extensive (4,775,136 acres), but foreseeable activity is confined to central Campbell County and north-central Sheridan County, and is anticipated to affect a maximum of 195,700 acres. The potential adverse effect on historic properties (approximately 130) would be major.

Leasable Minerals – Fluids

Most of the surface overlaying federal mineral estate would be available for leasable fluid minerals exploration and development (3,386,530 acres). Foreseeable leasable fluid minerals development is anticipated to affect a maximum of 22,255 acres. Therefore, the potential adverse effect on historic properties (approximately 20) would be moderate.

Salable Minerals

Most BLM surface overlaying federal mineral estate would be available for salable minerals exploration and development (777,310 acres). Foreseeable salable minerals development is anticipated to affect a maximum of 2,090 acres. Therefore, the potential adverse effect on historic properties (approximately 1) would be minor.

Fire and Fuels Management

Surface disturbing activities associated with fire and fuels management can have an impact on historic properties.

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Cultural resources can be inadvertently damaged or destroyed by any fire suppression efforts.

Digging hand lines, constructing fire lines using heavy equipment, and fire-retardant drops can result in adverse effects. Fire rehabilitation can increase the protection of buried cultural resources by preventing or reducing erosion through rapid revegetation of denuded surfaces. Effects from rehabilitation activities (such as seeding and water barring) would be mitigated.

Biological Resources

The following programs do not have any management actions common to all alternatives that would affect cultural resources: **Fish and Wildlife Resources, Special Status Species – Plants and Fish and Invasive Species and Pest Management.**

Special Status Species – Wildlife (including Greater Sage-Grouse)

Any application of NSO stipulations as a result of wildlife management would benefit cultural resources as immediate threats to cultural resources would be reduced as surface disturbance is prohibited.

Vegetation – Forests and Woodlands, Grassland and Shrubland Communities, and Riparian/Wetland Resources

Vegetation surveys could identify plants or plant communities that are important to Native American tribes for traditional uses. Reducing adverse effects on vegetative resources would help stabilize soil and help preserve buried cultural resources.

Heritage and Visual Resources

The **Paleontological Resources** program does not have any management actions common to all alternatives that would affect cultural resources.

Visual

Managing any area as VRM Class I or II and screening, painting, and designing facilities to blend with the surrounding landscape would preserve the integrity of the settings of historic properties such as TCPs or historic trails. This would have a minor beneficial effect on cultural resources as the areas managed as VRM Class I or II within the planning area are limited.

Land Resources

Management of **Lands with Wilderness Characteristics** and management of **Renewable-Energy** development would not include actions common to all alternatives that would directly affect surface-disturbing activities. Therefore, management of those resources would not affect cultural resources.

Forest Products

Management actions common to all alternatives include a prohibition of timber harvest within 200 feet of surface waters. This would protect cultural resources in those areas. The amount of plants harvested for personal use would be very small and not considered to affect cultural resources unless the collection includes species that are significant to tribes. Overall, management actions for forest products common to all alternatives would have a minor beneficial effect on cultural resources.

Lands and Realty

Land exchanges can result in adverse effects if historic properties leave public ownership.

Inventory and associated mitigation of historic properties must be completed before exchanges. However, when considering Native American religious or traditional use of certain sites, it is difficult or impossible to mitigate direct effects on TCPs such as Pumpkin Buttes. The BFO would be responsible for managing any cultural resources on new lands the BLM might acquire. Overall, these management actions would have a negligible adverse effect on cultural resources.

Rights-of-Way and Corridors

Issuing ROW that result in surface-disturbing activities has the potential to adversely affect cultural resources. Inventories in response to proposals for development, and avoidance or mitigation, can minimize effects on historic properties. Inventories could adversely affect sites if discoveries inadvertently resulted in unauthorized collection or vandalism. There can be inadvertent effects if buried sites are not identified through a surface inventory. Effects on historic properties can take place through data recovery. However, when data recovery is completed, aside from destroying part of the site, it limits or diminishes potential opportunities for future research and interpretation. In some cases it may be difficult to mitigate effects on historic properties especially when considering Native American religious or traditional use sites. It is difficult or impossible to mitigate direct adverse effects on TCPs such as Pumpkin Buttes.

Travel and Transportation Management

Acquiring new access to public lands could result in adverse effects on cultural resources from unauthorized collection and vandalism. Unimproved roads designated for use through sites could cause erosion that could damage buried cultural resources. New access routes also could provide or improve tribal access to sacred sites or TCPs. Overall, management of travel and transportation common to all alternatives would have a negligible adverse effect on cultural resources.

Recreation

Effects from dispersed recreational activities are difficult to assess because such activities could affect cultural resources that have yet to be identified. Indirect and inadvertent effects on cultural resources can result from attracting attention or visitation to certain areas such as SRMAs and ACECs. Increased visitation and recreational use can lead to unauthorized collection and vandalism of cultural resources. Providing recreational or public interpretation of cultural and historic resources can enhance appreciation and understanding of the fragile and finite nature of cultural resources. Disturbance would be the greatest in areas of concentrated use, such as hiking trails, developed facilities, and dispersed camping sites. Improving and maintaining recreation sites localizes possible disturbances. Overall, recreation management actions common to all alternatives would have a negligible adverse effect on cultural resources.

Livestock Grazing Management

While direct effects on cultural resources associated with range improvement projects would be mitigated, there could be other effects as a result of livestock grazing. Livestock congregating and trailing at or across locations of cultural resources can damage artifacts and their contexts. Cattle shading and rubbing can damage standing historic structures and prehistoric rock art panels. Excessive trampling at spring sources and along stream banks, cattle trailing, and overgrazing can lead to removal of vegetative cover and affect cultural resources through erosion. These types of effects would generally be localized at particular sites, and could range from short term to irreversible.

Special Designations

There are no management actions for **Scenic or Back Country Byways, WSAs, and WSRs** common to all alternatives or that vary by alternative that would directly affect surface-disturbing activities. Management of these resources would have no effect on cultural resources; therefore, these resources are not further addressed in the *Cultural Resources* section.

Areas of Critical Environmental Concern and Wilderness Study Areas

Managing areas as ACECs and WSAs would preserve cultural resources because surface-disturbing activities would not be allowed in these areas and public access is typically limited. This management would have a moderate beneficial effect on cultural resources as the immediate threat of surface disturbance is eliminated. WSAs would be managed as such in all alternatives and therefore are not discussed further in this section. If Congress were to release a WSA, then BLM would complete an RMP amendment for any changes in management.

Socioeconomic Resources

There are no social, economic, or health and safety management actions common to all alternatives or specific to individual alternatives that would have a measurable effect on cultural resources. Therefore, these subjects are not further addressed in this section.

4.5.1.3. Alternative A

Cultural Resources

Under Alternative A, establishing site stewardship opportunities on a project-specific basis would likely result in the BFO reacting to external requests. Other priorities would take precedence and the BFO could forego proactive opportunities for public outreach and site preservation. Even though implementation of site stewardship may not be actively promoted by BFO, this management would have a beneficial effect on cultural resources.

Creating Cultural Resource Management Plans (CRMPs) for existing sites and any additional sites that could be eligible for listing on the National Register is intended to more effectively preserve those resources. The existing CRMPs are out of date and need to be updated; developing new CRMPs would benefit cultural resources. Any site listed on the National Register also would warrant a specific management plan, although no sites in the planning area have been listed since the 1970s. There are other sites that likely will never be listed that require management plans to ensure adequate preservation. This management would have a beneficial effect on cultural resources.

Applying an NSO stipulation to mineral leases within 0.25 mile of the Bozeman Trail and Crazy Woman Battle Site is intended to preserve the setting of the sites, although practical application of the NSO stipulation is problematic. Many National Register eligible or significant segments of the Bozeman Trail do not retain their historic settings, and applying an NSO stipulation to all such areas would not be practical. Alternatively, in many cases it is necessary to consider impacts beyond 0.25 mile from the trail to preserve setting. In addition, Alternative A does not adequately address the complexity of preserving the setting of the Bozeman Trail or the Crazy Woman Battle Site, or the numerous other significant sites in the planning area such as the Pumpkin Buttes TCP or Cantonment Reno. Applying NSO stipulations on mineral leases under Alternative A would have a beneficial effect on cultural resources.

Under Alternative A, mitigating impacts to historic properties or their settings on a project-specific basis would adequately address effects at that level. However, it is difficult to assess cumulative

effects on the setting of a specific site if each project is addressed in a separate document. Multiple projects that result in weak or moderate contrast to the setting of a site can result in a cumulative strong contrast. If projects that affect the setting of a site are analyzed on a project-specific basis, the lack of a cumulative impacts analysis could allow for adverse effects. In addition, Alternative A does not consider minerals withdrawals or close to leasing areas with historic properties. This would preclude an opportunity to protect historic properties. This alternative could result in an adverse effect on cultural resources.

Requiring archeological monitors for construction on a project-specific basis could address unanticipated impacts to sites not identified during inventory. Requiring an archeological monitor is based on contractor recommendations, the BFO cultural resources specialists' analysis, and the application of a regional model. Using this strategy, archeological monitors have identified very few sites in the planning area. The lack of discoveries could be due to unusual depositional characteristics in the planning area or inconsistent observations by various monitors. Although not quantifiable, it is likely that there would be a benefit to cultural resources as a result of project-specific archeological monitoring.

Creating programmatic agreements with tribes on a project-specific basis would likely result in the BFO reacting to external requests. Other priorities would take precedence and the BFO might forego such proactive opportunities for effective government-to-government consultations with tribes. Although any agreement would be beneficial, if BFO misses a pro active opportunity to coordinate with tribes, this management could have an adverse effect on cultural resources.

Establishing agreements that provide tribal access to TCPs and sacred sites on BLM surface on a project-specific basis would likely result in the BFO reacting to external requests. Other priorities would take precedence and the BFO might forego such proactive opportunities for effective government-to-government consultations with tribes. Although any agreement would be beneficial, if BFO misses a pro active opportunity to coordinate with tribes, this management could have an adverse effect on cultural resources.

Under Alternative A, mitigating impacts to TCPs and sacred sites on a project-specific basis would adequately address effects at that level. However, it is difficult to assess cumulative effects on the setting of a specific site if each project is addressed in a separate document. Multiple projects that result in weak or moderate contrast to the setting of a site can result in a cumulative strong contrast. If projects that affect the setting of a site are analyzed on a project-specific basis, the lack of a cumulative impacts analysis could allow for major adverse effects. In addition, Alternative A does not consider minerals withdrawals or close to leasing areas containing TCPs or sacred sites. This would preclude an opportunity to protect those properties. This alternative could have an adverse effect on cultural resources.

Requiring Native American monitors for construction on a project-specific basis could address unanticipated impacts to sacred sites or TCPs not identified during inventory. Any requirement for Native American monitors on a project under this alternative would be the result of the BFO reacting to external requests. Other priorities would take precedence and the BFO might forego such proactive opportunities for effective government-to-government consultation with tribes. This alternative could have an adverse effect on cultural resources.

Overall, management actions for cultural resources under Alternative A would have minor beneficial effects on cultural resources in the planning area as immediate threats would be reduced.

Physical Resources

Air Quality

Alternative A air quality management actions would have no effect on cultural resources.

Soil

Any prohibition on surface disturbances or the application of NSO stipulations as a result of soil resources management would benefit cultural resources. Buried cultural resources are essentially a part of soil resources, and any measure to protect soil stability should protect cultural resources. Prohibiting surface disturbance on rock outcrops would protect rock art and rock shelters. Alternative A soils management actions would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Water Resources

Prohibiting surface disturbance near springs and perennial streams would benefit cultural resources. Buried cultural resources are often located near water sources, especially around springs. Alternative A water management actions would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Cave and Karst Resources

Prohibiting surface disturbance near caves would benefit cultural resources. Buried cultural resources are often located in or near cave entrances. Alternative A cave management actions would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Mineral Resources**Locatable Minerals**

Under Alternative A, withdrawing areas from minerals location would have a major beneficial effect on cultural resources. Minerals withdrawals in the existing game ranges and WSAs would benefit cultural resources, especially considering that some of those areas are in the southern Big Horn Mountains and have a higher density of historic properties than the rest of the planning area. Any surface disturbance, including activities associated with exploration and extraction of locatable minerals, could result in a negligible to major adverse effect on cultural resources. Foreseeable locatable minerals development is anticipated to affect a maximum of 554 acres, which would affect less than one historic property. However, uranium development is foreseeable on or near the Pumpkin Buttes TCP, which could result in adverse effects on the physical characteristics of the site. Since Pumpkin Buttes is significant to multiple tribes and impacts cannot be mitigated, this would be a major adverse effect.

Leasable Minerals – Coal

Under Alternative A, opening all federal coal lands to exploration and leasing on a project-specific basis could result in major adverse effects on cultural resources. Although potential damage to many historic properties could be mitigated through data recovery before mining, mitigation might not be possible for certain types of sites, including historic properties that retain setting, sacred sites, and TCPs. The surface disturbance prediction of 195,700 acres of coal development could affect more than 195 historic properties.

Leasable Minerals – Fluids

Under Alternative A, allowing minerals leasing on all federal mineral estate on a project-specific basis could result in a moderate adverse effect on cultural resources. Many historic properties can be avoided or potential damage mitigated before surface-disturbing

activities. Mitigation might not be possible for certain types of sites, including historic properties that retain setting, sacred sites, and TCPs, which would lead to a major adverse effect. The estimated total acres disturbed associated with construction of well sites, access roads, and pipelines would be approximately 10,575 acres over the total federal fluid mineral estate of 3,386,530 acres. This could result in physical effects on 18 historic properties, although there would be a much larger number of sites, such as the Bozeman Trail and the Pumpkin Buttes TCP, that would experience effects on setting. Overall, Alternative A management of leasable fluid minerals would have a moderate adverse effect on cultural resources.

Salable Minerals

Under Alternative A, prohibiting mineral materials activities in WSAs would have a beneficial effect on cultural resources, especially considering that some of those areas have a higher density of historic properties than the rest of the planning area. Under this alternative, 530 acres would be disturbed, with the potential to affect less than one historic property. This would have a negligible adverse effect on cultural resources.

Fire and Fuels Management

Under Alternative A, fire suppression techniques that result in surface disturbance or retardant drops could have a minor adverse effect on cultural resources. Wildland fire suppression strategies are designed to avoid known historic properties whenever possible.

Biological Resources

Vegetation – Forests and Woodlands, Vegetation – Grassland and Shrubland Communities, and Special Status Species – Plants

Under Alternative A, management of forests and woodlands, grasslands and shrublands, and special status plants would have no effect on cultural resources.

Vegetation – Riparian/Wetland Resources

Any prohibition on surface disturbances or the application of NSO stipulations as a result of riparian and wetlands management would benefit cultural resources. Any measure to protect the stability of vegetation should protect cultural resources. Under Alternative A, these management actions would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Invasive Species and Pest Management

Under Alternative A, controlling invasive species could protect plant communities important to Native American tribes for traditional uses. This would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Any prohibitions on surface disturbances or the application of NSO stipulations as a result of fish habitat management would benefit cultural resources. Any measure to protect bank stability should protect cultural resources. This management under Alternative A would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Any prohibitions on surface disturbances or the application of NSO stipulations as a result of wildlife habitat management would benefit cultural resources. Any measure to protect habitat stability should protect cultural resources. This management under Alternative A would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Heritage and Visual Resources

Paleontological Resources

Alternative A management of paleontological resources would have no effect on cultural resources.

Visual Resources

Any action that protects visual resources would help preserve the setting of historic properties. Any measure to preserve visual integrity would result in minor beneficial effects on cultural resources.

Land Resources

The alternatives for **Lands with Wilderness Characteristics** will have no effect on cultural resources.

Lands and Realty

Land exchanges can result in adverse effects if historic properties leave public ownership and Alternative A identifies 108,243 acres of BLM-administered lands as available for disposal. Inventory and associated mitigation of historic properties must be completed before exchanges. However, when considering Native American religious or traditional use of certain sites, it is difficult or impossible to mitigate direct effects on TCPs such as Pumpkin Buttes. Overall, these management actions would have a negligible adverse effect on cultural resources due to the potential of historic properties leaving federal control as it is difficult to predict the actual number of acres that will be exchanged or sold.

Forest Products

Under Alternative A, a maximum of 6,000 acres of forest-product related activity is predicted on BLM surface. This could affect six historic properties, which would be a minor adverse effect on cultural resources.

Renewable Energy

Although there have been no renewable-energy projects to date on BLM surface in the planning area, wind-energy projects resulting in 20,000 acres of disturbance are predicted in the future. Renewable-energy development at this scale could have adverse effects on the physical characteristics of 20 historic properties. Lacking specific restrictions, under Alternative A, there would be major adverse effects on the settings of numerous historic properties because wind-energy facilities can create a high visual contrast.

Rights-of-Way and Corridors

Under Alternative A, fully utilizing South Middle Butte as a location for communications towers would result in a major adverse effect on a specific cultural resource. Numerous tribes have stated that allowing any surface disturbance or construction on the Pumpkin Buttes TCP would result in an adverse effect that is impossible to mitigate. Previous decisions have

allowed such uses on the buttes and there are existing roads and structures. However, there would likely be cumulative adverse effects from allowing further uses. The predicted disturbance from ROW actions is 38,762 acres of BLM surface, which could adversely affect 39 historic properties.

Travel and Transportation Management

Under Alternative A, acquiring new access routes to public lands could adversely affect cultural resources through unauthorized collection and vandalism. New access routes also could provide or improve tribal access to sacred sites or TCPs, which would be a beneficial effect. Overall under Alternative A, there would be a negligible adverse effect as sites may be adversely impacted, but it would be difficult to detect the change.

Recreation

Under Alternative A, any prohibition of surface disturbance would beneficially affect cultural resources. This management under Alternative A would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Lands with Wilderness Characteristics

The alternatives for lands with wilderness characteristics would have no effect on cultural resources.

Livestock Grazing Management

Restricting livestock grazing under Alternative A would have an indirect beneficial effect on cultural resources. Any management action that restricts the removal of vegetation would indirectly preserve buried cultural resources if soils were stabilized. This management under Alternative A would have a minor beneficial effect on cultural resources by reducing immediate threats through restricting surface disturbance.

Special Designations

Areas of Critical Environmental Concern

Under Alternative A, failure to manage Pumpkin Buttes as an ACEC could have a major adverse effect to cultural resources. Without any surface use restrictions, there could be major, long term impacts to the Pumpkin Buttes TCP.

4.5.1.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to cultural resources from implementation of Alternative B.

Cultural Resources

Under Alternative B, establishing site stewardship opportunities with the State Historic Preservation Office (SHPO) and other stakeholders would have a beneficial effect on cultural resources. Site stewardship results in increased monitoring of sensitive sites, allowing the BFO to efficiently react to any threats to those sites. Providing site stewardship opportunities would allow the public to participate in preserving and protecting cultural resources sites with little cost to the BLM.

Although natural and human-caused effects on cultural resources are inevitable, CRMPs can be developed and implemented for specific sites to help prevent such effects through active management. Protective measures can include site condition monitoring, site stabilization, road

closures, and signage. Early identification of natural or human-caused effects would allow for successful protective measures. Implementing CRMPs for specific sensitive sites or regions would have a beneficial effect on cultural resources in those areas.

Withdrawing lands from minerals exploration and development and closing to leasing areas with historic properties that retain their historic settings would have a beneficial effect on cultural resources. There are relatively few historic properties in the planning area that retain their historic settings (examples include the Bozeman Trail, Pumpkin Buttes, and certain historic homesteads). It is difficult to avoid or mitigate adverse effects on settings if adjacent federal minerals are leased. If these areas were not leasable or not open to minerals entry, settings would essentially be protected. Prohibiting surface disturbance within five miles of historic properties that retain their historic settings also would have a beneficial effect on cultural resources. However, there are undoubtedly unidentified historic properties in the planning area that retain integrity of setting.

Requiring archeological monitors for all surface-disturbing activities would have a beneficial effect on cultural resources. Archeological monitoring is intended to identify cultural resources not identified before surface-disturbing activities. Cultural resources discovered during archeological monitoring could be avoided or adverse effects on those resources mitigated.

Establishing programmatic agreements with each tribe with which the BFO consults would have a beneficial effect on cultural resources. Such agreements provide a process for consultation and can lead to improved government-to-government relationships. Establishing agreements that provide tribal access to known TCPs also would have a beneficial effect on cultural resources.

Withdrawing lands from minerals exploration and development and closing to leasing in areas with TCPs or sacred sites would have a beneficial effect on cultural resources. It is difficult to avoid or mitigate effects on cultural resources under federal mineral estate when it is leased. If these areas were not leasable or not open to minerals entry, cultural resources sites would essentially be protected. Prohibiting surface disturbance within the settings of TCPs or sacred sites would also have a moderate to major beneficial effect on cultural resources.

Requiring Native American monitors for all surface-disturbing activities would have a beneficial effect on cultural resources. Native American monitoring is intended to identify cultural resources not identified before surface-disturbing activities. Cultural resources discovered during Native American monitoring could be avoided or adverse effects on those resources mitigated.

Overall, management actions for cultural resources under Alternative B would have major beneficial effects on cultural resources in the planning area as immediate threats would be reduced.

Physical Resources

Air Quality

Alternative B air quality management actions would have no effect on cultural resources.

Soil

The frequent application of NSO stipulations and prohibitions on surface disturbance related to soils under Alternative B would benefit cultural resources. The most restrictive soils protections under this alternative would prohibit surface disturbance on 455,090 acres (58%) of BLM surface and 1,514,445 acres (45%) of federal fluid mineral estate. This management would have a minor beneficial effect as immediate threats to cultural resources are reduced through surface disturbance prohibitions.

Water Resources

Under Alternative B, increased prohibitions on surface disturbance and the application of NSO stipulations for management of water resources would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Cave and Karst Resources

Under Alternative B, developing and implementing CRMPs would benefit cultural resources where historic properties are present in caves. Increased prohibitions on surface disturbance and the application of NSO stipulations for management of cave and karst resources would also have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Mineral Resources

Impacts Common to All Alternatives describes how minerals activities affect soil resources. In general, Alternative B substantially reduces the amount of area available for minerals exploration and development; however, predicted development under Alternative B is not substantially less than predicted for other alternatives.

Locatable Minerals

There are 277 acres predicted to be disturbed (less than one historic property) by locatable minerals development under Alternative B. Alternative B withdrawals from locatable minerals entry would have a major beneficial effect on cultural resources. However, it is likely there would be uranium development on Pumpkin Buttes, which would have a major adverse effect on cultural resources.

Leasable Minerals – Coal

Under Alternative B, closing coal lands to exploration or leasing would benefit cultural resources. However, the surface disturbance prediction of 186,600 acres of coal development could affect 186 historic properties. This would be a major adverse effect.

Leasable Minerals – Fluids

Restricting fluid minerals and other leasable minerals exploration and leasing identified within this alternative related to fluid minerals would benefit cultural resources. This alternative would allow for leasing and development of the federal fluid mineral estate with increased protections cultural resources. The approximate total acres disturbed associated with the construction of well sites, access roads, and pipelines are 286 acres, potentially impacting one historic property, a negligible adverse effect.

Salable Minerals

Closure areas for salable exploration or development in this alternative would be a benefit to cultural resources. Under this alternative, 114 acres (less than one historic property) are forecasted to be disturbed by salable mineral development.

Fire and Fuels Management

Under Alternative B, limiting the use of heavy equipment during fire suppression efforts would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Biological Resources

Vegetation – Forests and Woodlands

Alternative B management actions for forests and woodlands would have no effect on cultural resources.

Vegetation – Grassland and Shrubland Communities

Under Alternative B, authorizing only native plant species for reclamation projects would benefit cultural resources through the preservation of setting for historic properties. This would have a minor beneficial effect on cultural resources as an immediate threat of potential impacts to setting would be reduced.

Vegetation – Riparian/Wetland Resources

Prohibition of surface disturbance and application of NSOs under the riparian/wetland alternatives would have a beneficial effect on cultural resources. A buffer around riparian areas would prohibit surface disturbance on 23,831 acres of BLM surface and 144,045 acres overlying federal fluid minerals in areas that contain a high likelihood of buried cultural deposits.

Invasive Species and Pest Management

Alternative B management actions for invasive species and pest management would have no effect on cultural resources.

Fish and Wildlife Resources – Fish and Wildlife, Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Under Alternative B, increased prohibitions on surface disturbance and the application of NSO stipulations for management of all fish and wildlife and SSS would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Heritage and Visual Resources

Paleontological Resources

Under Alternative B, paleontological resources management actions that prohibit surface disturbance, closes areas to leasing, and withdraw lands from minerals exploration and development would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Visual Resources

Under Alternative B, managing specific areas as VRM Class II and III could have minor beneficial effects on cultural resources by protecting the settings of historic properties. This would have a minor beneficial effect on cultural resources as an immediate threat of potential impacts to setting would be reduced.

Land Resources

Forest Products

Alternative B management of forest products would have no effect on cultural resources.

Lands and Realty

Land exchanges can result in adverse effects if historic properties leave public ownership and Alternative B identifies 120,722 acres of BLM-administered lands as available for disposal.

Inventory and associated mitigation of historic properties must be completed before exchanges. However, when considering Native American religious or traditional use of certain sites, it is difficult or impossible to mitigate direct effects on TCPs such as Pumpkin Buttes. Overall, these management actions would have a negligible adverse effect on cultural resources due to the potential of historic properties leaving federal control as it is difficult to predict the actual number of acres that will be exchanged or sold.

Renewable Energy

Excluding or avoiding wind-energy development within the settings of historic properties would benefit cultural resources. Management under Alternative B would exclude renewable-energy projects wherever minerals development and other surface-disturbing activities are prohibited, but would not necessarily protect the settings of specific sites. In addition, 5,000 acres of disturbance on BLM surface are predicted. Development at this scale could adversely affect the physical characteristics of five historic properties.

Rights-of-Way and Corridors

Under Alternative B, restricting authorizations for communications sites in the Pumpkin Buttes area and maintaining existing land use authorizations until they expire would have a major beneficial effect on the Pumpkin Buttes TCP. Restricting facilities to protect visual integrity would have a beneficial effect on the setting of historic properties. Retaining BLM-administered lands that have important natural resource values would have a beneficial effect on cultural resources. Management under this alternative would exclude ROW activity from 706,556 acres of BLM surface and restrict communications sites on the Pumpkin Buttes TCP, which would have a beneficial effect on cultural resources. The predicted disturbance from ROW actions is 18,011 acres of BLM surface; this could adversely affect 18 historic properties. Overall the management actions would have a moderate beneficial effect as immediate threats to certain sites are eliminated.

Travel and Transportation Management

Under Alternative B, prohibiting OHV use and limiting vehicle travel would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Recreation

Under Alternative B, prohibition of surface disturbance would beneficially affect cultural resources by reducing an immediate threat of surface disturbance.

Lands with Wilderness Characteristics

Alternative B management of lands with wilderness characteristics would have no effect on cultural resources.

Livestock Grazing Management

Under Alternative B, locating mineral supplements away from sensitive resources (including historic properties) would benefit cultural resources. Restricting livestock grazing would have an indirect beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Special Designations

Areas of Critical Environmental Concern

Under Alternative B, determining that Cantonment Reno and Pumpkin Buttes are ACECs would benefit those cultural resources as site specific protective measures are implemented. There also

would be a benefit to cultural resources in all other ACECs as surface disturbance would be restricted. Overall, this management would have a major beneficial effect on cultural resources as protection, preservation and enhancement of cultural resources would be a priority.

4.5.1.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to cultural resources due to its implementation.

Cultural Resources

Unless specifically noted below, Alternative C management actions and effects would be the same as management and effects under Alternative A.

Not establishing site stewardship opportunities could result in adverse effects on cultural resources. Site stewardship provides opportunities for site condition monitoring the BLM cannot normally perform. Monitoring site condition is the best way to identify and prevent natural and human-caused degradation of cultural resources.

Not developing and implementing CRMPs for specific sensitive sites or regions could result in adverse effects on cultural resources. Absent definite plans or process for monitoring and stabilizing cultural resources, historic properties could experience inadvertent neglect.

Applying NSO stipulations to leases to protect the setting of historic properties would have a beneficial effect on cultural resources. However, applying an NSO stipulation to a concept as broad as the setting of a historic property without a well- defined extent might preclude the opportunity to develop a lease.

Not pursuing programmatic agreements with tribes could have an indirect adverse effect on cultural resources. A large part of determining significance for certain cultural resources includes consultations with Native American tribes, and precluding an opportunity to facilitate consultation is counter intuitive. Absent programmatic agreements, tribes could decline to fully consult with BFO, inadvertently leading to adverse effects on cultural resources as a result of federal authorizations.

Applying NSO stipulations to leases to protect sacred sites and TCPs would have a beneficial effect on cultural resources. However, applying an NSO stipulation to a particular site type could preclude the opportunity to develop a lease.

Not involving Native American monitors in any surface-disturbing activity could have an indirect adverse effect on cultural resources. Archeological monitors might not be qualified to perform the same types of monitoring as Native American monitors, and there could be inadvertent adverse effects on cultural resources.

Physical Resources

Air Quality

Alternative C air quality management would have no effect on cultural resources.

Soil

Under Alternative C, allowing surface disturbance in areas with severe erosion hazard could result in inadvertent adverse effects on cultural resources through increased erosion. Allowing

surface occupancy on rock outcrops could lead to adverse effects through the destruction of rock art sites or Native American burial sites. Overall, soils management under Alternative C could have a negligible adverse effect on cultural resources since activities would be allowed in areas that may contain sensitive sites.

Water Resources

Management actions for and effects on water resources would be the same as actions and effects under Alternative A.

Cave and Karst Resources

All restrictions on activities around and in cave and karst resources would have an indirect beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Mineral Resources

Locatable Minerals

Under this alternative, 1,455 acres of soils are predicted to be disturbed, with potential adverse effects on one historic property. Uranium development would likely occur on Pumpkin Buttes, which would have a major adverse effect.

Leasable Minerals – Coal

The surface disturbance prediction of 195,700 acres of coal development under Alternative C would affect 195 historic properties. This would have a major adverse effect on cultural resources.

Leasable Minerals – Fluids

Under Alternative C, approximately 22,255 of the 3,386,530 acres of federal fluid mineral estate are predicted to be disturbed from construction of well sites, access roads, and pipelines. This could result in physical impacts to 22 historic properties, although there would be a much larger number of sites, such as sites along the Bozeman Trail and the Pumpkin Buttes TCP that would experience impacts to setting.

Salable Minerals

Under Alternative C, 2,090 acres of soils are predicted to be disturbed, with potential effects on one historic property. This would have a negligible adverse effect on cultural resources.

Fire and Fuels Management

Fire and fuels management would be analyzed on a project-specific basis under Alternative C and would not result in an effect to cultural resources. Alternative C fire and fuels management and effects therefrom would be the same as management and effects under Alternative A.

Biological Resources

Under Alternative C, effects on **Forests and Woodlands**, **Invasive Species and Pest Management**, and **Grassland and Shrubland Communities** would be analyzed on a project-specific basis and would not result in any inadvertent benefits to cultural resources. Alternative C management of these resources and effects on cultural resources would be the same as management and effects under Alternative A.

Vegetation – Riparian/Wetland Resources

Under Alternative C, allowing surface disturbance within 500 feet of riparian and wetland areas could lead to inadvertent negligible adverse effects on cultural resources since buried cultural resources can occur in alluvial deposits and activities would be allowed in areas that may contain sensitive sites.

Fish and Wildlife Resources – Fish and Wildlife and Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Under Alternative C, any prohibitions on surface disturbance and the application of NSO stipulations for management of fish and wildlife resources and SSS would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Heritage and Visual Resources**Paleontological Resources**

Alternative C management of paleontological resources would have no effect on cultural resources as proposals would be analyzed on a project-specific basis and mitigated where necessary to not result in any effects to cultural resources.

Visual Resources

Any action to protect visual resources would help preserve the setting of historic properties and visual integrity which would result in minor beneficial effects on cultural resources.

Land Resources

Under Alternative C, effects from **Forest Products, Lands and Realty, Renewable Energy, Travel and Transportation Management, Recreation, Lands with Wilderness Characteristics, and Livestock Grazing Management** would be analyzed on a project-specific basis and would not result in any inadvertent benefits to cultural resources. Alternative C management of these resources and resulting effects on cultural resources would be essentially the same as management and effects under Alternative A.

Rights-of-Way and Corridors

Under Alternative C, allowing unrestricted development of communications towers on Pumpkin Buttes would have a major adverse effect on the Pumpkin Buttes TCP.

Special Designations**Areas of Critical Environmental Concern**

Under Alternative C, failure to manage Pumpkin Buttes as an ACEC could have a major adverse effect to cultural resources. Without any surface use restrictions, there could be major, long term impacts to the Pumpkin Buttes TCP.

4.5.1.6. Alternative D

This section describes management actions and potential impacts to cultural resources under Alternative D, which generally allows resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and emphasizes moderate

constraints on resource uses to reduce adverse effects on resource values. Alternative D is the Proposed RMP.

Cultural Resources

Establishing sites stewardship opportunities with SHPO and other stakeholders would be a benefit to cultural resources. Site stewardship results in increased monitoring of sensitive sites, allowing to efficiently react to any threats to those sites. Providing these opportunities allows the public to participate in site preservation and protection with little cost to BLM.

Developing CRMPs for the sites and regions identified under Alternative D would have a beneficial effect on cultural resources in those areas.

Applying NSO stipulations to the sites identified under Alternative D would have a beneficial effect on cultural resources in those areas. Surface disturbance associated with mineral leases would not be allowed in these areas. The NSO will apply to a minimum of a 40 acre block centered on the specific site boundary. If the site boundary was larger than 40 acres, the boundary of the NSO was defined by all the aliquot parts (minimum size of 40 acres) that the site boundary crossed. As a result of the application of the CSU, projects within 3 miles of these sites might need to be modified to create a weak contrast to the setting of specific historic properties. Examples of project modifications that may be necessary to reduce a project to a weak contrast include (but are not limited to), painting infrastructure to blend in with its surroundings, reducing the footprint of surface disturbance, use of smaller or less conspicuous infrastructure or routing roads or pipelines to follow natural contours rather than making straight lines. The CSU would not apply to drilling activities and temporary infrastructure (such as a drill rig or work over rig) used during the drilling process. Some proposals that involve large or conspicuous infrastructure might not be allowed within 3 miles of the sites if adverse effects could not be mitigated to the point where they create a weak (or less) contrast. BFO would need to complete a maintenance action or plan amendment to add any new NSO and/or CSU restrictions to any similar sites that may be discovered after the signing of the RMP. If upon site-specific analysis it is determined by BLM that the setting of any of the sites listed in Cultural-5006 is compromised, the CSU may be waived as described in Appendix H (p. 1959).

Restricting surface disturbance on the sites identified under Alternative D would have a beneficial effect on cultural resources. Allowing undertakings only if they would result in a weak (or less) contrast to the setting of the sites also would have a beneficial effect on cultural resources. Projects within three miles of the sites may need to be modified in order to create a weak contrast to the setting of specific historic properties. Some proposals that contain large or conspicuous infrastructure may not be permitted within three miles of the sites listed in the alternative if the impacts cannot be mitigated to the point where they create a weak contrast or less.

Requiring archeological monitors in accordance with the developed strategy would have a beneficial effect on cultural resources. Archeological monitoring would be required in accordance with a written strategy outlined in a plan based on the best available geomorphologic and archeological data. Proper treatment of cultural resources discovered during archeological monitoring would be outlined in the strategy. Adopting a strategy for archeological monitoring would result in consistency between consultations with the SHPO and tribes, and would improve working relationships. Requiring Native American monitors on a project-specific basis or based on agreements with tribes would have a beneficial effect on cultural resources. Monitoring would likely be required only for large or high-profile projects if it were applied on a project-specific

basis. Determining Native American monitoring based on agreements with tribes would result in consistency in government-to-government consultations and improved working relationships.

Establishing agreements to provide tribal access to the Pumpkin Buttes and other TCPs or sacred sites on BLM surface would result in improved working relationships with tribes and ensure that the field office meets its responsibilities under various statutes and EOs. Establishing agreements to provide tribal access to known TCPs and sacred sites also would have a beneficial effect.

There is currently one documented TCP (Pumpkin Buttes) in the planning area, which would be protected through management actions Cultural 5005, 5006, and 5007. Any other TCPs which may be identified in the future and sacred sites would only be withdrawn from minerals entry or leasing if BFO completed a maintenance action or plan amendment. Impacts to these sites would be mitigated on a project-specific basis. Mitigation might not be possible for certain sacred sites and TCPs, which would require that projects be modified or denied. This management would have a negligible to moderate beneficial effect on cultural resources.

Overall, Alternative D management of cultural resources would have a major beneficial effect as protection, preservation and enhancement of certain cultural resources is a priority.

Physical Resources

Air Quality

Alternative D air quality management actions would have no effect on cultural resources.

Soil

Under Alternative D, the application of any NSO stipulations and prohibiting surface disturbance would benefit cultural resources. This alternative would protect soils by prohibiting surface disturbance on more than 1.5 million acres, which would protect buried cultural resources. Prohibiting surface occupancy on rock outcrops would protect rock art, rock shelters, and Native American burials would reduce an immediate threat of surface disturbance.

Water Resources

Under Alternative D water management, prohibiting surface disturbance and applying NSO stipulations would have a beneficial effect on cultural resources. The stream buffer would protect cultural resources in alluvial deposits on 19,861 acres of BLM surface and 95,172 acres over federal fluid mineral estate.

Cave and Karst Resources

Developing and implementing CRMPs would benefit cultural resources where historic properties are present in caves. Prohibiting surface disturbance and applying CSU stipulations would have a beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Mineral Resources

In general, the amount of area available for minerals exploration and development under Alternative D is comparable to that available under Alternative A, as is predicted development. Alternative D incorporates similar levels of resource protections as Alternative A, but with defined exception criteria.

Locatable Minerals

Under this alternative, 1,252 acres of soils are predicted to be disturbed by locatable minerals activities, with the potential to affect one historic property. Uranium development would likely occur on Pumpkin Buttes, which would have a major adverse effect on cultural resources.

Leasable Minerals – Coal

Opening all federal lands to coal exploration or leasing under Alternative D would have an adverse effect on cultural resources. Although mitigation of historic properties would be required prior to coal mining, all archeological sites in mining areas would be destroyed. Although scientific data would be gained through site mitigation, sites that could include data important to future researchers would be destroyed. It is difficult to locate sites that are completely buried and have no expression on the surface or in a cutbank. It is very likely that undiscovered significant buried sites would be destroyed during mining operations. In addition, there might not be mitigation related to the destruction of TCPs or sacred sites. The surface disturbance prediction of 195,700 acres of coal development could adversely affect 195 historic properties.

Leasable Minerals – Fluids

The approximate total acres disturbed associated with the construction of well sites, access roads, and pipelines are 14,869 acres. This could result in physical impacts to 14 historic properties, although there would be a much larger number of sites such as the Bozeman Trail and the Pumpkin Buttes TCP that would experience impacts to setting.

Salable Minerals

Under Alternative D, a predicted 1,193 acres of soils would be disturbed from salable minerals activities, with the potential to affect one historic property.

Fire and Fuels Management

Under Alternative D, restricting the use of heavy equipment for fire suppression within historic properties would benefit cultural resources by reducing an immediate threat of surface disturbance.

Biological Resources**Vegetation – Forests and Woodlands**

Alternative D management of forests and woodlands would have no effect on cultural resources.

Vegetation – Grassland and Shrubland Communities

Only authorizing native plant species for reclamation would benefit cultural resources as immediate threats to the setting of sites would be reduced.

Vegetation – Riparian/Wetland Resources

Prohibiting surface disturbance and applying NSO stipulations for riparian and wetland areas would have a beneficial effect on cultural resources. A buffer around riparian and wetland areas would prohibit surface disturbance on 23,831 acres of BLM surface and 144,045 acres overlying federal fluid minerals in areas with a high likelihood to have buried cultural deposits.

Invasive Species and Pests

Alternative D management of invasive species and pests would have no effect on cultural resources.

Fish and Wildlife Resources – Fish and Wildlife and Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Increasing prohibitions on surface disturbance and applying NSO stipulations for the protection of fish and wildlife resources and SSS would have a beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Heritage and Visual Resources**Paleontological Resources**

Prohibiting surface disturbance, closing to leasing, and withdrawing lands from minerals activities would have a beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Visual

Managing specific areas as VRM Class II and III could have a minor beneficial effect on cultural resources as immediate threats to the setting of sites would be reduced.

Land Resources

Alternative D management of **Forest Products, Recreation, and Lands with Wilderness Characteristics** would have no effect on cultural resources.

Lands and Realty

Land exchanges can result in adverse effects if historic properties leave public ownership. Inventory and associated mitigation of historic properties must be completed before exchanges. However, when considering Native American religious or traditional use of certain sites, it is difficult or impossible to mitigate direct effects on TCPs such as Pumpkin Buttes. The BFO would be responsible for managing any cultural resources on new lands the BLM might acquire. Overall, these management actions would have a negligible adverse effect on cultural resources.

Renewable Energy

Excluding renewable-energy development within 3 miles of historic properties that retain their settings would have a beneficial effect on cultural resources. Restricting renewable-energy development more than 3 miles from historic properties but still visible to the properties that retain their settings would have a beneficial effect on cultural resources. Almost the entire planning area is within sight of at least one historic property that retains its setting. It is likely that any renewable-energy development authorized by the BLM would be required to mitigate impacts to the setting of at least one historic property. However, due to the scattered and interspersed land ownership pattern, there would likely be very few cases in which the BLM would be the lead agency authorizing this type of development. Overall the effect of renewable energy management actions on cultural resources would be minor adverse as there would be a slight but detectable change.

Rights-of-Way and Corridors

Restricting authorizations for communications sites in South Middle Pumpkin Butte to existing towers and prohibiting towers on North Middle Pumpkin Butte would benefit cultural resources. Restricting facilities to protect visual integrity would have a beneficial effect on the settings of historic properties. The predicted disturbance from ROW actions is 38,762 acres of BLM surface, which would adversely affect 38 historic properties. Overall, due to the amount of disturbance, these management actions would have moderate adverse effects on cultural resources.

Travel and Transportation Management

Under Alternative D, prohibiting OHV use and limiting vehicle travel in the transportation alternatives would result in a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Livestock Grazing Management

Any restriction of livestock grazing would have an indirect beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Special Designations**Areas of Critical Environmental Concern**

Under Alternative D, designating Pumpkin Buttes an ACEC would greatly benefit this TCP by making protection, preservation and enhancement of the Pumpkin Buttes TCP a priority. The cultural resource protections given to Cantonment Reno under this alternative negate the justification for determining the area an ACEC. Overall, ACEC management actions would have a moderate beneficial effect on cultural resources.

4.5.1.7. Cumulative Impacts

Actions outside of the scope of BLM authority have the potential to significantly impact cultural resources on and off federal lands. Because of the high visual contrast created by wind-energy projects, they can completely compromise the settings of historic properties, even if they are several miles away. Certain BLM actions intended to preserve the setting of any historic property could be negated by construction wind-energy projects on non-BLM-administered lands. In July of 2010, the Wyoming Industrial Siting Commission permitted a 100 turbine wind energy project which is within clear view of the entire eastern half of the Pumpkin Buttes (Wyoming DEQ 2014). Construction of the project may effectively compromise the setting of the TCP. The project has yet to be constructed, but if it happens, the BLM may no longer consider impacts to the setting of the TCP from federal undertakings. However, prior to doing so BLM must make a formal determination in consultation with the SHPO and all interested parties that the setting of the TCP is no longer intact and a maintenance action or plan amendment may be necessary.

Fee actions constructed in support of federal actions can result in impacts to historic properties. Large CBNG developments often include associated infrastructure that is not permitted through the BLM. Project applicants could connect wells to drain fee minerals, or use previously constructed pipelines on fee surface with a federal plan of development. The BLM has no authority over such private development, which can adversely affect historic properties. For example, the BLM approved several CBNG plans of development containing hundreds of individual wells near the Pumpkin Buttes TCP that were designed to blend into the natural environment to reduce impacts to the setting of the site. The operator also constructed a fee action pipeline with a large storage tank to dispose of water from federal and fee wells. The storage tank created a strong visual contrast to the setting of the TCP. Although the project resulted in an adverse effect, the BLM did not have any regulatory authority over the project.

The nature of split estate minerals development is complex. The BLM has the authority to modify or deny federal undertakings on private surface. However, that authority is limited to the extent of the federal approval. Historic properties on private surface are the property of the surface owner. A surface owner is not obligated to preserve or protect any historic properties they own. The

BLM might go to great lengths to protect a site on private surface from a federal undertaking, but the same site can be legally affected by the landowner at any time.

The cumulative effect of numerous federal approvals can adversely affect historic properties. Archeological inventories reveal the locations of sites, and although the BLM goes to great lengths to protect site location data, that information can get into the wrong hands. BLM authorizations that result in new access can inadvertently lead to impacts to sites from increased visitation by the public. In addition, any time the BLM identifies a site to the public in an interpretive context, there is increased potential for vandalism or looting of the site.

4.5.1.8. Conclusion

Beneficial and adverse effects on cultural resources are typically a reflection of the amount of surface disturbance caused by an authorized activity. Therefore, Alternative B would provide the greatest protections for cultural resources, followed by Alternative D, Alternative A, and Alternative C.

4.5.2. Paleontological Resources

Significant paleontological resources are almost always contained in the bedrock rather than in well-developed soil horizons or more recent alluvial material. Many BLM-administered lands in the planning area exhibit exposed or thinly covered bedrock or badlands topography, which results in a higher potential for the discovery of important fossil localities. Alternatives that include actions that would affect the bedrock could directly affect paleontological resources by physically altering, damaging, or destroying significant paleontological resources or their contextual settings. Alternatives that would increase or make access easier also could have indirect effects, including vandalism, theft of materials, and inadvertent physical damage to significant paleontological resources or their settings. Finally, disposing of lands containing paleontological resources would remove those resources from public ownership, which would mean the loss of any legal protections for those resources and the loss of opportunities for public collecting or education. Conversely, actions that result in data collection and preservation of paleontological resources through research or applied mitigation efforts can be considered beneficial. Acquiring lands with paleontological resources also would be beneficial to the public by providing important protections for significant paleontological resources and increasing opportunities for education and casual collecting.

Surface disturbance would be expected to result in short- and long-term adverse effects to paleontological resources. Short-term effects would occur at the time of disturbance and up to 5 years following disturbance, before full revegetation and soil stabilization. Long-term effects could occur beyond 5 years as a result of erosion that might be associated with altered drainage patterns or reclamation efforts that are not 100 percent effective in soil and landscape stabilization. This erosion could lead to accelerated exposure and subsequent damage to or loss of fossils and their contexts.

4.5.2.1. Methods and Assumptions

Methods and assumptions used in this impact analysis are:

- The management actions and allowable uses with the greatest potential to impact paleontological resources are surface-disturbing activities associated with all resources, changes in land ownership, public accessibility, and OHV use.
- Proactive paleontological resources management can lead to better knowledge, increased protections of those resources, and increased public benefits. Actions such as BLM-initiated studies, identification of hobby collecting areas, and public education and interpretation efforts can lead to better management and use of paleontological resources under all the alternatives. Inventories required before surface disturbance in high-probability areas would result in the identification and evaluation of previously undiscovered resources, which the BLM would then manage accordingly. Surface-disturbing and disruptive activities could dislocate or damage paleontological resources not discovered before surface disturbance (unanticipated discoveries). Destruction of these resources would result in a loss of scientific information and preclude interpretation of the resource values to the public.
- Significant paleontological resources will continue to be found in the planning area, either from the effects of natural erosion and exposure or through mitigation of surface-disturbing activities, as well as research activities.
- Adverse effects on paleontological resources from surface-disturbing activities occur primarily at the time of initial surface disturbance. Therefore, the projected acreage or mileage numbers for short-term surface disturbance are used to quantify impacts to paleontological resources. Erosion resulting from long-term surface disturbance also can adversely affect paleontological resources, but to much less extent because most reclamation efforts will be successful.
- BLM WO IM No. 2009-011 Assessment and Mitigation of Potential Impacts to Paleontological Resources, describe mitigation procedures for paleontological resources. All surface-disturbing activities and land tenure adjustments will follow the procedures in that memorandum.
- Proper application of standard paleontological mitigation practices will identify and recover many significant paleontological resources during disturbance actions.
- Locations of known paleontological resources will be protected either by avoiding the location or full recovery of significant fossils and all related data. Avoidance is the preferred approach in all cases. New locations discovered during mitigation actions will be avoided as much as possible, or full recovery of significant fossils and data will be completed before disturbance activities will be authorized to begin or to resume.
- It is likely that a some significant paleontological resources will be destroyed during surface-disturbing activities because they will not be seen or recovered. This will primarily be a function of the large size of machinery being used, the larger volume of material being disturbed or removed, and the relatively small size of many significant fossils.
- Paleontological resources are considered a part of the surface resource.

Significance Criteria

Adverse effects on paleontological resources would be significant if an action or development causes substantial direct or indirect damage to or destroys important paleontological resources.

4.5.2.2. Impacts Common to All Alternatives

Paleontological Resources

The types of projected impacts to paleontological resources under the alternatives are similar – primarily physical damage, destruction, or other loss of significant fossils, or alteration or loss of contextual information. However, the intensity of these effects would vary by alternative. Implementing paleontological resource mitigation procedures would protect

most paleontological resources and add to the overall public knowledge through recovery of significant fossils and their associated contextual data. However, mitigation measures also can adversely affect development of other resources or implementation of other actions by preventing or otherwise altering project locations or the degree of development. These adverse effects are anticipated to be relatively rare and minor in scope.

Management actions associated with paleontological resources would directly protect paleontological sites through restrictions on surface-disturbing and disruptive activities. These protective measures are required by law before any surface-disturbing or disruptive activity and include measures such as paleontological resource inventory and mitigation of potential effects, generally through avoidance. In areas where inventory, evaluation, and avoidance are not considered adequate to preserve paleontological resources, mitigation measures would be prescribed on a case-by-case basis, depending on the nature of the action and the type of paleontological resource involved. Mitigation measures would ensure that a proposed action would not significantly affect known paleontological sites. These management actions would apply to any proposed actions that have the potential to affect paleontological resources. Paleontological resource inventory, recordation, evaluation, and data recovery excavation would increase the site database and further our understanding of fauna and flora from geologic times. This increased knowledge would allow for the implementation of revised and more appropriate practices to manage future undertakings. Data recovery excavations would remove all or a portion of paleontological materials at sites, but would require an approved research design to minimize future data loss if new data-recovery and analysis techniques were developed.

Physical Resources

Management actions common to all alternatives for air quality and cave and karst resources would have a negligible effect on paleontological resources. Surface disturbance from management of soil resources would be evaluated on a project-specific basis. The effects of surface disturbance for actions associated with water resources would be managed. Overall, physical resources management actions common to all alternatives would have a minor beneficial effect on paleontological resources.

Mineral Resources

Under all alternatives, most lands in the planning area would be open for minerals exploration and development. Mineral development with its associated mitigation would have both adverse and beneficial impacts. Mitigation of paleontological resources associated with mineral development will have a beneficial impact as surface fossils will be documented. Surface resources will be identified, collected, and mitigated as the result of predisturbance activity. However, the actual disturbance has the potential of adversely affecting unknown subsurface material. Thus, paleontological resources in the subsurface could be adversely impacted if operators do not recognize the fossils that may be inadvertently uncovered.

Locatable minerals activities shall not knowingly disturb, alter, injure, or destroy any scientifically important paleontological remains, such activities may require mitigation plans be in effect before and during surface-disturbing activities. Impacts to paleontological resources from activities associated with leasable coal and fluid minerals management would have the potential to directly and indirectly affect paleontological resources because of the amount of surface disturbance involved in those actions. Management actions for other leasable minerals would be minimal,

since there is limited potential in the planning area. Overall the level of effect from mineral actions would be minor adverse.

Fire and Fuels Management

Wildland fire suppression activities (e.g., constructing of fire lines, bulldozing access roads, and general movement of heavy equipment) and post-fire rehabilitation activities would have an adverse effect on paleontological resources. Displacing paleontological resources adversely affects the potential to understand the context of the site and limits the ability to extrapolate data. Because of the unplanned nature of wildland fires, effects on paleontological resources from wildland fires and suppression activities are generally assessed and mitigated subsequent to the fire.

Biological Resources

Actions designed to maintain vegetative resources and manage wildlife habitat would indirectly protect paleontological resources by managing surface disturbance and minimizing soil erosion. This would help prevent the degradation of soils that might contain paleontological resources.

Heritage and Visual Resources

Cultural resources management actions common to all alternatives would have a negligible beneficial effect on paleontological resources. Visual Resources management actions common to all alternatives would have no effect on paleontological resources.

Land Resources

Lands and Realty

Disposing of BLM surface with known or previously undocumented paleontological resources would have an adverse effect on paleontological resources because of the lack of protective measures when lands are under private ownership. However, before disposal, lands would be examined for significant resource values, including paleontological resource values. If significant values are present, the parcels with those values could be removed from the disposal or considered for other protective actions. Conversely, acquiring lands in the planning area would have a beneficial effect on paleontological resources because of the protective measures offered under federal ownership. Lands could be acquired through direct purchase, legislative mandates, donations, condemnations, or exchanges. Resource values could be included in the identification of desired parcels, so important paleontological resources could be targeted for acquisition. At present, there are no acquisitions pending specifically for paleontological values.

Rights-of-Way and Corridors

ROW management actions affect paleontological resources. Requiring paleontological resources inventory, recordation, and mitigation procedures in conjunction with ROW actions would help protect most paleontological resources from significant damage and increase the database of known paleontological resource sites.

Travel and Transportation Management

Any road creation or substantial improvement or maintenance work, or any increase in OHV use would result in increased access to public lands that might not presently be readily accessible.

Road construction or new surface disturbance during maintenance also could adversely affect paleontological resources (see the discussion above on surface-disturbing activities). Therefore, adverse effects, such as looting, vandalism, and inadvertent physical damage, on previously remote paleontological resources could increase from an increase in use or development. Most use in Open areas is casual one-time use, so there would be very little increase in erosion, which typically is a result of repeated travel. If a vehicle drives directly on fragile fossils, significant paleontological resources could be damaged or destroyed, but this would be an extremely rare occurrence. Many of the existing roads and trails have not been examined for the presence of significant paleontological resources; therefore there would be a potential for loss of these resources on the acres presently in use. This would represent a major adverse effect on paleontological resources. OHV use on improved roads would have a negligible effect on paleontological resources. However, most unimproved two-track roads and vehicle routes in the planning area have not been inventoried for paleontological resources, which would increase the potential for unmitigated impacts. OHV use of these roads and vehicle routes would disturb or displace paleontological resources within the roadways. Inappropriate use of unimproved roads and vehicle routes by OHVs would accelerate erosion and indirectly disturb deposits that contain paleontological resources. Where effects on paleontological resources from OHV use are identified, there could be closures to motorized vehicle use to protect sensitive paleontological resources. Adverse effects on paleontological resources from OHV use off of roads and vehicle routes for necessary tasks would be negligible.

Recreation

Promoting recreation throughout the planning area could increase the amount of incidental or purposeful disturbance of paleontological resources. Unauthorized disturbance would result in displacement or loss (either complete or partial) of the paleontological resource involved. Displacement of paleontological resources adversely affects the potential to understand the context of the site and limits the ability to extrapolate data. Recreation management would affect paleontological resources by pursuing new access areas and consolidating public lands to increase recreational opportunities in these new areas, which would increase the potential for incidental or purposeful disturbance of paleontological resources. Facilitating use of these areas would result in increased surface-disturbing and disruptive recreational activity and the loss of vegetative cover, which would increase the potential to expose and destroy paleontological resources. The area of greatest overlap between paleontological resources and recreation is at the Dry Creek Petrified Tree site (2,567 acres).

Special Designations

Surface-use restrictions associated with management of special designation areas (ACECs, Scenic or BCBs, WSRs, and WSAs) would indirectly protect paleontological resources in these areas by reducing the potential for unanticipated discoveries and subsequent loss of paleontological information. Management could restrict the amount and size of surface disturbance, indirectly decreasing the potential to disturb buried paleontological deposits in special designation areas. Management of special designation areas would encourage recreation and development of facilities, which could result in direct damage to paleontological resources through surface-disturbing activities and indirectly affect those resources through the greater presence of human activity. Paleontological resource surveys and appropriate mitigation would be completed before any new facilities were constructed in high-fossil-yield formations. Protections afforded to special designation areas (i.e., intensive management of surface-disturbing and disruptive activities) would indirectly protect paleontological resources in these areas by reducing the

potential for unanticipated discoveries and subsequent loss of data. ROW exclusion requirements and stipulations in special designation areas would provide the greatest level of protection by prohibiting surface-disturbing activities.

Socioeconomic Resources

Management actions for socioeconomic resources would have a negligible beneficial effect on paleontological resources.

4.5.2.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes potential impacts to paleontological resources from management actions for those and other resources under Alternative A.

Paleontological Resources

See Impacts Common to All Alternatives above.

Physical Resources

Alternative A management actions for air quality and cave and karst resources would have a negligible effect on paleontological resources. Surface disturbance from management of soil resources would be evaluated on a project-specific basis. Limited surface disturbance for management actions for Soil with NSO stipulations is allowed. The effects of surface disturbance for actions associated with water resources would be managed on a project-specific basis. Overall, Alternative A physical resources management actions would have a minor beneficial effect on paleontological resources.

Mineral Resources

Under Alternative A, withdrawals and restrictions in specific areas would close these areas to locatable minerals entry and future land disposal actions. This would provide additional protections to paleontological resources in these areas by reducing surface-disturbing and disruptive activities and eliminating the possibility of placing undiscovered paleontological resources outside federal jurisdiction.

Mineral development with its associated mitigation would have both adverse and beneficial impacts. Mitigation of paleontological resources associated with mineral development will have a beneficial impact as surface fossils will be documented. Surface resources will be identified, collected, and mitigated as the result of predisturbance activity. However, the actual disturbance has the potential of adversely affecting unknown subsurface material. Thus, paleontological resources in the subsurface could be adversely impacted if operators do not recognize the fossils that may be inadvertently uncovered. Overall the level of effect would be minor adverse.

Fire and Fuels Management

Under Alternative A, wildland fire suppression activities would be limited, which could protect natural and cultural resources. This would help reduce damage to paleontological resources

from suppression activities by considering these resources when determining the degree and locations of suppression activities.

Biological Resources

Alternative A would allow project-specific effects from biological resources management actions, and would prohibit surface-disturbing activities, occupancy, and disruptive activities in specific areas. Protections afforded for species and habitat would indirectly protect paleontological resources by restricting the amounts and sizes of disturbances that could adversely affect paleontological resources through displacement or loss. Surface-use restrictions associated with management of wildlife and fisheries would indirectly protect paleontological resources in specific areas by reducing the potential for unanticipated discoveries and subsequent loss of information about paleontological resources. Surface-disturbing and disruptive activities would be managed, and could restrict the amounts and sizes of surface disturbance, indirectly decreasing the potential to adversely affect paleontological deposits in these areas.

Heritage and Visual Resources

Cultural resources management actions common to all alternatives would have a minor beneficial effect on paleontological resources. Visual resources management actions would have no effect on paleontological resources.

Land Resources

No effects from management of **Forest Products, Renewable Energy, ROW and Corridors, or Lands with Wilderness Characteristics** are anticipated to occur to paleontological resources and will not be addressed further in this section.

Lands and Realty

Development activities associated with lands and realty actions could affect paleontological resources. Because of the large-scale nature of these types of developments, there would be a potential to adversely affect paleontological sites. Areas with important resource values such as significant paleontological resources would be avoided where possible to reduce the effects of these types of developments. Where it becomes necessary to place developments in the avoidance areas, effects would be intensively managed. In addition, oil and gas leasing, locatable minerals entry, and mineral materials disposals would be managed. This management could restrict the amounts and sizes of surface disturbance, decreasing the potential for adverse effects on paleontological deposits in these areas.

Under Alternative A, 108,243 acres of BLM surface are identified for disposal through sales or exchange due to small parcel size or other management considerations. This could have a major adverse effect on paleontological resources. However, before disposal, these lands would be examined for significant resource values, including paleontological values. If significant values are present, the parcels with those values might be removed from the disposal or considered for other protective actions. Conversely, acquiring lands in the planning area would have a beneficial effect on paleontological resources due to the protective measures offered under federal ownership.

Travel and Transportation Management

Alternative A would seasonally open 37,646 acres to motorized travel, would designate motorized

travel on 737,166 acres of existing roads and trails, and close 3,650 acres to motorized travel. Most use in Open areas would be casual one-time use, so there would be very little increase in erosion, which typically is a result of repeated travel. If a vehicle drove directly on fragile fossils, significant paleontological resources could be damaged or destroyed. However, this would be an extremely rare occurrence. Many of the existing roads and trails have not been examined for the presence of significant paleontological resources; therefore, there would be a potential for loss of these resources on the acres where motorized travel would be Open or Limited. This would have a major adverse effect on paleontological resources.

Recreation

Although there could be impacts to paleontological resources from recreation activities, Alternative A would manage certain recreation areas to limit surface disturbance. Applying an NSO stipulation for development activities in developed and undeveloped recreation sites and intensively managing such activity would limit surface disturbance and thereby help prevent damage to paleontological resources in these areas. Recommending withdrawal to locatable minerals entry and closing developed recreation sites and mineral materials disposal would provide further protection from surface-disturbing and disruptive activities.

Livestock Grazing Management

Constructing livestock range improvements could damage or dislocate paleontological resources in these areas not discovered before surface disturbance. Standard inventory and mitigation procedures in high-fossil-yield areas in conjunction with range improvement actions would protect most paleontological resources from significant damage and would increase the database of known paleontological sites. A small but proportional number of these sites would be adversely affected as a result of unanticipated discoveries, but the effects would be mitigated through standard treatment measures. Designing livestock grazing systems to improve or maintain desired range conditions would maintain vegetative cover and soil stability, and thereby prevent the indirect exposure and deterioration of paleontological resources.

Special Designations

Alternative A would not designate ACECs and would continue current management of areas proposed for ACEC designation under other alternatives. If not designated wilderness, specific WSAs could be opened for oil and gas development. Alternative A management of special designations would have a negligible adverse effect on paleontological resources.

Socioeconomic Resources

Alternative A effects on paleontological resources from management actions related to socioeconomic resources would be beneficial but negligible.

4.5.2.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to paleontological resources from management of those and other resources from implementation of Alternative B.

Paleontological Resources

Alternative B would require paleontological surveys on all PFYC Class 3, 4, and 5 formations potentially affected by proposed activities, and would require monitoring of

surface-disturbing activities on Class 4 and 5 formations and on Class 3 formations as needed. Alternative B would not specify areas for casual collecting; could designate special management areas for paleontological resources; could withdraw or close areas to locatable minerals leasing in areas of important paleontological resources; and could prohibit salable minerals exploration and development in areas of important paleontological resources. Assessments of paleontological resources would be actively solicited and cooperative agreements proactively supported under Alternative B. These management actions would have a major beneficial effect on paleontological resources.

Physical Resources

Alternative B management of air quality and cave and karst resources would have a negligible effect on paleontological resources. Prohibited surface disturbance associated with management actions for soil and water would have a beneficial effect on paleontological resources.

Mineral Resources

Alternative B effects on paleontological resources from minerals management would be similar to effects under Alternative A, but Alternative B would include more withdrawals and restrictions. However, there is always the opportunity with subsurface activities that paleontological resources will be damaged; therefore, the level of effect is minor adverse.

Fire and Fuels Management

Under Alternative B, limiting the use of heavy equipment during fire suppression efforts would have a minor beneficial effect on paleontological resources. However, Alternative B includes full suppression of wildfires, which would allow fuels to build up and increase the intensity of wildfires. If wildfires increased in intensity, the result would be increased soil erosion, greater loss of vegetation, slower recovery of plant communities, and the consequential indirect deterioration of paleontological properties. The potential for damage to paleontological resources from fire suppression activities decreases when there are fewer surface-disturbing suppression activities.

Biological Resources

Alternative B would prohibit surface-disturbing activities, occupancy, and disruptive activities in specific areas, and apply NSO, CSU, and TLS stipulations in certain areas. Alternative B protections for fish, wildlife, and plant species and their habitats would indirectly protect paleontological resources by restricting the amounts and sizes of disturbances that could adversely affect paleontological resources through displacement or loss. Surface-use restrictions associated with management of wildlife and fisheries would indirectly protect paleontological resources in specific areas by reducing the potential for unanticipated discoveries and subsequent loss of paleontological information. Surface-disturbing and disruptive activities would be managed, which could restrict the amounts and sizes of surface disturbances, indirectly decreasing the potential to adversely affect paleontological deposits in these areas. Alternative B effects on paleontological resources from management of biological resources would be similar to effects under Alternative A, but Alternative B would include more restrictions on surface disturbance.

Heritage and Visual Resources

Alternative B cultural resources management actions, such as site stewardship, withdrawals from minerals exploration and development, closures to minerals leasing, and prohibitions on surface disturbance would have a minor beneficial effect on paleontological resources. Visual resources management actions would have no effect on paleontological resources.

Land Resources

Lands and Realty

The BLM surface acreage identified for possible disposal under Alternative B is 120,722 acres and would represent a major adverse effect on paleontological resources. Consideration of resource values would affect the actual number of acres disposed of, and parcels with important resource values would be retained. Under this alternative, more restrictions would be applied during consideration of approvals, so resource values present in the tracts would more often result in retention of parcels. Disposing of BLM surface acres would adversely affect paleontological resources as described under Alternative A, but under Alternative B, fewer acres would be transferred to public ownership.

Travel and Transportation Management

The types of impacts anticipated to occur from road development and OHV use under Alternative B are the same as described for Alternative A, but less intense. Alternative B would include the least amount of development and the most restrictions (as represented by acres of surface disturbance listed in Appendix G (p. 1937)), and close 625,854 acres to motorized use and limit motorized use elsewhere to designated roads and trails. These actions would have an indirect, beneficial effect on paleontological resources. Overall, the impacts to paleontological resources from TTM actions would be moderate beneficial.

Recreation

Alternative B management actions for recreation promote protection of paleontological resources. It is feasible that increased education could potentially reduce the level of vandalism or unauthorized removal of specimens.

Special Designations

Alternative B would designate eight ACECs, including Dry Creek Petrified Tree and Pumpkin Buttes, both known to contain significant paleontological resources, and would prohibit surface-disturbing activities in those special designations. Motorized and mechanized equipment use would be prohibited in WSAs. Surface-use restrictions associated with management of special designation areas would indirectly protect paleontological resources in these areas by reducing the potential for unanticipated discoveries and subsequent loss of paleontological information. The Dry Creek Petrified Tree area would require intensive management of surface-disturbing and disruptive activities. Intensive management could restrict the amounts and sizes of surface disturbance, indirectly decreasing the potential to disturb buried paleontological deposits.

Socioeconomic Resources

Alternative B management of socioeconomic resources would have a negligible beneficial effect on paleontological resources.

4.5.2.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to paleontological resources due management of those and other resources from its implementation.

Paleontological Resources

Alternative C would require paleontological resource surveys on all PFYC Class 4 and 5 formations potentially affected by proposed activities, could require monitoring on a project-specific basis, and could specify areas for casual collecting. Areas of important paleontological resources would not be designated under this alternative. Alternative C would not withdraw areas of important paleontological resources from locatable minerals entry, and would allow minerals leasing and salable minerals exploration in those areas. Partnerships to assess paleontological resources would be evaluated and established as appropriate.

Physical Resources

Under Alternative C, there would be negligible effects on paleontological resources from management actions associated with air quality and cave and karst resources. Soils management actions would allow surface-disturbing activities and water management actions would allow surface occupancy. There would be no NSO stipulations under Alternative C. Overall, Alternative C management of physical resources would have a moderate adverse effect on paleontological resources.

Mineral Resources

Under Alternative C, there would be no new locatable minerals withdrawals and all areas would be open to locatable minerals entry. This would provide fewer protections for paleontological resources by increasing surface-disturbing and disruptive activities.

Fire and Fuels Management

Alternative C would allow the use of heavy equipment for fire suppression and include full fire protection strategies and tactics. This would have a major adverse effect on paleontological resources because more wildland fires would be suppressed. Increasing suppression would increase the potential for catastrophic fires over the long term through the buildup of flammable materials that would damage a wider range of paleontological resource types.

Biological Resources

Alternative C biological resources management would allow or include limited restrictions on surface-disturbing activities, surface occupancy, and disruptive activities in specific areas, and would not apply NSO, CSU, and TLS stipulations or would apply those stipulations in a limited manner in certain areas. This management would have a minor adverse effect on paleontological resources.

Heritage and Visual Resources

Effects on paleontological resources from Alternative C management actions for cultural resources would be minor beneficial. Alternative C cultural resources management would not include site stewardship, minerals withdrawals, closures to minerals leasing, or prohibitions on surface disturbance. Visual resources management actions would have no effect on paleontological resources.

Land Resources

Lands and Realty

The BLM surface acreages identified for disposal under Alternative C is 120,722 acres, which would represent a major adverse effect. Considering resource values would affect the actual number of acres disposed of, and parcels with high resource values would be retained. Retention criteria under Alternative C would be at a lower level than under Alternative B, which would result in less acreage retained for resource values.

Travel and Transportation Management

The types of effects anticipated under Alternative C from road development and motorized vehicle use would be the same as those under Alternative A; however, there would be more acres under Alternative C where vehicle restrictions or closures would be applied than under Alternative A. Alternative C management would decrease development compared to Alternative A (as represented by surface disturbance numbers in Appendix G (p. 1937)), but would increase development and use compared to Alternative B. Alternative C would designate fewer acres for travel Limited to existing roads and trails or where travel is Closed than Alternative A.

Recreation

Impacts from Alternative C for Recreation would generally be the same as those from Impacts Common to All as there would not be strict protective measures limiting surface disturbance in SRMAs.

Special Designations

Alternative C would not designate ACECs, but would prohibit motorized and mechanized equipment in WSAs.

Socioeconomic Resources

Effects on paleontological resources from Alternative C management of socioeconomic resources would be negligible.

4.5.2.6. Alternative D

This section describes management actions and potential impacts to paleontological resources under Alternative D, which generally allows resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and emphasizes moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the **Proposed RMP**.

Paleontological Resources

Under Alternative D, paleontological resource surveys would be required on PFYC

Class 4 and 5 formations and Class 3 formations (as needed) potentially affected by proposed activities, and monitoring would be required for surface-disturbing activities based on survey results. Areas for casual collecting would not be specified; special management areas for paleontological resources could be designated; areas of important paleontological resources would be avoided during locatable and salable minerals development; NSO stipulations could be applied to minerals leases in areas of important paleontological resources; locatable minerals withdrawals and closures to minerals leasing in areas of important paleontological resources could be initiated; and salable minerals exploration and development in areas of important paleontological resources could be prohibited. Under Alternative D, partnerships to assess paleontological resources would be evaluated and established as appropriate, and cooperative agreements proactively supported. Alternative D management of paleontological resources would have a major beneficial effect on those resources.

Physical Resources

Under Alternative D, there would be negligible effects on paleontological resources from management actions for air quality and caves and karst resources. The alternative would allow surface disturbances for management of soils and water, which would have a major adverse effect on paleontological resources.

Mineral Resources

Alternative D effects on paleontological resources from locatable minerals and mineral materials management would be similar to effects under Alternative B.

Fire and Fuels Management

Alternative D effects on paleontological resources from fire and fuels management would be similar to effects under Alternative B.

Biological Resources

Alternative D would prohibit surface-disturbing activities, surface occupancy, and disruptive activities in specific areas and would apply NSO, CSU, and TLS stipulations in certain areas. Effects on paleontological resources from Alternative D management of biological resources would be similar to effects under Alternative B.

Heritage and Visual Resources

Minor beneficial effects would occur for paleontological resources from Alternative D management actions for cultural resources that would include site stewardship, minerals withdrawals, closures to minerals leasing, prohibitions on surface disturbance, and NSO and CSU stipulations, and would allow surface disturbance in certain areas. Visual resources management actions would have no effect on paleontological resources.

Land Resources

Lands and Realty

The BLM surface acreages identified for possible disposal under Alternative D is 120,722 acres and therefore would represent a major adverse effect on paleontological resources. Considering resource values would affect the actual number of acres disposed of, and parcels containing important resource values would be retained. Under this Alternative D, restrictions would be applied during consideration of approvals, so resource values present in the parcels would more often result in the parcels being retained. Disposing of BLM surface acres would have an adverse effect on paleontological resources as described for alternatives A and B; however, under Alternative D, acres transferred out of public ownership would be appropriately assessed for paleontological resources before disposal.

Travel and Transportation Management

The types of effects from road development and OHV use under Alternative D would be the same as under alternatives A, B, and C, but the intensity of effects would vary. In relation to the other alternatives, Alternative D includes determinable amounts of assessment and mitigation. These actions would have an indirect adverse effect on paleontological resources. Alternative D largely limits vehicle use to designated routes, while alternatives A and C would Open areas to such use. Keeping vehicles to defined routes under Alternative D should help protect paleontological resources better than alternatives A and C.

Recreation

Alternative D management actions for recreation seeks to balance recreational opportunities with protection of paleontological resources. It is feasible that increased education could potentially reduce the level of vandalism or unauthorized removal of specimens.

Special Designations

The ACEC with the greatest overlap of paleontological resources (Dry Creek Petrified Tree) would not be designated. However, Pumpkin Buttes TCP would protect some paleontological resources. Alternative D would prohibit motorized and mechanized equipment use in WSAs. Surface-use restrictions associated with management of special designations would indirectly protect paleontological resources in these areas by reducing the potential for unanticipated discoveries and subsequent loss of paleontological information.

Socioeconomic Resources

Effects on paleontological resources from management actions for socioeconomic resources be negligible beneficial.

4.5.2.7. Cumulative Impacts

Effects on paleontological resources from past and present actions (federal and non-federal) are part of the affected environment and are described in Chapter 3. Effects from foreseeable federal actions are described by alternative above. The primary non-BLM-authorized activities in the planning area relate to energy development, including ROW and livestock grazing. Non-federal actions will affect paleontological resources similar to federal actions; however the extent of disturbances and mitigation measures would vary. Paleontological resources belong to the surface estate and, except for leasable minerals, typically are not mitigated unless the surface estate is federal. Adverse effects to paleontological resources would likely be greater on non-federal surface, because there would be fewer federal mitigation measures implemented.

4.5.2.8. Conclusion

Allowable uses and management actions described for the alternatives were used to determine potential effects on paleontological resources. Meaningful differences in surface-disturbing activities; land disposal and acquisition; transportation and access; and proactive management form the basis for the following conclusion: Effects on paleontological resources under the alternatives would be similar, but the intensity of effects would vary by alternative. Proactive paleontological resource management actions would result in beneficial effects under all alternatives. Potential effects on paleontological resources under Alternative A would be the most adverse, whereas potential effects under alternatives B and D would be the least adverse. Potential adverse effects on paleontological resources under Alternative C would be approximately intermediate in intensity.

4.5.3. Visual Resources

BLM-administered public lands contain many outstanding scenic landscapes. While these lands provide a place to enjoy the beauty of nature, they also are used for a multitude of other activities. Any activities on these lands, such as recreation, mining, timber harvesting, grazing, or road development have the potential to disturb the surface of the landscape and adversely affect scenic values. VRM is a system for minimizing the visual effects of surface-disturbing activities and maintaining scenic values for the future. Disturbances that draw the viewer's attention or contrast with the basic elements (form, line, color, or texture) of a given landscape affect the viewer's perceptions.

Adverse effects include the addition of visual intrusions such as roads and facilities, or the removal of natural materials such as soil and vegetation). Beneficial effects are normally a direct result of post-disturbance reclamation efforts. Allowable uses and management actions that could affect visual resources primarily include surface development and vegetation management.

4.5.3.1. Methods and Assumptions

The BFO completed a Visual Resources Inventory in 2009 (BLM 2009b). This visual resources impacts analysis and its conclusions include a review of the VRI for the planning area, coordination with BLM specialists and information provided by cooperating agencies.

This section describes the methods and assumptions used in the impact analysis for visual resources. The assumptions and methods include, but are not limited to:

- VRM Classes are assigned to BLM-administered surface only.
- BMPs to protect scenic resources should be incorporated into project planning for all federal actions, including actions on split estate.
- VRM class objectives are not discretionary; all BLM-administered surface will be managed to meet the VRM objectives established during the RMP revision, and all subsequent management actions will be held to that objective. VRM class objectives provide for varying degrees of change to (effect on) the visual quality of the landscape and vary by alternative.
- Projects located on BLM surface would be designed or mitigated to meet the established VRM objectives of a given location. A proposed action would have a significant effect on visual resources if that action does not conform to the corresponding VRM class for an area and cannot be mitigated.

- If VRM objectives are not incorporated into project design or able to be mitigated in a site-specific analysis, either the application must be denied, an EIS must be prepared or the land use plan must be amended to assign the appropriate VRM Class that would accommodate approval of a permit or action.
- The VRI was created using quantifiable and consistent methods to classify the planning area based on the visual attributes and the visual sensitivity of the area.
- For site-specific projects, the visual resource analysis will focus on the individual visual values (Scenic Quality, Sensitivity and Distance Zones) in context of aesthetic elements and their relative frequency in the landscape rather than the aggregated values assigned through a VRI class.
- Scenic resources will remain in demand from local residents who want to maintain scenic quality, local businesses that depend on tourism, and increasing numbers of recreationists in the planning area.
- Temporary structures, defined as present on BLM-administered lands for less than 90 days, are not subject to visual effects mitigation.
- Future development and other land use activities described under each alternative are compared to recommended VRM classes, existing visual conditions, and the degree of measurable contrast to the natural environment to determine potential effects.
- To adequately describe the potential effects under each alternative in the context of the capacity for differing landscapes to absorb visual intrusions, actions potentially affecting visual resources are divided into general categories, as follows: high-profile developments, low-profile or short-term projects, and resource management prescriptions.
- A contrast rating evaluation will be performed for all surface-disturbing activities in VRM Class I, II, and III areas to determine effects on visual resources. Effects on visual resources that would not meet VRM class objectives will require mitigation in accordance with the VRM objectives. Contrast rating evaluations may or may not be required for high visual impact activities and projects in VRM Class IV areas. All projects within VRM Class IV will be required to minimize and mitigate effects to visual resources.
- Trends in visual change can be quantified using the scoring for the cultural modification factor of scenic quality in the VRI in comparison to implementation of a proposed action.
- The USFS manages approximately 720,000 acres of surface within the planning area. This analysis does not include any determination on visual resources management of lands outside of BLM jurisdiction. However, the objectives outlined for visual resources on lands managed by USFS (or other federal agencies, as appropriate) will be taken into consideration and consultation will take place for compatible visual/scenic resource management across jurisdictional boundaries where applicable.
- Management decisions that limit the amount of surface disturbance or that encourage the placement of projects away from the viewshed of publicly accessible areas and routes (roads, trails, and navigable waterways) will benefit visual resources, but must be weighed against impacts to other resources (soil, wildlife, etc.).
- Most oil and gas development is expected to occur in the PRB.
- Coal mining operations would be most likely to occur in Campbell County (PRB).
- Disposal of public lands would remove all VRM designations and accompanying objectives for protection of their scenic values.

The following terms are used to define the extent of environmental consequences:

- Negligible – The effect on the visual resource would be barely detectable; general stipulations would be sufficient to mitigate adverse effects on the visual resource. This term would also be

used to describe impacts from prescription of a particular VRM class for less than one percent of the BLM-administered land in the planning area.

- Minor – The effect on the visual resource would be slight but detectable; there would be a small change in the visual resource. General stipulations would not be sufficient to mitigate adverse effects on the visual resource; additional review or simulations might be necessary. This level of impact is considered to be out of conformance with VRM Class I and II management objectives, which may require additional mitigation of proposed actions, serve as the basis for denying the proposed action, or require a land use plan amendment to alter the VRM Class to one compatible with proposed action. This term would also be used to describe impacts from prescription of a particular VRM class for 1-5 percent of the BLM-administered land in the planning area.
- Moderate – The effect on the visual resource would be readily apparent; there would be a measurable change in the visual resource. General stipulations would not be sufficient to mitigate adverse effects on the visual resource; alternative sites or a change in project design might be necessary. This level of impact is considered to be out of conformance with VRM Class I, II, and areas of high visual sensitivity, which may require additional mitigation of proposed actions, serve as the basis for denying the proposed action, or require a land use plan amendment to alter the VRM Class to one compatible with proposed action. This term would also be used to describe impacts from prescription of a particular VRM class for 5–10 percent of the BLM-administered land in the planning area.
- Major – The effect on the visual resource would be great; there would be a highly noticeable, long-term, or permanent measurable change at the project site. Administrative stipulations would not be sufficient to mitigate adverse effects on the visual resource; alternative sites or a change in project design would be necessary. This level of impact is considered to be out of conformance with VRM Class I, II and III, which may require additional mitigation of proposed actions, serve as the basis for denying the proposed action, or require a land use plan amendment to alter the VRM Class to one compatible with proposed action. This term would also be used to describe impacts from prescription of a particular VRM class for 10 percent of the BLM-administered land in the planning area.
- An adverse effect on the visual quality of the landscape occurs when a management action creates noticeable surface disturbance that contrasts with the form, line, color, or texture of the landscape. The intensity of such effects would vary by alternative and by project based on the scale of development and the designated VRM class.
- Activities that require substantial road building, clearing of vegetation, or other activities that introduce noticeable visual contrast to the landscape have the greatest potential to affect visual resources. Even when such activities meet the established VRM objectives, their adverse effects should be mitigated when possible. Low-profile, dispersed developments (e.g., range improvements) have less effect due to the increased ability to blend this development with natural landscapes. High-profile developments (such as transmission lines and wind turbines) have more effect on the visual environment due to increased visibility and less ability to mimic natural elements.
- Visual resources would be degraded primarily by surface-disturbing activities, such as those associated with ROW construction (e.g., pipelines, transmission lines, and communications lines) and oil and gas facilities (e.g., well pads, reserve pits, and roads). The development of permanent structures would result in long-term degradation of scenic quality and in some cases could become the dominant feature on the landscape. The degree of effect would depend on the projected amount of development and the effectiveness of mitigation measures (design strategies such as siting, painting, and screening). Other activities, such as vegetation

manipulation (e.g., prescribed fire) and OHV use, would affect scenic quality by removing soil and vegetation and creating temporary, short-term intrusions on the landscape.

- Project development would affect all landscape character elements, as follows:
 - **Form** – By introducing forms such as clearings in the vegetation or structures that contrast with natural forms of the landscape.
 - **Line** – By introducing lines such as roads or ROW that contrast with natural lines.
 - **Color** – By causing changes in color such as exposing soil or introducing structures with colors that contrast with the natural colors in the landscape.
 - **Texture** – By changing the texture of the land or structures; for example, by placing a smooth structure against a coarse background of vegetation.

Significance Criteria

In addition to the scale of effects described above, an adverse effect on visual resources as a result of project actions would be considered potentially significant if:

- An action would violate objectives associated with VRM and its magnitude would be such that it cannot be mitigated at the site-specific analysis level.
- An action would be inconsistent with the objectives for the VRM class in the project area and a land use plan amendment would be necessary to accommodate the action.

4.5.3.2. Impacts Common to All Alternatives

This section describes specific management actions and resulting impacts to visual resources common to all alternatives. The generic changes to the basic visual elements from a typical action is discussed where applicable, however, only the impact from the “common to all” alternatives are considered when discussing the scale of impacts. There would be no impacts from **Cave and Karst Resources, Lands and Realty, Social and Economic Conditions, and Health and Safety**, and these resources will not be discussed further in the *Visual Resources* section.

Visual Resources

Managing WSAs under VRM Class I objectives is mandated and helps to meet WSA management goals and objectives. The visual quality of WSAs will be protected under both Manual 6330 (BLM 2012c) and the VRM Class I objectives, which would retain visual quality until Congress provides alternative direction for their management. WSRs generally are managed as VRM Class I areas. In total 30,103 acres would be managed as VRM Class I. Providing for automatic alteration of the VRM class of a designated WSR (Middle Fork Powder River is suitable, eligible and recommended) would eliminate the need for an RMP amendment when Congress acts. The objectives for VRM Class I management allow virtually no change to the visual character of the landscape. In Class II areas, projects may be seen but may not create enough effect (i.e., contrast with the surrounding landscape) to attract the attention of the casual observer. Therefore, there would be no effect on the visual quality of the landscape in Class I areas, and effects in Class II areas would be negligible. However, ongoing resource use and development in Class III and Class IV areas would have the potential to adversely affect visual resources. This is particularly true in areas that are currently natural in appearance.

Although resource development activities may meet VRM Class III and Class IV objectives, the fact that projects are seen and attract attention (Class III) or may dominate the view of the casual observer (Class IV) means they would affect visual resources (the scenic quality or character of the landscape). For Class III and Class IV areas that currently have ongoing development

activities, additional development would add to the cumulative effects from development in those areas. In other words, more surface disturbance or structures would add to the cumulative effects of resource development on the visual quality of the landscape. Incorporating BMPs for visual resources into project planning for federal actions would alleviate impacts to visual resources on split estate. Requiring permanent facilities and structures to blend with the surrounding landscape (except where safety dictates otherwise) would help protect visual resources in the planning area.

Physical Resources

Air Quality

Working with stakeholders to reduce dust emissions would improve visibility and would have a slight but detectable beneficial effect on visual resources. Air quality monitors consist of an aluminum frame equipped with monitoring systems that collect air quality and weather data. Currently, there are two monitors on BLM-administered land in the planning area, and agency partners have requested several additional monitors in the planning area. If properly mitigated through site placement and painting with standard environmental colors, the small number of additional monitors would have a slight adverse effect. Overall, the air quality management actions have a minor beneficial effect on visual resources management.

Soil and Water Resources

Actions protecting soil or water resources would generally benefit visual resources by maintaining the natural character of the landscape. Requiring an approved reclamation plan for surface-disturbing activities would have a readily apparent and moderate beneficial effect on visual resources.

Mineral Resources

Locatable Minerals and Salable Minerals

Effects on visual resources from the extraction of solid mineral depend on the methods used and the size of operation. Materials stockpiles and reserve pits also would create color contrast between the greens of vegetation and the browns of soils. Support structures from any aboveground support facilities also would affect line, form, color, and texture by introducing vertical lines from buildings into a predominately horizontal landscape. Colors would contrast between the greens of vegetation and the building colors. Buildings introduce a smooth texture into a more coarse texture of the vegetation, and a more geometric square or rectangular form into the more random and irregular form of the landscape. Depending on the sizes and geographic extents of operations, mineral activities could attract the attention of the casual observer.

Leasable Minerals - Coal

Large-scale surface mining is highly noticeable, nearly impossible to mitigate visually, and would have a major adverse effect on visual resources during the life of the mine. The line, form, color, and texture of mined areas would be affected through the removal of vegetative cover and stockpiled materials, which would create form contrast between the mined areas and the stockpiled materials and the background landforms. Materials stockpiles and reserve pits also would create color contrast between the greens of vegetation and the browns of soils. Texture would change from a natural medium, subtle texture of vegetation to a coarse, rough contrast of disrupted soils and organic materials. There could be changes in line from the irregular, weak line of the natural landscape to a regular, strong line between natural vegetation and disturbed

landscape. The impact would affect only the portions of the planning area that are within the viewshed of the mine and would generally be limited to southern and central Campbell County.

Leasable Minerals - Fluids

Opening all oil and gas mineral estate to leasing except where specifically identified as closed could have a major impact to visual resources across all alternatives. Continuing to develop fluid minerals resources would affect the visual environment through surface disturbance and construction related to the recovery of minerals resources. Deferring fluid minerals leasing to accommodate recovery of coal resources would result in a stronger contrast in affected areas over the short term, because coal extraction requires more intensive disturbance of the land than fluid minerals.

Effects from mineral resource development is often further intensified by the presence of lights. The ability to substantially shield the nighttime sky from the ambient light created by fluid minerals drilling operations is somewhat limited by operational safety requirements. Night lighting in the immediate area of gas field development, and potentially in large areas surrounding the gas fields, would significantly reduce the nighttime viewing experiences of individuals.

Visual resources in areas available for minerals resource development would likely be more substantially affected over the long term. BLM-administered surface in the planning area with high mineral potential classified as VRM Classes II would have the highest level of conflict between mineral development and VRM objectives. Mineral resource development with appropriate mitigation would be compatible in VRM Class III and IV areas, but would still produce impacts to the aesthetic environment.

Fire and Fuels Management

Fuels reduction and unplanned ignitions result in localized, temporary alteration of the landscape. The effects of fire and fuels reduction in the planning area would be negligible to minor. Rehabilitating fire lines will reduce the impacts to visual resources, resulting in fewer adverse effects from wildfire and prescribed burns. The effects of rehabilitating fire lines would be short-term and negligible beneficial.

Unplanned and prescribed fires affect visual resources by changing the line, color, and texture of burned areas in contrast to the surrounding unburned areas. Line would change from a more regular, smooth line to an irregular, jagged line along the adjacent burned and unburned area in the foreground and middleground zones. Short-term effects on color would be expected in burned areas until the areas were revegetated. Fire can enhance color over time by creating more diversity in the hues and colors associated with a more diverse vegetative composition. Vegetative texture can change from a medium to fine, dense texture in natural areas to a coarse, sparse texture in burned areas as a result of fire. Burned areas, if viewed in the foreground-middleground and background zones, would attract the attention of the casual observer and would be minor and adverse.

Biological Resources

Vegetation – Forests and Woodlands, Grassland and Shrubland Communities, and Riparian/Wetland Resources, Invasive Species and Pest Management, and Fish and Wildlife Resources – Fish

Management actions designed to protect vegetation resources would generally protect scenic

quality and landscape character. However, vegetative treatments (chemical or mechanical) can have a temporary adverse effect on visual resources. Proposed treatments would be subject to interdisciplinary review before implementation to reduce adverse effects. Management of vegetation, riparian areas, and fish habitat would generally limit the amount of surface-disturbing activities and associated removal of vegetation. Measures to prevent noxious weeds would reduce the amount of non-native (and often visually contrasting) vegetation present in the planning area, resulting in a beneficial effect to visual resources. Where these actions overlap with VRM Class I and Class II areas, there would be an increase in the potential for such landscapes to retain or preserve their existing visual character. Overall, the vegetation and fish management actions would have a moderate beneficial effect on visual resources management.

Fish and Wildlife Resources – Wildlife and Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Restrictions on facility development related to wildlife concerns are generally beneficial to VRM. However, constraints based on wildlife will likely take precedence over VRM when proposed mitigation measures for VRM conflict with sensitive wildlife resources (e.g., a well cannot be relocated closer to a raptor nest to reduce impacts to visual resources; or wind turbines become more visible to prevent wildlife collision). Management of vegetation diversity and structure would benefit visual resources as long as the basic elements of the landscape are repeated; if applied across the planning area, the effects would be moderate and long term.

Actions designed to prevent surface disturbance (e.g., CSU and NSO stipulations) and disturbance to wildlife and SSS would indirectly limit the level of change to characteristic landscapes, which would benefit VRM. Where these actions overlap with VRM Class I and Class II areas, there would be an increase in the potential for such landscapes to retain or preserve their existing visual character.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Measures to protect cultural and paleontological resources generally benefit visual resources. The visual landscape is considered a component of the cultural setting, and areas considered important to Native Americans would likely experience additional protection for retention of natural visual settings.

Land Resources

Forest Products

Timber and firewood harvest activities would have effects similar to those described above for fire and fuels management because timber activities can primarily affect line, form, color, and texture. The removal of trees changes the density of vegetation, a characteristic of texture. Changes in line from the irregular, weak line of the natural landscape to a regular, strong line between natural vegetation and the harvest area depends on the harvest technique. Removing vegetation changes form from the irregular shape of the vegetation to a regular geometric shape. There would be changes in color from the deeper hue of trees to the more diverse colors of lower-growing vegetation. Clear-cutting would have the greatest effect on visual resources, while select cutting would have the least. Depending on the size of the operation, timber harvest activities could attract the attention of the casual observer in the foreground-middleground and background zones, and even the seldom seen zone. These effects would be limited to the portions of the

planning area that are forested (mostly located in the southern Big Horn Mountains), which would have a minor adverse effect on visual resources. Forest products would potentially impact visual resources where harvest of minor wood products through the sale of permits would occur. Some of these harvests would potentially occur in VRM Class II areas, but the acreage would be small and locations of harvest would not be readily visible from key observation points, so visual impacts are anticipated to be minor and short term.

Renewable Energy

Cooperation with stakeholders to coordinate renewable energy development could produce either an adverse or beneficial effect on visual resources. It can be surmised from the alternative that wind-energy development would be allowed except in areas made administratively unavailable to renewable energy. Promoting opportunities for scientific research and renewable energy would likely include the placement of meteorological towers, which are temporary, tall structures equipped with blinking lights. The adverse effects on visual resources from wind-energy development are difficult to mitigate. Current regulations require turbines to be painted white, usually a noticeable difference from the colors of the natural landscape. Additionally, the requisite red blinking lights detract from the naturalness of the night sky. There are also changes to the line and form of the landscape as a consequence of placing large (250-400 feet) vertical structures, with motion, in a horizontal landscape. Wind turbines could conceivably be allowed within VRM Class III areas with appropriate mitigation and by siting facilities at an adequate distance (~8 miles or more) away from Key Observation Points to reduce the visual dominance to a scale appropriate to the landscape setting. The portions of the field office with the highest wind potential are generally located in areas with the most unique and intact visual settings. Developing guidelines for determining where wind-energy may be developed would be the first step in projecting effects on visual resources. Renewable energy development would significantly detract from the typical visual settings in the planning area by creating linear and focal visual intrusions on the horizon, and would create an industrial setting. The scale of impacts will be dependent on the size and location of a given project.

Rights-of-Way and Corridors

Land use authorizations such as leases and ROW could adversely affect visual resources. Most of effects from utilities would be from support structures for powerlines, communications sites, and weather stations, which would introduce straight, vertical lines into a horizontal landscape. Effects on color would include changes from the matte greens of natural vegetation to glossy reflective colors of metal structures and other colors of facilities such as buildings or towers. Effects on texture and form would include changes from irregular, random textures of vegetation to smooth, definite geometric shapes of buildings. Collocating ROW would reduce the overall disturbance in the planning area, but could temporarily increase adverse effects on visual resources on a localized level. Below-ground utilities and some above-ground facilities associated with ROW would be compatible with VRM Class II if properly mitigated.

Travel and Transportation Management

TTM would maintain an adequate road network across the planning area. Development of the transportation network within the planning area would potentially alter visual resources and would likely attract the attention of a casual observer. Adverse effects on visual resources from route construction or OHV use include changes in color, line, and texture on the landscape. In addition, fugitive dust from construction activities and from the use of gravel or natural material roads also has an adverse effect on visual resources. However, fugitive dust is a short-term effect that can be temporary and would depend on the amount of traffic on a road. Limiting travel to designated routes rather than allowing travel on existing routes would benefit visual resource

as undesignated routes would be closed and allowed to reclaim. Designating areas Open to OHV use would adversely affect visual resources through road proliferation and vegetation loss. Designating areas “Closed” to OHV use would protect visual resources from the effects of unsustainable OHV use. Road closures and restricted access would enhance the visual settings of the area by removing contrasting linear elements from the natural landscape. Impacts from TTM would have minor adverse effects on visual resources.

Recreation

Recreation activities such as development of recreational facilities would affect visual resources by introducing straight, vertical lines and smooth textures into a predominantly horizontal, random landscape. Increased use of existing and new facilities would affect visual resources by introducing different colors into a predominantly green and brown landscape. Some of the facilities could be made of reflective materials, making them more visible from long distances. Buildings and other structures introduce a more geometric square or rectangle form into the more random and irregular form of the landscape. Proper design and construction techniques can reduce effects on visual resources from recreation facilities and help maintain a more natural-appearing landscape. If viewed from a higher observation point, facilities and recreation activities in the foreground-middleground zone would attract the attention of the casual observer. Depending on size, facilities in the background zone also could attract the attention of the casual observer. As viewed from ground level, only activities in the foreground-middleground zone would attract the attention of the casual observer.

Lands With Wilderness Characteristics

Protections related to lands with wilderness characteristics would vary by alternative; however, the lands with wilderness characteristics area would generally benefit from VRM if managed according to the inventory class or if afforded VRM Class II protection through alternatives related to the management of wilderness characteristics.

Livestock Grazing Management

Livestock grazing management and rangeland management often require the construction or maintenance of range improvements, including fences and stockwater tanks. While such features can create contrast in the line and texture of the landscape, range improvements are usually low-profile developments with a minor effect on visual resources. Implementing the *Wyoming Standards for Healthy Rangelands* would reduce the potential for overgrazing, which can create a contrast in the color and texture of the landscape. The beneficial effect on visual resources from rangeland management across the planning area would be minor and long term.

Special Designations

Stipulations to protect areas with special designations would generally protect visual resources. The three WSAs are currently managed under BLM Manual 6330 – Management of Wilderness Study Areas, which provides protection for the visual setting. Similarly, the Middle Fork Powder River is managed under Manual 6400 which protects the canyon and the viewshed of the river corridor. Protections related to ACECs and BCBs would vary by alternative. Table 4.58, “Estimated BLM Surface Acreage of Visual Resource Management Classes by Alternative” (p. 1386) lists the estimated BLM surface acreages of VRM classes under each alternative.

Table 4.58. Estimated BLM Surface Acreage of Visual Resource Management Classes by Alternative

	Alternative A¹	Alternative B	Alternative C	Alternative D
VRM Class I (acres)	30,103	30,103	30,103	30,103
VRM Class II (acres)	127,594	217,021	0	112,329
VRM Class III (acres)	63,583	276,107	167,334	379,429
VRM Class IV (acres)	559,674	258,866	584,500	260,238

Source: BLM 2012f

¹The 1985 RMP did not designate any Class I areas, but the three Wilderness Study Areas and Middle Fork Powder River corridor that is suitable and eligible for Wild and Scenic River designation are managed as such. The 1985 RMP did designate 702 acres of Class V, which is no longer a VRM classification.

BLM Bureau of Land Management
VRM Visual Resource Management

4.5.3.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes potential impacts to visual resources from management actions for those and other resources under Alternative A. The following resources would have no discernible impacts under Alternative A: **Air Quality, Water Resources, Grassland and Shrubland Communities, Livestock Grazing Management, Scenic and Back Country Byways, Wilderness Study Areas, and Socioeconomic Resources.**

Visual Resources

Alternative A would place almost 71 percent of BLM surface in the planning area in VRM Class IV, which allows effects on visual resources that would change the character of the landscape and would dominate the view of the casual observer. Only 19 percent of BLM surface would be managed as VRM Class II areas and approximately 10 percent as VRM Class III.

The current VRM classes cannot be traced to a science-based study of the planning area and therefore could be considered arbitrary. Careful consideration should be given to a quantifiable method for assigning the VRM classes. Current VRM classes were designed to protect visual resources along major travel routes; however, the mixed land tenure along many routes (e.g., Interstate 90) can make protection of visual resources across the landscape obsolete. In addition, the current VRM classes do not adequately account for VRM of recently acquired parcels. Finally, using visual simulations on a project-specific basis has resulted in inconsistent VRM mitigation measures applied across the planning area due to discrepancies in the level of analyses for proposed actions in relation to visual resources, particularly in VRM Class III and IV areas. A more uniform approach to using these simulations (e.g., based on visual sensitivity and VRM class) would benefit visual resources.

Physical Resources

Soil

Prohibiting surface-disturbing activities in areas of severe erosion, on steep slopes and in areas with poor reclamation potential will generally reduce development in areas with high visibility (slope faces) and would produce moderate beneficial effects visual resources.

Mineral Resources

Locatable Minerals and Salable Minerals

Under Alternative A, locatable minerals would be restricted in WSAs (28,931 acres) and winter game ranges (4,583 acres), a minor beneficial impact to the visual resource. For salable minerals, prohibitions are limited to the WSAs only, producing a minor beneficial effect on visual resources. However, the majority of the planning area would remain open to locatable and salable mineral development, resulting in a net major adverse effect on visual resources.

Leasable Minerals - Coal and Fluids

Under Alternative A, 96 percent of the planning area would be available for oil and gas leasing or for coal development, and effects from accompanying development would be widespread throughout the area. Effects would include those from low-profile developments such as access roads and CBNG wells and high-profile developments such as open pit mines and oil rigs. The adverse effect on visual resources in the PRB would be major and long term. Elsewhere in the planning area, the effect of mineral resource development would be less severe.

Fire and Fuels Management

Under Alternative A, restricting the use of heavier or larger types of suppression equipment in some areas could benefit visual resources, because the extent of disturbance related to fire suppression often increases as the size of equipment increases. Rehabilitating disturbance related to fire and fire suppression could temporarily increase the amount of disturbance in an area, but the long-term effects on visual resources would be beneficial.

Biological Resources

Vegetation – Forests and Woodlands, Riparian/Wetland Resources, and Invasive Species and Pest Management

There were slight but detectable beneficial impacts from the forests and woodlands resource through stipulations of vegetation treatment design. Additionally, prohibitions on surface-disturbing activities within 500 feet of water produced a minor beneficial impact to visual resources from the riparian/wetland resource. Controlling noxious weeds is also generally beneficial to the visual resource.

Fish and Wildlife Resources – Fish and Wildlife and Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Management related to biological resources that may affect visual resources were generally not previously addressed. There would be little to no effect from fish, wildlife and all SSS resources in Alternative A.

Heritage and Visual Resources

Cultural Resources

Management alternatives related to cultural resources that may affect visual resources were generally not previously addressed. However, some provisions to protect the viewshed of the Bozeman Trail and Pumpkin Buttes were applied in Alternative A. The overall impact to the visual resource is moderate and long term.

Paleontological Resources

Management related to paleontological resources that may affect visual resources were generally not previously addressed. There would be little to no effect from paleontological resources in Alternative A.

Land Resources

Forest Products

Basing timber harvest on a desired production level could adversely affect visual resources by producing an unsustainable level of forestry activity. A size limitation on individual clear-cuts would benefit visual resources by restricting the amount of vegetation removal on a local scale. Fencing regeneration areas would adversely affect visual resources over the short term by drawing attention to the area, but would have a beneficial effect over the long term by promoting successful regeneration. Overall, impacts from forest product activities using BMPs would have a slight but detectable, minor adverse effect on visual resources.

Renewable Energy

Under Alternative A, renewable energy issues would be considered on a project-specific basis. Wind-energy development would not be compatible with areas currently classified as VRM Class II without a plan amendment. The majority of the southern Big Horn Mountains, which is the area with the highest wind potential, would be protected under this alternative. Conversely, the majority of the PRB would likely allow wind-energy development under Alternative A.

Rights-of-Way and Corridors

ROW associated with utilities or roads would create linear features across the landscape. However, Alternative A would have less stipulations on the placement of ROW and above ground utilities. The degree of impact would depend on the scale of the individual project. Overall a minor adverse effect is anticipated on visual resources management.

Travel and Transportation Management

Alternative A would designate more areas as Open compared to other alternatives. This could allow unmanaged OHV use, to the detriment of visual resources as user created routes often produce contrast with natural vegetation.

Recreation

Management alternatives related to recreation resources that may affect visual resources were generally not previously addressed. Stipulations to protect recreational opportunities in Mosier Gulch and Dry Creek Petrified Tree would also protect visual resources. Overall, there would be a negligible beneficial effect from recreation in Alternative A.

Lands with Wilderness Characteristics

There were no decisions related to lands with wilderness characteristics in Alternative A. Thus, there would be no effect from this resource.

Special Designations

Areas of Critical Environmental Concern and Wild and Scenic Rivers

There were no decisions related to ACECs or WSRs in Alternative A. Thus, there would be no effect from these resources.

4.5.3.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to visual resources from implementation of Alternative B. Effects would be similar to those described under *Impacts Common to All Alternatives*, and also would include the effects below.

Visual Resources

Alternative B would place 67 percent of BLM surface in the planning area in VRM Class III and Class IV, which provide for varying degrees of visual effects from resource development activities. Compared to Alternative A, the acreage in Class II would be increased to 28 percent of the planning area and the acreage in Class III would be increased to 35 percent. The acreage in Class IV would be decreased to 33 percent of the planning area.

Basing VRM classifications on the corresponding VRI class provides some consistency between an objective science-based inventory and management decisions. This approach will further require that the BLM consider the existing character of the landscape identified in the VRI (BLM 2009b) and the context of the individual scenic quality, sensitivity and distance zones at the site-specific analysis level to ensure VRM Class Objectives are met. By including special emphasis areas in VRM Class II, sensitive visual resources are ensured administrative protection. Currently, several areas with high recreational value or cultural significance are managed as VRM Class III and Class IV. Managing special emphasis areas as VRM Class II would ensure that the visual resources are adequately protected, which in turn, would protect the unique settings and other resource values present in these areas. Prohibiting surface disturbance in areas with historic properties to retain the integrity of the setting also would retain the integrity of the visual resources. However, constraints based on cultural resources will likely take precedence over VRM when proposed mitigation measures for VRM conflict with an eligible cultural site. Completing a visual simulation and mitigation design for all proposed actions within or viewable from VRM Classes I, II, and III would benefit visual resources because potential effects for sensitive areas would be properly identified and mitigated.

Physical Resources

Soil

Prohibiting surface-disturbing activities in areas of severe erosion, on steep slopes and in areas with poor reclamation potential will produce moderate beneficial effects visual resources by decreasing the likelihood of development in area with high visibility (slopes).

Mineral Resources

Locatable Minerals and Salable Minerals

Alternative B proposes the greatest restrictions to mineral resource development, however, the adverse effects to visual resources from permissible locatable and salable development would remain scattered throughout the planning area. Development would be readily apparent to the casual observer within the viewshed of each project. The net effect to the visual resource would be moderate and adverse.

Leasable Minerals – Coal and Fluids

Under Alternative B, nearly half of the planning area would be closed to oil and gas leasing and a

quarter would be unavailable for coal development. The remaining lands would be subject to additional constraints compared to Alternative A. Development would be readily apparent to the casual observer within the viewshed of each project. The adverse effect on visual resources in the PRB would be moderate and long term. Elsewhere in the planning area, the effect of mineral resource development would be less.

Fire and Fuels Management

Under Alternative B, limiting heavy equipment usage for fire suppression to areas immediately adjacent to existing roads would benefit visual resources because future disturbance from such equipment would be limited to areas of existing disturbance. Rehabilitating disturbance related to fire and fire suppression could temporarily increase the amount of disturbance in an area, but the long-term effects would benefit visual resources.

Biological Resources

Vegetation – Forests and Woodlands and Riparian/Wetland Resources, Invasive Species and Pest Management, Fish and Wildlife Resources – Fish, and Special Status Species – Plants and Fish

Alternative B management actions would limit the amount of surface disturbance compared to Alternative A by encouraging the placement of structures away from the viewshed of waterways, which often are sensitive to disturbance due to public support for the recreational values present. Measures to protect vegetation would benefit visual resources.

Fish and Wildlife Resources – Wildlife

Increasing prohibitions on above-ground powerlines would benefit visual resources because the disturbance time associated with burying lines is shorter and the disturbance is less noticeable than traditional aboveground utility lines. Requiring installation of anti-perching devices on new high-voltage powerlines could increase the visibility of the powerlines, increasing the level of effects on visual resources at a local level.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Any action that increases the visibility of human structures, including fencing designs for the protection of Greater Sage-Grouse, would be detrimental to visual resources. Considering the VRM classes designated under this alternative, the small size of the fence markers, and the relative size of Greater Sage-Grouse habitat where these measures would be applied, on a planning area basis the effect should be minor. Prohibitions on development related to protection of sensitive species (buffering leks, riparian areas, etc.) may also increase protection of visual resources in the PRB and along creeks and rivers. However, protection of sensitive species would likely take priority over protection of visual resources in site-specific decisions. The overall impact is expected to be minor and long-term.

Heritage and Visual Resources

Cultural Resources

Initiating withdrawals to protect cultural resources would produce a beneficial effect on visual resources. Specifically, a protection of the visual horizon up to 5 miles from historic properties would include a substantial portion of the planning area. The overall impact to the visual resource is moderate and long term.

Paleontological Resources

Initiating withdrawals or closing to leasing to protect paleontological resources would produce a beneficial effect on visual resources. Given the small portion of the planning area with high quality specimens, the overall impact to the visual resource would be negligible.

Land Resources**Forest Products**

Designing timber harvest areas to have meandering boundaries, follow topography, and avoid natural barriers would help mitigate adverse effects on visual resources. The benefits would be detectable by the casual observer.

Renewable Energy

Renewable energy development would be excluded from the majority of the planning area, a major beneficial effect to visual resources. Considering the VRM classifications, wind development potential and renewable energy exclusion and avoidance areas, very little development would be permitted under this alternative.

Rights-of-Way and Corridors

While disturbance associated with ROW development generally creates adverse impacts to visual resources, ROW grants would avoid the placement of above-ground facilities along major transportation routes to protect visual resources. This would result in a minor beneficial effect to visual resources along routes. co-location of ROW and facilities would be required, which would increase the visibility of a project at the site-specific level, but would benefit visual resources overall by reducing the amount of surface disturbance.

Travel and Transportation Management

Designating areas Closed to OHV use and limiting OHV use in other areas to designated roads and trails would increase the ability to protect such areas from OHV-related effects on visual resources. Alternative B would close or limit motorized use across much of the planning area, and would result in considerably fewer adverse effects on visual resources as a result of unmanaged motorized recreation.

Recreation

Under Alternative B, designating eight SRMAs (55,529 acres; 7.0% of BLM surface) would increase the acreage under VRM Class II management. Additionally, development within SRMAs would be restricted, to the benefit of the visual resources.

Lands with Wilderness Characteristics

Under Alternative B, 12,237 acres (1.5% of BLM surface) would be managed as VRM Class II. Additionally, development within the lands with wilderness characteristics would be restricted, to the benefit of the visual resources.

Special Designations**Areas of Critical Environmental Concern**

Designation of eight ACECs (511,000 acres; 65% of BLM surface) under Alternative B would substantially increase the acreage managed as VRM Class II. Almost all of the ACECs include scenic values as relevant and important, and designation would increase protections for visual resources.

Wild and Scenic Rivers

Under Alternative B, the outstanding and remarkable values, including visual values, of the Middle Fork Powder River would be protected regardless of a Congressional designation. The Middle Fork Powder River canyon (9.5 miles in length, 0.5-mile buffer of river; 0.7% of BLM surface) would be managed as VRM Class II.

4.5.3.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to visual resources due management of those and other resources from its implementation.

Effects under Alternative C would be similar to those described under *Impacts Common to All Alternatives*, and also would include the effects below.

Visual Resources

Alternative C would place 95 percent of BLM surface in the planning area in VRM Classes III and IV, which provide for varying degrees of effects on visual resources from resource development activities.

This alternative would result in the greatest degree of adverse effects on visual resources of any of the alternatives. The Alternative C surface acreage under VRM Class IV management would be 584,500 acres; the surface acreage under VRM Class III management would be 167,334 acres (21%), and no areas would be designated as VRM Class II. This alternative would allow effects on visual resources that would change the character of the landscape and dominate the view of the casual observer (Class IV) on 74 percent of the total public land surface in the planning area. Effects would result from surface disturbance and construction of structures, primarily (but not exclusively) from the oil and gas industry. Vegetative manipulation, range improvement projects, and communications facilities also would affect visual resources. There would be adverse effects on form, line, color, and texture.

BLM would generally manage high visual values for moderate levels of visual change under this alternative. Managing VRI Class II areas as VRM Class III areas would reduce the protection of visual resources in VRI Class II areas that were formerly protected under the VRM Class II objectives. Such management is not likely to adequately protect sensitive areas such as recreation areas and cultural sites. Allowing surface disturbance in areas with historic properties could affect visual resources because mitigation would be decided on a project-specific basis. Under Alternative C, areas with VRI Class III values would be managed for major modification that may visually dominate the landscape under a VRM Class IV designation. The adverse effects could be major and long term. Finally, using visual simulations on a project-specific basis has resulted in inconsistent VRM mitigation measures applied across the planning area due to discrepancies in the level of analyses for proposed actions in relation to visual resources, particularly in VRM Class III and IV areas. A more uniform approach to using these simulations (e.g., based on visual sensitivity and VRM class) would benefit visual resources.

Physical Resources

Soil

Allowing surface disturbing-activities in areas of severe erosion, on steep slopes which are

highly visible, and in areas with poor reclamation potential will produce moderate adverse effects visual resources.

Mineral Resources

Locatable Minerals and Salable Minerals

The effects from locatable and salable minerals would essentially be the same as Alternative A.

Leasable Minerals - Coal and Fluids

Under Alternative C, most of the planning area would be available for oil and gas leasing, and adverse effects on visual resources from accompanying development would be widespread throughout the planning area. Effects would include those from low-profile developments such as access roads and CBNG wells and high-profile developments such as oil rigs. The adverse effect in the PRB would be major and long term. Elsewhere in the planning area, the adverse effect on visual resources from mineral resources development would be less severe.

Fire and Fuels Management

Under Alternative C, using heavy equipment for fire suppression with few tactical constraints could be inconsistent with visual resource values. Heavy equipment would be likely to increase the amount of disturbance in a given area compared to hand tools. Rehabilitating only suppression-related damage would ignore damage from wildfire and prescribed fire. The effects on visual resources would depend on the locations and extents of such fires, but should be minor and short term.

Biological Resources

Vegetation – Forests and Woodlands

Utilizing intensive management tactics such as large clear-cuts would have a minor effect on visual resources depending on the location and intensity of related projects.

Vegetation – Riparian/Wetland Resources, Invasive Species and Pest Management, Fish and Wildlife Resources – Fish, and Special Status Species – Plants and Fish

Under Alternative C, removing limitations on the amount of surface disturbance in the viewshed of waterways would have an adverse effect on visual resources. The effect of allowing surface disturbance near streams and waterways would be minor and long term.

Fish and Wildlife Resources – Wildlife

The effect of not requiring operators to bury all new low-voltage utility lines or to require anti-perching devices on powerlines would increase visibility and generally be adverse.

Allowing facility development or prohibiting renewable-energy projects and occupancy in elk crucial winter range and calving areas would have adverse effects on visual resources. Under Alternative C, visual resources will be considered on a case-by-case basis as projects are proposed.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Under Alternative C, there would be no special provisions to increase visibility of fencing, thus there would be no effect on visual resources from this alternative.

Heritage and Visual Resources

Cultural Resources

Alternative C allows for surface disturbance with appropriate mitigation, but does not define standards. Therefore adverse effects to the setting of historic properties and visual resources are likely. The overall impact to the visual resource is moderate and adverse.

Paleontological Resources

Withdrawals or closing to leasing to protect paleontological resources would not occur under Alternative C. Given the small portion of the planning area with high quality specimens, the overall impact to the visual resource would be negligible.

Land Resources**Forest Products**

Under Alternative C, allowing timber harvests without limits on the sizes or shapes of harvest areas could adversely affect visual resources. Under this alternative, visual resources would be considered on a case-by-case basis as projects are proposed. Depending on the size and location of projects, the effect would be moderate.

Renewable Energy

Renewable energy development would be allowed where consistent with other resource values. Because Alternative C would not designate any VRM Class II areas and would place the vast majority of the planning area in VRM Class IV, wind-energy development could take place across the planning area with little requirements for visual mitigation. The effects to the visual resources would be major and adverse.

Rights-of-Way and Corridors

ROW grants would not avoid the placement of above-ground facilities along major transportation routes to protect visual resources, resulting in a moderate adverse effect to visual resources.

Travel and Transportation Management

Under Alternative C, designating areas Open to OHV use could adversely affect visual resources through road proliferation and vegetation loss. On the other hand, designating areas Closed to OHV use and limiting OHV use to designated roads and trails would increase the ability to protect such areas from OHV-related effects on visual resources. This alternative would open fewer acres to OHV use than Alternative A and would therefore result in fewer adverse effects on visual resources than Alternative A.

Recreation

While several SRMAs would be designated (30,570 acres; 3.9% of BLM surface), and recreational use would be a priority in those areas, there would essentially be no protective management decisions associated with SRMAs.

Lands with Wilderness Characteristics

There would be no prescriptions related to protection of lands with wilderness characteristics, and therefore there would be no effect from this resource.

4.5.3.6. Alternative D

This section describes management actions and potential impacts to visual resources under Alternative D, which generally allows resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and emphasizes moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the Proposed RMP.

Effects on visual resources under Alternative D would be similar to those described under *Impacts Common to All Alternatives*, and also would include the effects below.

Visual Resources

Alternative D would place 81 percent of BLM surface in the planning area in VRM Classes III and IV, which provide for varying degrees of effects on visual resources from resource development activities. This alternative would allow effects on visual resources that would change the character of the landscape and dominate the view of the casual observer (Class IV) on 260,238 acres or 32 percent of the total BLM surface in the planning area. Class II management would encompass 112,329 acres (14%) of the planning area, and the Class III management would affect 379,429 acres (49%).

Basing VRM classifications on the corresponding VRI class provides some consistency between an objective science-based inventory and management decisions. This approach will further require that the BLM consider the existing character of the landscape identified in the VRI (BLM 2009b) and the context of the individual scenic quality, sensitivity and distance zones at the site-specific analysis level to ensure VRM Class Objectives are met. By including special emphasis areas in VRM Class II, sensitive visual resources are ensured administrative protection. Currently, several areas with high recreational value or cultural significance are managed as VRM Class III and Class IV. Managing special emphasis areas as VRM Class II would ensure that the visual resources are adequately protected, which in turn, would protect the unique setting and other resource values present in these areas. Prohibiting surface disturbance in areas with defined historic properties to retain the integrity of the settings also would retain the integrity of the visual resources at the local level. However, constraints based on cultural resources would likely take precedence over VRM when proposed mitigation measures for VRM conflict with an eligible cultural site. Completing a visual simulation and mitigation design for all proposed actions in VRM Class I and II areas and sensitive Class III areas would benefit visual resources because potential effects to sensitive areas would be properly identified and mitigated.

Physical Resources

Soil

Increasing requirement for reclamation related to surface-disturbing activities in areas of severe erosion, on steep slopes, and in areas with poor reclamation potential will produce minor beneficial effects visual resources.

Mineral Resources

Locatable Minerals and Salable Minerals

Alternative D proposes moderate restrictions to mineral resource development, however, the adverse effects to visual resources from permissible locatable and salable development would

remain scattered throughout the planning area. The net effect to the visual resource would be moderate and adverse.

Leasable Minerals – Coal and Fluids

Under Alternative D, the majority of the planning area would be available for oil and gas leasing, and adverse effects on visual resources from accompanying development would be widespread throughout the planning area. The remaining lands would be subject to additional constraints compared to Alternative A, but the measures would generally be insufficient to prevent a substantial impact to the visual resource. The adverse effect in the PRB would be major and long term. Elsewhere in the planning area, the effect of mineral resources development would be less severe.

Fire and Fuels Management

Under Alternative D, limiting the use of heavy equipment for fire suppression to areas immediately adjacent to existing roads would benefit visual resources because future disturbance from such equipment would be limited to areas of existing disturbance. Rehabilitating disturbance related to fire and fire suppression could temporarily increase the amount of disturbance in an area, but the long-term effects would benefit visual resources.

Biological Resources

Vegetation Resources, Invasive Species and Pest Management, Fish and Wildlife Resources – Fish, and Special Status Species - Plants and Fish

Management decisions under Alternative D that limit the amount of surface disturbance or encourage placement of structures away from the viewshed of waterways, which often are sensitive to disturbance due to public support for the recreational values present, would benefit visual resources. Restrictions on facility development or renewable-energy projects are generally beneficial to visual resources. Utilizing intensive management tactics would have an adverse effect on visual resources depending on the location and intensity of related projects. The beneficial and adverse management actions interact to result in an overall negligible, beneficial effect on visual resources.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Requiring new low-voltage utility lines to be buried would benefit visual resources because the disturbance time associated with burying lines is shorter and the disturbance less noticeable than traditional aboveground utility lines.

Modifying fences to protect Greater Sage-Grouse could increase the visibility of fences and could adversely affect visual resources. Considering the VRM classifications designated under this alternative, the small size of the fence markers, and the relative size of Greater Sage-Grouse habitat where these measures would be applied, on a planning area basis the adverse effect should be negligible.

Heritage and Visual Resources

Cultural Resources

Applying NSOs and increasing stipulations on surface disturbance to protect cultural resources

would produce a beneficial effect on visual resources. The overall impact to the visual resource is moderate and long term.

Paleontological Resources

Applying NSOs and increasing stipulations on surface disturbance to protect paleontological resources would produce a beneficial effect on visual resources. Given the small portion of the planning area with high quality specimens, the overall impact to the visual resource would be negligible.

Land Resources

Forest Products

Under Alternative D, failure to place limitations on timber harvest size would increase the potential size of a forestry action and could adversely affect visual resources through the potential permitting of larger-scale operations. Because of resource protections set forth under other resources (ACECs, etc.) in areas with commercial timber, the overall impact to visual resources would be minor.

Renewable Energy

Renewable energy development would be excluded from the portions of the planning area with the highest VRM classifications, a major beneficial effect to visual resources. Given the VRM classifications, wind development potential and renewable energy exclusion and avoidance areas, some development would be permitted under this alternative, but would likely take place out of the more visually desirable portions of the planning area.

Rights-of-Way and Corridors

ROW grants would require a resource protection plan for the placement of above-ground facilities along major transportation routes to protect visual resources, resulting in a negligible beneficial effect to visual resources. co-location of ROW and facilities would be preferred, which would increase the visibility of a project at the site-specific level, but would benefit visual resources overall by reducing the amount of surface disturbance.

Travel and Transportation Management and Recreation

Designating areas Open to OHV use would reduce the potential for adverse effects on visual resources through road proliferation and vegetation loss. On the other hand, designating areas Closed to OHV use and limiting OHV use to designated roads and trails would increase the ability to protect such areas from OHV-related effects on visual resources. This alternative would open many fewer acres to OHV use than Alternative A and would therefore result in considerably fewer adverse effects on visual resources from unmanaged motorized recreation than Alternative A. Under Alternative D, designating eight SRMAs would increase the acreage under VRM Class II management.

Recreation

Under Alternative D, designating seven SRMAs (54,160 acres; 6.9% of BLM surface) would increase the acreage under VRM Class II management. Additionally, development within SRMAs would be restricted, to the benefit of the visual resources.

Lands with Wilderness Characteristics

Under Alternative D, 6,864 acres (0.9% of BLM surface) would be managed as VRM Class II. Additionally, development within the lands with wilderness characteristics would be restricted to the benefit of the visual resources.

Special Designations

Areas of Critical Environmental Concern

Under Alternative D, designation of two ACECs would increase the acreage under VRM Class II management. Each of the ACECs includes scenic values as relevant and important, and designation would increase protections for visual resources.

Wild and Scenic Rivers

Under Alternative D, the outstanding and remarkable values, including visual values, of the Middle Fork Powder River would be protected regardless of a Congressional designation.

4.5.3.7. Cumulative Impacts

Renewable-energy projects, utility and pipeline projects, communications towers, oil and gas development, and other surface-disturbing developments would degrade the scenic quality of landscapes through development of associated roads, barren ground, and facilities associated with industrial development. These effects on visual resources would result primarily from surface disturbance combined with other industrial activities on both federal and non-federal lands. Development activities on private and state lands with no federal jurisdiction would have the greatest potential for cumulative effects on the natural setting of the landscape as these projects are generally not subject to visual quality mitigation. Large-scale and high-profile developments such as wind turbines and communications towers and disturbance areas would affect the integrity of settings. In combination with these, some large-scale developments outside federal jurisdiction would alter the landscape surrounding these sites to the point that the development would exceed the prescribed VRM objectives for adjacent federal surface. The incremental damage to and loss of visual integrity would result in a landscape altered from a natural setting to an industrial setting. Under all alternatives, adverse effects on visual resources would be avoided or mitigated by VRM program actions, through special designations, and through BMPs and by VRM program actions (contrast ratings, visual simulations and mitigation measures, etc.) or COAs prescribed to protect visual resources.

Historic uses in the planning area include livestock grazing, forestry actions, and conventional oil production. These uses have negligible to minor effects on visual resources. In the past 10 years, increased minerals extraction in the planning area has resulted in widespread surface disturbance and linear utility development that have altered the appearance of the landscape. The degree of visual change currently imposed on the landscape can be extracted from the VRI scenic quality ratings using the scores for the cultural modification factor.

The presence of federal (BLM and USFS) lands in the planning area has an overall beneficial effect on visual resources because the BLM and the USFS are required to consider scenic resources. Although management activities by other federal agencies would likely maintain or enhance visual resources through management objectives or mitigation measures, surface-disturbing activities on non-federal land adjacent to BLM surface could affect visual resources if activities that are incompatible with prescribed VRM class objectives occur in the viewsheds of those areas.

4.5.3.8. Conclusion

Under Alternative A, the direct effect on visual setting associated with surface disturbance and facility development would continue throughout the planning area and have the potential to affect areas that are highly valued by the public, such as cultural sites and recreational areas, more than all other alternatives. This conclusion is based on the outdated VRI under Alternative A.

Overall, Alternative B would have the fewest adverse impacts to visual resources because other management actions under this alternative would be restricted to certain geographic areas, cover proportionately less area, or would be buffered from other resources, therefore producing smaller, more localized disturbances to visual resources. Alternatives A and C would allow considerably more disturbance compared to Alternative B, while Alternative D would allow slightly more disturbance. The order of the alternatives in ascending degree of potential severity of effects on visual resources from least adverse to most adverse is Alternative B, Alternative D, Alternative A, and Alternative C.

4.6. Land Resources

4.6.1. Forest Products

4.6.1.1. Methods and Assumptions

This section describes potential effects on the forest product program from BLM management of resources and resource uses under the alternatives. The *Forest Products* section of Chapter 3 describes the BLM forest products program. Actions that reduce the utilization of forest products are considered adverse; actions that promote forest product use are considered beneficial.

Assumptions

- This impact analysis and its conclusions are based on interdisciplinary team knowledge of resources in the planning area, reviews of existing literature, and information from other agencies.
- Spatial analysis was performed using the ESRI ArcGIS 10.0 computer software.
- Effects are quantified where possible. In the absence of quantitative data, best professional judgment was used. Effects are sometimes described using ranges of potential impacts or in qualitative terms, if appropriate.
- Forest inventory data were collected in 2005.
- The resource analysis concentrates on the 16,234 acres of BLM surface within the six forest management areas, because that is where most forest product activities are predicted to occur. However, because opportunities and interest arise in the scattered woodlands for various products, the analysis also considers those lands.

Short-term effects would result during initial surface disturbance (product removal) before commercial quality product is regenerated, or from decreases to forest product quality. Long-term adverse effects would be changes in the sustainability of the desired forest products. The scale of effects would be the same as identified in the Introduction of Chapter 4.

4.6.1.2. Impacts Common to All Alternatives

Forest Products

Under all alternatives, timber harvest would be prohibited within 200 feet of surface water. This would prohibit forest product activities on 396 acres (2.21%) of the forest management areas, a minor adverse effect.

Physical Resources

Air Quality

Restrictions on vegetative treatments to prevent adverse effects on air quality would vary depending on air quality conditions in the immediate area at the time of proposed treatments. Potential short-term adverse effects on vegetative treatments include planning and timing restrictions to minimize emissions associated with fugitive dust or smoke. This effect would be minor. Implementing measures to mitigate adverse effects on air quality by reducing dust emissions could adversely affect forest product sales. However, because such mitigation would not be likely to prevent forest product sales, the effect would be minor.

Soil

Soil types and conditions could affect forest management. Timber harvest could be restricted in areas with unstable soils or particularly steep terrain. This would have a moderate adverse effect on forest product sales.

Water Resources

Timber harvesting could be limited in areas with high-value water resources. It would be necessary to modify timber sales and stand improvement projects, which would have a moderate adverse effect on the forest product resource.

Cave and Karst Resources

Common to all management actions are procedural, conducting inventories and mapping, which would add negligible time and financial costs to forest product projects.

Mineral Resources

Almost the entire planning area would be available for exploration and development of locatable, salable, and fluid minerals under all alternatives. Coal leasing would be limited to areas with high potential for coal development in areas of central Campbell County and north-central Sheridan County.

Locatable Minerals

Public lands not formally withdrawn from mineral entry would be available for locatable mineral development. At present, locatable mineral operations affect 0.3 percent of BLM-administered forest and woodland communities, 138 and 92 acres, respectively. The trend in locatable minerals development is predicted to be similar throughout the planning period. This would have a negligible adverse effect on forest products as the presence of mineral claims could limit forest product sales.

Leasable Minerals – Coal

The potential acreage available for coal leasing is extensive, but the foreseeable activity would be confined to central Campbell County and north-central Sheridan County, and

would only affect the scattered woodlands. Therefore, coal development activities would not have a noticeable effect on forest products and is not further discussed in this section.

Leasable Minerals – Fluids

Federal fluid mineral estate in the planning area would be available to fluid minerals leasing unless it is identified as closed. Based on the predicted activity from oil and gas operators surveyed as part of the reasonably foreseeable development forecast, conventional oil and gas development (potential of low to moderate 10 to 40 wells per township could occur on 3,468 acres (13%) of BLM-administered woodlands. CBNG development could occur on 5,737 acres (22%) of BLM-administered woodlands. Physical disturbance and the loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result have a minor adverse effect on forest products.

Salable Minerals

There are 205 acres (1.2%) of sand and gravel deposits in forest management areas (Billy Creek and the Horn). With the typically small size of salable minerals development, small acreages would be removed from forest production. The foreseeable development scenarios for all alternatives predict less than one percent of BLM surface would be disturbed through salable minerals development. Although sand and gravel deposits are present in slightly more than one percent of the forest management areas, it is not likely the entire amount of predicted salable minerals development would occur in forest management areas. Therefore, salable minerals development would have a negligible adverse effect on the forest products program.

Fire and Fuels Management

Fire management can affect forestry activities. Fuels treatment projects in forested areas can reduce the potential for wildfire by reducing the fuels source. These projects can reduce the amount of woody material on the ground and alter the structure of both the understory and overstory, changing the stand composition and structure. These projects also could open seed beds and help regeneration, helping make forest products a sustainable resource. Wildland fire use for resource benefit also could affect forestry. In areas where this practice is allowed, wildland fire could alter stand composition, structure, and function. Wildland fire could change the seral state of the forest or woodland. Potential commercial material (e.g., sawlogs and firewood) could be burned and no longer be salvageable. Fire and fuels management actions common to all alternatives when considered as a whole would have a moderate beneficial effect on forest products.

Biological Resources

Vegetation – Forests and Woodlands

There are no forest and woodland management actions common to all alternatives.

Vegetation – Grassland and Shrubland Communities

Grassland and shrubland communities overlap forest and woodland communities and play an important role in creating vegetative mosaics and diversity; which benefits forest and woodland health and therefore forest products. When products are removed, this allows for residual vegetation to protect the soil and water resources promoting forest product regeneration. Grassland and shrubland management actions common to all alternatives would have a moderate beneficial effect on forest products.

Vegetation – Riparian/Wetland Resources

The Wyoming Forestry requires streamside MZs in harvesting operations. These zones are located with consideration of slope, aspect, stream type, and stream life. This could reduce the acres available for the harvest of forest products, which would be a moderate adverse effect.

Invasive Species and Pest Management

The regulations for controlling invasive species could increase the cost for the removal of forest products. Requirements to flush equipment and reseed only with approved seed are examples of the restrictions that would increase the cost of harvesting forest products. At the same time, the ability to control pests in forests plays a vital role in forest product removal. Invasive species and pest management actions common to all alternatives overall would have a minor adverse effect on forests products due to the increased costs associated with invasive species requirements.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

The management actions common to all alternatives would restrict forest product activities near fish bearing waters. There are 3,432 acres (19%) of the forest management areas within 0.25 mile of fish-bearing waterbodies. Because commercial sales would be restricted, but not prohibited, the impact is minor. Special status fish are presently limited to the Tongue River drainage which does not contain any commercial forests; therefore, there would be no effect to forest products from special status fish species and they will not be discussed further in this section.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

The management of wildlife and special status wildlife species and their habitats would have an effect on the forest product program. Management would include precluding or placing seasonal restrictions on timber harvest in areas with habitat for these species, such as raptors and their nests. Overall, wildlife management actions common to all alternatives would have a moderate adverse effect on forest products.

Heritage and Visual Resources**Cultural Resources**

Protection of significant cultural resources could indirectly affect the forest products program through increased costs to avoid sites that require protection, and delay projects. Significant sites are rare and typically small, the impacts to the forest product program would be negligible.

Paleontological Resources

Retention of public lands with significant paleontological values would likely have no effect on the forest products program as such areas are rare, typically small, and unlikely to occur within commercial forest areas.

Visual Resources

Visual resources management actions common to all alternatives would likely not have discernible impacts on the forest products program as the primary requirement would be to screen or paint non-temporary facilities. Typically there would not be any non-temporary facilities associated with forest product sales.

Land Resources

Lands and Realty

There are no lands and realty management actions common to all alternatives that would directly affect the forest products program.

Renewable Energy

Management actions common to all alternatives are procedural, requiring cooperation, and would not directly affect forest products.

Rights-of-Way and Corridors

Placing ROW corridors adjacent to roads and other disturbance corridors would benefit the forest products program by preventing corridors through commercially suitable stands. The potential for new access roads in forest management areas could allow for better access to forest products, thereby increasing demand for those products. Because few ROW actions are anticipated in forest management areas, ROW and corridors management common to all alternatives would have a minor beneficial effect on forest products.

Travel and Transportation Management

TTM actions common to all alternatives could increase access to forest product areas through negotiating access to isolated parcels of public lands, evaluating and potentially retaining roads constructed for other programs, and minimizing surface disturbance. Few transportation actions are anticipated in the forest management areas. This management would have a minor beneficial effect on forest products.

Recreation

The effects of dispersed recreation on forest products are related primarily to access, which is discussed under *Travel and Transportation Management*. Management actions for developed recreation sites and SRMAs could affect the forest products program by removing some areas from commercial production. Since there is little overlap with developed recreation sites, SRMAs and forest management areas these management actions would have a negligible adverse effect on forest products.

Lands with Wilderness Characteristics

Newly acquired lands are unlikely to meet the size and naturalness requirements for wilderness characteristics and therefore would not affect the forest products program.

Livestock Grazing Management

Appropriate livestock grazing would be authorized under all alternatives. Livestock grazing tends to be compatible with forest product production, except in areas of aspen or other deciduous hardwood regeneration. There have been very few commercial sales of hardwoods. Therefore, the effect of livestock grazing on the forest products program would be negligible.

Special Designations**Areas of Critical Environmental Concern**

Proposed management of ACECs has no measurable effect on the forest products resource, as the two resources do not overlap, and will not be discussed further in this section.

Scenic or Back Country Byways

The analysis of suggested byways would not affect the forest products resource. However, Byway designation could increase traffic flow, and therefore increase the need for safety measures and

increase costs for logging and hauling activities. This would have a minor adverse effect on the forest products program.

Wild and Scenic Rivers

The portion of the Middle Fork Powder River that is suitable and eligible for WSR designation does not intersect a forest management area. Management of WSRs would not affect the forest products resource and will not be discussed further in this section.

Wilderness Study Areas

WSAs do not overlap with forest management areas. Management of WSAs would not affect the forest products resource and will not be discussed further in this section.

Socioeconomic Resources

There are no social, economic, or health and safety management actions common to all alternatives, or by alternative, that would have a measurable effect on the forest products program. Therefore, socioeconomic resources are not further addressed in this section.

4.6.1.3. Alternative A

This section describes management actions and potential effects associated with the continuation of the current management and provides a baseline to identify potential consequences to the forest products program. The effects described above under Impacts Common to All Alternatives would be in addition to the effects described below for management actions under Alternative A.

Forest Products

The primary management actions under Alternative A would allow the sale of minor forest products from throughout the planning area, offer approximately 18 MMbf of saw timber during the planning period, and limit clear-cuts to 20 acres. These actions would provide for an active forest products program. Because there would be some restrictions on the program, the beneficial effects of this management would be moderate.

Physical Resources

Air Quality

Under Alternative A, air quality monitoring would be required of forest product projects expected to approach or exceed emission standards. Few sales would likely be required to perform monitoring, and the monitoring would likely not prevent any sales. The effect on the forest product program would be negligible adverse.

Soil

Alternative A soils management actions include prohibiting surface-disturbing activities seasonally in areas of severe erosion hazard, on slopes equal to or greater than 25 percent, and in areas with poor reclamation suitability. All three prohibitions have an undefined allowance for waivers, and therefore would not prohibit potential forest product sales outright. The seasonal prohibition would have an effect because it could delay sale activities, which are already limited seasonally by winter weather. There are 10,058 acres (56%) of the forest management areas on slopes equal to or greater than 25 percent, and 6,203 acres (35%) of the forest management areas in areas rated as having poor reclamation suitability. Silviculture treatments are typically less damaging to soil resources than other surface-disturbing activities, and are commonly authorized

when other activities might not be. With the exception of clear-cuts, not all overstory trees are removed; the understory typically is not removed, and physical disturbance to soils is limited. All of this reduces adverse effects on soils compared to other surface-disturbing activities. Therefore, although more than 10 percent of the forest management areas have sensitive soils, the effect on the forest product program would be moderate.

Water Resources

The only water management action under Alternative A that would directly affect forest products is a 500-foot restriction on surface-disturbing activities around springs, reservoirs, water wells, and perennial streams. Like many management actions under Alternative A, the authorized officer can waive the prohibition. This buffer would affect 58,445 acres of forest management areas and therefore restrict product removal from these zones. Forest product sales within 500 feet of water resources would be considered on a project-specific basis. Overall, the effect of Alternative A water management actions on the forest products program would be moderate adverse.

Cave and Karst Resources

Under Alternative A, forest product sales in cave and karst areas would be considered on a project-specific basis. Karst formations are present primarily along the Big Horn Mountains and include the forest management areas. Restrictions on forest product activities would likely be confined to buffers around the entrances to significant caves. At present, there is only one documented significant cave in the forest management areas. Alternative A cave and karst management would have a negligible adverse effect on the forest products program.

Mineral Resources

Locatable Minerals

Under Alternative A, existing withdrawals from locatable minerals entry would continue. At present, locatable minerals operations affect 0.3 percent of BLM-administered forest and woodlands communities (138 and 92 acres, respectively). The trend in locatable minerals development is predicted to be similar throughout the planning period. This would have a negligible adverse effect on forest products as the presence of mineral claims could limit forest product sales.

Leasable Minerals – Fluids

Based on the predicted leasable fluid minerals activity under Alternative A, conventional activity (potential of moderate or above) could occur on 1,209 acres (2.7%) of BLM-administered forest lands and 1,942 acres (7.4%) of woodlands. CBNG activity could occur on 2,148 acres (4.7%) of BLM-administered forest lands and 5,779 acres (22.1%) of woodlands. Physical disturbance and the loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Salable Minerals

Salable mineral activities could prevent potential forest product sales. The estimated areas of salable mineral activity during the planning period would be 530 acres (Appendix G (p. 1937)) a minor adverse effect on the ability to provide forest product sales.

Fire and Fuels Management

Alternative A would give priority to fire suppression in commercial timber areas and provide for prescribed fire to support vegetation management objectives. The suppression efforts, utilizing the different levels and restricting some types of suppression, would have a beneficial effect on forest products. Fuels reduction projects could be performed in forested areas to reduce the potential hazard of wildfire. These projects can alter the structure of both the understory and overstory of trees, changing the composition and structure of the stand and leading to increased productivity and desirability for forest products. This would have a major beneficial effect on the forest products program.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative A, designing forest management treatments to meet overall resource management objectives would have a major beneficial effect on the forest products program. Forest management areas could be managed for forest product production.

Vegetation – Grassland and Shrubland Communities

The present RMP does not contain any grassland and shrubland management decisions, therefore their management would be considered on a project specific basis. Grassland and shrubland communities are often adjacent to and intermingled with forest and woodland communities; therefore restrictions within grass and shrub communities could limit access to commercial forests. Such limitations are expected to be rare, therefore the effect would be negligible.

Vegetation – Riparian/Wetland Resources

Alternative A would prohibit surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams. This would affect approximately 23,831 acres, unless the authorized officer waives the prohibition. Aspens, cottonwoods, ash, and willows often grow in these moist areas, and this management would limit actions to ensure the reproduction and maintenance of these species. However, this would have a negligible adverse effect on the forest products program because historically, these species have not played a major role in the forest products market.

Invasive Species and Pest Management

Weed and pest control is limited to biological means, sanitation and salvage harvest to remove insect and disease trees. Forest products are derived from treated lands. Measures to control invasive plant species, would increase the operational expenses of some harvest operations. Applications to make the forest and woodlands more resilient to infestations will produce forest product opportunities. Overall, management of invasive species and pests would benefit forest products to a moderate degree by reducing forest pest infestations.

Fish and Wildlife Resources – Fish

There are no fisheries management actions under Alternative A. Therefore, effects are considered on a project-specific basis. Forest product sales would likely be controlled and potentially prohibited near fish-bearing streams. This would have a minor adverse effect on the forest products program as few commercial sales would likely be prevented.

Fish and Wildlife Resources – Wildlife

Big game and raptor management actions under Alternative A would have a major adverse effect on the forest products program. At present, there are no documented raptor nests within 0.5 mile of the forest management areas, but this is likely due to inadequate inventory data, not the absence

of nesting raptors. The Alternative A management action with the greatest effect would be the prohibition of timber harvest activities in crucial elk habitat or hiding cover. At present 11,153 acres (62.1%) of the forest management areas provide elk hiding cover.

Special Status Species – Plants

Alternative A does not include management for special status plant species except on a project specific basis. Forest products projects would consider special status plants. However, because special status plants are typically rare and have small populations, it is not likely they would have more than a negligible adverse effect on the forest product program.

Special Status Species – Wildlife (including Greater Sage-Grouse)

At present, there are no documented raptor nests, bald eagle nests, or bald eagle roosts in the forest management areas, but there is potential for all to occur. Alternative A does not include management actions for amphibians and reptiles; therefore, they are considered on a project-specific basis. There are 4,680 acres (26.1%) of amphibian and reptile habitat in the forest management areas. Forest product sales would have to consider SSS during planning and projects might have to be modified or relocated. It is not likely that any projects could not be accommodated. The effect on the forest products program would be moderate adverse.

Heritage and Visual Resources

Cultural Resources

Alternative A does not include cultural resources management actions that would directly affect the forest product program, because none of the cultural resources sites identified for management are in the forest management areas. Cultural resources would be considered on a project-specific basis, and a cultural resources inventory would be required during project planning. Projects might have to be modified to prevent adverse effects on cultural resources, but it is not likely that a forest product sale would be canceled. The adverse effect on the forest products program would be negligible.

Paleontological Resources

Alternative A does not include management for the protection of paleontological resources, but would consider effects on a project-specific basis. Implementing protective measures for paleontological resources could require avoidance and other mitigation measures for proposed forest product sales. These measures could require that sales projects be relocated or redesigned. It is not likely that a forest product sale would be canceled, and the effect on the forest products program would be negligible.

Visual Resources

Alternative A would manage 14,727 acres (82.1%) of the forest management areas under VRM Class II. Activities in Class II areas should not attract the attention of the casual observer. This management would affect the designs, types, sizes, and shapes of timber harvests, but would not prohibit them. For example, clear-cuts could be kept small and irregular in shape to mimic natural forest openings. VRM Class III and IV areas have greater management flexibility. The effect on the forest products program would be moderate adverse.

Land Resources

Lands and Realty

The BLM-administered land ownership pattern in the planning area is scattered, interspersed

with private, state, and lands administered by other federal government agencies. Land tenure adjustments would occur on a project specific-basis under Alternative A, with an emphasis on acquiring areas adjacent to existing blocks of BLM surface and disposing of isolated BLM parcels. The forest management areas are mostly within large blocks of BLM surface. Consolidating surface lands could facilitate forest product management by providing for a more contiguous public land base. Acquisitions are primarily driven by outside proponents; therefore, the result would be a minor beneficial effect on the forest products program.

Renewable Energy

The present RMP does not contain any renewable energy decisions and therefore any proposals would be considered on a project specific basis. The forest management areas have wind energy potential, but commercial projects are not anticipated due to the costs associated with removing the forest cover for siting solar panels. Therefore, no effects are expected to the forest products program.

Rights-of-Way and Corridors

New ROW could increase access to forest products. Alternative A would prohibit ROW on slopes equal to or greater than 25 percent. There are 10,058 acres (56.0%) of the forest management areas with slopes equal to or greater than 25 percent. Few ROW applications are anticipated for forest management areas, therefore ROW prohibition effects on the forest products program would be minor.

Travel and Transportation Management

Alternative A would limit motorized vehicle use to existing roads and vehicle routes on public lands in and around forest management areas, which would minimize potential damage to forest products. Public access would have the potential to adversely affect forest products (e.g., through damage to regenerating forests by illegal off-road travel and through theft of forest products). Such incidents have been rare and are anticipated to remain rare; therefore, the effect on the forest products program would be negligible adverse.

Recreation

Management actions for developed recreation sites and SRMAs would remove some areas from commercial production. Since there is little overlap between developed recreation sites or SRMAs and recreation site development is anticipated to disturb approximately 5 acres, these management actions would have a negligible adverse effect on forest products.

Lands with Wilderness Characteristics

Alternative A would continue to manage forest management areas for forest products and other resources. There would be no effect on the forest products program.

Livestock Grazing Management

Alternative A would require rest from grazing in vegetative treatment areas for one year following treatment, and defer livestock grazing a second year. Rest and deferment would provide aspen and other hardwoods some time to regenerate. One year of livestock grazing rest likely not be sufficient for aspens to grow beyond the reach of livestock. This effect on the forest products program would be negligible adverse.

Special Designations

Scenic or Back Country Byways

Alternative A does not include special designations or recommendations for scenic or BCBs.

4.6.1.4. Alternative B

This section describes management actions under Alternative B, which would emphasize resource conservation, and the resulting effects on the forest products program due to their implementation. The effects described above under *Impacts Common to All Alternatives* would be in addition to the effects described below for management actions under Alternative B.

Forest Products (minor adverse)

Alternative B would allow timber sales only within the forest management areas and would manage sales to keep forest products within ecologically sustainable limits. These actions would limit the forest products program, a minor adverse effect.

Physical Resources

Air Quality

Under Alternative B, potential restrictions on forest product sales to prevent adverse effects on air quality would vary depending on air quality conditions in the immediate area at the time of proposed sales. Few projects would likely be required to perform monitoring, and the monitoring would likely not prevent any sales. Potential short-term adverse effects include planning and timing restrictions to minimize emissions associated with fugitive dust or smoke. The effect on the forest product program would be negligible adverse.

Soil

Alternative B soils management actions include prohibitions on surface-disturbing activities in areas of severe erosion hazard, on slopes equal to or greater than 25 percent, in areas with poor reclamation suitability, and on miscellaneous soil types. There are 30,819 acres (60%) of the forest management areas with slopes equal to or greater than 25 percent, and 6,203 acres (35%) of the forest management areas on soils with poor reclamation suitability. Alternative B prohibitions on surface-disturbing activities in these areas would have a major adverse effect on the forest products program.

Water Resources

Alternative B would prohibit surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams. The water management buffer would affect 1,010 acres (5.6%) of the forest management areas. The effect of Alternative B water management actions on the forest product program would be moderate adverse.

Cave and Karst Resources

Alternative B would prohibit surface-disturbing activities, including most silviculture activities, in cave and karst areas. There are karst formations along the Big Horn Mountains, including in the six forest management areas. Alternative B cave and karst management would have a major adverse effect on the forest products program.

Mineral Resources

Locatable Minerals

Alternative B would recommend withdrawal from minerals entry 15,870 acres (31%) of BLM-administered forest lands and 10,777 acres (41%) of woodlands. This would have major beneficial effect on forest program by preventing potential claims that could interfere with forest product activities.

Leasable Minerals – Fluids

Based on the predicted fluid minerals activity under Alternative B, conventional activity (potential of moderate or above) could occur on 340 acres (1.0%) of BLM-administered forest lands and 812 acres (6.9%) of woodlands. CBNG activity could occur on 900 acres (2.7%) of BLM-administered forest lands and 2,820 acres (24.0%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect to potential forest product sales.

Salable Minerals

Salable mineral activities could prevent potential forest product sales. The estimated areas of salable mineral activity during the planning period would be 114 acres (Appendix G (p. 1937)), a negligible adverse effect on the ability to provide forest product sales.

Fire and Fuels Management**Unplanned Fire (Wildfire)**

Alternative B would use full suppression strategies in commercial timber areas. Full suppression strategies can have a moderate beneficial effect on the forest products program because while most fires would be suppressed the accumulation of fuels could lead to a large uncontrollable fire.

Planned Fire (Prescribed Fire)

Alternative B would provide for fire and other treatments to restore fire-adapted ecosystems. Planned vegetative treatments would be for the benefit of ecosystem health, with forest product suitability a minor consideration. The effect on the forest product program would likely be moderate beneficial, for protection from wildfire and making soil available for forest regeneration.

Biological Resources**Vegetation – Forests and Woodlands**

Alternative B would minimize silviculture treatments and allow natural processes to run their course. The forest products program would be minimal and limited to situations where silviculture treatments would only be applied to reduce hazardous conditions. This would have a major adverse effect on the forest products program.

Vegetation – Grassland and Shrubland Communities

Requiring native plant species for reclamation activities would contribute to ecosystem health by promoting biological diversity. However, native species can be difficult to establish, costing time and resources, limiting the benefit to moderate.

Vegetation – Riparian/Wetland Resources

A 500-foot buffer of water bodies would reduce acres available for harvest activities. The effect on the forest products program would be moderate adverse.

Invasive Species and Pest Management

Alternative B would allow aerial applications of insecticides. However, this has not been the preferred treatment in forest management areas. Sanitation harvest and biological treatments are the most common treatments. Forest product sales would likely include measures to control

invasive species and pests, and more forest acreage would likely be treated than under other alternatives. Operational expenses would increase, but the overall effect on the forest products program would be minor beneficial.

Fish and Wildlife Resources – Fish

Alternative B would prohibit surface-disturbing activities, including forest product sales, within 0.25 mile of fish-bearing waterbodies. The prohibition would affect 3,432 acres (19%) of the forest management areas. This would have a major adverse effect on the forest products program.

Fish and Wildlife Resources – Wildlife

Big game and raptor management actions under Alternative B would have the greatest effect on the forest products program. Timber harvest activities would be prohibited within crucial elk habitat or hiding cover (which currently includes 11,153 acres, or 62%, of the forest management areas). Wildlife management actions would have a major adverse effect on the forest products program.

Special Status Species – Plants

Surveys for special status plant species would be required during planning for forest product projects, and the projects would be required to avoid adverse effects to special status plant habitat. Projects would likely have to be modified, including changing their locations. Limber pine is designated as a BLM Wyoming Sensitive Species and will require special management for protection. These management actions could severely limit forest product sales.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative B would prohibit surface-disturbing activities, including forest product sales, on amphibian and reptile habitat in the forest management areas (4,680 acres, or 26%). Protections for northern goshawks and other SSS residing in forested areas would seasonally restrict and could prevent forest management activities. These actions would have a major adverse effect on the forest products program.

Heritage and Visual Resources

Cultural Resources

Alternative B would prohibit surface disturbance, including forest product sales, up to 5 miles from historic properties. This action would affect 6,475 acres (36%) of the forest management areas, and have a major adverse effect on the forest products program.

Paleontological Resources

Forest product activities could be prohibited in areas with paleontological resources of high quality or importance. However, at present, there are no high-quality paleontological areas in the forest management areas, and typically the areas are small. Forest product sales could be located to avoid paleontological sites. Therefore, the effect on the forest products program would negligible adverse.

Visual Resources

Alternative B would manage 14,909 acres (83%) of the forest management areas under VRM Class II. This management would affect the designs, types, sizes, and shapes and locations of timber harvests, but would not prohibit them. The effect on the forest products program would moderate adverse because projects would need to meet the VRM requirements.

Land Resources

Lands and Realty

Alternative B would place a priority on retaining and acquiring lands with natural resource values. Consolidating surface lands could facilitate forest product management by providing for a more contiguous public land base, creating better access, and additional acres for forest production.

Renewable Energy

Portions of the Big Horn Mountains and PRB area have a potential for renewable-energy (e.g., wind) development. Renewable energy would be prohibited in the Big Horn Mountains thus avoiding potential conflict with forest product sales.

Rights-of-Way and Corridors

Alternative B would prohibit ROW on slopes equal to or greater than 25 percent. There are 10,058 acres (56%) of the forest management areas with slopes equal to or greater than 25 percent. Few ROW applications are anticipated for in forest management areas. Therefore, the adverse effect of the slope prohibition on the forest products program would be minor.

Travel and Transportation Management

Alternative B TTM actions would have a moderate beneficial effect on the forest product program. The extension of new access roads in forest and woodland areas could allow for better access to resources, which could benefit timber sales. Expanded road access also could mean easier access for wood cutters and other users of forest products, thereby increasing the demand for forest products.

Recreation

Alternative B designates 55,529 acres as SRMAs. Forest product removal could be adversely affected in these areas as surface-disturbing activities would be restricted within SRMAs. Commercial forest product sales are unlikely within SRMAs due to the small overlap with recreation areas and thus the restrictions would have a negligible to minor effect.

Lands with Wilderness Characteristics

Alternative B would manage 12,237 acres for wilderness characteristics. Commercial woodcutting would be prohibited unless for environmental restoration. The lands with wilderness characteristics unit is predominately forested, however the steep topography limits the potential for commercial woodcutting. This would result in a minor to moderate adverse impact to the forest products resource depending on technological advancements in forest management or the economic market for timber in the area.

Livestock Grazing Management

Alternative B would rest vegetative treatment areas for two years following treatment. Two years of rest from livestock grazing rest could be sufficient for some aspen to grow beyond the reach of livestock. The effect on the forest products program would be moderate beneficial.

Special Designations**Scenic or Back Country Byways**

Under Alternative B, designating Slip Road and Hazelton Road as BCBs could increase the traffic flow and create safety issues with forest product removal and hauling operations. This would have a minor adverse effect on forest management.

4.6.1.5. Alternative C

This section describes management actions under Alternative C, which would emphasize resource utilization, and the resulting effects on the forest products program. The effects described above under *Impacts Common to All Alternatives* would be in addition to the effects described below for management actions under Alternative C.

Forest Products

The management actions under Alternative C would allow the sale of forest products throughout the planning area, maximize economic potential, and not limit the design or shape of timber harvests. These actions would provide for an active forest products program that emphasizes economic return. There would be few restrictions on the program; therefore, the beneficial effect of this management would be major.

Physical Resources

Air Quality

Alternative C management would not require air quality monitoring for forest product projects.

Soil

Alternative C soils management actions would include allowing surface-disturbing activities in areas with severe erosion hazard, on slopes equal to or greater than 25 percent, in areas with poor reclamation suitability, and on miscellaneous soil types. Silviculture treatments would be designed to accommodate the slope, erosion potential, and soil moisture content consistent with the Wyoming Forestry BMPs. These management actions would allow forest product sales on sensitive soils in the planning area, which comprise much more than 10 percent of the forest management areas. Therefore, this would have a major beneficial effect on the forest products program.

Water Resources

Alternative C would allow surface disturbances within 500 feet of springs, reservoirs, water wells, and perennial streams. This management would allow for project-specific adjustments for slope, aspect, stream type, and other conditions. Wyoming Forestry BMPs and other mitigation measures would be incorporated to reduce adverse effects on water resources. There would be some costs associated with incorporating BMPs and other mitigation measures, however; the overall result would be a moderate beneficial effect on the forest products program.

Cave and Karst Resources

Management actions include establishing buffers from significant cave entrances to minimize effects from surface-disturbing activities. Presently, there is only one documented significant cave within the Forest Management Areas. Alternative C cave and karst management would result in a negligible adverse impact to the forest products program.

Mineral Resources

Locatable Minerals

Alternative C would not recommend any additional minerals withdrawals. At present, locatable minerals operations affect 0.3 percent of BLM-administered forest and woodlands communities, 138 and 92 acres, respectively. The locatable minerals development trend is predicted to be

similar throughout the planning period, and the effect on forest and woodland resources would be negligible adverse.

Leasable Minerals – Fluids

Based on the predicted fluid minerals activity under Alternative C, conventional activity (potential of moderate or above) could occur on 1,205 acres (2.7%) of BLM-administered forest lands and 1,936 acres (7.7%) of woodlands. CBNG activity could occur on 2,057 acres (4.7%) of BLM-administered forest lands and 5,512 acres (21.8%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Salable Minerals

Salable mineral activities could prevent potential forest product sales. The estimated areas of salable mineral activity during the planning period would be 2,090 acres (Appendix G (p. 1937)), a minor adverse effect on the ability to provide forest product sales.

Fire and Fuels Management

Alternative C would allow full suppression across the planning area and provide for prescribed fire to support commodity production. Planned vegetation management projects could be used to increase the productivity and desirability of forest products. These actions are moderately beneficial as full suppression can increase the risk of fuel buildup and risk of an uncontrollable wildfire.

Biological Resources

Vegetation – Forests and Woodlands

Alternative C would have a major beneficial effect on the forest products program. Designing treatments to maximize forest health would improve opportunities for a sustained forest products program. Clear-cut size would not be regulated. Old-growth forests could be managed to emphasize saw timber or other forest products.

Vegetation – Grassland and Shrubland Communities

Allowing the planting of desirable non-native species could speed reclamation and vegetation recovery, a beneficial effect for the ecosystem and therefore, forest product production.

Vegetation – Riparian/Wetland Resources

Alternative C management would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams. This management would allow for project-specific adjustments for slope, aspect, stream type, and other conditions. Wyoming Forestry BMPs and other mitigation measures would be incorporated to reduce adverse effects to riparian and wetland resources. Although there would be some costs associated with incorporating BMPs and other mitigation, the overall result would be a major beneficial effect on the forest products program.

Invasive Species and Pest Management

Under Alternative C, invasive species pest management would continue in the forest management areas, with treatment areas and methods determined annually. Management emphasis only on the State of Wyoming list would be a limiting factor in forest and woodlands pest management. Forest

product sales could include measures to control invasive species, which would increase operating expenses. Overall, there would be a minor adverse effect on the forest products program.

Fish and Wildlife Resources – Fish

Alternative C would allow forest product sales within 0.25 mile of fish-bearing waterbodies consistent with other resource values. This management would affect 3,432 acres (19%) of the forest management areas. Forest management activities could be subject to some regulation for the protection of other resources, but protective buffers would not be likely to extend more than 500 feet from fish-bearing waters. The effect on the forest products program would be moderate beneficial.

Fish and Wildlife Resources – Wildlife

Alternative C would allow forest product activities in elk habitat and near raptor nests, with mitigation appropriate for multiple resource management. The overall result would likely be a major beneficial effect to the forest products program.

Special Status Species – Plants

Under Alternative C, adverse effects on documented special status plant populations would be avoided. Surveys would be required all listed proposed, or candidate species. If any populations of such plants were found during surveys, projects would likely be modified, including change their locations. With the limber pine being designated as a BLM Wyoming Sensitive Species, this will impact forest product projects, as this species is often intermixed with commercial species.

Special Status Species – Wildlife (including Greater Sage-Grouse)

At present, there are no documented raptor nests, bald eagle nests, or bald eagle roosts in the forest management areas. There are 4,680 acres (26%) of amphibian and reptile habitat in the forest management areas that would be available for forest product sales. Forest product projects would consider SSS during planning, and projects might have to be modified. This would have a minor adverse effect on the forest products program as forest product sales would require modifications but would not be prohibited.

Heritage and Visual Resources

Cultural Resources

Alternative C would allow surface disturbance in areas surrounding historic sites. Effects on cultural resources would be considered on a project-specific basis. A cultural resource inventory would be required during project planning. Projects might have to be modified to prevent adverse effects on cultural resources. It is not likely that a forest product sale would be canceled. The effect on the forest products program would be negligible adverse.

Paleontological Resources

Alternative C would require surveys and monitoring of paleontological resources in PFYC Class 4 and 5 formations during surface-disturbing activities. Forest product activities could be prohibited in areas containing paleontological resources of high quality or importance. However, at present there are no high-quality paleontological areas in the forest management areas, and areas of such resources are typically small. Forest product sales could be located to avoid paleontological resource sites. Therefore, the effect on the forest products program would be negligible adverse.

Visual Resources

Under Alternative C, managing most of the planning area as VRM Class III or IV would have a beneficial effect on forest product activities because there would be few restrictions for the protection of visual resources. This would allow harvesting of all areas that are needed for forest health and sustainability, therefore product availability would increase.

Land Resources**Lands and Realty**

Under Alternative C, disposing of lands that have resource value would have an adverse effect on the forest products program. Removing the option of acquiring lands adjacent to the larger public land blocks also would have a long-term adverse effect by denying opportunities to acquire lands with forest product potential. These management actions could have a major effect on the forest products program. However, it is not anticipated that there would be an active disposal campaign and therefore the impact would likely be minor.

Renewable Energy

Under Alternative C, renewable-energy development must be consistent with all other resource values. All public lands in the planning area would be open to such development. The forest management areas have wind energy potential, but commercial projects are not anticipated due to the costs associated with removing the forest cover for siting solar panels. Therefore, no effects are expected to the forest products program.

Rights-of-Way and Corridors

Alternative C would allow ROW on slopes equal to or greater than 25 percent, which could increase access to forest products. However, few ROW applications are anticipated in the forest management areas. Therefore, the beneficial effect on the forest products program would be minor.

Travel and Transportation Management

Under Alternative C, allowing motorized vehicle use on saturated soils and steep slopes would have a long-term adverse effect on forest and woodland areas. This management would open all roads to motorized vehicle use and would allow access to management areas where regeneration could be damaged by OHV use. The adverse effect on forest and woodlands regeneration and therefore products would be minor.

Recreation

Alternative C designates 30,570 acres as SRMAs. Forest product removal could be adversely affected in these areas as surface-disturbing activities could be limited or require intense mitigation within SRMAs. The forecast is that 20 acres would be disturbed for recreation facilities over the planning period, it is unlikely any facilities would be proposed in the commercial forest areas. Commercial forest product sales are unlikely within SRMAs due to the small overlap with recreation areas and thus the restrictions would have a negligible effect.

Lands with Wilderness Characteristics

Alternative C does not propose any management related to lands with wilderness characteristics, thus there would be no effect on the forest products resource.

Livestock Grazing Management

Under Alternative C, allowing livestock grazing in regeneration areas and after prescribed fire would affect the sustainability and health of forests and woodlands by limiting species and

age-class diversity. This would have a major adverse effect on the future availability of forest products.

Special Designations

Scenic or Back Country Byways

Alternative C does not include special designations or recommendations for scenic or BCBs.

4.6.1.6. Alternative D

This section describes management actions under Alternative D, the **Proposed RMP**, and the likely resulting effects on forest products due to its implementation. The effects described above under *Impacts Common to All Alternatives* would be in addition to the effects described below for management actions under Alternative D.

Forest Products

Forest Products Management actions under Alternative D would allow the sale of forest products in portions of the planning area, with accommodations for other resource values such as wildlife and special designations, a moderate benefit.

Physical Resources

Air Quality

Under Alternative D, effects on the forest products program would be possible if product sales are anticipated to exceed or approach ambient air quality standards. However, few forest product projects are large enough or have durations long enough to warrant monitoring.

Soil

Under Alternative D, disturbances would be considered in areas with severe erosion hazard, on slopes equal to or greater than 25 percent, and in areas with poor reclamation suitability where the soil resources could be appropriately mitigated. There are 40,032 acres of forest and woodland on slopes equal to or greater than 25 percent suitability that would be limited for forest products removal due to safety, inaccessibility, and soil conservation. This would have a moderate adverse effect on the forest product program.

Water Resources

Alternative D water management would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams where water quality could be protected. Project design features and mitigation would ensure that water resources are protected while allowing for activities such as forest product sales and silviculture treatments. Wyoming Forestry BMPs require a 200-foot buffer and other mitigation measures incorporated into project designs. The overall result would be a minor adverse effect (less than 5% of forest and woodlands affected) on the forest products program.

Cave and Karst Resources

Alternative D would require a disturbance-free buffer around the entrances and passages of significant caves. This could require the relocation or redesign of individual projects, but likely would not prevent any forest product sales. At present, there is only one documented significant cave in the forest management areas. Alternative D cave and karst management would have a negligible effect on the forest products program.

Mineral Resources

Locatable Minerals

Alternative D would not recommend any additional minerals withdrawals. At present, locatable minerals operations affect 0.3 percent of BLM-administered forest and woodlands communities, 138 and 92 acres, respectively. The locatable minerals development trend is predicted to be similar throughout the planning period, and the effect on forest and woodland resources would be negligible adverse.

Leasable Minerals – Fluids

Based on the predicted fluid minerals activity under Alternative D, conventional activity (potential of moderate or above) could occur on 949 acres (2.2%) of BLM-administered forest lands and 1,576 acres (6.5%) of woodlands. CBNG activity could occur on 1,968 acres (4.6%) of BLM-administered forest lands and 5,350 acres (22.1%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. However, this could result in fragmentation of adjoining stands of forest and woodland vegetation. The result would be a minor adverse effect on forest products.

Salable Minerals

Salable mineral activities could prevent potential forest product sales. The estimated areas of salable mineral activity during the planning period would be 1,193 acres (Appendix G (p. 1937)) a minor adverse effect on the ability to provide forest product sales.

Fire And Fuels Management

Alternative D would prioritize fire suppression based on resource goals and objectives. Forest management areas would receive a higher suppression priority compared to other forested areas. Prescribed fire and other vegetative treatments would be performed to support vegetation management objectives. These projects can alter the structure of both the understory and overstory of trees, changing the composition and structure of the stand and leading to increased productivity and desirability for forest products. Vegetation treatments can keep fuel loads down reducing the risk of an uncontrollable wildfire. This management would have a major beneficial effect on the forest products program.

Biological Resources

Vegetation – Forests and Woodlands

Alternative D would utilize silviculture treatments, including intensive tactics to maximize forest health, while emphasizing multiple resource values. Old-growth forests and aspen communities would be maintained and encouraged with multiple treatments. These management actions would benefit the forest products program and promote forest products through making forests and woodlands sustainable.

Vegetation – Grassland and Shrubland Communities

Allowing desirable non-native plant species for short-term reclamation activities could speed reclamation and vegetation recovery, a beneficial effect for the ecosystem and therefore, forest product production.

Vegetation – Riparian/Wetland Resources

Alternative D riparian management would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams with adequate protection. Project design features and mitigation would ensure that riparian and wetland resources are protected while allowing for forest product sales. Wyoming Forestry BMPs require a 200-foot buffer and other mitigation measures incorporated into project designs. The overall result would be a minor beneficial effect (less than 5% of forest and woodlands affected) on the forest products program.

Invasive Species and Pest Management

Alternative D would allow aerial applications of insecticides. BLM specialists would be allowed to determine tree species and areas of treatment. This would benefit forest product sales, including salvage sales. Invasive species pest control would continue in the forest management areas, with priority given to treatment areas that could be a safety factor for the public, and forests and woodlands that have increased mortality. Forest product sales would likely include measures to control invasive species. The cost of control measures is outweighed by the benefit to forest product productions, so that overall these management actions are a minor benefit to the forest product program.

Fish and Wildlife Resources – Fish

Alternative D would allow forest product sales within 0.25 mile of fish-bearing waterbodies where fish objectives can be met. This management would affect 3,432 acres (19%) of the forest management areas. Forest management activities would be subject to restrictions for the protection of fish and other resources, but the restriction would likely extend no more than 500 feet from fish-bearing waters. The effect on the forest products program would moderate adverse.

Fish and Wildlife Resources – Wildlife

Under Alternative D, forest product activities would be required to maintain current amounts of crucial elk habitat and hiding cover. This would constrain, but not prohibit, well-planned forest product sales. Restrictions on disturbances in calving areas and big-game corridors, and the buffers around raptor nests would have the greatest effect on forest products by limiting the timing forest products removal, the types of removal, and the sizes of the harvest areas.

Special Status Species – Plants

Alternative D would require surveys for special status plant species during planning for forest product projects in modeled habitat, and would require that adverse effects on populations of this species be avoided. There are populations of limber pine throughout the forest and woodlands. The projects will need to be adapted to assure the regeneration and the survival of this tree species and any and all others that are designated and were found in the proposed project areas, the projects could be modified, including relocation.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Most of the forest and woodland areas include amphibian and reptile habitat and their protective buffers. Forest product sales would have to protect SSS, and this measure would affect harvesting activities. Locating amphibians and reptiles through surveys would result in loss of time to implement forest product sales.

Heritage and Visual Resources**Cultural Resources**

Under Alternative D, the cultural resources program would develop CRPPs for the protection

and preservation of identified geographic areas. These could include a prohibition on surface-disturbing activities for specifically identified sites containing historic properties that retain their historic settings, and appropriate mitigation for surface-disturbing activities for the protection of TCPs, sacred sites, and other culturally sensitive areas. At present, none of the identified sites where surface-disturbing activities would be prohibited are in the forest management areas.

To protect the setting of historic properties, surface-disturbing activities could be restricted up to three miles from the sensitive cultural sites, which would affect 15,694 acres (87%) of the forest management areas. Forest product sales projects would have to mitigate adverse effects on cultural resources, which could include relocating the projects.

Paleontological Resources

Alternative D would require surveys and monitoring of paleontological resources in PFYC Class 4 and higher formations. Forest product activities could be prohibited in areas containing paleontological resources of high quality or importance. However, at present there are no high-quality paleontological areas in the forest management areas, and such areas typically are small. Forest product sales could be located to avoid paleontological sites. Therefore, the effect on the forest products program would be negligible adverse.

Visual Resources

Alternative D would manage 10,997 acres (61%) of the forest management areas under VRM Class II. This management would affect the designs, types, sizes, locations, and shapes of timber harvests, but would not prohibit them. The effect on the forest products program would be moderate adverse because projects would need to meet the VRM requirements.

Land Resources

Lands and Realty

Management under Alternative D would actively pursue land tenure adjustments to consolidate BLM surface estate and dispose of small, isolated parcels of BLM-administered land or lands have limited natural resource values. Consolidating surface lands would benefit the forest products program by providing for a more contiguous public land base and resolving access issues.

Renewable Energy

Under Alternative D, excluding renewable-energy development in the southern Big Horn Mountains would protect and preserve the larger forest management areas for forest production and product removal.

Rights-of-Way and Corridors

Alternative D would seek to avoid ROWs on slopes equal to or greater than 25 percent. There are 10,058 acres (56%) of the forest management areas with slopes equal to or greater than 25 percent. Few ROW applications are anticipated for the forest management areas, and combined with the slope restriction versus prohibition, this would result in a negligible effect on the forest products program.

Travel and Transportation Management

Under Alternative D, allowing motorized vehicle use on designated routes and managing roads consistent with forest and woodland resources would have a moderate beneficial effect on forest and woodlands management by preventing off-road use which damages regeneration.

Recreation

Alternative D designates 54,160 acres as SRMAs. Forest product removal could be adversely affected in these areas as surface-disturbing activities would be restricted within SRMAs. The forecast is that 20 acres would be disturbed for recreation facilities over the planning period, it is unlikely any facilities would be proposed in the commercial forest areas. Commercial forest product sales are unlikely within SRMAs due to the small overlap with recreation areas and thus the restrictions would have a negligible to minor effect.

Lands with Wilderness Characteristics

Alternative D would manage 6,864 acres for wilderness characteristics. The proposed alternative will prohibit commercial woodcutting unless it is a by-product of environmental restoration. The lands with wilderness characteristics unit is predominately forested, however the steep topography limits the potential for commercial products. This alternative would result in a minor adverse impact to the forest products resource.

Livestock Grazing Management

Alternative D would rest or defer livestock grazing in vegetative treatment areas until resource objectives are met. In the forest management areas, the resource objectives would likely include vegetation regeneration. The effect on the forest products program would be major as forest product production would be sustained.

Special Designations**Scenic or Back Country Byways**

Under Alternative D, designating Slip Road and Hazelton Road as BCBs could increase the traffic flow and create safety issues with forest product removal and hauling operations. This would have a minor adverse effect on forest management.

4.6.1.7. Cumulative Impacts

Forest products derived from forest and woodland management activities play an important role in supporting the socioeconomics of the community and supporting other resources in forest and woodland communities.

The intermingling of private, state, and USFS lands with BLM-administered lands throughout the planning area ensures that activities outside BLM control would continue. Timber harvest activities, silviculture treatments, and development of housing and other structures on private, State of Wyoming, and USFS lands would leave roads in place and reduce forest and woodland acres by creating more fragmentation and edge effects. This could delay implementation of BLM harvest activities, fuel reduction activities, or silviculture activities until effects associated with the activities are mitigated or are no longer a factor. However, using these same roads to manage BLM-administered lands would result in fewer roads being built, and the BLM would have the option of mitigating the effects of roads on BLM-administered lands.

As private land is fragmented, there will be less forest product activity because having numerous landowners to negotiate with will make it more difficult to gain access to the adjacent public lands.

4.6.1.8. Conclusion

Alternative B would place the greatest restrictions on the forest products program, and Alternative C the least. Alternative D provides for forest product sales and other land uses while conserving resource values.

4.6.2. Lands and Realty

The land ownership pattern in the planning area is scattered and interspersed with private and state lands and other agency-administered lands. Through the lands and realty program, lands in the planning area will be acquired or disposed of through exchanges, sales, or the R&PP Act of 1926 (as amended, 43 U.S.C. 869 et seq.). Exchange is the preferred method of land tenure adjustments and must be considered before other land tenure adjustment methods. Approximately 120,722 acres in the planning area are identified for disposal (Appendix L (p. 2211)). This section describes potential impacts to the lands and realty program from land actions within the program and management actions for other resources and programs.

4.6.2.1. Methods and Assumptions

In an effort to consolidate ownership and improve access and management opportunities, adjustments will focus on disposing of scattered, isolated parcels while acquiring lands adjacent to larger blocks of BLM-administered public lands. This will decrease conflicts between public land users and private landowners, and decrease the cost of public land administration. Adjustments also will provide community expansion opportunities.

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources in the planning area, reviews of existing literature, and information provided by other agencies. Spatial analysis was performed using computer software. Effects are quantified where possible. In the absence of quantitative data, effects are described using ranges of potential effects or in qualitative terms if information is available and appropriate.

Demand for land tenure adjustments (e.g., retention, and disposal and acquisition [primarily through exchange]) will likely increase during the planning period. Land tenure adjustments will benefit the overall administration of the lands and realty program by improving the BFO ability to administer resources and protect resource values. If there are effects that were not beneficial and could not be properly mitigated, a land tenure adjustment will not be considered. Certain lands will not be considered for disposal unless they are exchanged with lands of equal or greater value, including functional resource value or monetary value.

Assumptions

This analysis uses the following assumptions:

- The demand for land tenure adjustments and land use authorizations will increase over the life of the plan.
- Lands with known minerals values or lands likely to include minerals values will generally be retained. Alluvial valley floors will generally be retained under federal ownership to protect the resource. Consistent with the Surface Mining Control and Reclamation Act of 1977, minerals owned or leased by other entities, and occurring in alluvial valley floors will

be considered for exchange. Currently there is one alluvial valley floor exchange proposal that is being entertained.

- Unless identified for disposal, all BLM-administered lands will generally be retained in federal ownership to protect resource values. Because of their limited presence in the planning area, the BFO will generally retain lands with aquatic resources, agricultural potential, and wetland/riparian habitat.
- Disposal of small, isolated parcels of public land will enhance efficiency in management of the remaining public lands. Accomplishing these types of disposals will increase the BFO financial ability to pursue land tenure adjustments.
- Land acquisitions will occur, when appropriate, if required to meet the goals and objectives of other resources programs (e.g., cultural resources, fish and wildlife, and recreation).
- Resolving trespass issues on public lands will continue during the planning period. Avoiding inadvertent trespass by people accessing public lands will be addressed through the use of appropriate signs and access authorizations.
- Existing withdrawals will be retained throughout the planning period unless it is determined, through a withdrawal review, that existing withdrawal(s) should be revoked or modified. Management will consider withdrawals on surface and minerals estate on a project-specific basis. In addition, review of withdrawal proposals from other agencies will be addressed on a project-specific basis.
- There are multiple resource values on a given land parcel making acquisition into public ownership more desirable or decreasing the potential for disposal.
- Opportunities for land tenure adjustments are substantially reduced due to increased demand for other land use authorizations. For example: a higher priority is placed upon the ROW, or renewable energy programs not providing sufficient time for BLM realty specialists to devote to the lands and realty program, as well as budget constraints.

4.6.2.2. Impacts Common to All Alternatives

Lands and Realty

There are no proposed management actions common to all alternatives that would adversely effect the lands and realty program. The management actions provide for a flexible and diverse lands and realty program. Lands and realty management common to all alternatives management seeks to improve access to public land and enable better overall management of BLM-administered land. Lands and realty management would consider R&PP leases on a project specific basis and prohibit subsequent uses on these lands unless they are compatible with R&PP authorization. Lands and realty management common to all alternatives would consider FLPMA leases and permits, acquisitions to include easements, exchanges, sales, and withdrawals on a case-by-case basis. Consider land withdrawals for other agencies and review withdrawal proposals on a project specific basis. Review existing land withdrawals to determine if the use is consistent with the intent of the withdrawal and whether the withdrawal should be continued, modified, revoked or terminated. Review existing land classifications and segregations on a case-by-case basis to determine whether this land management is appropriate and should be continued, modified, or terminated. Lands on which withdrawals, classifications, and segregations have been terminated or revoked, will be managed in a manner consistent with the adjacent land within the planning area, opening the lands. Lands meeting the identified disposal criteria will have priority consideration for disposal. Land exchanges, sales, and purchases would help to consolidate the relatively fragmented public land ownership pattern within the planning area and allow for better management of public lands over the long term. Consolidating public land holdings improves access to public lands, reducing the number of access easements needed and helping to reduce

encroachment problems from adjacent property owners. Avoid the potential of inadvertent trespass on public lands through the use of appropriate signage and access authorizations.

Overall, lands and realty management actions common to all alternatives would have a major beneficial effect on the lands and realty program.

Physical Resources

Air Quality

There are no air quality management actions common to all alternatives or that vary by alternative that would effect the acquisition, disposal, or withdrawal of public lands; therefore air quality will not be addressed further in the *Lands and Realty* section.

Soil

The soil management actions common to all alternatives and by alternative all discuss surface-disturbing activities and would not affect the acquisition, disposal, or withdrawal of public lands. Soil is typically not a primary resource when considering a proposed land tenure adjustment. Proposed soil management actions would have no effect on the lands and realty program and will not be addressed further in the *Lands and Realty* section.

Water Resources

The water management actions common to all alternatives and those that vary by alternative all relate to surface disturbance or water use; they would not affect the acquisition, disposal, or withdrawal of public lands. The presence or absence of water would be a primary factor when considering proposed land tenure adjustments. Water will not be addressed further in the *Lands and Realty* section.

Cave and Karst Resources

The cave and karst management actions common to all alternatives and those that vary by alternative are not directly related to land tenure adjustments; they would not affect the acquisition, disposal, or withdrawal of public lands. The presence or absence of significant caves would be a primary factor when considering proposed land tenure adjustments. Cave and karst resources will not be addressed further in the *Lands and Realty* section.

Mineral Resources

Mineral resource (locatable, leasables, salables) management actions common to all alternatives and those that vary by alternative are not directly related to land tenure adjustments. The management actions relate to what lands would be available for mineral development. The proposed management actions would not affect the acquisition, disposal, or withdrawal of public lands. The presence or absence of a federal mineral resource would be a primary factor when considering proposed land tenure adjustments. Mineral resources will not be addressed further in the *Lands and Realty* section.

Fire and Fuels Management

Fire and fuels management actions common to all alternatives and those that vary by alternative pertain to managing planned and unplanned fires. They do not directly related to land tenure adjustments and would not effect the land and realty program; fire and fuels management will not be addressed further in the *Lands and Realty* section.

Biological Resources

There are no management actions common to all alternatives or by alternative for vegetation resources (forest and woodland communities, grassland and shrubland communities, riparian and wetland communities, and invasive species) or fish and wildlife species, including SSS, that propose to acquire or dispose of public lands. The presence or absence of particular biological resources (e.g., riparian and wetland communities, SSS habitat) would be a primary factor when considering proposed land tenure adjustments. Biological resources will not be addressed further in the *Lands and Realty* section.

Heritage and Visual Resources

There are no management actions common to all alternatives or by alternative for heritage resources (cultural, and paleontological) or visual resources, that propose to acquire, dispose, or withdrawal of public lands. The presence or absence of heritage resources would be a primary factor when considering proposed land tenure adjustments, lands with significant paleontological values would be retained in federal ownership and visual resources would likely be a secondary consideration. Heritage and visual resources will not be addressed further in the *Lands and Realty* section.

Land Resources

Management actions common to all alternatives and management actions by alternative for all land resources (**Forest Products, ROW and corridors, Travel and Transportation Management, Recreation, Lands with Wilderness Characteristics, and Livestock Grazing Management**) with the exception of Lands and Realty do not propose to acquire, dispose, or withdrawal of public lands. Designated stock driveways withdrawals and livestock trails will be retained. The presence or absence of commercial forests, legally accessible public lands, recreational opportunities, wilderness characteristics, and forage productions would all be primary factors when considering proposed land tenure adjustments. Lands and realty will be the only resource addressed further in the *Lands and Realty* section.

Special Designations

There are no management actions common to all alternatives or by alternative for special designations (ACECs, BCBs, WSRs, and WSAs) that propose to acquire, dispose, or withdrawal of public lands. The presence or absence of special designations would be a primary factor when considering proposed land tenure adjustments. Special designations will not be addressed further in the *Lands and Realty* section.

Social and Economic Resources

There are no management actions common to all alternatives or by alternative for social and economic resources or health and safety that propose to acquire, dispose, or withdrawal of public lands. Social and economic resources would likely be a minor factor when considering proposed land tenure adjustments. Social and economic resources will not be addressed further in the *Lands and Realty* section.

4.6.2.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained.

Lands and Realty

Alternative A would support the acquisition of lands or interests in lands from willing private and state entities on a project specific basis. Priority would be given to lands adjacent to larger blocks of BLM-administered public lands, particularly those with high recreational potential. In acquiring lands or interests in lands from willing sellers the BLM will initially consider the following: (1) any lands considered void of important natural resource values could be exchanged for the acquired lands, and (2) during the planning period, the BLM will not engage in acquisitions resulting in an overall net gain of publicly administered lands. Acquiring easements will result from access needs that will improve administration of public lands. Acquiring lands with important natural resource values will require coordination with other resource disciplines, appropriate to the acquisition.

Over the last 25 years, the identified disposal lands were reduced by approximately 30,500 acres. However, authorizations related to oil and gas development have taken precedence over land tenure adjustments. CBNG activity is expected to continue, although reasonably foreseeable development data show a steady reduction in CBNG development and increase in federal conventional development. Therefore, it would be reasonable to assume that the overall decrease in land disposals would be similar to the last planning period. Assuming this pattern continues, an average disposal rate of 1,200 acres per year under Alternative A would have a major effect on the lands and realty program through the disposal of small, isolated parcels. This would increase multiple resource management opportunities in a more contiguous land ownership pattern.

Approximately 108,243 acres of BLM-administered lands identified for disposal and have high priority consideration for exchange, public sale, or transfer of jurisdiction to another agency, subject to the disposal criteria. Lands with high surface values would generally be retained, although BLM would consider disposal of lands having agricultural potential and water through sale, exchange or Desert Land Entry.

Overall, Alternative A lands and realty management actions would have a moderate beneficial effect on the lands and realty program, by improving the ability to administer resources and protect resource values.

4.6.2.4. Alternative B

Alternative B would emphasize resource conservation.

Lands and Realty

Alternative B management would pursue all lands available for acquisition in the planning area, without regard to their priority of major blocks of public land consolidation and high recreational or natural resource values. If land acquisitions occur, the effect would likely be beneficial.

All lands identified for disposal will be examined for the presence of high-value resources. Lands with high surface values would be retained, including those with agricultural potential. The BFO would generally retain lands identified for disposal, having natural resource values, until all other

identified disposal lands (those with no natural resource values) were disposed of. This practice would have an adverse effect on the ROW program.

Alternative B management would recommend withdrawal of mineral lands within 4.0 miles of Greater Sage-Grouse leks and winter concentration areas. In proposed large withdrawals, the analysis that must be made is a review of the adequacy of application of the 43 CFR 3809 surface management regulations with mitigation impacts, consistent with whatever cumulative disturbance threshold is allowed in a particular Priority Habitat Area. Such analysis would clearly demonstrate that application of the 43 CFR 3809 surface management regulations could not adequately control or mitigate impacts when considering the Priority Habitat Area as a whole and only under this circumstance can a withdrawal be justified. Withdrawal recommendation would apply to proposals not associated with mineral activity unless the land management is consistent with Greater Sage-Grouse conservation measures.

Alternative B would pursue easements to access public lands that would benefit BLM management for any resource value and pursue land tenure adjustments on lands holding Category C allotments and sales, in accordance with other resource values. Areas within 4.0 miles of leks and winter concentration areas would be recommended for withdrawal to protect Greater Sage-Grouse habitat.

Overall, Alternative B lands and realty management actions would have a moderate beneficial effect on the lands and realty program, by improving the ability to administer resources and protect resource values.

4.6.2.5. Alternative C

Alternative C would emphasize resource use.

Lands and Realty

Under Alternative C, the BLM would not acquire lands or interests in lands. This would eliminate the agency's ability to gain access to some BLM-administered parcels. This would inhibit the BFO ability to manage resources and multiple uses, and would limit recreational opportunities. The consequences would be continued higher costs because of the difficulty and time-consuming efforts required to obtain access through private lands to administer multiple uses manage natural resources, and to negotiate conflicts for activities and development with other land owners where federal actions would cross ownership boundaries.

Under Alternative C, the BLM would not retain lands identified for disposal having important natural resource values, until all other land identified for disposal are disposed of (Map 54). Alternative C management would not acquire land in areas adjacent to major blocks of public land and high recreational potential, or pursue easements to facilitate BLM management.

Under Alternative C, the BLM would dispose of lands having agricultural or water potential. Lands and realty management would allow land tenure adjustments for lands holding Category C allotments and sales independent of other resource values. Overall, Alternative C would have a major adverse effect on the lands and realty program, by limiting access to isolated parcels and would not improve the ability to administer resources and protect resource values.

4.6.2.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the Proposed RMP.

Lands and Realty

Under Alternative D, priority would be given to acquiring lands or interests in lands in areas adjacent to large blocks of BLM-administered lands and pursue easements accessing public lands that would benefit any resource value on a project specific basis.

Alternative D management would actively pursue disposal of all identified disposal lands and other lands not identified but meeting appropriate disposal criteria. These parcels would be examined for the presence of high-value resources. Approximately 85 percent of BLM surface in the planning area is identified for retention and management, whereas approximately 120,722 acres (15%) is identified for disposal (Map 54 and Appendix L (p. 2211)). Lands with high surface values would be retained, including those with agricultural potential. The BFO would generally retain lands identified for disposal, but possessing natural resource values, until all other identified disposal lands (those with no natural resource values) were disposed of. Actively disposing of identified disposal lands would have a beneficial effect on the lands and realty program.

Alternative D management would not classify, open or make available any BLM surface in the planning area for agricultural leasing or agricultural entry under either Desert Land Entry or Indian Allotment for one or more of the following reasons: rugged topography, presence of sensitive resources, lack of water or access, small parcel size, and/or unsuitable soils.

The BLM would pursue land tenure adjustments related to custodial grazing allotments. Under Alternative D, disposing of these types of grazing lands would decrease the potential need for the public to request land use authorizations. It would therefore eliminate the need to monitor activities on these small, isolated parcels that are generally surrounded by private land. There are 171,749 acres (22%) of BLM-administered lands in the planning area under custodial allotments. Disposing of these acres would have a major beneficial effect on the lands and realty program.

Overall, Alternative D lands and realty management actions would have a major beneficial effect on the program by reducing small isolated parcels that are difficult to manage.

4.6.2.7. Cumulative Impacts

There is a high interest in pursuing land tenure adjustments amongst the BLM, the state, local government, and private land owners. The difficulties in pursuing action are typically finding equitable resources, in terms of funding or resource values (appraisal, mineral deposits, etc.), or BLM staff availability. The predominant land use activities within the planning area are energy development and livestock production. Both have tremendous potential to influence land tenure adjustments. Many past land tenure proposals have been related to livestock production, and many future proposals are anticipated, with the objective of consolidating land ownership. Mineral resources have also prompted several past land tenure adjustments as the BLM or another party has desired to consolidate mineral ownership. For example the Pittsburgh-Midway Coal exchange where BLM exchanged federal coal lands with Pittsburgh Midway for several of their private

surface holdings. The presence of surface oil and gas facilities, or other energy facilities, would likely deter land tenure adjustments, unless mineral rights were a component of the adjustment.

4.6.2.8. Conclusion

Under Alternative A, the BFO would not pursue land tenure adjustments, but would consider adjustments on a case-by-case basis. This would likely result in minimal effort to consolidate land ownership patterns, which would cause continued increases in uses on fractionated parcels; continued conflicts with adjacent land owners; continued administrative costs associated with managing the scattered land ownership pattern; and continued trespass incidence. Special management areas (e.g., SRMAs) would continue to be difficult to access and manage, increasing administrative costs continuing the incidence of trespass across BLM-administered or private and state lands.

Alternative B would allow the lands and realty program to actively pursue land tenure adjustments, but does not prioritize based on resource values or other factors.

Alternative C would significantly limit opportunities for land tenure adjustments, compounding the effects described under Alternative A.

Alternative D would provide directed land tenure management to allow multiple resource uses, conservation, access and protection while maintaining or improving the overall health of the landscape.

In summary, Alternative A would have a moderate beneficial impact to the lands and realty program, Alternative B would have a moderate beneficial impacts to the lands and realty, Alternative C would have a major adverse impact and Alternative D would have a major beneficial impact to the lands and realty program.

4.6.3. Renewable Energy

The BLM manages renewable energy as part of the ROW program. Renewable-energy sources can include wind, solar, thermal, and water. Other renewable-energy sources not yet identified might also fall under this program in the future. Wind presents the greatest renewable-energy potential in the planning area and is therefore, used in this analysis. This section describes potential effects on renewable-energy management from management actions for other resources and other management programs. Chapter 3 describes existing conditions concerning the renewable-energy program.

4.6.3.1. Methods and Assumptions

Assumptions

- The effects analysis focuses on the constraints (adverse effects) that would decrease opportunities for renewable-energy development authorizations.
- The effects analysis focuses on the opportunities (beneficial effects) that would increase opportunities for renewable-energy development.
- Surface-disturbing effects would occur from the implementation of management actions primarily designed to protect natural resources by preventing or minimizing effects on

those resources. In other words, the types and degrees of limitations and restrictions on renewable-energy development authorizations depends on the locations of sensitive or high-value resources and the potential for environmental effects on those resources.

- The demand for land use authorizations will continue during the planning period, and will likely remain a primary function of the overall lands and realty program. Land use authorizations would be considered on a project-specific basis and consistent with other resource objectives.
- The demand for compliance monitoring and reclamation activities will likely continue to increase throughout the planning period.
- The BFO would cooperate with stakeholders to promote opportunities for scientific research for renewable energy in accordance with other resource values; and coordinate renewable-energy opportunities in accordance with other resource values.
- The effects analysis and conclusions are based on the 49,694 acres of BLM surface in the planning area with a wind power class rating of good (5) or higher.

Significance Criteria

In addition to acreage where renewable-energy development is excluded, adverse effects on renewable-energy development could be considered significant if there are substantial limitations placed on how to develop renewable energy, such as increased wildlife protections or visual resource constraints.

4.6.3.2. Impacts Common to All Alternatives

Renewable Energy

Future renewable-energy development projects could include wind, solar, hydropower, or other energy-development activities. Cooperation with stakeholders for scientific research and development opportunities would facilitate the renewable-energy program. Cooperative efforts are more likely to be supported by the public and therefore increase opportunity for renewable development. The beneficial effect of cooperation would be moderate.

Physical Resources

Air Quality

Air quality management actions common to all alternatives include implementing mitigation measures such as dust suppression and cooperative efforts to reduce dust emissions. These actions could require ongoing monitoring for compliance and decreased opportunity, which add cost to renewable-energy projects and therefore would have a minor adverse effect on the renewable-energy program.

Soil

Soils management actions common to all alternatives include an onsite evaluation of proposed renewable-energy activities, mitigation of adverse effects on soils where necessary, and site-specific reclamation plans. None of these actions would affect where renewable energy could be developed, but would require time and other resources to address. Mitigation measures and site-specific reclamation plans on soils would decrease opportunities for renewable-energy development, this would have a minor adverse effect.

Water Resources

Water management actions common to all alternatives include managing surface-disturbing

activities to prevent degradation of water quality, and managing water to meet Wyoming Standards for Healthy Rangelands. These actions would be applied across the entire planning area, which would have a minor adverse effect by decreasing areas for renewable-energy development.

Cave and Karst Resources

The cave and karst program does not have any management actions common to all alternatives that would affect the renewable energy program

Mineral Resources

Under management actions common to all alternatives, almost the entire planning area would be available for exploration and development of locatable, leasable fluid, and salable minerals. Coal leasing would be limited to the high development potential areas of central Campbell County and northern Sheridan County, which does not overlap areas with wind-energy potential rated good or higher. Coal activity in the planning area would have no effect on renewable-energy development and is not further addressed in the *Renewable Energy* section.

Locatable Minerals

Areas with locatable minerals development would likely be unable to accommodate other energy development. There is minimal overlap between existing locatable minerals activities and areas with wind-energy potential rated good or higher. The maximum foreseeable locatable minerals development is 1,455 acres of BLM surface (0.2%) in the planning area. Therefore, the potential for locatable minerals development to adversely affect renewable-energy development would be negligible.

Leasable Minerals – Coal

Federal coal lands identified acceptable for further coal leasing considerations are available for LBAs, lease modifications, emergency leases, and exchanges. Coal leasing would be limited to areas mostly in central Campbell County. Coal activity in the planning area would have no effect on renewable-energy development and is not further addressed in the *Renewable Energy* section.

Leasable Minerals – Fluids

Oil and gas development activities are anticipated to be compatible with other energy-development activities, potentially even sharing infrastructure such as roads. The foreseeable development scenarios for all alternatives predict that fluid minerals development would disturb less than one percent of BLM surface in the planning area. Overall, fluid minerals development would likely have a negligible beneficial effect on renewable-energy development. There is no discernible difference between the alternatives and therefore fluid minerals will not be discussed further in this section.

Salable Minerals

With the wide spacing of meteorological towers and typically small size of salable minerals development, the two land uses are anticipated to be compatible, potentially even sharing infrastructure such as roads. Salable minerals would likely be needed to construct access roads and pads for renewable energy infrastructure. The foreseeable development scenarios for all alternatives predict that salable minerals development would disturb less than one percent of BLM surface in the planning area. Overall, salable minerals development would likely have a negligible beneficial effect on renewable-energy development, by sharing infrastructure and increase opportunity for development.

Although mineral resource development would vary across the alternatives, the trade-offs described above would apply to all alternatives. In this respect effects, would not be highly variable among the alternatives, and therefore not discussed for each alternative.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Fire and fuels management would not have actions common to all alternatives or by alternative that would affect renewable-energy development. Therefore, fire and fuels management is not further addressed in the *Renewable Energy* section.

Biological Resources

Management actions for biological resources are designed to protect those resources typically by limiting surface-disturbing activities such as renewable-energy development.

There are no management actions common to all alternatives for **Vegetation – Forests and Woodlands, Fish and Wildlife Resources – Fish, or Special Status Species – Plants and Fish** that would affect the renewable-energy program. The forest and woodland management actions that do vary by alternative do not regulate land use activities other than timber harvest, and therefore would have no effect on the renewable-energy program. Therefore, forests and woodlands are not further addressed in the *Renewable Energy* section.

Vegetation – Grassland and Shrubland Communities

Grass and shrub vegetation communities cover most of the planning area. renewable-energy facilities would be sited to reduce adverse effects on vegetation impacts, which could result in the relocation or redesign of renewable-energy projects before authorization. The overall adverse effect would be slight but detectable on renewable-energy development from this management and would be minor.

Vegetation – Riparian/Wetland Resources

Prohibiting of renewable-energy activities would be required to prevent the degradation, loss, or destruction of riparian and wetland communities; which would most likely exclude renewable-energy development from these communities. Riparian and wetland management actions common to all alternatives would have a negligible adverse effect on renewable-energy development due to the limited amount (207 acres or 0.03%) of riparian and wetland communities on BLM-administered lands within the planning area.

Invasive Species and Pest Management

Renewable-energy proponents would be required to limit surface disturbance to prevent weed spread, use certified seed during reclamation, and treat reclamation for invasive species. Collectively, these actions would be barely detectable and decrease opportunity, which would have a negligible adverse effect on renewable-energy development.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Wildlife and SSS management actions common to all alternatives include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing, maintaining, and restoring Greater Sage-Grouse habitat; and a permanent disturbance-free buffer for bald eagle nests. Collectively, these actions would be

readily apparent and have a moderate adverse effect on renewable-energy development by causing the relocation, modification, or redesign of renewable-energy projects.

Special Status Species – Fish

Special status fish distribution is limited to northwestern Sheridan County, where there is little potential for renewable-energy development. Therefore, management of special status fish would not affect the renewable-energy program, and special status fish are not further addressed in the *Renewable Energy* section.

Heritage and Visual Resources

There are no management actions common to all alternatives for **Cultural Resources** or **Paleontological Resources** that would affect renewable-energy development.

Visual Resources

A management action common to all alternatives is the requirement for permanent facilities to blend with the surrounding landscape. This requirement is secondary to managing within the VRM class, meaning that although facilities might be visible within VRM Class II through IV areas, mitigation for adverse effects on visual resources should be included wherever possible. Because this management action would not prohibit renewable-energy development, but would decrease development opportunity and increase costs of the projects, the adverse effect on renewable-energy development would be negligible.

Land Resources

The following programs do not include any management actions common to all alternatives that would affect the renewable-energy program: **Lands and Realty, Recreation, and Lands with Wilderness Characteristics**.

Forest vegetation and renewable-energy potential overlap in the southern Big Horn Mountains. However, with the abundance of shrubland and grassland vegetation in the planning area, including in the southern Big Horn Mountains, it is highly unlikely that renewable-energy development would be proposed in forest communities. Therefore, the forest product program should not affect the renewable-energy program and is not further addressed in the *Renewable Energy* section.

Rights-of-Way and Corridors

The designation of ROW corridors preferably adjacent to roads and other disturbance corridors could affect the design of renewable-energy projects by limiting the placement of powerlines and other facilities. Because these management actions would not prohibit development and there would be a small change to the resource with decreased opportunity for development, their level of effect would be minor adverse.

Travel and Transportation Management

TTM actions under each alternative regulate motorized vehicle access for recreational use, and would not affect the potential for renewable-energy development. Management actions common to all alternatives would include standards for the location, design, and maintenance of roads. These actions would require some expenditures of time and money by renewable-energy developers for compliance, but would not limit renewable-energy development. Therefore, TTM are not further addressed in the *Renewable Energy* section.

Livestock Grazing Management

Livestock grazing management actions under each alternative would not prohibit or limit other land uses. Therefore, livestock grazing would have no effect on renewable-energy development, and is not further addressed in the *Renewable Energy* section.

Special Designations

Scenic or Back Country Byways designation would not affect other activities; therefore, byways are not further addressed in the *Renewable Energy* section. WSAs and WSRs are managed to a non-impairment standard under respective Interim Management Policies (IMPs) until Congress acts to designate these areas or release them from consideration. Renewable-energy development is limited to these areas due to the constraints mandated in BLM Manual 6330 – Management of Wilderness Study Areas. The only special designation addressed by alternative is ACECs.

Areas of Critical Environmental Concern

There are no management actions common to all alternatives for ACECs.

Socioeconomic Resources

There are no **Social and Economic Conditions** or **Health and Safety** management actions common to all alternatives or by alternative that would have a measurable effect on the renewable-energy program. Therefore, these topics are not further addressed in the *Renewable Energy* section.

4.6.3.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained.

Renewable Energy

There are no management actions related to renewable-energy in the 1985 RMP; therefore, the entire planning area would be available to renewable-energy development under Alternative A, and proposals would be considered on a project-specific basis. There have been no renewable-energy projects to date. Under Alternative A, 49,694 acres (6%) of the planning area have a wind potential rating of good or higher, and the BFO anticipates up to 20,000 acres of BLM surface would be developed during the planning period. Renewable-energy development at this scale would have a major beneficial effect on the renewable-energy program.

Physical Resources

Air Quality

Alternative A would require air quality monitoring for renewable-energy projects expected to approach or exceed emissions standards. It is likely that few renewable-energy projects would be required to monitor air quality, and the monitoring would not prevent any renewable-energy projects. Due to the effects being barely detectable and a decrease in opportunities for development, the over all effect on renewable-energy development from this management action would be negligible adverse.

Soil

Alternative A soils management actions that affect the renewable-energy program include prohibitions on surface-disturbing activities seasonally in areas of severe erosion hazard, on slopes equal to or greater than 25 percent, and in areas with poor reclamation suitability. All three prohibitions have an undefined allowance for waivers, and therefore would not outright prohibit renewable-energy development. The seasonal prohibition would have an adverse effect because it could delay renewable-energy development, but would not prevent any proposed projects. A total of 25,705 acres (52%) of BLM surface in the planning area with a wind-potential rating of good or higher is rated as having poor reclamation suitability. Although more than 10 percent of the areas with renewable-energy potential also have sensitive soils, because the authorized officer could waive the surface disturbance prohibition, when the proponents could demonstrate an ability to protect the soil resource, there would be limited development opportunities and an adverse effect on the renewable-energy program would be reduced to moderate.

Water Resources

Under Alternative A, surface-disturbing activities would be prohibited near waterbodies unless the authorized officer waived the prohibition. The water buffer affects 697 acres (1%) of BLM surface in the planning area with potential for wind-energy development. However, because the authorized officer could waive the prohibition, when the proponent could demonstrate an ability to protect the soil resource, the effect on renewable-energy development would be negligible. Renewable-energy projects requiring water resources would be considered on a project-specific basis. Overall, the effect of Alternative A water management on renewable-energy development would be negligible adverse, due to the reduced opportunity for development.

Cave and Karst Resources

Under Alternative A, renewable-energy projects in cave and karst areas would be considered on a project-specific basis. Karst formations are located primarily along the Big Horn Mountains; therefore, the overlap between karst formations and renewable-energy potential on BLM surface, would be limited to 44,559 acres (6%) in the southern Big Horn Mountains. Restrictions on renewable-energy development would likely be confined to buffers around significant caves, which would further limit the area of potential overlap. Alternative A management of cave and karst resources would have a negligible adverse effect on the renewable-energy program, due to decreased opportunity for development.

Mineral Resources**Locatable Minerals**

Under Alternative A, locatable minerals development would be considered on a project-specific basis. The predicted locatable minerals development under Alternative A would disturb 554 acres. This is less than one percent of the planning area, primarily in areas without wind-energy development potential. The effect on the renewable-energy program would be negligible adverse with decreased development opportunities.

Salable Minerals

With the wide spacing of met-towers and typically small size of salable mineral development the two land uses are anticipated to be compatible potentially even sharing infrastructure such as roads. The foreseeable development scenarios for all alternatives predict less than one percent of BLM surface would be disturbed. Overall, salable mineral development would likely have a negligible beneficial effect on renewable-energy development.

Biological Resources

Under Alternative A, management actions for biological resources are designed to protect those resources, typically by limiting surface-disturbing activities.

Vegetation – Grassland and Shrubland Communities

Alternative A does not include management actions for grassland and shrubland communities. Reclamation activities would be consistent with the BLM reclamation policy. Compliance with the reclamation policy would be barely detectable on grassland and shrubland communities and restrict development opportunities, and therefore have a negligible adverse effect on renewable-energy development.

Vegetation – Riparian/Wetland Resources

Under Alternative A, surface-disturbing activities would be prohibited within 500 feet of riparian resources unless the authorized officer waives the prohibition. Although 23,831 acres (3.0%) of BLM surface in the planning area are within the riparian buffer, only 944 acres (less than 1%) of BLM surface, have wind-energy potential rated good or higher. This management action would likely decrease development opportunities and have a negligible adverse effect on renewable-energy development.

Invasive Species and Pest Management

Alternative A management actions would focus on the control of invasive plant species in cooperation with the counties and project proponents. Renewable-energy developers would be expected to control invasive species as part of their authorizations. The time and costs associated with control activities would decrease development opportunities and have a negligible adverse effect renewable-energy development.

Fish and Wildlife Resources – Fish

Alternative A does not include management actions specific to fish. Renewable-energy projects would consider fish and incorporate BMPs to mitigate adverse effects on fish. The effect on the renewable-energy program would likely decrease development opportunity and would be negligible adverse.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Under Alternative A, management of wildlife habitat would affect uses administered by the ROW associated with renewable energy. Implementing species-specific conservation measures for BLM-administered sensitive wildlife species and prohibiting actions that would affect Threatened or Endangered species could result in the denial or relocation of proposed public land uses.

The wildlife and SSS wildlife management actions under Alternative A with the greatest effect on renewable-energy development are prohibiting surface-disturbing activities on BLM surface with a wind-energy potential rating of good or higher, including within the Ed O. Taylor winter game range (2,406 acres, or 5% of the federal wind resource) and within biological buffers of raptor nests (1,186 acres or 2% of the federal wind resource). At present, there are no documented Greater Sage-Grouse leks within 0.25 mile or plains sharp-tailed grouse within 750 feet of areas with wind-energy development potential. However, it should be noted that much of the wildlife data, particularly for raptors and both grouse species, have been collected in association with CBNG development; therefore, there is little data associated with the southern Big Horn Mountains. It is doubtful, even with complete wildlife data for the southern Big Horn

Mountains, that renewable-energy development would be prohibited on more than five percent of the better wind-energy potential areas. Timing limitations could delay renewable-energy development, however, they typically do not prevent development. Overall, the Alternative A effect on renewable-energy development from management of wildlife and special status wildlife species would be minor adverse.

Special Status Species – Plants

Under Alternative A there is no previous management action decision for SSS plants. Renewable-energy development would be considered on a case-by-case basis. Populations are typically small in acreage and within specialized habitats, avoiding populations should not be a burden to renewable-energy proponents. This management action would have no effect on the renewable-energy development.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Under Alternative A, CRMPs would be developed for sites identified nominated for listing on the National Register. However, none of the nominated sites coincide with areas of wind-energy development potential rated good or higher. Other than developing the CRMPs, Alternative A would not regulate surface-disturbing activities in relation to cultural or paleontological resources, but would consider effects on a project-specific basis. Implementing protective measures for cultural or paleontological resources could require avoidance and other mitigation measures for proposed land uses near these resources. These measures could result in the relocation or redesign of proposed uses before authorization. Because cultural and paleontological resources occur throughout the planning area, effects could vary in degree throughout the planning area. However, Alternative A does not prohibit renewable-energy development as part of cultural and paleontological resources management, but could decrease development opportunities, and the effect of this management on renewable-energy development would be negligible adverse.

Visual Resources

Under Alternative A, 45,524 acres (92%) of BLM surface in the planning area with wind-energy development potential rated good or higher would be managed as VRM Class II areas. Renewable-energy development would be incompatible within VRM Class II. Therefore, the effect on renewable-energy development would be major adverse.

Land Resources

The following programs do not have any management actions under Alternative A that would affect the renewable-energy program: **Travel and Transportation Management, Recreation, and lands with wilderness characteristics.**

Lands and Realty

The BLM-administered land ownership pattern in the planning area is scattered, and interspersed with private and state lands and other agency- administered lands. Under Alternative A, land tenure adjustments would occur on a project-specific basis, with an emphasis on acquiring areas adjacent to existing blocks of BLM surface and disposing of isolated BLM parcels, which are difficult to administer. Consolidating surface lands would facilitate renewable-energy development by providing for a more contiguous public land base and by encouraging such development near communities. The result would be a minor beneficial effect on renewable-energy development.

Rights-of-Way and Corridors

The Alternative A ROW and designated corridors program includes management actions related to soils and exclusion and avoidance areas. The effects of these management actions on renewable-energy are described in the soils and renewable-energy sections above. The only Alternative A management actions not previously discussed that could affect the renewable-energy program concern transmission line placement. Because these management actions would not exclude renewable-energy development, but do constrain the locations of transmission lines to serve renewable-energy projects, the effect would be minor adverse.

Recreation

Alternative A would prohibit surface-disturbing activities within 0.5 mile of the Dry Creek Petrified Tree EEA. Renewable-energy development would not be likely, because wind-energy potential in that area is rated as poor. Therefore, there would be no effect on renewable-energy development from the Renewable Energy management action.

Lands with Wilderness Characteristics

Alternative A does not include management actions for areas with wilderness characteristics and would not manage BLM-administered lands outside the three WSAs for wilderness characteristics. This management would have no effect on the renewable-energy program.

Special Designations**Areas of Critical Environmental Concern**

Alternative A would not designate ACECs in the planning area, and there would no effect on renewable-energy development from ACEC management.

4.6.3.4. Alternative B

Alternative B would emphasize resource conservation.

Renewable Energy

Alternative B would exclude renewable-energy development on 730,530 acres (84%) of BLM surface in the planning area, and recommend avoidance on another 45,441 acres (13%) of BLM surface with a wind-energy potential rating of good or higher. The remaining acreage in the planning area would be available for renewable-energy consideration. The exclusion and avoidance areas at the renewable-energy scale would have a major adverse effect on renewable-energy development by decreasing opportunities for development.

Physical Resources**Air Quality**

Alternative B would require air quality monitoring for renewable-energy projects expected to approach or exceed emissions standards. Few renewable-energy projects would likely be required to perform monitoring and the monitoring would not prevent any renewable-energy projects, although it would decrease development opportunity. The effect on renewable-energy development would be negligible adverse.

Soil

Soils management actions under Alternative B. include prohibitions on surface-disturbing activities in areas with severe erosion hazard, on slopes equal to or greater than 25 percent,

in areas with poor reclamation suitability, and on miscellaneous soils types. All prohibitions would be absolute, with no allowance for waivers. A total of 25,705 acres (52%) of BLM surface in the planning area with wind-energy potential rated good or higher is rated as having poor reclamation suitability. The surface-disturbing prohibitions under Alternative B soils management would have a major adverse effect on renewable-energy development by decreasing opportunities for development.

Water Resources

Alternative B would prohibit surface disturbance within 500 feet of springs, reservoirs, water wells, or perennial stream. Land use authorizations would be routed to avoid these areas. The water buffer would affect 697 acres (1%) of BLM surface with wind-energy development potential. This action would have a minor adverse effect renewable-energy development by decreasing opportunities for development.

Cave and Karst Resources

Alternative B would prohibit surface-disturbing activities in cave and karst areas. BLM surface with karst-bearing formations and renewable-energy potential is limited to 44,559 acres (6%) in the southern Big Horn Mountains. This management would have a minor adverse effect on renewable-energy energy by decreasing opportunities for development.

Mineral Resources

Locatable Minerals

Under Alternative B, foreseeable locatable minerals development would disturb 277 acres, which is less than one percent of BLM surface in the planning area. Most of these areas would likely not coincide with areas that have wind-energy potential. Therefore, decreasing opportunities for development would have an adverse effect on renewable-energy development and would be negligible.

Salable Minerals

With the wide spacing of met-towers and typically small size of salable mineral development the two land uses are anticipated to be compatible potentially even sharing infrastructure such as roads. The foreseeable development scenarios for all alternatives predict less than one percent of BLM surface would be disturbed. Overall, salable mineral development would likely have a negligible beneficial effect on renewable-energy development.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Under Alternative B, native plant species would be required for reclamation. Native species could increase the reclamation time and cost, but would not restrict, but would decrease renewable-energy development. The anticipated effect on the renewable-energy program would be negligible adverse.

Vegetation – Riparian/Wetland Resources

Under Alternative B, surface-disturbing activities would be prohibited within 500 feet of riparian resources. Although 23,831 acres (3%) of BLM surface in the planning area are within the riparian buffer, only 944 of those acres have wind-energy potential rated good or higher, and would decrease development opportunity. Therefore, Alternative B management of riparian and wetland communities would likely have a negligible adverse effect on renewable-energy development.

Invasive Species and Pest Management

Alternative B would take an aggressive approach to managing invasive species. Renewable-energy developers would be expected to control invasive species as part of their authorizations. The time and cost associated with control activities would decrease development opportunities and have a negligible adverse effect on renewable-energy development.

Fish and Wildlife Resources – Fish

Alternative B would prohibit surface-disturbing activities, including renewable-energy development, within 0.25 mile of fish-bearing waters. There are 3,994 acres (8.0%) of BLM surface within the fisheries buffer in areas with wind-energy potential rated good or higher, all confined to the southern Big Horn Mountains. The result would be a moderate adverse effect on the renewable-energy program.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

The wildlife and SSS wildlife management actions under Alternative B that would have the greatest effect on renewable-energy development are prohibitions on surface-disturbing activities on BLM surface with wind-energy potential rated good or higher in the Ed O. Taylor winter game range (2,406 acres, or 5%), within big-game migration corridors (3,688 acres, or 7%), within elk crucial ranges (20,470 acres, or 41%), within elk security habitat (35,915 acres, or 72%), and within biological buffers for raptor nests (1,186 acres, or 2%). Renewable-energy development would be prohibited on BLM surface with wind potential of good or better that are within 4.0 miles of Greater Sage-Grouse leks or winter concentration areas. At present, there are no documented plains sharp-tailed grouse within 750 feet of areas with wind-energy development potential. The effect on renewable-energy development would be major adverse particularly from the management of big game (general wildlife) and Greater Sage-Grouse (SSS) and decreasing development opportunities.

Special Status Species – Plants

Alternative B would allow renewable-energy development in special status plant habitat, but not within known populations. Because populations are typically small in acreage and within specialized habitats, avoiding populations should not be a burden to renewable-energy proponents. This management action would prohibit ROW within suitable habitat which includes the South Big Horns, and would have a slight and detectable effect on the renewable-energy development. Overall this would have a minor adverse effect by limiting development to the renewable-energy program.

Heritage and Visual Resources

Cultural Resources

Alternative B would prohibit surface disturbance up to 5 miles from historic properties. This action would affect 33,879 acres (68%) of BLM surface in the planning area with wind-energy potential rated good or higher and decrease development opportunity. This would have a major adverse effect on renewable-energy development.

Paleontological Resources

Alternative B would regulate surveying and monitoring of paleontological resources during surface-disturbing activities. Renewable-energy activities could be prohibited in areas with paleontological resources of high quality or importance. However, at present, there are no high-quality paleontological areas in potential renewable-energy development areas, such

areas are typically small, and renewable-energy projects could be located to avoid the sites. Therefore, the effect on renewable-energy development would be negligible adverse due to the decreased opportunity for development.

Visual Resources

Under Alternative B, 5,838 acres (12%) and 12,544 acres (25%) of BLM surface with wind-energy development potential would be managed as VRM Class I and II, respectively. Renewable-energy development would be incompatible with these VRM classes and decrease development opportunity. This would have a major adverse effect on renewable-energy development.

Land Resources

Lands and Realty

Alternative B would place a priority on retaining and acquiring lands with natural resource values. Consolidating surface lands would facilitate renewable-energy development by providing for a more contiguous public land base and by encouraging such development near communities. This would have a minor beneficial effect on renewable-energy development.

Rights-of-Way and Corridors

Alternative B would restrict major transmission and utility lines to identified ROW corridors, of which only one would overlap (52 acres, or 0.1%) an area with wind-energy potential rated good or higher. This management action would essentially preclude renewable-energy development from the planning area, a major adverse effect.

Recreation

Alternative B would prohibit surface-disturbing activities in designated SRMAs unless those activities would be consistent with other resource values. There are 2,101 acres (4%) of BLM surface in identified SRMAs that also have wind-energy potential rated good or higher. This management action would have a minor adverse effect on renewable-energy development by decreasing opportunity for development.

Lands with Wilderness Characteristics

Alternative B would manage the lands with wilderness characteristics area to emphasize natural values, thereby prohibiting renewable-energy development on 12,237 acres (17%) of BLM surface with wind-energy potential rated good or higher. This exclusion would have a major adverse effect on the renewable-energy program.

Special Designations

Areas of Critical Environmental Concern

Alternative B would designate eight ACECs, within which renewable-energy development would be prohibited. The Pumpkin Buttes ACEC has 888 acres (2%) of BLM surface with wind-energy potential rated good or higher. Designating the Pumpkin Buttes ACEC would have a minor adverse effect on renewable-energy program.

4.6.3.5. Alternative C

Alternative C would emphasize resource use.

Renewable Energy (major beneficial)

Renewable energy development would be allowed anywhere in the planning area, consistent with other resource values. This would have a major beneficial effect on renewable energy development.

Physical Resources**Air Quality**

Alternative C would not require air quality monitoring for renewable-energy projects. The effect on the renewable-energy program would be readily apparent with measurable change to air quality and would increase opportunity for development. This would have a moderate beneficial effect on renewable-energy development.

Soil

Under Alternative C, requests for disturbances would be considered in areas of severe erosion hazard, on slopes equal to or greater than 25 percent, in areas with poor reclamation suitability, and on miscellaneous soils types. This would allow renewable-energy development on all sensitive soils in the planning area. BMPs and other mitigation measures would be incorporated to reduce and localize renewable-energy effects on sensitive soils. Overall, Alternative C soils management would have a negligible adverse effect on renewable-energy development due to the limited amount of acres rated good or higher for renewable-energy the effect would be barely detectable and decrease opportunities for development.

Water Resources

Alternative C would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams. Land use authorizations would be routed to avoid these areas. BMPs and other mitigation measures would be incorporated to reduce and localize renewable-energy effects on water resources. Overall, Alternative C water management would have a negligible adverse effect on renewable-energy development due to the limited number of acres rated good or higher and the effect would barely be detectable with decreased opportunities for development.

Cave and Karst Resources

Under Alternative C, site-specific buffers would likely prohibit surface-disturbing activities near significant caves. This could result in the relocation or redesign of individual facilities, but likely would not prevent any renewable-energy project authorizations. Overall, Alternative C management of cave and karst resources would barely be detectable and decrease opportunities for development this would have a negligible adverse effect on renewable-energy management.

Mineral Resources**Locatable Minerals**

Under Alternative C, foreseeable locatable minerals development would disturb 1,455 acres, less than one percent of BLM surface. This would have a negligible adverse effect on renewable-energy development with decreased opportunity for development.

Salable Minerals

With the wide spacing of met-towers and typically small size of salable mineral development the two land uses are anticipated to be compatible potentially even sharing infrastructure such as roads. The foreseeable development scenarios for all alternatives predict less than one percent of

BLM surface would be disturbed. Overall, salable mineral development would likely have a negligible beneficial effect on renewable-energy development.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Under Alternative C, the BLM would authorize native and non-native plant species for initial reclamation activities. There would be some time and financial expense for renewable-energy proponents to plan and perform reclamation, but renewable-energy activities would not be restricted, although it could decrease development opportunity. The anticipated effect on the renewable-energy program would be a negligible adverse effect.

Vegetation – Riparian/Wetland Resources

Alternative C would allow surface-disturbing activities in riparian communities; BMPs would be incorporated to mitigate adverse effects to riparian resources. This management action would likely be barely detectable and decrease opportunity, and would have a negligible adverse effect on renewable-energy development.

Invasive Species and Pest Management

Under Alternative C, renewable-energy developers would be expected to control invasive species as part of their authorizations. The time and costs associated with control activities and decrease opportunity would have a negligible adverse effect on renewable-energy development.

Fish and Wildlife Resources – Fish

Alternative C would allow surface-disturbing activities, including renewable-energy development, within 0.25 mile of fish-bearing waters. Fish and other resource values would be considered during project analyses. There are 3,994 acres (8.0%) of BLM surface in the fisheries buffer with a wind-energy potential rating of good or higher, all confined to the southern Big Horn Mountains. Because Alternative C fish management would allow development and decrease development opportunity, this would have a minor adverse effect on the renewable-energy program.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative C would allow renewable-energy development on BLM surface with a wind-energy potential of good or higher within the Ed O. Taylor winter game range (2,406 acres, or 5%), within big game migration corridors (3,688 acres, or 7%), within elk crucial ranges (20,470 acres, or 41%), within elk security habitat (35,915 acre or 72%), within biological buffers for raptor nests (1,186 acres, or 2%), and near Greater Sage-Grouse and plains sharp-tailed grouse leks. At present, there are no documented Greater Sage-Grouse leks or plains sharp-tailed grouse within 0.25 mile of areas with wind-energy development potential. However renewable-energy development proposals must consider and mitigate adverse effects on wildlife and other resource values. Alternative C wildlife management would have a minor adverse effect on renewable-energy program with decreased development opportunities.

Special Status Species – Plants

Alternative C would allow renewable-energy development in special status plant habitat, but not within known populations. Because populations are typically small in acreage and within specialized habitats, avoiding populations should not be a burden to renewable-energy proponents. This management would barely be detectable but could decrease opportunity, having

a negligible adverse effect by avoiding populations that are small and isolated or relocating sites on renewable-energy development.

Heritage and Visual Resources

Cultural Resources

Alternative C would not prohibit surface-disturbing activities from any large areas of the planning area, but rather would manage cultural sites individually with site-specific mitigation. Implementing mitigation for potential adverse effects on cultural resources would require avoidance and other protective measures for renewable-energy development proposed near these resources. These measures could result in the relocation or redesign of proposed renewable-energy development structures and infrastructure, but should not prevent renewable-energy projects. The effect on the renewable-energy program would be negligible adverse.

Paleontological Resources

Alternative C would regulate surveying and monitoring of paleontological resources during surface-disturbing activities. The effects of renewable-energy activities would be mitigated in areas with paleontological resources of high quality or importance. The effect on renewable-energy development would be negligible adverse with barely detectable effects and decreased development opportunities.

Visual Resources

There would be no areas in the planning area managed as VRM Class II. Under Alternative C, 8,443 acres (17.0%) of BLM surface in the planning area with wind-energy development potential would be managed as VRM Class III; renewable-energy development would not be precluded, but could be heavily regulated to prevent more than a moderate change to the landscape. Overall, Alternative C management of visual resources would have a moderate adverse effect on renewable-energy development.

Land Resources

Lands and Realty

Under Alternative C management, the BLM would not acquire lands or interests in lands. This would eliminate the BLM ability to gain access to some BLM-administered parcels and inhibit the BFO ability to manage resources and uses such as renewable-energy. The consequences of this would be continued higher costs for the BLM and renewable-energy proponents because of the difficulty and time required to obtain access through private lands. Alternative C would have a minor adverse effect on renewable-energy development.

Rights-of-Way and Corridors

The only management actions for Alternative C not previously discussed that could affect the renewable-energy program concern transmission line placement. These management actions do not exclude renewable-energy development, but do constrain the locations of major transmission and utility lines to serve renewable-energy developments. This would have a slight but detectable effect with an overall minor adverse effect on renewable-energy development.

Recreation

Alternative C would designate six SRMAs (30,570 acres). Renewable-energy development could be authorized if in those areas if it would be compatible with other resource values. Because

renewable-energy development conflicts with recreation and other values are likely within some SRMAs, effects on renewable-energy development would be minor adverse.

Lands with Wilderness Characteristics

Under Alternative C, lands with wilderness characteristics areas would be managed consistent with management for the surrounding areas. This would likely allow for renewable-energy development except for immediately adjacent to the current WSAs and Middle Fork WSR. Because these areas coincide with areas that have a wind-energy potential rating good or higher, the Renewable Energy management action would readily be apparent and would decrease opportunity development this would have a moderate adverse effect on the renewable-energy program.

Special Designations

Areas of Critical Environmental Concern

Alternative C would not designate any ACECs. Therefore, there would be no effect on renewable-energy development.

4.6.3.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the Proposed RMP.

Renewable Energy

Under Alternative D, renewable-energy development would be excluded on 352,067 acres (45%) of BLM surface. Exclusion at this scale would have a major adverse effect on renewable-energy program.

Physical Resources

Air Quality

Air quality monitoring would be required of renewable energy projects expected to approach or exceed emission standards. Few renewable energy projects would likely be required to conduct monitoring and the monitoring would not prevent any renewable energy projects. The effect on renewable energy development would be negligible adverse and would decrease development opportunities.

Soil

Under Alternative D, requests for disturbances would be considered under defined conditions within areas with severe erosion hazard, on slopes equal to or greater than 25 percent, and in areas with poor reclamation suitability with an approved reclamation and stabilization plan. Surface-disturbing activities would be required to avoid miscellaneous soils types unless they have an approved project construction and site-specific reclamation plan. This would allow renewable-energy development on sensitive soils in the planning area while adequately protecting soil resources. Soils with poor reclamation suitability coincide with 25,705 acres (52%) of BLM surface in the planning area with wind-energy development potential. Although more than 10 percent of the planning area has sensitive soils, Alternative D soils management would

have a moderate adverse effect on the renewable-energy program due to the provisions allowing for disturbance of sensitive soils.

Water Resources

Alternative D would allow surface disturbance that would meet resource objectives within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams on 697 acres (1%) of BLM surface in the planning area with wind-energy development potential. Land use authorizations might be rerouted to avoid these areas, but rerouting would be required only if the objectives could not be met. BMPs and other mitigation measures would be incorporated to reduce and localize renewable-energy effects on water resources. This would have a negligible adverse effect on the renewable-energy program by decreasing development opportunity.

Cave and Karst Resources

Alternative D would require a disturbance-free buffer around entrances and passages of significant caves. This could result in the relocation or redesign of individual facilities, but would not likely prevent any renewable-energy project authorizations. This would have a negligible adverse effect on renewable-energy development.

Mineral Resources

Locatable Minerals

Under Alternative D, most of the planning area would be available for locatable minerals development. However, because foreseeable locatable minerals development would disturb 1,252 acres, less than one percent of BLM surface, the effect on renewable-energy program would be negligible adverse and decrease development opportunity.

Salable Minerals

With the wide spacing of met-towers and typically small size of salable mineral development the two land uses are anticipated to be compatible potentially even sharing infrastructure such as roads. The foreseeable development scenarios for all alternatives predict less than one percent of BLM surface would be disturbed. Overall, salable mineral development would likely have a negligible beneficial effect on renewable-energy development.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Under Alternative D, grassland and shrubland management objectives would allow desirable non-native plant species for short-term reclamation. This action would provide more opportunities to mitigate the effects of surface-disturbing activities from approved ROW actions. There would be some time and financial expense for renewable-energy proponents to plan and perform reclamation, but renewable-energy activities would not be restricted. The anticipated effect on the renewable-energy program is barely detectable with decrease opportunity for development and therefore, would be negligible adverse.

Vegetation – Riparian/Wetland Resources

Alternative D would allow surface-disturbing activities within 500 feet of riparian resources in accordance with identified criteria. Although 23,831 acres (3%) of BLM surface in the planning area are within the riparian buffer, only 944 of those acres (less than 1%) have wind-energy potential rated good or higher. Therefore, Alternative D management of riparian and wetland

communities would have a negligible adverse effect on renewable-energy program by decreasing development opportunity.

Invasive Species and Pest Management

Alternative D would take a moderate approach to managing invasive species. Renewable-energy developers would be expected to control invasive species as part of their authorizations. The time and cost associated with control activities would have a negligible adverse effect on renewable-energy development.

Fish and Wildlife Resources – Fish

Alternative D would allow surface-disturbing activities, including renewable-energy development, within 0.25 mile of fish-bearing waters where fish resource objectives can be met. There are 3,994 acres (0.5%) of BLM surface in the planning area within the fisheries buffer with a wind-energy potential rating of good or higher, all confined to the southern Big Horn Mountains. Alternative D fish management would have negligible adverse effect on the renewable-energy program by decreasing development opportunity.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

The wildlife and SSS wildlife management actions under Alternative D that would have the greatest effect on renewable-energy development are prohibitions on surface-disturbing activities on BLM surface with wind-energy potential rated good or higher in the Ed O. Taylor winter game range (2,406 acres, or 5%), within big game migration corridors (3,688 acres, or 7%), within elk security habitat (35,915 acres, or 72%), within Greater Sage-Grouse Priority Habitat Area (Core Population Areas and Core Population Connectivity Corridors) (6,521 acres, or 13%), and within biological buffers for special status raptor nests (1,186 acres, or 2%). Within the Core Population Areas and Core Population Connectivity Corridors, renewable-energy development would be limited to no more than 5 percent total disturbance per 640 acres and protected within 0.6 mile of Greater Sage-Grouse leks. At present, there are no documented Greater Sage-Grouse leks within 0.6 mile of areas with wind-energy development potential of good or higher. Avoid commercial renewable energy projects in Greater Sage-Grouse core population areas unless it can be demonstrated that the activity would not result in declines of core Greater Sage-Grouse populations. The effect on renewable-energy development would be moderate adverse from management of general wildlife because there would be restricted development and provisions to allow for renewable-energy development with appropriate mitigation, and major adverse from management of special status wildlife species because of the development restrictions in Greater Sage-Grouse Core Population Areas.

Special Status Species – Plants

Alternative D would allow renewable-energy development in special status plant habitat, but not within known populations. Because populations are typically small in acreage and within specialized habitats, avoiding populations should not be a burden to renewable-energy proponents. This management would barely be detectable and would decrease opportunity and would have a negligible adverse effect on renewable-energy program.

Heritage and Visual Resources

Cultural Resources

Under Alternative D, the cultural resources program would develop CRPPs for the protection

and preservation of identified geographic areas. These could include a prohibition on surface-disturbing activities for specifically identified sites containing historic properties that retain their historic settings, and appropriate mitigation for surface-disturbing activities for the protection of TCPs, sacred sites, and other culturally sensitive areas. To protect the settings of the identified historic properties, surface-disturbing activities could be restricted up to 3 miles from the sensitive cultural sites. These management actions would prohibit renewable-energy development on 1,694 acres (3%) and restrict renewable-energy development on 38,648 acres (78%) of BLM surface in the planning area with a wind-energy potential rating of good or higher. Although the prohibition would not affect 5 percent of the potential wind-energy resource, because so much of the potential wind-energy resource would be in the restriction area (for which mitigation could include prohibition), the effect on renewable-energy development would be moderate adverse.

Paleontological Resources

Alternative D would regulate surveying and monitoring of paleontological resources during surface-disturbing activities. Renewable-energy activities would avoid areas with high-quality or high importance paleontological resources. The effect on renewable-energy development would be barely detectable and therefore be a negligible adverse.

Visual Resources

Under Alternative D, 5,838 acres (12%) and 9,833 acres (20%) of BLM surface in the planning area with wind-energy development potential would be managed as VRM Classes I and II, respectively. Renewable-energy development would be incompatible with these VRM classes, and there would be a major adverse effect on wind-energy development from the Renewable Energy management.

Land Resources

Lands and Realty

Management under Alternative D would actively pursue land tenure adjustments to consolidate BLM surface estate and dispose of lands that are small and isolated or have limited natural resource values. Consolidating surface lands would facilitate renewable-energy development by providing for a more contiguous public land base and by encouraging such development near communities. The end result would effect less than 5 percent of BLM surface having a wind potential rating of good or higher, which would have a minor beneficial effect on renewable-energy development.

Rights-of-Way and Corridors

Under Alternative D, these management actions would not exclude renewable-energy development, but would allow transmission lines within existing ROW and designated corridors and other disturbance areas when resource objectives can be met. Constrain the locations of transmission and utility lines to serve renewable-energy developments. There would be a small change and therefore renewable-energy authorizations would have a minor adverse effect on renewable-energy development.

Recreation

Alternative D would allow surface-disturbing activities in seven designated SRMAs for administrative purposes only. This management action would prohibit renewable-energy development on 2,101 acres (4%) of BLM surface in the planning area with a wind-energy potential rating of good or higher. This management action would have a minor adverse effect on renewable-energy development.

Lands with Wilderness Characteristics (moderate adverse

Alternative D would manage 6,864 acres for natural values, which would prohibit most surface-disturbing activities in an area with a wind-energy potential rating of good or higher. This would have a moderate adverse effect on the renewable-energy program.

Special Designations**Areas of Critical Environmental Concern**

Alternative D would designate two ACECs, within which renewable-energy development would be prohibited. The Pumpkin Buttes ACEC has 888 acres (2%) of BLM surface in the planning area with wind-energy potential of good or higher. Designating the Pumpkin Buttes ACEC would have a minor adverse effect on renewable-energy development.

4.6.3.7. Cumulative Impacts

Wind-energy projects are the most likely form of renewable energy projects in the planning area. The most likely area for development is in the southeast quarter of the planning area where there is very little BLM surface. There are currently two non-federal wind-energy developments proposed within viewshed of Pumpkin Buttes. The maximum estimated foreseeable non-federal renewable-energy development is 323,636 acres. Reasonably foreseeable development assumptions indicate renewable-energy development could affect up to 75,240 acres of BLM-administered lands in the planning area. Furthermore, oil and gas development will affect approximately 39,000 acres (cumulatively), or less than 5 percent of the planning area.

There could be interest in developing other forms of renewable energy development throughout most of the planning area. Renewable-energy technology is changing and could improve future opportunities for other renewable-energy projects not specifically identified in this analysis. Management actions not identified for specific projects in this analysis would refer to the appropriate resource management goals and objectives to ensure conformance to the land use plan.

4.6.4. Rights-of-Way and Corridors

This section describes potential impacts on the ROW program from land actions within the program and management actions by other resources programs. The ROW program supports public land use interests by responding to public requests for federal land use authorizations, ROW, permits and leases including; roads, pipelines, fiber optic lines, communication sites, powerlines and power stations, compressor sites, injection wells, etc. This program also acts as a support program for all other resource programs.

Corridor management involves aligning multiple authorizations within identified primary linear routes and development centers to minimize the overall effects to the landscape, wildlife, and natural resources. Chapter 3 describes existing conditions concerning this program.

Significance Criteria effects to ROW management would be considered substantial if any of the following occur:

- Substantial reduction in opportunity for ROW authorizations and related development activities.
- Substantial reduction in the opportunity for land tenure adjustments, limiting connectivity and contiguity for ROW development authorizations.

4.6.4.1. Methods and Assumptions

Impact analysis and conclusions are based on interdisciplinary team knowledge of resources in the planning area, reviews of existing literature, and information provided by other agencies. Spatial analysis was performed using the ESRI ArcGIS Desktop 10.0 computer software. Effects are quantified where possible. In the absence of quantitative data, effects are described using ranges of potential effects on the qualitative terms if information is available and appropriate.

Assumptions

- The demand for ROW authorizations will increase during the planning period, and shall remain a primary function of the realty program. Consideration of land use authorizations would be addressed on a project specific basis, and shall be consistent with other resource objectives.
- The demand for compliance monitoring and reclamation activities would continue to increase over the life of the planning period.
- Resolving trespass issues on public lands would continue over the life of the planning period. Avoidance of inadvertent trespass by people accessing public lands would be addressed through the use of appropriate signs and access authorizations.
- Denial or alternative routes or site locations of ROWs based on management actions for other resource programs would have an adverse effect by decreasing development opportunities.
- Exclusion areas would be areas with sensitive resource values, such as WSAs, city boundaries, WSRs and commercial airports; no authorizations would be allowed.
- Avoidance areas would be areas with sensitive resource values and authorizations would be compatible with the purpose for which the area was designated, such as wildlife and cultural buffered areas and areas of high erosion hazard and steep slopes.
- Sharing existing infrastructure such as roads for other resource and management actions would reduce trespass potential, increase ROW development opportunities and would benefit the ROW and corridor program.

The discussion of the effects on the ROW program under each Alternative encompasses all influences from land use authorizations. The effects on the ROW program focuses on the constraints and opportunities for ROW authorizations (e.g., for pipelines, powerlines, transmission lines, roads, reservoirs and communication sites, etc.). Surface-disturbing effects would occur from the implementation of management actions primarily designed to protect natural resources by preventing or minimizing effects on those resources. In other words, the type and degree of limitations and restrictions placed on ROW authorizations depend on the location of sensitive or high-value resources and the potential for environmental effects on those resources. This analysis would determine whether the implementation of management actions for other resource programs influences or modifies the location, size, or design of a given ROW proposal. In some cases, management actions for other resources would cause a denial or redesign; or require an alternate route or site location of a given proposal.

4.6.4.2. Impacts Common to All Alternatives

Rights-of-Way and Corridors (major beneficial)

ROW authorizations in Northern Sheridan County and Campbell County would be minimized due to substantial amounts of coal development that adversely affect multiple use opportunities on public lands.

Energy development through mineral and renewable resources would continue into the foreseeable future and would require authorizing uses to facilitate development during the plan period. Currently, more than 90 percent of the workload under ROW management is related to oil and gas development authorizations, monitoring, and reclamation.

ROW corridors would be designated to minimize surface disturbances and effects to other resources. ROWs would primarily be placed in or adjacent to existing disturbed areas associated with other existing ROW authorizations, or constructed roads and highways and would be the preferred future location. ROW development would benefit from placement of ROWs in a corridor where land use conflicts have been eliminated or reduced. Designated corridors given preference are intended to reduce resource and land use conflicts as much as possible; which would reduce the potential for modification, or mitigation needed to approve a ROW and develop infrastructure and facilities. Designating and preferring the location of ROW authorizations in corridors could also create adverse impacts to ROWs by preventing the location of ROWs along the most direct route for the intended purpose, or preventing additional ROW authorizations in a corridor if the maximum safe density of existing powerlines or pipelines is reached. Designated ROW corridors would be utilized with major ROW projects, such as intrastate pipelines and transmission lines.

The BFO would maintain a transportation management system in cooperation with appropriate state and local agencies to meet public and resource management needs; provide reasonable access across public land to private land, subject to other resource values; and develop a communication site management plan for all existing and newly identified communication site concentration areas.

Increasing demand for GHG emission mitigation measures is increasing interests for pore space disturbances, or uses. These are considered a lands and realty action and require a land use permit and ROW authorization for geologic studies and injection wells. The majority of the planning area could be utilized for these activities.

Overall the common to all alternatives in the majority of the planning area could be utilized for multiple use ROW and corridors and would have a major beneficial effect on the ROW program.

Physical Resources

Air Quality

Air quality management would include implementing air quality impact mitigation measures or COAs (within BLM's authority) to reduce emissions from current levels in the planning area and work cooperatively to encourage industry and other permittees to adopt measures to reduce emissions. These actions could require ongoing monitoring for compliance and decreased development opportunity, adding cost to ROW and corridor projects, and would be an ongoing requirement for ROW actions in the planning area. This management would have a minor adverse effect on the ROW program.

Soil

Using soil surveys and onsite investigation would ensure proper use of soil resources. Applying appropriate mitigation (including project relocation or denial) and requiring an approved reclamation plan would ensure all disturbances were effectively remediated to BLM standards. Authorized surface-disturbing activities would include plans for reclamation; site-specific reclamation actions would reflect the complexity of the project, environmental concerns, and reclamation potential of the site. Applying mitigation measures if necessary, could include relocating the disturbance to a more suitable soil type, or deny the authorization.

There are approximately 215,496 acres of BLM-administered surface lands identified as highly erosive by wind and water with little opportunity for successful mitigation and reclamation. These areas include Powder River Breaks, Recluse, Spotted Horse, Durham Ranch, and north of the community of Wright; South of Gillette Highway 59 to Hilight Road includes numerous hills with substantial amounts of scoria; Kaycee areas, including Tisdale Mountain have significant amounts of Bentonite, which limits development opportunities. Implementing management actions for vegetation and soil protection would place land use restrictions on those areas. This would result in the limitation or avoidance of overall disturbance when reclamation would be difficult, extensive, or where reclamation is known to fail.

Limitations for disturbance on all identified lands with highly erosive soils and poor reclamation potential would include consideration for minimizing surface-disturbing activities within those areas as well as those identified as having slopes of more than 25 percent (approximately 133,689 acres, see Map 4). The Lands and Realty staff would incorporate stipulations or COAs appropriate for successful mitigation and reclamation of those disturbed areas. The overall effect for disturbances on difficult to reclaim and steep soils as described would have a minor adverse effect on the ROW program.

Water Resources

Water quality and watershed management actions common to all alternatives would likely cause changes in the locations or design of some projects, but would not be likely to prohibit realty actions in most of the planning area. Water management actions common to all alternatives would not be substantial and would have a minor adverse effect on the ROW program.

Cave and Karst Resources

Management actions common to all alternatives for cave and karst resources are procedural actions (inventories) and would have no effect on the ROW program. As a BMP land use requests will not be considered for locations with known or suspected cave and karst values. Protecting these resources has not historically had an effect on the ROW program, and would likely have no effect on land uses in the future.

Mineral Resources

Locatable Minerals

Lands not formally withdrawn or segregated from mineral entry would be open for the exploration and development of locatable minerals. However, foreseeable locatable mineral development would affect 1,455 acres of BLM surface (0.2%) in the planning area. Designation of ROW corridors and siting new ROW adjacent to existing disturbances to minimize surface disturbance, which may necessitate modifying the siting of some roads and access routes, which would decrease development opportunity. This would have a negligible adverse effect on the ROW program.

Leasable Minerals – Coal

Similarly, the potential acreage available for coal leasing is extensive, but the foreseeable activity would disturb a maximum of 195,700 acres (less than 1% of BLM-administered coal area), all in central Campbell County and north-central Sheridan County (Map 11). Overall, coal leasing would result in a negligible adverse effect on the ROW program by decreasing development opportunities within the leased coal areas.

Leasable Minerals – Fluids

Authorizations related to oil and gas development would continue to require lessees to conduct operations in a manner that minimizes adverse effects to other resources and other land uses and users. Considerable oil and gas development is likely to continue during the planning period. CBNG and conventional potential is approximately 52 percent of federal fluid minerals. Energy development is currently the resource dominate surface-disturbing activity under the ROW program, with some of the largest CBNG reserves found in the PRB. Oil and gas development activities are anticipated to be compatible with other energy-development activities, potentially sharing infrastructure such as roads, structures and utility corridors, and increasing development opportunities. Therefore, oil and gas (fluid) development would have a major beneficial effect on the ROW program.

Although mineral resource development would vary across the alternatives, the trade-offs described above would apply to all alternatives. In this respect, effects would not be highly variable among the alternatives, and therefore not discussed for each alternative.

Salable Minerals

The BFO would make most lands in the planning area, including federally administered surface, minerals, and split estate, available for mineral materials exploration and development. Salable minerals projects are relatively rare; these actions likely have an overall negligible adverse effect, due to possible increased costs from limited projects and would decrease development opportunities. The maximum predicted disturbance from ROW actions related to salable minerals is 2,090 acres of BLM surface lands (0.2%). This would have a negligible adverse effect on the ROW program.

Fire and Fuels Management

Fire and fuels management will have no effect on the ROW program and will not be discussed any further in the ROW and corridors section.

Biological Resources

Management actions for biological resources are designed to be protective of the biological resources typically by limiting surface-disturbing activities.

Vegetation – Forests and Woodlands

There are no management actions common to all alternatives for forests and woodlands that affect the ROW and corridor program. The forest and woodland management actions that do vary by alternative do not regulate land use activities other than timber harvest, and therefore would have no effect on the ROW and corridor program. Therefore, forests and woodlands are not further addressed in the *ROW and Corridors* section.

Vegetation – Grassland and Shrubland Communities

Achieving a high level of species diversity, meeting the Wyoming Standards for Healthy Rangelands for vegetation, and preventing or minimizing soil erosion would result in the relocation or redesign of projects before they are authorized, when appropriate. Achieving diversity as well as an integrated management approach (e.g., mechanical, chemical, biological treatments, prescribed fire, and grazing management techniques) to maintain, restore, and enhance the health and diversity of plant communities to achieve resource or multi-resource objectives would be managed to maintain sustainable forage levels for livestock and wildlife habitats.

Manage grasslands and shrublands to protect, preserve, or enhance plant communities. Managing the siting of facilities and related infrastructure (utility corridors, roads) would reduce effects to vegetation resources, and managing the planning and development of ROWs would reduce effects to the vegetation resource.

Short-term effects would occur with disturbance and reclamation activities. Application of appropriate mitigation measures would limit or avoid long-term effects on the resources.

Long-term effects primarily occur from roads and powerlines. They would continue to occur in the planning area and would likely include further disturbances from roads, overhead powerlines, and some structures (e.g., abandoned structures from current mineral energy development, and future energy development structures like wind towers and potentially solar fields, or others not yet identified). Grass and shrub vegetation communities cover most of the planning area, ROW projects would be sited to reduce effects on vegetation impacts, which could result in relocation or redesign; therefore management common to all alternatives would have a major adverse effect on the ROW and corridor program.

Vegetation – Riparian/Wetland Resources

ROW management would strive to prevent degradation, loss, or destruction of riparian/wetland habitat, prohibit conflicting uses within riparian research areas and special enclosures, such as waterfowl supporting reservoirs and wetland systems on springs and streams, and evaluate CBNG created riparian and wetland systems for retention or reclamation. Riparian areas are generally held under BLM administration for the conservation, maintenance, and improvement to wildlife and natural resources. For all proposed surface disturbances, the BFO would prohibit surface disturbances that would have adverse effects on water sources that support wetland and riparian conditions. If a water source is considered important to other natural resource discipline(s), the parcel would be retained under BLM administration. There is 2 percent of riparian and wetland communities on BLM-administered lands within the planning area. Retaining these lands and avoiding disturbances that would affect riparian and wetland communities would likely have a minor adverse effect on the ROW program and would decrease development opportunities.

Invasive Species and Pest Management

ROW authorizations would require operators and users to manage to limit surface disturbance to prevent weed spread, using an IPM approach consistent with DOI Manual 517. This program would limit surface disturbance to the minimum needed for safe project completion to limit the spread of invasive species, and require permit holders to use vegetation products certified to be free of invasive species on all BLM-administered projects and lands. Collectively these measures would barely be detectable and decrease ROW development opportunity, having a minor adverse effect on the ROW program.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

ROW authorizations would include stipulations or COA requiring authorized users to construct new fences to avoid adverse effects on wildlife and in accordance with BLM Fencing Handbook 1741-1 (BLM 1989), WO IM 2010-022 (BLM 2009e), and to promote the maintenance and improvement of habitat for migratory bird species of conservation concern in a manner consistent with national, regional, and statewide bird conservation priorities. Projects that could affect SSS fish would be modified or denied as appropriate. Stipulations or COAs would also require users to minimize disturbances that would result in alterations to springs and riparian Greater Sage-Grouse habitat.

Water facilities would be designed with protective features to reduce the risk of mosquito infestations resulting in an increase of WNV, and reduce the risk of mortality of Greater Sage-Grouse from drowning or entrapment.

Overall, management of fish and wildlife habitat and SSS will effect uses administered by the ROW program through the implementation of mitigation measures designed to protect them. Implementing species-specific protection measures for BLM-administered sensitive plant and wildlife species and prohibiting actions that would affect Threatened or Endangered species could result in the relocation of proposed disturbances and uses. This would effect approximately eight percent of the area and would decrease ROW development opportunities. Overall, there would be a moderate adverse effect on the ROW and corridor program.

Fish and Wildlife Resources – Fish and Special Status Species – Plants and Fish

The current RMP does not have any management actions that pertain directly to the ROW and corridor program due to the limited amount of occupied fisheries and species status plant habitat.

Heritage and Visual Resources

Cultural Resources

Because there are known cultural resources throughout the planning area, and because it is likely that additional cultural resources would be discovered, there could be varying degrees of effects throughout the planning area. Implementing protective measures and site stabilization for cultural resources would require avoidance and other mitigation measures for ROW actions proposed near such resources. These measures could result in the relocation, redesign or denial of proposed land uses.

Communication towers, compressor stations, tanks, and wind turbines would have the potential to directly effect the visual integrity of classes of cultural properties that derive their significance from natural settings and settings relatively devoid of modern intrusion. This resource would not have a significant effect on the ROW program, but would increase cost for development. Overall, this would have a minor adverse effect on the ROW program.

Paleontological Resources

Survey and monitoring activities for paleontological resources will occur during the entire planning period. Any paleontological resources discovered would be protected in accordance with the appropriate protective laws under all alternatives. Dry Creek Petrified Tree EEA would continue to be protected from land use effects. The protection and monitoring of paleontological resources would be considered not significant, although it would decrease development opportunity. This would have a negligible adverse effect on the ROW program.

Visual Resources

Any facilities or structures proposed in WSAs would be designed so as not to impair wilderness suitability. If the Middle Fork Powder River is designated by Congress as a WSR, the river would be managed as VRM Class I. Areas rated as VRI Class IV that do not contain special emphasis areas would be managed as VRM Class IV. Authorizations would require non-temporary facilities and structures to be screened, painted, and designed to blend with the surrounding landscape except where safety indicates otherwise.

Managing the planning area to meet VRM objectives could affect the locations, routes, heights, and colors of proposed uses and associated facilities. Additional effort would be required to design projects to meet the objectives of the specific VRM class designation of an area in which a

land use is proposed. Some additional project planning might be necessary for proposed projects within VRM Class III areas to ensure that the landscape is partially retained. The ROW program could require intensive mitigation measures, or preclude uses proposed in VRM Class II areas.

A management action common to all alternatives is the requirement for non temporary facilities to blend with surrounding landscape. This requirement is secondary to managing within the VRM class, meaning, although facilities may be visible within VRM Class II-IV, mitigation for visual effects should be included wherever possible. Because this management action does not prohibit ROW development the cost would increase and therefore decrease ROW development opportunity. The effect on the ROW program is a minor adverse effect.

Land Resources

Forest Products

Forest management areas within 200 feet of surface waters would be prohibited and affect less than one percent of the planning area. ROW and corridors would be denied or relocated, which would increase costs and decrease ROW development opportunities. The Lands and Realty staff will coordinate activities affecting forest products as necessary. This would have a negligible adverse effect for the ROW and corridor program.

Lands and Realty

R&PP applications would be considered on a project specific basis, and prohibit subsequent uses on these lands unless they were compatible with each R&PP authorization. Consideration for land use authorizations (permits, leases, etc.) would occur on a project specific basis consistent with other resource objectives. Consideration for withdrawals for surface and minerals and review withdrawal proposals from other agencies would occur on a project specific basis. Lands meeting the identified disposal criteria would have priority consideration for disposal.

The land ownership pattern in the planning area is scattered interspersed with private and state lands and other government agency administered lands. The lands and realty program will make land tenure adjustments through acquiring and disposing of lands through exchange, sale or through R&PP Act of 1926 patents. This would facilitate the location and routing of uses by providing for a more contiguous public land base and by encouraging such developments near communities.

Approximately 108,243 acres (7% of BLM surface) are identified for disposal. Disposal of small, isolated parcels would improve ROW management by reducing effects to the land by resolving access and adjacent landowner conflicts by 14 percent.

Trespass Resolution

Access easements would help resolve trespassing issues on public land. Inadvertent trespass would also be minimized through the use of appropriate signage. Other resource uses may affect trespassing incidences through the increased use of BLM-administered lands. Road development resulting from mineral development, grazing activities, and recreation would likely have a minor effect on trespass management. ROW management would include avoiding potential of inadvertent trespass by people accessing public lands through the use of appropriate signs and access authorizations. This level of effect is minor.

Custodial Allotments

Marginal grazing allotments on small, isolated parcels that are surrounded by private land owners are difficult to manage and contribute little to the rangeland management program. The BFO

would consider disposing of these properties through sale or exchange, improving management opportunities for higher priority grazing allotments. If these types of parcels are sold and taken out of the grazing system, management opportunities would improve by eliminating the need to manage ROW on these isolated, difficult to access, parcels.

Overall, the common to all management actions would likely have a moderate beneficial effect on the ROW program.

Renewable Energy

The BFO would cooperate with stakeholders to promote opportunities for scientific research for renewable energy in accordance with other resource values. This includes coordinating renewable energy development opportunities in accordance with other resource values.

Energy development in the planning area is expected to continue during the planning period. Future activities may include wind, solar, hydropower, or other energy development activities not yet identified. As a result of these ongoing uses, reclamation activities would continue to increase into the foreseeable future.

The National Renewable Energy Laboratory (NREL) identifies the planning area as having some solar energy development potential, but is not identified for large solar energy fields or high concentration areas. However, future interest is possible with improved technology. The affect is expected to be negligible and not be substantial.

NREL identifies good to excellent potential wind-energy development, and is beginning to enter the planning area on private surface. This would likely result in future applications for wind-energy projects over the life of the plan. Wind energy requires thousands of acres, and could eliminate other uses. Considerations for national energy needs would include other resources to minimize or avoid adverse effects to meet other relevant resource laws. Interests for renewable energy development would increase the need for ROWs, creating a major beneficial effect on the ROW program.

Travel and Transportation Management

TTM would affect the ROW program by increasing the number of easements issued per year to provide reasonable access to other government managed lands (federal, state, and local), and privately owned lands. Inventory all roads on public land and develop a transportation plan to identify roads/trails for closure or maintenance. Inventory, designate, number and sign all roads and trails. Post signs authorizing uses and activities. This could lead to less trespass incidents, including illegal dumping, unauthorized access to other agency managed or privately owned lands, and unauthorized grazing access. Providing ROWs to maintain or improve transportation needs would be potentially substantial and would continue into the foreseeable future. Overall, TTM would have a moderate beneficial effect on the ROW program.

Recreation

Demands for recreation related activities on public lands could increase the need for ROWs to access these areas. This would increase opportunities for willful trespass, dumping, and other illegal uses, requiring recreation management, BMPs, the presence of law enforcement, and monitoring uses on public lands, the presence of recreational sites would preclude the location of certain land use authorizations. Overall, recreation management common to all alternatives would not be substantial and would have a minor adverse effect on the ROW program.

Lands with Wilderness Characteristics

Areas managed for wilderness characteristics would preclude any ROW actions in those areas, consisting of approximately less than one percent of BLM surface in the planning area. The majority of the planning area is open for development, however, this would only have a minor adverse effect on the ROW program.

Livestock Grazing Management

Livestock grazing activities will likely have a short-term adverse effects on reclamation efforts under ROW management because livestock often use the reclaimed areas as forage and travel corridors. The use of BMPs to meet the Wyoming Standards for Healthy Rangeland would minimize any long-term effects. Mitigation actions could include deferring or temporarily limiting grazing on recently reclaimed areas to alleviate long-term effects. Livestock grazing management actions under each alternative would not prohibit or limit other land uses. Therefore, livestock, grazing management would have no effect on the ROW development and is not further addressed in the *ROW and Corridors* section.

Special Designations

Potential effects from all special designations whether existing or proposed, would primarily be minimal and would vary by the management prescriptions associated with each special designation. Intensive management could affect the ROW program by altering land disturbance and use locations. WSA management would impose the greatest restriction on ROW management actions, while the other special designations management actions would impose fewer restrictions on proposed disturbance activities. Surface-disturbing activities in ACEC could be allowed in consideration of other resource programs.

Land uses within the boundaries of special designations will be restricted to protect or conserve resource values, such as Gardner Mountain WSA (6,423 acres), North Fork WSA (10,089 acres), and Fortification Creek WSA (12,419 acres). The total acres managed for this resource is less than five percent of the planning area. Management of special designations common to all alternatives would have a minor adverse effect on the ROW program.

WSAs and WSRs are managed to a non-impairment standard under respective IMPs and BLM Manual 6330 – Management of Wilderness Study Areas until Congress acts to designate these areas or release them from consideration.

Socioeconomic Resources

There are no **Social, Economic, or Health and Safety** management actions common to all alternatives that would have a measurable effect on the ROW and corridor program. Therefore, these topics will not be further addressed in the *ROW and Corridors* section.

4.6.4.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained.

Rights-of-Way and Corridors

Alternative A, the predicted overall disturbance from ROW actions is 38,762 acres (4.96%) of BLM surface in the planning area. Identified ROW Transmission lines and

transportation facilities would primarily be placed within ROW corridors, where feasible and appropriate. The BFO expects to receive ongoing interests in activities related to oil and gas development (e.g., reservoirs, utilities, sites, and roads). Incorporating BMPs by meeting required road standards and ensuring proper reclamation measures would minimize effects to the greatest extent possible. Use of existing infrastructure, or surface structures where feasible, would increase ROW development opportunities.

Under Alternative A, 32,378 acres of BLM surface would be designated ROW corridors (Map 57). There are seven identified ROW corridors in the planning area the Powder River, Echeta Road, Interstate 90, Highway 59 North, Interstate 25, Powder River Breaks, and Highway 14/16. There are no management restrictions on these corridors, allowing subsurface, surface, or above ground authorizations. Although lines must be buried in Greater Sage-Grouse Core Population Area, unless the line is within one half mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than one mile wide.

Under Alternative A, prohibit communications sites on North Middle Pumpkin Butte, unless it becomes absolutely necessary to use the butte for the line-of-sight needs, such as microwave transmission, and limit authorizations to South Middle Pumpkin Butte until that area has been fully utilized, unless the decision is waived.

Alternative A would have a minor beneficial effect on the ROW and corridor program.

Physical Resources

Air Quality

Alternative A would require air quality monitoring for ROW and corridor projects expected to approach or exceed emission standards, analysis would be performed on activities with expected effects to air resources, and modeling may be performed on a project-specific basis. This would not have a substantial effect on the ROW program and would decrease development opportunities. Overall this management action would have a negligible adverse effect to the ROW program.

Soil

Under Alternative A, soils management actions within the 1985 RMP affecting the ROW program include no surface-disturbing seasonally within areas of severe erosion hazard, prohibit surface-disturbing activities on slopes of more than 25 percent, and within areas having poor reclamation suitability, approximately 170,590 acres, (22%) of BLM surface. All three prohibitions have an undefined allowance for waivers on surface-disturbing activities on soils with poor reclamation suitability and would not protect the soils, primarily because the authorized officer could waive the restrictions. The inadequate protection of soils with poor reclamation suitability on 455,090 acres (58%) of BLM surface in the planning area would have a moderate adverse effect on the ROW program. Even though more than 10 percent of the area identified in the ROW program contain sensitive soils, because the surface disturbance prohibition is conditional, the effect is considered to be a moderate adverse effect by requiring stipulations and COA which would eliminate or minimize adverse effects, and monitoring to ensure compliance associated with authorized activities would potentially decrease development opportunities.

Water Resources

Under Alternative A, water resources would be managed following current management principles. For all proposed surface disturbances, the BFO would prohibit surface disturbance within 500 feet of any spring, reservoir, water well, or perennial stream unless the prohibition

is waived by the authorized officer on a project specific basis, approximately 19,861 acres (2.0%) of BLM surface. Land use authorizations would be rerouted to avoid these areas which would require a ROW project to be considered on a project specific basis and could decrease development opportunities. Therefore, Alternative A water management would have a minor adverse effect on the ROW program.

Cave and Karst Resources

Cave and karst formations are characterized by steep cliffs, rocky outcrops, and sensitive soils under desirable ROW and corridor locations. Under Alternative A, no previous management decision was made, therefore current ROW projects in cave and karst areas would be considered on a project specific basis resulting in a slight but detectable effect and proposals would be denied, rerouted or deferred, decreasing development opportunities; overall this would have a minor adverse effect to the ROW program.

Mineral Resources

Locatable Minerals

Locatable minerals management is considered on a project specific basis under Alternative A. Because foreseeable locatable mineral development is estimated to disturb 554 acres of surface (less than 1% of the planning area), locatable minerals projects are extremely rare (most crossings/use of BLM surface would qualify as legitimate occupancy under 43 CFR 3715) which could increase costs and therefore decrease development opportunities, effects on the ROW program would have a negligible adverse effect.

Leasable Mineral – Coal

Reasonably foreseeable coal development would be localized and would likely occur on 195,700 net disturbance acres (less than 1% of BLM-administered coal area) in central Campbell County and north-central Sheridan County. Coal development would limit ROW development opportunities in the planning area. Under Alternative A, this could have a negligible adverse effect on the ROW program.

Salable Minerals

Under Alternative A, salable minerals management is considered on a project specific basis. Reasonable foreseeable salable mineral development is estimated to disturb 530 acres of surface (less than 1% of the planning area), and would increase development opportunities by sharing infrastructures, such as roads. Effects on the ROW program would have a negligible beneficial effect.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Under Alternative A there are no decisions within the 1985 RMP related to grassland and shrubland management; therefore management would follow current policies and regulations. Reclamation activities would have to be consistent with the BLM Wyoming reclamation policy. Application of appropriate mitigation activities would limit or avoid long-term effects, and short-term effects would occur from vegetative removal and would require appropriate placement, storage, and replacement to minimize or avoid long-term effects. Grassland and shrub vegetation communities cover most of the planning area (over 10%), and ROW projects would be sited to reduce adverse effects on vegetation impacts, which would result in the relocation or redesign of

ROW projects before authorization, decreasing development opportunities. Overall this would result in a major adverse effect to ROW and corridor program.

Vegetation – Riparian/Wetland Resources

For all proposed surface disturbances, the BFO would prohibit surface disturbance within 500 feet of water sources that support wetland and riparian conditions, which account for 2 percent of BLM surface in the planning area. If a water source is considered important to other natural resource discipline(s) the action would be considered and mitigation measures would limit or prevent effects and land use, therefore decreasing ROW development opportunities. Minimizing or preventing disturbances would have a minor adverse effect on the ROW and corridor program.

Invasive Species and Pest Management

The only current management action is to control noxious weeds in cooperation with the counties. This management will have no effect on the ROW program.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Under Alternative A, management of fish and wildlife habitat and SSS plant and wildlife species would effect uses administered by the ROW program through the implementation of mitigation measures designed to protect those biological resources. Implementing species-specific protective measures for sensitive plant and wildlife species and prohibiting actions that would affect Threatened or Endangered species could result in the denial or relocation of proposed public land uses. The following management actions apply:

- Restrict surface disturbance and occupancy within a 0.25-mile radius (3,594 acres) of the center of Greater Sage-Grouse strutting grounds, year round, no exceptions. Prohibit surface disturbance within an additional 1.75-mile radius (203,724 acres) from March 15 to June 30. The effect on the resources is approximately 27 percent; this would have a major adverse effect on the ROW program.
- Prohibit surface disturbance and occupancy within 750 feet of sharp-tailed grouse leks (323 acres) at any time. The effect on the resource is approximately less than one percent. This would have a negligible adverse effect on ROW.
- Prohibit surface disturbance within an additional 0.64-mile radius of sharp-tailed grouse leks (7,607 acres) from April 1 through May 30. The effect on the resource is approximately one percent. There would be a minor adverse effect on ROW.
- Preclude new surface-disturbing activities within 0.5 mile of raptor nests (385,148 acres) that could cause increased stress to and/or displacement of animals during the critical time period (February 1 to July 31). The effect on the resource is approximately 23 percent. This would have a major adverse effect on ROW.
- Prohibit surface disturbance or occupancy within a biologic buffer zone around active nests of special status raptor species. Under current management, this action is considered minor, adverse.

Any disturbing land use proposal that would disturb areas containing fish bearing waters, and areas with special status fish species, would be addressed on a case by case basis.

These management actions would delay, or reroute ROW proposals, decreasing opportunities. Overall, Alternative A management of wildlife and special status wildlife would have a major adverse effect on the ROW and corridor program although there are provisions for exceptions, which would reduce the impacts of these management actions.

Fish and Wildlife Resources – Fish and Special Status Species – Plants and Fish

The current RMP does not have any management actions that pertain directly to ROW and corridor management. Proposals would be considered on a project-specific basis, and would likely have negligible effects on the ROW and corridor program due to the limited amount of occupied fisheries and special status plant habitat.

Heritage and Visual Resources**Cultural Resources**

Under Alternative A, implementing protective measures for cultural resources would require avoidance and other mitigation measures for proposed land uses near these resources. These measures could result in the relocation or redesign of proposed use before they could be authorized. Because there are known cultural resources throughout the planning area, and because it is likely that additional cultural resources would be discovered, effects could vary in degree throughout the planning area. Land use proposals within the view shed of the Bozeman trail would be denied unless the authorized officer waives the prohibition. Cultural and resource specialists would be included during the scoping and analysis of potential effects, and survey and monitoring activities for proposed uses would be identified in each analysis for land uses. Alternative A, cultural resource management would likely have a moderate adverse effect on the ROW program.

Paleontological Resources

Under Alternative A, implementing protective measures for paleontological resources would require avoidance and other mitigation measures for proposed land uses near these resources. These measures could result in the relocation or redesign of proposed uses before they are authorized. Because there are known paleontological resources throughout the planning area, and because it is likely that additional paleontological resources would be discovered effects could occur in and vary in degrees throughout the planning area. Paleontological and resource specialists would be included during the scoping and analysis of potential effects, and survey and monitoring activities for proposed uses would be identified in each analysis for land uses. Under Alternative A, the Dry Creek Petrified Tree EEA would continue to be protected from the adverse effects of land use, and casual collection areas would be designated on a case-by-case basis. Public lands with significant paleontological values would be retained. Overall, Alternative A management of paleontological resources would have a minor adverse effect on the ROW program.

Visual Resources

Under Alternative A, managing the planning area to meet VRM objectives could affect the locations, routes, heights, and colors of proposed land uses and associated facilities. ROW development or other resource use could be considered within the line-of-site of VRM classes. Disturbance in forested areas could cause habitat fragmentation and affect visual resources. Additional effort would be required to design projects to meet the objectives of the specific VRM class designation of an area in which a use is proposed. Visual resources are considered with proposed land uses. Effect on visual resources would be minimized or prevented, appropriate to the VRM classes.

Pumpkin Buttes is a significant VRM feature. All proposed land use actions in the view shed of Pumpkin Buttes would consider and minimize or prevent adverse effects on visual resources coordination with the cultural resources program, consistent with national objectives, and resource management objectives. Some additional project planning might be necessary for VRM Class III areas to ensure that the landscape is partially retained. Considerations for national energy

priorities or other land uses, could reduce VRM classifications. There are 127,594 acres (16%) of BLM surface classified as VRM II, which would reduce but not prohibit surface disturbances.

Overall, Alternative A management of visual resources would have a moderate adverse effect on the ROW program.

Land Resources

Under Alternative A, the following programs do not have any management actions that would affect the ROW program: **Travel and Transportation Management, Recreation, Lands with Wilderness Characteristics, and Livestock Grazing Management**, and therefore will not be discussed any further in this section.

Forest Products

Alternative A forest management areas within 200 feet of surface waters would be prohibited, affecting less than one percent of the planning area. ROW and corridors would be denied or relocated, which would increase costs and decrease ROW development opportunities. The Lands and Realty staff will coordinate activities affecting forest products as necessary. This would have a negligible adverse effect for on the ROW and corridor program.

Lands and Realty

Under Alternative A, management supports the acquisition of lands or interests in lands from willing private and state entities on a project specific basis. Priority would be given to those lands adjacent to larger blocks of BLM-administered public lands, particularly those with high recreational potential. In acquiring state lands or interests in lands from willing sellers the BLM would initially consider the following: (1) any lands considered void of important natural resource values could be exchanged for the acquired lands and (2) during the planning period, the BLM would not engage in acquisitions resulting in an overall net gain of publicly administered lands. Acquiring easements would result from access needs that would improve administration of public lands. Acquiring lands with important natural resource values would require coordination with other resource disciplines, appropriate to the acquisition.

Over the last 25 years, the identified disposal lands were reduced by approximately 30,500 acres (3%). However, authorizations related to oil and gas development have taken precedence over land tenure adjustments. This activity is expected to continue, although reasonably foreseeable development data shows a steady reduction in CBNG development; and continued or increased conventional oil development. Therefore, it would be reasonable to assume that the overall decrease in land disposals would be similar to the last planning period. Assuming this pattern continues, an average disposal rate of 1,200 acres per year under Alternative A would have a major beneficial effect on the ROW program through the disposal of small, isolated parcels. This would increase multiple resource management opportunities in a more contiguous land ownership pattern.

Lands with high surface values would generally be retained, although lands could be disposed of if determined to benefit the recipient. This includes land with water and agricultural potential. The BFO would consider selling lands with agricultural development or through the Desert Land Entry Act.

Overall, Alternative A Lands and Realty management actions would have a minor beneficial effect on the ROW program.

Renewable Energy

Alternative A, there are no management actions related to renewable energy in the 1985 RMP; therefore, the entire planning area would allow renewable energy development across the planning area without specific or defined criteria. There are no renewable-energy projects to date. Under Alternative A, the BFO anticipates approximately 20,000 acres (3%) of BLM surface in the planning area during the planning period would be developed, increasing ROW development opportunities. Development on this scale would have a minor beneficial effect on the ROW program and corridor program.

Special Designations

Under Alternative A, potential effects on ROW actions from management of special designations would be minimal even though it would vary by the management prescriptions associated with each special designation area. Intensive management could affect the ROW program by altering locations of land uses.

Areas of Critical Environmental Concern and Scenic or Back Country Byways

Under Alternative A, there are currently no ACECs and scenic or national BCBs designated in the planning area; this would have no effect on the ROW program.

Wild and Scenic Rivers

Under Alternative A, there is one potential WSR, the Middle Fork Powder River, which will be managed in accordance with the Middle Fork Powder River Interim Management Plan until congress acts upon the management. This would decrease ROW development opportunities and would have a negligible adverse effect on the ROW program.

Wilderness Study Areas

WSA management would impose the greatest restrictions on ROW management actions of all special designations. Any development or activity within the boundaries of a WSA would be restricted to protect or conserve resource values while meeting national and resource management objectives. This management would affect less than five percent of the planning area (6,423 acres in the Gardner Mountain WSA, 10,089 acres in the North Fork Powder River WSA, and 12,419 acres in the Fortification Creek WSA) resulting in a minor adverse effect on the ROW program.

4.6.4.4. Alternative B

Alternative B would emphasize resource conservation.

Rights-of-Way and Corridors

Management under Alternative B would exclude ROW and corridor activity from 706,556 acres (69%) of BLM surface and restrict communications sites. Prohibit new authorizations for communication sites in the Pumpkin Buttes area and maintain existing lands use authorization until they expire and require co-location of new communication sites within designated areas. The predicted disturbance from ROW actions is 18,011 acres (2.3%) of BLM surface, which would result in a minor adverse effect by limiting opportunities for ROW development across the planning area.

Under Alternative B, a total of 29,126 acres of BLM surface are designated for **transportation and utility** major ROW corridors (Map 58). The Echeta Road, Highway 14/16, Highway 59 North,

Interstate 25, Interstate 90, and Powder River corridors would be authorized, removing Powder River Breaks corridor and resulting in 3,167 fewer acres of BLM surface as ROW corridors. Management actions would not allow above ground authorizations only subsurface authorizations.

Under Alternative B, ROWs would be prohibited from surface-disturbing activities on slopes equal to or greater than 25 percent. The BFO expects ongoing interests in overhead powerline development. Transmission lines associated with ROW development would be placed within identified ROW corridors and all other above ground facilities would avoid major transportation routes to prevent visual resources. Overall, this management would likely have a major adverse effect on the ROW program due to the potential need for transmission lines outside identified corridors and require actions that are not feasible or appropriate for the proposed use, therefore decreasing development opportunities.

Physical Resources

Air Quality

Under Alternative B, management actions would require air quality monitoring, and quantitative air quality modeling of industrial activities (e.g., oil and gas field development or mining activities) to determine the potential impacts of proposed emission sources and subsequently potential mitigation strategies for projects expected to approach or exceed emission standards at the project level. This would not have a substantial effect, but would decrease ROW development opportunities; overall there would be a negligible adverse effect to the ROW and corridor program.

Soil

Under Alternative B, requests for disturbances on slopes equal to or greater than 25 percent and soils with poor reclamation suitability, badlands, rock outcrops, biologic crusts, and slopes susceptible to movement would not be considered and the authorized officer would not waive the prohibition on such disturbances. This would prevent disturbance on approximately 28 percent of the planning area. Preventing or minimizing soil erosion would result in the relocation or redesign of proposed projects before they could be authorized, decreasing development opportunities. Alternative B would prohibit ROW development on 215,496 acres (28%) of BLM surface in the planning area, which would have a major adverse effect to ROW development.

Water Resources

Under Alternative B, surface-disturbing activities would be prohibited within 500 feet of springs, reservoirs, water wells, and perennial streams and associated riparian habitat. A NSO stipulation for any mineral leases would also be applied to ROWs within 500 feet of the same features. Additionally, no surface discharge of produced water would be allowed from federal mineral development, and oil and gas wells could not be converted to water supply wells.

This would encompass 19,861 acres (2.5%) of BLM surface in the planning area. Proposed projects would be rerouted to avoid these areas and would decrease development opportunities. Before authorizing a ROW, the BLM would consider important resource values. Overall, Alternative B water management actions would have a minor adverse effect on the ROW and corridor program.

Cave and Karst Resources

Cave and karst formations are characterized by steep cliffs, rocky outcrops, and sensitive soils. Alternative B, would prohibit surface-disturbing and disruptive activities in these areas, a total of 101,455 acres prohibited from ROW development; 13 percent of BLM surface in

the planning area. ROWs would not likely occur on these types of surface conditions. Therefore, there would be a minor adverse effect to the ROW program.

Mineral Resources

Locatable Minerals

Locatable minerals management recommend withdrawals from mineral entry for areas identified to conserve other resource values under Alternative B. Because foreseeable locatable mineral development is estimated to disturb 277 acres of surface (less than 1% of the planning area), locatable minerals projects are extremely rare and would increase costs due to the limited number of projects, development opportunities would be decreased and effects on the ROW program would have a negligible adverse effect.

Leasable Minerals - Coal

Under Alternative B, the reasonable surface disturbance prediction of 186,600 net acres of coal is identified as acceptable for further coal leasing consideration (less than 1% of BLM-administered coal) in the planning area. This action would decrease ROW development opportunities and therefore would have a negligible adverse effect on the ROW program.

Salable Minerals

Salable minerals management is to close or restrict from mineral exploration and development and to conserve other resource values under Alternative B. Because reasonable foreseeable mineral development is estimated to disturb 114 acres of surface (less than 1% of the planning area), sharing infrastructure such as roads would increase ROW development and would have a negligible beneficial effects on the ROW program.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Under Alternative B, reclamation activities would have to be consistent with the BLM reclamation policy. Authorizing only native plant species for all reclamation activities and applying appropriate mitigation measures activities would limit or prevent long-term effects. Short-term effects would occur from vegetation disturbance and would require appropriate placement, storage, and replacement to minimize or prevent long-term effects. Long-term vegetation disturbance effects would primarily occur from roads and associated structures that support ROW projects. Native species could increase the reclamation time and cost, but would not restrict ROW development opportunities. Overall, this management would result in a negligible adverse effect to the ROW and corridor program.

Vegetation – Riparian/Wetland Resources

Riparian areas are generally held under BLM administration for the conservation, maintenance, and improvement of wildlife and natural resources. Under Alternative B, surface-disturbing activities and disruptive activities would be prohibited within 500 feet of riparian/wetlands systems, aquatic habitats, and floodplains, approximately 2 percent of BLM surface in the planning area. Proposed projects would be rerouted to avoid these areas, therefore decreasing ROW development opportunities. Overall, Alternative B riparian and wetland management would likely have a minor adverse effect on the ROW program.

Invasive Species and Pest Management

Alternative B would take an aggressive approach to managing invasive species. Under Alternative

B, 15,000 acres (2%) of BLM surface in the planning area are predicted to be treated. The time and cost associated with control activities would decrease ROW development opportunities. This would have a minor adverse effect on the ROW program.

Fish and Wildlife Resources – Fish and Wildlife

Alternative B, management of fish and wildlife habitat would effect uses administered by the ROW program through the implementation of mitigation measures designed to protect those resources. Surface disturbance and occupancy would be prohibited in the Ed O. Taylor (3,896 acres), Kerns (163 acres), and Amsden Creek (525 acres) winter ranges for big game. This would effect less than one percent of the planning area and have a negligible adverse effect on the ROW program. Surface-disturbing and disruptive activities would not be allowed in crucial elk winter range (50,586 acres) between November 15 and April 30, and in elk calving areas (37,549 acres) from May 1 to June 30. This would have a minor adverse effect on the ROW program. No land uses would be authorized on elk crucial winter range and calving areas. This would affect approximately four percent of the planning area and would have a minor adverse effect on the ROW program. Surface-disturbing activities in or near priority big-game migration and travel corridors would not be allowed. Elk security habitat would require a no net loss in the year round range (132,148 acres, or 17% of BLM surface in the planning area).

Alternative B management would prohibit surface disturbance and occupancy within 0.25 mile (940 acres, or 0.12% of BLM surface in the planning area) of the center of sharp-tailed grouse leks year round and with no exceptions. Surface disturbance and occupancy would be prohibited within a 2 mile radius of sharp-tailed grouse leks (323 acres) from April 1 through May 30. This would affect approximately 0.04 percent of BLM surface in the planning area.

Alternative B management would prohibit surface-disturbing activities potentially disruptive to nesting raptors within 1.5 miles of an active raptor nests of high federal interest (255,129 acres, or 33% of BLM surface in the planning area) during specific time periods: golden eagle, barn owl, and great horned owl would be from February 1 to July 15; osprey, merlin, sharp-shinned hawk, kestrel, prairie falcon, northern harrier, Swainson's hawk, and Cooper's hawk from April 1 to July 31; red-tailed hawk, short-eared owl, long-eared owl, and screech owl would be from March 1 to July 31.

Overall Alternative B would have a minor adverse effect on the ROW development program by incorporating stipulations, and mitigation activities to avoid or minimize effects on fish and wildlife resources which increase cost and time, decreasing ROW development opportunities.

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

The SSS management actions under Alternative B would have the greatest effect on the ROW program. Implementing species-specific protective measures for sensitive plant and wildlife species and prohibiting actions that affect Threatened or Endangered species could result in the denial or relocation of proposed public land uses.

Alternative B SSS plants management actions prohibit surface-disturbing activities that could adversely impact special status plant species habitat, mineral exploration and development, all motor vehicles use including uses related to fire suppression and geophysical exploration, ROWs within habitat, and the use of explosives and blasting (Map 34).

Under Alternative B, SSS fish, the proposed surface-disturbing activities within 0.25 mile of fish bearing waters would not be authorized (51,745 acres, 1% of BLM surface in the planning area),

and prohibit impoundments and instream structures where adverse impacts on special status fish species and their habitat would potentially occur.

Alternative B, special status wildlife would require enlarging and enhancing habitat and habitat connectivity for SSS; maintaining the integrity of traditional wildlife migration and travel corridors; locating and managing facilities to minimize noise impacts on SSS; managing surface-disturbing and disruptive activities to minimize impacts on special status wildlife and their habitats; and prohibiting surface-disturbance activities in all prairie dog colonies (Map 35). Alternative B special status upland game birds management actions, would prohibit renewable-energy projects within Greater Sage-Grouse nesting, brood-rearing and winter habitat, require anti-perching devices on existing and new powerlines in occupied Greater Sage-Grouse habitat, and habitat identified for restoration; prohibit surface-disturbing and disruptive activities, occupancy within 4.0 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks and winter habitat concentration areas; prohibit surface-disturbing and disruptive activities in nesting and early brood-rearing habitat greater than 4.0 miles of occupied and undetermined Greater Sage-Grouse leks, from March 1 to July 15; prohibit surface-disturbing and disruptive activities within winter habitat greater than 4.0 miles of Greater Sage-Grouse winter concentration areas, from November 15 to March 14; prohibit surface-disturbing and disruptive activities within 4.0 miles of winter concentration areas, from November 15 to March 14; and allow no more than one disturbance and 3 percent total surface disturbance per 640 acres within the DDCT analysis area to demonstrate and restore disturbed sagebrush communities on BLM surface.

Alternative B special status upland game birds management within Priority Habitat Area would exclude all ROWs except where valid existing rights exist; prohibit mineral material sales; avoid constructed roads beyond 4 miles of occupied and undetermined Greater Sage-Grouse leks and winter concentration areas; recommend area for withdrawal; and retire grazing allotments.

Alternative B special status upland game birds management within general habitat areas would avoid ROWs and require full reclamation bonding specific to the site and sufficient to cover costs required for full reclamation.

Alternative B special status raptors would establish a year-round disturbance-free buffer zone of at least 0.5 mile following the Clear Creek, Crazy Woman Creek, Piney Creek, Powder River and Tongue River riparian corridors used by bald eagles (Map 41). This buffer may be adjusted to one mile or greater based on topographic features, visibility, disturbance and human activity levels. This buffer zone restriction will be based on site specific information and coordinated with the USFWS's Wyoming Field Office, which will provide written concurrence. Prohibit surface disturbance and occupancy within a biologic buffer zone around active nests of special status raptors. Apply TLS prohibiting surface-disturbing and disruptive activities to nesting raptors within 1.5 miles of a SSS raptor nest during the following time periods: January 1 to August 15 for bald eagle; March 1 to July 31 for ferruginous hawk and peregrine falcon; April 15 to September 15 for burrowing owl; April 1 to August 31 for northern goshawk (Map 32). Alternative B would also apply a year-round biological buffer zone for raptors of high federal interest during critical times (255,129 acres, 33% of BLM surface in the planning area).

Alternative B special status amphibians, reptiles, and bats would prohibit surface-disturbing and disruptive activities in the following areas: (1) identified 100-year floodplains; (2) areas within the 1,640 feet (500 meters) of perennial waters, springs, playas, wells, and wetlands; (3) areas within 100 feet of ephemeral channels; and (4) within 1,640 feet (500 meters) of south-facing rock outcrops.

Overall, the management of SSS plants, wildlife, and fish, would have a major adverse effect on the ROW and corridor program, decreasing ROW development opportunities.

Heritage and Visual Resources

Cultural Resources

Under Alternative B, implementing protective measures for cultural resources would require that land authorizations be avoided within the boundaries of historic properties and within 5 miles of the visual horizon (whichever is closer) of historic properties that retain their historic settings. This would affect 330,592 acres (42%) of BLM surface in the planning area. Each analysis of a proposed land use would include cultural resource specialists during the scoping and analysis of potential impacts, and identify survey and monitoring activities for proposed uses. Surface-disturbing activities would be prohibited in areas with historic properties that retain their historic settings, TCPs, sacred sites, and other culturally sensitive areas. Alternative B management of cultural resources would have a major adverse effect on the ROW program.

Paleontological Resources

Alternative B management actions for paleontological resources would require field surveys on all PFYC Class 3, 4, and 5 formations potentially affected by proposed activities and monitoring of surface-disturbing activities on all Class 4 and 5 formations (class 5 formations are 3.6% of BLM surface), and as needed for Class 3 formations. Designate areas containing paleontological resources of high quality or importance for special management, as they are identified, this management action would decrease ROW development opportunities. Therefore, Alternative B would have a minor adverse effect on ROW the program.

Visual Resources

Under Alternative B, managing the planning area to meet VRM objectives would affect the locations, routes, heights, and colors of proposed land uses and associated facilities. WSAs (28,931 acres) and Middle Fork Powder River would be managed as VRM Class I; manage all VRI Class II areas and special emphasis areas as VRM Class III; and manage all VRI Class III areas outside special emphasis areas as VRM Class III. Under Alternative B areas inventoried as Class II and special emphasis areas would be managed as VRM Class II. There are 217,021 acres (28%) of BLM surface in the planning area classified as VRM Class II; however, because surface disturbance would be reduced but not prohibited, ROW development opportunities would decrease. VRM could change the location of or preclude a ROW development action. This would have a major adverse effect on the ROW program by restricting the majority of potential ROW development opportunities.

Land Resources

Forest Products

Under Alternative B, forest management areas within 200 feet of surface waters would be prohibited and affect less than one percent of the planning area. ROW and corridors would be denied or relocated which would increase costs and decrease ROW development opportunities. The Lands and Realty staff will coordinate activities affecting forest products as necessary. This would have a negligible adverse effect for on the ROW and corridor program.

Lands and Realty

Under Alternative B, management would pursue all lands for acquisition. All lands would be considered, regardless of their recreational or natural resource values. Acquired lands would

include those that improve administrative access, or lie adjacent to or near other large blocks of public lands. Under this Alternative, the impact would moderately effect all resources, including interests for ROW development, and escalate management responsibilities and land use authorization opportunities. The reasonably foreseeable activities associated with land acquisitions is minimal. The most likely foreseeable activities would occur with retaining lands identified for disposal.

Alternative B, would pursue easements to access public land that would benefit BLM management for any resource value and pursue land tenure adjustments on lands holding custodial grazing allotments and sales, in accordance with other resource values.

All lands identified for disposal would be examined for the presence of high-value resources. There are approximately 108,243 acres (14% BLM surface) currently identified for disposal. Lands containing high surface values will generally be retained, including those with agricultural potential. The BFO would pursue land tenure adjustment on lands identified for disposal having no natural resource values prior to pursuing lands identified for disposal having natural resource values, generally the management action would be to retain these lands identified for disposal until after the lands identified as having no natural resource value have been disposed of. This management practice would consolidate lands, decreasing trespass potential and would increase ROW development opportunities; this would have a major beneficial effect on ROW and corridor program.

Renewable Energy

Under Alternative B, 730,530 acres (84%) of BLM surface in the planning area would be excluded and 45,441 acres (11%) would be avoided for renewable energy development. This Alternative would eliminate most of the lands from ROW development. Management would exclude renewable-energy projects wherever mineral development and other surface-disturbing activities are prohibited, and allow ROW development where other surface-disturbing activities are allowed. A predicted 5,000 acres (1%) of BLM surface would be disturbed from renewable-energy development during the planning period. Overall, renewable-energy development at that scale would have a minor adverse effect on the ROW program by restricting development opportunities.

Travel and Transportation Management

Under Alternative B, TTM would limit motorized vehicle use to designated routes within the stock driveways, allow over-snow vehicle use consistent with motorized use designations, and limit motorized travel to designated roads and trails on 137,126 acres (57%) of BLM surface, consistent with other resource values, prohibit motorized vehicle use from November 15 to April 30 within the big game crucial winter ranges, close areas to motorized vehicle use to protect sensitive resources on 625,854 acres of BLM surface, and allow travel off identified designated routes to signed areas only under a special use permit. Authorizations would provide reasonable access to other federally managed lands, state lands and privately owned lands. Alternative B would evaluate existing routes in the vicinity of any new system roads for closure and reclamation consistent with other resource values, as well as close areas for motorized vehicles to protect sensitive resources as defined in the corresponding special designation and resource sections of Alternative B. This management would have a major adverse effect on the ROW program restricting development opportunities.

Recreation

Alternative B, recreation management actions would be prioritized for 55,529 acres, (7%) of the planning area, and divide the planning area into the Southern Big Horn Mountains

ERMA and Buffalo ERMA. This could restrict ROW development opportunities by limiting allowable surface disturbance from facilities and infrastructure. Overall, this would have a moderate adverse effect to the ROW program.

Lands with Wilderness Characteristics

Alternative B would manage lands with wilderness characteristics to emphasize primitive recreational opportunities and natural values. Lands with wilderness characteristics include 12,237 acres (less than 1%) of BLM surface in the planning area. Management prohibitions would be closed or limit vehicles to designated roads and trails; manage for visual resources as Class II; close the area to mineral leasing; recommend withdrawal to locatable mineral entry; close areas to salable minerals; exclude ROWs; prohibit renewable-energy development; prohibit commercial wood cutting only when the by-product would be an environmental restoration; and prohibit all other surface-disturbing activities not compatible with retaining or enhancing the areas natural values. Overall, this exclusion would have a minor adverse effect on the ROW program.

Special Designations

Areas of Critical Environmental Concern , Wilderness Study Areas, Scenic or Back Country Byways, and Wild and Scenic Rivers

Under Alternative B ROW actions would be restricted in all special designation areas. Management prescriptions associated with each special designation would take precedence over ROW projects. WSA management would impose the greatest restrictions on ROW management actions, while other management of other special area designations would impose fewer restrictions on proposed disturbance activities. Any development or activity within the boundaries of special designation areas would be restricted to protect or conserve resource values while meeting national and resource management objectives when necessary. ACECs would affect 511,000 acres (69%) (major adverse) and WSAs 28,931 acres (4%) (minor adverse) of BLM surface in the planning area. Byway designation should not affect ROW authorization, but could adversely affect the perception of ROWs and therefore be a consideration in proposing ROWs along a designated byway, having a negligible adverse effect. Alternative B would designate one Middle Fork Powder River WSR, which would prohibit ROW development. If congress denies this nomination, management will continue in accordance with the Middle Fork Powder River Interim Management Plan to retain its free-flowing characteristics and outstanding resource value; this would have a negligible adverse effect.

4.6.4.5. Alternative C

Rights-of-Way and Corridors

Management under Alternative C would allow ROW and ROW corridor actions unless they are specifically excluded, developing and designating transportation and utility ROW and ROW corridors. The predicted disturbance from ROW actions under Alternative C is 57,083 acres (7.3%) of BLM surface in the planning area.

Under Alternative C, authorizations for communications sites in the Pumpkin Buttes area would be allowed without first fully utilizing the South Middle Butte and co-location would not be required on new communication site proposals, and authorize communication sites on North Middle Butte regardless of line-of-site needs.

Under Alternative C, surface-disturbing activities on soils with a severe erosion hazard, on slopes equal to or greater than 25 percent, on soils with poor reclamation potential, and on miscellaneous soil types would be allowed.

Under Alternative C, designate a total of 32,293 acres of BLM surface for transportation and utility ROW corridors, with no management action restrictions allowing subsurface, surface or above ground authorizations. There are seven identified corridors: Echeta Road, Highway 14/16, Highway 59 North, Interstate 25, Interstate 90, Powder River, and the Powder River Breaks. Corridors would be designated for above ground facilities such as overhead distribution powerlines and would be placed adjacent to existing major transportation routes. Linear ROW transmission lines would be authorized consistent with other resource values. Activities generally excluded from ROW corridors include mineral materials disposals, range and wildlife habitat improvements involving surface disturbance and facility construction, campgrounds and public recreation facilities, and other facilities that would attract public use. Facilities would not be placed adjacent to each other if there would be resource conflicts or issues with safety or incompatibility. Designated corridors would vary by total width, numbers, types, extents, and compatibility with other surface-disturbing activities or other public uses.

Under BMPs, ROW holders are encouraged to use existing disturbed corridors, as well as coordinate with other authorized users for construction, maintenance and reclamation activities. Corridor management would decrease ROW development opportunities across the planning area and would have a minor adverse effect on the ROW and corridor program.

Physical Resources

Air Quality

Under Alternative C, quantitative air quality modeling of industrial activities would not be required for ROW and corridor projects. The effect on the ROW and corridor program would be potentially not substantial and would increase opportunity for development. This would have a negligible beneficial effect on the ROW program.

Soil

Under Alternative C, requests for disturbances on slopes equal to or greater than 25 percent and soils with severe erosion hazard and poor reclamation potential would be considered. Allowing surface-disturbing activities on miscellaneous soil types would have a major adverse effect on soil resources.

This would increase disturbance on approximately 28 percent of the planning area failing to protect 218,928 acres of BLM surface and increase development opportunities. Consistent implementation of BMP would strive to minimize those effects and localize them where there are determined sensitive vegetation and soils. This would have a major beneficial effect to the ROW program.

Water Resources

Alternative C, surface-disturbing activities would not be prohibited within 500 feet of springs, reservoirs, water wells, perennial streams, and associated riparian habitat approximately 19,861 acres of BLM surface. An NSO stipulation for any mineral leases would not be applied within 500 feet of the same features. Additionally, surface discharge of produced water would be allowed from federal mineral development; and oil and gas wells could be converted for water supply wells.

Riparian areas are generally held under BLM administration for the conservation, maintenance, and improvement of wildlife and natural resources. Land use authorizations would be rerouted to avoid these areas and would decrease development opportunities. Overall, this would have a minor adverse effect.

Cave and Karst Resources

Under Alternative C, cave and karst management requirements would effect 13 percent of BLM surface in the planning area, requiring a buffer around significant cave entrances. Generally, the BLM would not likely authorize land uses where there are known or likely cave and karst resources. The effect would be slight but detectable, and ROWs would be denied or rerouted which would decrease development opportunities. Therefore, this would have a minor adverse effect on the ROW program.

Minerals Resources

Locatable Minerals and Salable Minerals

Alternative C would allow ROW projects in other minerals development areas where land uses would be compatible, and would locate projects to lands appropriate to meet other resource objectives and minimize conflicts with other development activities. Many of these improvements would benefit the ROW program by utilizing previously disturbed areas, or corridors, and roads. However, some activities may cause ROW projects to be modified, relocated, or denied, decreasing ROW development opportunities. Because foreseeable mineral development is estimated to disturb locatable minerals 1,455 acres of surface (less than 1% of the planning area), and salable minerals 2,090 acres (0.2%), mineral management and development activities would have a negligible, beneficial effect on the ROW program.

Leasable Minerals - Coal

The Alternative C reasonable surface disturbance prediction of 195,700 net acres of coal identified as acceptable for further coal leasing consideration (less than 1% of BLM-administered coal). This would decrease ROW development opportunities, and would have a negligible adverse effect on the ROW program.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Under Alternative C, the BLM would authorize native and non-native plant species for initial reclamation activities. This could have a major beneficial effect on ROW development by allowing the use of non-native species for interim or short-term reclamation. Alternative C management would increase the success of soil stabilization and vegetation recovery efforts and increase the probability of achieving long-term reclamation goals.

Vegetation – Riparian/Wetland Resources

Under Alternative C, surface-disturbing and disruptive activities are allowed within 500 feet of riparian/wetlands systems, aquatic habitats, and floodplains consistent with other resource values. Proposed projects would not need to be rerouted to avoid these areas. ROW development opportunities would decrease when considering other resource values and ROWs would be denied or rerouted. Overall, Alternative C water management actions would have a minor (2%) adverse effect on the ROW and corridor program.

Invasive Species and Pest Management

Alternative C would take a conservative approach to managing invasive species. Under this alternative disturbances are predicted to affect approximately four percent of BLM acres, treating 10,000 acres (1.2%) of BLM surface in the planning area. This would not decrease or increase ROW development opportunities and therefore, would have no effect on the ROW program.

Fish and Wildlife Resources – Fish and Wildlife and Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Alternative C would generally allow disturbances where resource objectives can be met in areas with fish and wildlife resources. Management of fish and wildlife habitat and SSS would affect uses administered by the ROWs associated with a ROW, through the implementation of mitigation measures designed to protect them. Implementing species-specific protective measures for sensitive plant and wildlife species and prohibiting actions that would affect Threatened or Endangered species could result in the denial or relocation of proposed public land uses, but those uses would generally be allowed. This would develop ROW opportunities and would have a minor adverse effect to the ROW development program.

Heritage and Visual Resources

Cultural Resources

Under Alternative C, protective measures for cultural resources would require avoidance and other mitigation measures for ROW development proposed near these resources. These measures could result in the relocation or redesign of proposed structures and infrastructure, and appropriate stipulations such as NSO and CSU to protect the setting. Because there are known cultural resources throughout the planning area, and because it is likely that additional cultural resources will be discovered, the effects would vary by degree throughout the planning area. Construction activities that disturb the ground surface and subsurface in ROW corridors, and which are the result of ROW approvals, associated with ROW development, would have the potential to directly effect cultural resources, particularly if the resources were not identified prior to the construction activity. It is relatively common for road and pipeline construction through culturally sensitive sediments to lead to subsurface prehistoric discoveries. Data recovery excavations that enhance understanding of prehistory could often mitigate the effect on discoveries. There would likely be considerable effects where undocumented NRHP-eligible archeological sites are affected but have not been recognized (and therefore are not being treated as a discovery). ROW actions that result in construction of structures visible on or above the surface (e.g., communication towers, compressor stations, tanks, and wind turbines) would have the potential to directly effect the visual integrity of those classes of cultural properties that derive their significance from natural settings and settings relatively devoid of modern intrusion. Overall, Alternative C cultural resource management would likely have a minor adverse effect on the ROW program.

Paleontological Resources

Under Alternative C, implementing protective measures for paleontological resources will require field surveys for PFYC Classes 4 and 5. The BLM would monitor those areas on a project specific basis and identify and designate casual collection areas for common invertebrate, plant, and petrified wood fossil collection by the public. Because there are known paleontological resources throughout the planning area, Class 5 totals approximately 28,177 acres or approximately 3.6 percent of BLM surface, and because it is likely that additional paleontological resources would be discovered, effects on the ROW program would vary by degrees throughout the planning area. ROW proposal would be denied or relocated to retain

public lands with significant paleontological values, decreasing development opportunities. This would have a minor adverse effects on the ROW program.

Visual Resources

Under Alternative C, managing the planning area to meet visual objectives could affect the locations, routes, heights, and colors of proposed land uses and associated facilities. Renewable energy development or other resource use may be considered within the line-of-site of VRM classifications. Development of disturbance in forested areas could cause habitat fragmentation and visual effects. Additional effort would be required to design projects to meet the objectives of the specific VRM class designation of an area, where a use is proposed and utilize visual simulations on a project specific basis. Under Alternative C, VRI Class II areas would be managed as VRM Class II, and VRI Class III areas would be managed as VRM Class IV. Pumpkin Buttes is a significant VRM feature. All proposed land use actions within the viewshed of the Pumpkin Buttes would consider visual effects, although management under this alternative would allow those effects. Some additional project planning might be necessary for VRM Class III areas to ensure that the landscape is partially retained. Considerations for national energy priorities could lower VRM classifications. Alternative C management would consider intensive mitigation measures for ROW development actions but would not preclude authorizations in those areas; this would decrease development opportunity. This would likely effect less than one percent BLM surface in the planning area have a minor adverse effect on the ROW program.

Land Resources

Forest Products

Management under Alternative C would affect less than one percent of BLM surface resulting in a negligible adverse effect to the ROW program. ROW proposals would be denied or rerouted and decrease ROW develop opportunities.

Lands and Realty

Under this Alternative, management would not acquire state or private lands, or interests in lands. This would eliminate the agency's ability to gain access to some BLM-administered parcels, both large blocks, as well as small, isolated areas. This would inhibit BFO's ability to manage resources, multiple uses, and limit recreational opportunities. The consequences of this would be continued higher costs because of the difficulty and time consuming efforts required to obtain access through private lands for administrating multiple uses; management of natural resources; and negotiating conflicts for activities and development with other land owners where federal actions cross ownership boundaries. Overall, Alternative C would have a major adverse effect on the ROW program.

Renewable Energy

Management under Alternative C, would exclude 28,551 acres, or 4 percent of BLM-administrated surface, and avoid 618,676 acres or 79 percent of BLM surface, where inconsistent with other resource values. Renewable-energy development would be allowed on 134,875 acres (17%) of BLM surface. Renewable-energy development at this scale would have a major beneficial effect on the ROW program, increasing ROW development opportunities.

Travel and Transportation Management

Alternative C TTM would open stock driveways to motorized vehicles, allow over-snow vehicle use, allow motorized vehicle use within habitat of SSS consistent with travel management designations for that area, and would not close or reclaim existing routes in the vicinity of any

new system roads but would close areas to motorized vehicle use to protect sensitive resources on approximately 28,931 acres (3%). Motorized vehicle travel would be limited to designated road and trails on 723,497 acres, consistent with other resource values. Authorizations would provide reasonable access to other federally managed lands, state lands and privately owned lands and would likely increase the number of ROWs. Appropriate signs would be placed where needed to minimize or avoid inadvertent trespass. This management would have a minor beneficial effect on the ROW program.

Recreation

Under Alternative C, management would designate Burnt Hollow, Petrified Tree, Middle Fork Powder River, Mosier Gulch, Welch Ranch, Weston Hills, and Hole in the Wall as SRMAs that would be protected from development and land use authorizations. This would prohibit ROW actions on 30,570 acres (4%) of BLM surface in the planning area and would have a minor adverse effect on the ROW program.

Lands with Wilderness Characteristics

Alternative C would not manage any areas within the planning area for wilderness characteristics, therefore there would be no effect.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways

Under Alternative C, ROW actions would be allowed in accordance to management for surrounding management areas. There would not be any ACEC designations and no evaluation of roads within the planning area for National Back Country or Scenic Byway areas. These designations would therefore have no effect on ROW program.

Wild and Scenic Rivers

Under Alternative C, if congress denies the Middle Fork Powder River WSR nomination, special provisions related to protection of free-flowing characteristics and outstanding value would not apply. This would have no effect to the ROW program.

Wilderness Study Areas

Should congress act to designate or release WSAs, a plan amendment would take place. Overall, this would have a minor adverse effect on the ROW program.

4.6.4.6. Alternative D

Rights-of-Way and Corridors

Under Alternative D, ROW and corridors authorizations would be excluded from 79,777 acres (10%) and avoid 321,148 acres (41%) of BLM surface in the planning area, while allowing ROW and corridor authorizations on 381,176 acres (48%) of BLM surface use, but would be limited to existing ROWs and other disturbed areas. Surface-disturbing activities could be allowed on soils with a severe erosion hazard, on slopes equal to greater than 25 percent, and on soils with poor reclamation suitability with an approved construction, stabilization and reclamation plan.

Identify and designate communication site areas, and, within management designated sites, require additional communication sites to be co-located. Manage authorizations for communications sites in the Pumpkin Buttes area for cultural and visual resources, and, within

designated areas, require additional communication sites be co-located. Proposals outside designated areas will be evaluated on a project specific basis and co-locate where possible. Limit new communication authorizations on the Pumpkin Buttes to existing towers, while prohibiting communication sites on North Middle Butte.

Under Alternative D, a total of 32,293 acres of BLM surface would be designated for use as major transportation and utility ROW corridors in cooperation with the State of Wyoming. Echeta road, Highway 14/16, Highway 59 North, Interstate 25, Interstate 90, Powder River and the Powder River Breaks corridors would be identified. Management actions would apply to the Powder River and Powder River Breaks corridor requiring all authorizations to be subsurface or buried. As well as lines must be buried within Greater Sage-Grouse Core Population Area, unless the line is within one mile of either side of 115 kV or larger transmission line creating a corridor no wider than one mile wide.

Alternative D, ROW and corridor management would allow transmission lines and above ground facilities, such as compressor and electric distribution lines, within existing ROW and designated corridors when resource objectives can be met. This management would decrease development opportunities and have a major adverse effect on the ROW and corridor program.

Physical Resources

Air Quality

Under Alternative D, air quality monitoring would be required of ROW projects expected to approach or exceed ambient air quality standard emissions. Few ROW projects would likely be required to conduct monitoring and the monitoring would not prevent any ROW projects. The effect on ROW and corridor development would not be substantial, but would decrease opportunity for development having a negligible adverse effect.

Soil

Alternative D soils management activities would allow surface-disturbing activities on soils with a severe erosion hazard with an approved project construction plan and site specific reclamation plan to conserve the soil and meet reclamation and resource objectives.

Alternative D, would protect 215,496 acres or 28 percent of BLM surface in the planning area with soils with severe erosion hazard; 455,090 acres or 58 percent of BLM surface possessing soils without poor reclamation suitability with an approved reclamation plan; and on slopes less than 25 percent or greater (170,590 acres or 22% of BLM surface). Alternative D would avoid surface-disturbing activities by placing a CSU on areas containing LRP such as badlands, rock outcrops and slopes susceptible to mass movement (218,928 acres or 28% of BLM surface).

Analyses and decisions for proposed ROW actions would include appropriate consideration for soil management and other related resource management objectives, and include construction, reclamation and stabilization plans, or CSU stipulations when warranted. This management action would increase costs and decrease development opportunities. Under Alternative D, soil management across the planning area has a moderate adverse effect on the ROW program.

Water Resources

Alternative D would allow surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams where water and other resource objectives can be met, based on management decisions for other resource values on 19,861 acres of BLM surface,

and allow on-channel reservoirs effecting natural stream flow regimes in consideration of other resource values.

Before they are authorized, land uses might be rerouted to avoid these areas, but this would not be required. Furthermore, although a water source is considered important to other natural resource discipline(s), the parcel could be disposed of if other conditions warrant the action (see discussion under Alternative D Lands and Realty). Additionally, surface discharges of produced water would be allowed from federal mineral development, and oil and gas wells could be converted to water supply wells in consideration of other resource values. Retaining these lands and avoiding disturbances that would adversely effect water resources would likely have a minor adverse effect on the ROW program by decreasing development opportunities.

Cave and Karst Resources

Alternative D would require a CSU stipulation identifying a disturbance free buffer around cave entrances and passages of significant caves. This would prohibit ROW actions on 11 acres of BLM surface in the planning area. However, ROW and corridor actions would not be likely in cave and karst areas, so this management would have a minor adverse effect on the ROW program.

Mineral Resources

Locatable Minerals

Under Alternative D, most of the planning area would be available for locatable minerals development. However, because foreseeable locatable mineral development is predicted to disturb only an estimated 1,252 acres (less than 1%) area disturbed. These ROW are rare, therefore increasing costs and decreasing development opportunities; the effect on the ROW program would be negligible adverse.

Leasable Minerals - Coal

Reasonably foreseeable coal development would be localized and would likely occur on 195,700 net acres (less than 1% of BLM-administered coal area) located in central Campbell County and north-central Sheridan County. Federal coal lands identified acceptable for further coal leasing considerations are available for LBA's, lease modifications, emergency leases, and exchanges. ROW and corridors could be denied, relocated, or deferred if an active coal lease is in place, decreasing development opportunities. Overall, Alternative D would have a negligible adverse effect on the ROW development program.

Salable Minerals

Salable management is considered on a project specific basis under Alternative D. Because foreseeable salable mineral development is estimated to disturb 1,193 acres of surface (less than 1% of the planning area). Salable minerals projects are relatively rare, although infrastructure such as roads would be shared and would increase ROW development opportunities; effects on the ROW program would be negligible beneficial.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Under Alternative D, grassland and shrubland management objectives would allow desirable non-native plant species for short-term reclamation activities as a component in an authorized reclamation plan (followed up with planting of native species). Newly proposed powerlines and

ground facilities would be allowed within existing ROW and other disturbance areas, increasing development opportunities. This action would provide opportunities for mitigating surface disturbance from approved ROW and corridor actions and would be located in greater than ten percent of all grassland and shrubland communities in the planning area. This would have a major beneficial effect on the ROW program.

Vegetation – Riparian/Wetland Resources

Alternative D would allow surface disturbance within 500 feet of water sources that supply wetland and riparian conditions where resource objectives can be met and apply CSU stipulations, based on management decisions for other resource values (e.g., soils). There are 23,831 acres (3%) of BLM surface in the planning within the riparian buffer. Before they are authorized, land uses might be rerouted to avoid these areas, but this would not be required. Newly proposed powerlines and ground facilities would be allowed within existing ROWs and other disturbance areas, increasing development opportunities. Overall, this management would have a moderate beneficial effect on the ROW program.

Invasive Species and Pest Management

Alternative D would take a moderate approach to managing invasive species. Under Alternative D, 12,000 acres (2%) of BLM surface are predicted to be treated. Newly proposed powerlines and ground facilities would be allowed within existing ROW and other disturbance areas. All these actions would limit spread of invasive species and pest where ROWs are limited or avoid proper ecological conditions, vegetative communities, and habitat types will remain intact limiting invasive species establishment and spread. Alternative D would help mitigate adverse effects on ROW corridors and decrease development opportunities. This would have a minor adverse effect on the ROW and corridor program.

Fish and Wildlife Resources – Fish

Alternative D would allow surface-disturbing activities within 0.25 mile of naturally occurring waterbodies containing native and desirable non-native fish species by applying a CSU stipulation; where fish resource objectives can be met. Design crossings of waterbodies identified as supporting fish would be designed to allow fish passage and restore important instream segments for fish habitat in accordance with WGFD priorities. The BLM would cooperate with WGFD in introducing or reintroducing native and desirable non-native in support of WGFD and BLM objectives.

Under Alternative D, the BLM BFO would maintain or enhance streams and riparian areas associated with Blue and Red Ribbon streams, Powder River, Tongue River, and other areas, for desired fisheries potential and incorporate fisheries enhancement in reservoir design consistent with other resources. Overall, this would affect 51,745 acres (1%) of BLM surface in the planning area and have a moderate adverse effect on the ROW program.

Fish and Wildlife Resources – Wildlife

Under Alternative D, the BLM BFO would manage access to protect crucial habitats in cooperation with WGFD and other stakeholders and inventory, record, and report existing type, condition and location of BLM fences. Land use authorizations would require powerlines to be designed to minimize impacts to other wildlife related impacts and will be constructed in accordance with the latest APLIC standards to minimize raptor use of these poles and would prohibit above ground distribution powerlines unless identified in an approved distribution plan. Renewable energy projects would be prohibited in big game crucial winter range, elk calving areas, and identified big game priority travel corridors (Map 29). Surface disturbance

and occupancy would be prohibited in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges for big game and activity in crucial big game winter range, and in elk calving areas during specified dates (Map 29). This management would affect almost 13 percent of the planning area but would not prohibit ROW authorizations. Eighty five percent of existing security habitat would be retained and measured from roads within elk seasonal ranges (132,148 acres, or 17% of BLM surface in the planning area).

Although the acreages above suggest there would be a major adverse effect on the ROW program from Alternative D wildlife management, overall effect would be moderate. Interests for surface-disturbing activities in these areas would be constrained to the requirements identified above to alleviate potential adverse effects on the resource values. Most of the planning area would remain open for ROW interests and approvals.

Alternative D management would seasonally prohibit surface-disturbing and disruptive activities around active raptor nests using USFWS Wyoming Ecological Services' recommended spatial buffers for breeding raptors. Spatial buffers may be modified based on auditory and visual impacts, as well as topography and other ecological characteristics surrounding the nest site. The BLM may coordinate buffer distances with the WGFD and/or USFWS. This would provide opportunities to authorize surface-disturbing activities, requiring users to adhere to specified requirements. Land use authorizations would require users to avoid surface disturbance or occupancy within 0.25 mile of the perimeter of occupied sharp-tailed grouse leks and avoid human activity between 6 PM to 8 AM from March 15 to May 31, and avoid areas within 2 miles from April 1 to July 31. This would effect less than one percent of the BLM surface in the planning area, and would have a minor adverse effect on the ROW program.

Alternative D would allow surface disturbance and occupancy within the USFWS Wyoming Ecological Services' recommended spatial buffers for breeding raptors when nest productivity would not be harmed (Map 33). Spatial buffers may be modified based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site. BLM may coordinate buffer distances with the WGFD and/or the USFWS. This would affect 255,129 acres (33%) of BLM surface in the planning area. The BLM would prohibit surface-disturbing activities that could disrupt nesting raptors within the USFWS recommended buffer of an active raptor nest during specified periods. This management would have a moderate beneficial effect on the ROW program, because it would create use opportunities for the public while adhering to specified criteria to protect raptor species of conservation concern.

Overall, Alternative D wildlife management would have a moderate adverse effect on the ROW and corridor program.

Special Status Species – Plants

Alternative D would allow ROW development in habitat for special status plant species but not within known populations of such plants; after surveys establish site-specific botanic buffers, no surface-disturbing activities that could adversely effect special status plant species would be permitted.

This would affect 126,811 acres, 16 percent of BLM surface in the planning area, and have a major adverse effect on the ROW program by decreasing more potential for land use authorizations for the public.

Special Status Species – Fish

Alternative D would prohibit new surface-disturbing activities within 0.25 mile of

any waters containing special status fish species (Map 28), unless the activities would benefit the species. Exceptions must demonstrate that potential adverse effects could be avoided and the proposed action is the least environmentally damaging alternative. In addition, the alternative would apply an NSO stipulation with 0.25 mile of any waters containing special status fish species and allow instream structures only where adverse effects on special status fish species and their habitat, can be avoided. This would affect less than one percent of BLM surface in the planning area and decrease development opportunities from denial of ROW proposals. This would have a negligible adverse effect on the ROW program.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative D special status wildlife species management would locate and manage facilities to mitigate the adverse effects of noise on SSS and maintain or enhance the integrity of migration corridors, and identified special status wildlife species. This alternative would manage surface-disturbing and disruptive activities to mitigate adverse effects on special status wildlife species and their habitats as well as allowing surface-disturbing and disruptive activities within active prairie dog colonies on BLM surface that do not adversely impact suitable habitat. This management would have a moderate adverse effect on the ROW program.

Under Alternative D management action for SSS wildlife. Powerlines (distribution and transmission) will be designed to minimize wildlife related impacts. These actions include but are not limited to:

- Avoid areas of high avian use such as water bodies (including ponds, lakes, rivers, streams and wetlands), ridge tops, prairie dog colonies, Greater Sage-Grouse Core Population and Core Population Connectivity Areas, and sharp-tailed grouse leks. (PRB Final EIS, EO 2011–05)
- Prohibit uses within 0.6 mile of Greater Sage-Grouse Core Population and Core Population Connectivity Area leks unless within an established corridor or it can be demonstrated that the activity will not cause Greater Sage-Grouse population declines. Transmission and collector lines are not permitted if they are outside designated corridors or at distances greater than 0.5 mile of an existing 115 kV or greater powerlines, unless there is demonstration of no decline in Greater Sage-Grouse populations. ROWs for residential and agriculture distribution lines will be evaluated on a project specific basis. (EO 2011–05)
- Within general Sage-Grouse habitat (outside core population and connectivity areas) overhead powerlines will be located at least 0.5 mile from Greater Sage-Grouse breeding and nesting grounds. (PRB Final EIS)
- Any new powerlines authorized within the above identified areas will be buried or if overhead then marked to increase visibility and perch-guarded to prevent raptor perching. (PRB Final EIS)

Alternative D would apply the following surface-disturbing activities to the extent necessary to prevent unnecessary or undue degradation in Greater Sage-Grouse Core Population Areas:

- Prohibit surface disturbing activities, disruptive activities, and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability).
- Allow on average no more than one oil and gas or mining location and no more than 5 percent total surface disturbance per 640 acres within the DDCT analysis area (4 mile buffer of occupied leks within 4 miles of proposed surface disturbance restricted to Core Population Area and Connectivity Corridor). Design and manage facilities to prevent WNV transmission. Avoid overhead electric transmission lines and bury electrical distribution lines where possible; if not possible, then locate overhead lines at least 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards. Prohibit electric overhead transmission lines

unless within one-half mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than one mile. Limit noise sources to 10 dBA above ambient noise measured at the perimeter of occupied Greater Sage-Grouse leks from March 1 to May 15 6 PM to 8 AM unless scientific findings indicate a different noise level is appropriate. In addition, limit noise sources in other important Greater Sage-Grouse habitats if research and/or policy indicate the need. Locate new roads, used to transport products or waste, greater than 1.9 miles and other new roads, such as roads for site access, greater than 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks. Construct roads to minimum design standards needed.

- Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years.
- Prohibit surface disturbing and disruptive activities from March 15 to June 30 (independent of habitat suitability).
- Prohibit surface disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas from December 1 to March 14.

Alternative D would apply the following to surface-disturbing activities to the extent necessary to prevent unnecessary or undue degradation and to manage as follows within Greater Sage-Grouse Core Population Connectivity Corridors:

- Prohibit surface-disturbing activities, disruptive activities and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability).
- Allow no more than 5 percent total surface disturbance per 640 acres within the DDCT analysis area (4 mile buffer of occupied leks within 4 miles of proposed surface disturbance, restricted to Core Population and Core Population Connectivity Corridors). Design and manage facilities to prevent WNV transmission. Avoid overhead electric transmission lines and bury electric distribution lines where possible; if not possible, locate overhead lines at least 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards. Locate new roads, used to transport products or waste, greater than 1.9 miles and other, new such as site access, greater than 0.6 mile from the perimeter of the occupied Greater Sage-Grouse leks. Construct roads to minimum design standards needed, and facilities with motion, light sources, noise (10 decibels above ambient), with a height greater than 4.5 feet.
- Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years.
- Prohibit surface disturbing and disruptive activities within 4 miles of occupied Greater Sage-Grouse leks from March 15 to June 30 (independent of habitat suitability, restricted to within Core Population Connectivity Corridors).
- Prohibit surface disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas, from December 1 to March 14.

Alternative D would apply the following to surface-disturbing activities to the extent necessary to prevent unnecessary or undue degradation within occupied Greater Sage-Grouse habitat outside of Core Population Areas and Core Population Connectivity Corridors:

- Prohibit or restrict surface-disturbing and disruptive activities within 0.25 mile of the perimeter of occupied Greater Sage-Grouse leks. Reduce surface disturbance for authorizations within 0.25 mile of occupied Greater Sage-Grouse leks.
 - Design and manage facilities to prevent WNV transmission.
 - Prohibit overhead transmission lines.
 - Bury electric distribution lines where possible; if not possible, then locate overhead lines at least 0.5 mile from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards.
 - Restore disturbed sagebrush communities on BLM surface to meet the Wyoming DEQ community-specific full shrub density standard (Chapter 4 Rules and Regulations, option III) for all predisturbance shrub species and 5 percent minimum canopy cover of sagebrush. A 90 percent confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years. Recommend for all surface-disturbing activities on BLM surface adjacent to priority habitat, within or adjacent to lands involved in Greater Sage-Grouse conservation projects, or support an 85 percent Greater Sage-Grouse population density. BLM parcels less than 640 acres that only meet the population density factor may be excluded.
- Prohibit surface disturbing and disruptive activities within 2.0 miles of occupied Greater Sage-Grouse leks, from March 15 to June 30 (independent of habitat suitability) and prohibit Greater Sage-Grouse winter concentration areas, from December 1 to March 14.

Management under Alternative D for raptors, establish a year round disturbance-free zone of at least 0.5 mile for the for the Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River riparian bald eagle corridors. This buffer could be adjusted to 1.0 mile based on topographic features, visibility, disturbance and human activity levels, and other factors. This buffer zone restriction would be based on site specific information and coordinated with the USFWS Wyoming Field Office. This management would affect less than two percent of BLM surface in the planning area, and would have a minor adverse effect on the ROW program.

- Prohibit surface-disturbing and disruptive activities to nesting raptors using USFWS spatial recommendations for an active SSS raptor nest during established time periods (Map 33).

The ROW department assumes multiple potential uses that also could affect wildlife. Therefore, lands and realty personnel considering land use proposals would consult with fish and wildlife specialists before authorizing those uses.

Alternative D would allow surface-disturbing and disruptive activities within active prairie dog colonies on BLM surface, in accordance with identified criteria, that would not adversely effect suitable habitat for SSS that depend upon prairie dog colonies (Map 35). This would affect less than one percent of BLM surface in the planning area and would have a minor adverse effect on the ROW program.

Alternative D for amphibians, reptiles and bats, require surveys for special status amphibian, reptile, and bat species prior to approving any project or activity that may impact the habitat for these species.

Overall, Alternative D special status wildlife management would have a moderate adverse effect on the ROW program.

Heritage and Visual Resources

Cultural Resources

Under Alternative D, the BLM would prohibit surface disturbance on the following sites: Pumpkin Buttes, Cantonment Reno, Dull Knife Battlefield, Crazy Woman Battle, contributing and unevaluated segments of the Bozeman Trail, rock art sites, and all rock shelters.

The BLM would apply NSO stipulations and CSU stipulations (surface disturbance and infrastructure must either not be visible or would result in a weak contrast) to protect the setting within 3 miles of the Pumpkin Buttes, Cantonment Reno, Dull Knife Battlefield, Crazy Woman Battlefield, contributing and unevaluated segments of the Bozeman Trail, rock art sites, and Native American burial sites for historic properties (Map 45).

Implementing protective measures for cultural resources would require analysis of a proposed land use to include cultural resource specialists during the scoping and analysis of a potential effects, and identify survey and monitoring activities for proposed uses. ROW proposals would be denied or rerouted to protect cultural resources, the predicted disturbance from ROW actions is 38,762 acres (4.96%) of BLM surface in the planning area, this would decrease development opportunities.

Overall, Alternative D cultural resources management would have a minor adverse effect on the ROW program.

Paleontological Resources

Under Alternative D, implementing protective measures for paleontological resources would require surveys for PFYC Class 4 and 5. The BLM would monitor them as needed. This affects 98 percent of the planning area. However, these monitoring activities would have a negligible effect on the ROW program. These measures may result in the relocation or redesign of proposed use authorizations. Because known paleontological resources occur throughout the planning area, and because it is likely that additional paleontological resources would be discovered in the future, effects could occur in varying degrees throughout the planning area. The inclusion of paleontological and resource specialists during the scoping and analysis for potential effects, as well as identifying survey and monitoring activities for proposed uses would be included with each proposed land use analysis. There would be no casual collection areas designated. Areas containing paleontological resources of high quality or importance for special management, would be designated as they are needed. Overall there would not be significant effects to the ROW program, although development opportunities would decrease from the denial or deferment of a proposal. Protecting paleontological resources would have a minor adverse effect on the ROW program.

Visual Resources

Under Alternative D, the BLM would manage VRI Class II areas (except Powder River Breaks and Fortification Creek) and special emphasis areas as VRM Class II (Map 51). This would affect 112,329 acres, or 15 percent of BLM surface in the planning area.

Under this alternative, the BLM would prepare visual simulations and design mitigation for all proposed actions in VRM Class I and II areas. Visual simulations and mitigation design could be required on a project specific basis for VRM Class III areas with high visual sensitivity. This management action would affect a total of 379,429 acres, or 48 percent of BLM surface in the planning area.

Proposed land use activities would be required to incorporate VRM requirements. Authorizations would incorporate mitigation requirements to alleviate adverse effects on visual resources in the

planning area. The ROW program would be required to incorporate plans to minimize adverse effects on visual resources. Some proposed land uses could be denied if they would cause the VRM class to change.

Overall, Alternative D management of visual resources would have a major adverse effect on the ROW program.

Land Resources

Forest Products

Under Alternative D, Forest management areas within 200 feet of surface waters would be prohibited and would affect less than one percent of the planning area. ROWs and corridors would be denied or relocated which would increase costs and decrease ROW development opportunities. The Lands and Realty staff will coordinate activities affecting forest products as necessary. This would have a negligible adverse effect on the ROW and corridor program.

Lands and Realty

Under Alternative D priority would be given to acquiring land or interests in lands in areas adjacent to large blocks of BLM-administered lands.

Alternative D, management would pursue land tenure adjustment of all identified disposal lands. These parcels would be examined for the presence of high-value resources. There are approximately 120,722 (15%) acres currently identified for disposal. Lands containing high surface values would generally be retained, including those with agricultural potential. The BFO would pursue land tenure adjustment on lands identified for disposal having no natural resource values prior to pursuing lands identified for disposal having natural resource values; generally the management action would be to retain these lands identified for disposal until after lands identified as having no natural resource value have been disposed of. Actively disposing of identified disposal lands would have a major beneficial effect on the ROW program (Map 54, Appendix L (p. 2211)), and consolidating lands would reduce the amount of trespass cases.

The BLM would pursue land adjustments related to custodial grazing allotments. Under Alternative D, disposing of these types of grazing lands would decrease the potential need for the public to request land use authorizations. It would therefore eliminate the need to monitor activities on these small, isolated parcels that are generally surrounded by private land. There are 171,749 acres identified under custodial allotments (22%) of BLM-administered land in the planning area classified as custodial allotments.

Overall, Alternative D lands and realty management actions would have a major beneficial effect on the ROW program.

Renewable Energy

Under Alternative D, renewable-energy development ROWs would be excluded in the southern Big Horn Mountains, areas closed to mineral leasing (fluid and solid), areas closed to mineral entry (locatable and salable), ROW exclusion areas, areas within 3 miles and visible from historic properties that retain an intact setting, and all other areas where surface disturbance is prohibited, approximately 352,068 acres (53%) of BLM surface in the planning area identified with wind-energy potential. Renewable-energy development would be avoided on mineral leasing (fluid and solid) NSO, and CSU areas, ROW avoidance areas, areas greater than 3 miles from historic properties that retain and intact setting, and all other areas with surface disturbance restrictions, approximately 374,518 acres on BLM surface. Exclusion and avoidance at this

scale would have a major adverse effect on the ROW and corridor program, by limiting ROW development opportunities.

Travel and Transportation Management

Alternative D TTM would allow motorized vehicle use on designated routes under a permit and within stock driveways; over-snow vehicle use would be consistent with motorized use designation when snow cover is sufficient to prevent resource damage; allow motorized vehicle use within habitat of SSS consistent with travel management designations for that area; allow travel not causing resource damage to go up to 300 feet off designated routes for dispersed camping and game retrieval. Close areas to motorized vehicle use to protect sensitive resources in Middle Fork Canyon, Cantonment Reno, Dry Creek Petrified Tree EEA, and apply a 500 foot buffer on designated non-motorized trails, 37,389 acres (4%) of BLM surface. Appropriate signs would be placed where needed to minimize or prevent inadvertent trespass.

Alternative D TTM would protect winter big game by seasonally prohibiting motorized vehicle use within big game crucial winter ranges (Map 68), and protect big game calving areas.

This would not have a significant effect on the ROW program and would potentially decrease trespass opportunities within designated routes. Overall, this management action would have a minor beneficial effect on the ROW program.

Recreation

Under Alternative D, the BLM would divide the planning area into eight ERMA (totaling 349,663 acres) (Map 71), including Cabin Canyon ERMA (1,369 acres), Face of the Bighorns/North Fork ERMA (34,477 acres), Gardner Mountain ERMA (55,181 acres), Kaycee Stockrest ERMA (2,685 acres), North Bighorns ERMA (2,926 acres), PRB ERMA (224,483 acres), Southern Bighorns ERMA (25,535 acres), and the Walk-in Area ERMA (3,007 acres). ERMA designations emphasize recreation opportunities and do not specifically prohibit ROW authorizations.

The BLM would designate the following SRMAs under Alternative D: Burnt Hollow (17,280 acres), Dry Creek Petrified Tree (2,567 acres), Middle Fork Powder River (10,083 acres), Mosier Gulch (1,026 acres), Welch Ranch (1,748 acres), Weston Hills (9,504 acres), and Hole-in-the-Wall (11,952 acres), 7 percent of BLM surface in the planning area. The field office would consider additional lands for SRMA designation as appropriate. Surface disturbances in designated SRMAs would emphasize recreation opportunities and allow for administrative use only where consistent with other resource values. This management would have a moderate adverse effect on the ROW program.

Lands with Wilderness Characteristics

Under Alternate D the BFO would manage 6,864 acres of lands with wilderness characteristics (Map 74) to emphasize ecosystem health, natural values, and primitive recreational opportunities. The alternative prohibits surface-disturbing activities not compatible with retaining or enhancing wilderness characteristics by excluding ROW and prohibiting renewable energy development opportunity. Lands with wilderness characteristics effects approximately 0.8 percent of BLM surface in the planning area and currently have a negligible adverse effect on the ROW program.

Special Designations

Areas of Critical Environmental Concern

Under Alternative D, the BFO would designate the following proposed ACECs: Pumpkin Buttes (1,731 acres) and Welch Ranch (1,116 acres) totaling 0.3 percent of BLM surface in the planning

area. ROWs proposals, including new communication sites/locations on the Pumpkin Buttes, would be denied or have restrictive land uses under site specific management plans in the two ACEC areas, decreasing ROW development opportunities. Alternative D would have a negligible adverse effect on the ROW program.

Scenic or Back Country Byways

The BFO will evaluate roads and coordinate with the counties and other stakeholders for possible designations of National Back Country or Scenic Byways. Byway designation should not affect ROW authorization, but could adversely affect the perception of ROWs and therefore be a consideration in proposing ROWs along a designated byway, having a negligible adverse effect on the ROW program.

Wild and Scenic Rivers

If Congress denies the Middle Fork Powder River WSR nomination, management will continue to retain the free-flowing characteristics and outstanding resource values which would prohibit or restrict ROWs. Given the topography of the Middle Fork, ROW proposals are unlikely. Therefore the impact on the ROW and corridor program would be negligible adverse.

Wilderness Study Areas

Should congress act to designate or release WSAs, a plan amendment would take place. Alternative D prohibits all motorized and mechanized equipment in 28,931 acres (3%) of BLM surface. Overall, this would have a minor adverse effect on the ROW program.

4.6.4.7. Cumulative Impacts

Reasonably foreseeable development assumptions indicate oil and gas development would affect less than 39,000 acres (cumulatively), or less than five percent of the BLM-administered planning area. Therefore, cumulative impacts from oil and gas development, and associated ROWs, would have a minor effect on renewable-energy development (see Appendix G (p. 1937)). In other words, invasive species, wildlife, paleontological, transportation, recreation, and livestock grazing would have a minor effect on the renewable-energy program since these RFD identified disturbances effect less than five percent of the planning area. Oil and gas development activities would have a minor effect on the ROW and corridor program as far as authorizing ROWs in the planning area. In other words, substantial oil and gas development would not likely prohibit or preclude other ROW activities. ROWs associated with oil and gas development would be significant, considering the BFO is primarily an oil and gas office.

Cumulative effects would likely result from ongoing authorizations for multiple new surface-disturbing activities for oil and gas and renewable energy development (primarily wind towers), as well as ongoing mitigation activities for previously disturbed areas where reclamation is inadequate or has failed. Furthermore, effects to VRM may be significantly effected by increasing structures on the surface. Requiring authorized users to develop and color structures to blend in with the landscape would help alleviate these effects. The majority of the basin holds opportunities for future carbon sequestration. If this activity occurs in the area, the ROW program would be significantly affected by authorizing land use permits for surface and subsurface use, as well as ROW authorizations for linear disturbances ancillary to injection wells. This activity would benefit by utilizing those areas already affected by oil and gas development to limit new disturbances in the planning area. Current management (Alternative A) goals would likely result in adverse effects to resources across the planning area by allowing the authorized officer to waive restrictions to development activities without defining specific criteria to minimize effects

to resources. Alternative B is very restrictive, minimizing opportunities for multiple uses. Management actions related to Alternative C would likely significantly compromise, destroy, or otherwise adversely affect wildlife and rangeland resources in the planning area. Opportunities for recreation would also be effected with increased development activities.

4.6.5. Travel and Transportation Management

This section describes potential effects on the BLM's ability to acquire or develop public access to public lands and to effectively manage the transportation network in the planning area. Travel and transportation planning goes beyond allowing for motorized or OHV activities, and must address resource uses such as recreational, traditional, casual, authorized, commercial, and administrative, and accompanying modes and conditions of travel on the public lands. TTM includes management of ROWs for vehicular traffic and access to isolated parcels of public land. Acceptable modes of access and travel for each travel management area (TMA) will be determined during the RMP implementation process. Travel management is further discussed in Appendix R (p. 2519).

The transportation network in the planning area continues to expand as new roads are constructed for energy development and other land use activities. Additionally, an increase in OHV use for recreational activities has led to many user-created routes over BLM surface. Often these roads do not provide additional public access, but do provide administrative access for the BLM and authorized users under a permit. The alternatives for TTM apply to access and use of BLM-administered surface by members of the general public. Motorized travel for authorized users (i.e., under administrative permits and leases) will be analyzed under site-specific NEPA analyses and such use will be subject to the terms of the authorization in concert with other resources and resource uses.

Providing legal public access to portions of the planning area previously inaccessible to the public is considered a beneficial effect on the travel and access management program. These beneficial effects can be direct, such as when the BLM acquires access to an area for recreation purposes, or indirect, such as when a road developed for oil and gas exploration and development increases access in previously inaccessible parts of the planning area. Routine and emergency maintenance activities on roads and trails are considered inherent requirements of the TTM program and would not represent an adverse effect on the program. Certain resource management actions could adversely affect the TTM program by placing limitations on transportation development.

TTM is multi-disciplinary and affects many programs including realty, lands and minerals, wildlife, livestock management, etc. The program assists in maintaining an adequate transportation system and providing public access. The following discussion of the effects on TTM focuses on the constraints and opportunities for public access. Specifically, the analysis determines whether the implementation of management actions for other resource programs would influence or modify the locations, sizes, or designs of travel and transportation proposals or, in some cases, would preclude a proposal from being approved. Such effects would primarily occur from the implementation of management actions designed to protect natural resources and limit adverse effects on those resources from surface-disturbing activities. Therefore, the types and degrees of limitations and restrictions on travel and transportation proposals depends on the locations of sensitive or high-value resources and the potential for environmental impacts to those resources.

4.6.5.1. Methods and Assumptions

This section describes the methods and assumptions used in the impact analysis for TTM.

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources in the planning area, review of existing literature, and information provided by other agencies. Spatial analysis was performed using the ESRI ArcGIS Desktop 10 computer software. Effects are quantified where possible. In the absence of quantitative data, best professional judgment was used. Effects are sometimes described using ranges of potential effects or in qualitative terms, if appropriate.

Removal of the Designation “Limited to Existing Roads and Trails”

Under the “Limited to existing roads and trails” designation, which appeared in the previous RMP, unauthorized user-created roads and trails would continue to add to the number and miles of routes already in existence on public lands. An inventory of roads was not completed with the 1985 RMP, making it difficult for the BLM to determine what roads existed at the time of the RMP decision. A new set of vehicle tracks is often confused with an “existing” road and because these tracks attract use, new roads are made. Historically, this designation allows proliferation of unauthorized roads and associated effects on soils, vegetation, and the visual quality of the landscape. This slow process would have minor short-term effects, but over the long term, areas of interest to hunters and OHV enthusiasts could be changed to the point that roads would be a dominant feature on the landscape. The decision to remove this designation from the alternatives is consistent with management of adjacent lands (USFS) and with current travel and transportation guidance (Appendix R (p. 2519)).

Impacts from the Designation “Limited to Designated Roads and Trails”

Under this designation, the incremental growth of unauthorized user-created roads and trails would be curtailed, as would unauthorized OHV use. OHV use would be limited to a specific, designated network of roads and trails and could be further limited by season. Such a limitation would be beneficial to soils and vegetation, but would have little impact on commercial or industrial uses of public lands because roads necessary to facilitate those uses are handled under permits or authorizations. This designation would not affect nonmotorized public access, nor would it diminish OHV opportunities (only specify where OHV use might occur). Furthermore, it would have little impact on other resource uses, such as mineral development, because under such a designation, roads are authorized as needed.

Lands in the “Limited” categories would be subject to a variety of impacts, depending on the terms and conditions of the designations. OHV use would be limited to a specific road and trail network established through collaboration with users, other agencies, and the general public. Unauthorized road proliferation would be curtailed, therefore extending protections to vegetation, wildlife habitat, livestock grazing, and visual resources.

Impacts from the Designation “Open to OHVs”

“Open” designations often allow for unmanaged proliferation of roads, damage to or loss of vegetation, soil erosion, or degradation of the visual quality of the landscape. Such designations are often in direct conflict with other resource values, including wildlife habitat and scenic quality. However, this designation benefits OHV users by providing an appropriate, managed place for concentrated motorized recreation considered inappropriate in most areas.

Impacts from the Designation “Closed to OHVs”

OHV access is prohibited in Closed areas, limiting access to nonmotorized means (e.g., foot or horseback). This designation would be very beneficial to physical, biological, and heritage and visual resources because lands in this category would not experience adverse effects from motor vehicle use and would retain a more natural character. All OHV activities would be excluded from such areas, making the areas unavailable to recreationists who prefer to access the public lands exclusively by motor vehicle.

Assumptions

- The analysis of the TTM resource is limited to public access and use of BLM-administered surface in the planning area.
- Demand for adequate access – the physical ability and legal right of the public, agency personnel, and authorized users to reach public lands - will remain constant or increase slightly in the foreseeable future.
- The travel network (i.e., highways, railways, and airports) in the planning area is essentially complete and no major travel infrastructure facilities are anticipated.
- Developing new roads for recreation access will be limited to providing access to large parcels of BLM-administered lands currently without adequate access.
- Consolidation of and access to public lands with prime recreational values would be pursued as opportunities arise.
- Additional roads will be developed, as needed, to support authorized uses in compliance with the multiple use concepts of FLPMA; the TTM program could adopt some of these roads for specific uses, such as recreation access.
- Use of roads will increase based on anticipated increases in oil and gas activities. ROW applications for energy-related transportation facilities (e.g., roads and pipelines) are anticipated to increase.
- Road design and construction considers other resource programs to minimize adverse effects on those resources.
- This RMP does not affect existing ROWs granted to other parties for access across the public lands.
- ROW actions are expected to generally correlate with mineral resource development, and the effects are assumed to be the same for both resources.
- Lands will be assessed by an interdisciplinary team before disposal. Lands that currently provide access to other public lands will not be disposed of without procuring alternative means of access.
- Users generally follow rules and regulations for motorized vehicle use; however, some users do not follow rules and unauthorized travel and OHV use in closed areas affects resources such as vegetation, soils, water, and wildlife and primitive recreation.
- Providing access to BLM-administered lands through the designation of routes will benefit TTM.
- Permanent or temporary road closures for unauthorized routes or those that create substantial adverse effects to other resources are considered beneficial to TTM.
- TTM planning generally improves transportation planning by limiting new roads to only those that are needed and increases the efficiency of the roadway network by directing travel to designated routes in consideration of other resource values.
- Travel management plans will be developed with full public involvement.
- Reductions in road density have beneficial effects on some resources (e.g., big game and soils), but might require additional effort for users (e.g., longer travel routes).

- Disposal of mineral materials from BLM-administered lands will continue to be needed to support road construction and maintenance.
- OHV use will increase at a faster pace than the rate of population growth because of the increasing popularity of off-road travel, improvements to OHV technology, and intensity of development and use of public lands.
- Recreational OHV use is proportionally higher in large blocks of public land with legal access, (i.e., parcels visited for hunting).
- Any seasonal closures would not apply to tasks performed in support of current permits or authorizations issued by the BLM. However, these closures could affect the decision to issue new permits in the future. In addition, other government entities that require entry to perform tasks related to management, maintenance, and control of wildlife would be exempt from the seasonal closure rule.
- It is assumed that state and major county roads would continue to be maintained to current levels and that in general, county roads would not be abandoned. BLM facilities, mainly roads, would continue to be maintained, with priority given to those most heavily used by the public.
- The analysis assumes OHV designations are to be fully implemented five years after approval of this RMP.

Significance Criteria

The scale of effects would be the same as identified in the Introduction of Chapter 4. In addition, an adverse effect on TTM as a result of project actions would be considered potentially significant if the following were to occur:

- An action would violate objectives associated with TTM, and its magnitude would be such that special mitigation would be warranted or it would persist indefinitely.

4.6.5.2. Impacts Common to All Alternatives

The travel and transportation program collaborates with other entities and agencies to acquire access, initiates realty actions to provide access, and capitalizes on developments created under other resource programs as opportunities to meet access demand. Resource uses and values would be considered through the development of Travel Management Plans in the implementation stage of this RMP. Route designations would be analyzed through subsequent NEPA documents.

Each alternative designates OHV use on BLM-administered surface in the planning area as either “Open”, “Closed”, or “Limited to Designated Roads and Trails”; additionally, portions of the planning area “Limited to Designated Roads and Trails” may also be “Limited Seasonally” for resource protection (see Glossary). These designations are specific to OHV use. While individual alternatives are addressed in their corresponding sections, this section describes general impacts that would result from OHV use designations.

Travel and Transportation Management

TTM is completed in response to competing demands for resource uses or protections. Travel proposals and subsequent decisions are most influenced by demands for administrative or recreational uses, to provide access for resource uses, and to mitigate wildlife management concerns. It should be noted that there would be little to no effect on legal public access from OHV designations. OHV designations in this RMP would not remove the ability to access areas currently available to the public for nonmotorized recreational activities, though it may reduce OHV recreational opportunities.

Providing access to some areas could require multiple access routes, and multiple types of access (e.g., roads, pedestrian, or equestrian trails). Managing new roads would require routine and emergency maintenance. Consideration of other resources (e.g., cultural resources and SSS) could constrain routing alternatives, require that other routing alternatives be adopted, or increase costs, or may determine that access acquisition would not be feasible.

Wildlife are expected to benefit from OHV closures because they would be subject to fewer disturbances, particularly at critical times (e.g., elk calving). Recreational experiences (including hunting) would be significantly altered in areas closed to OHV use. This could enhance these experiences or detract from them, depending on the desires and attitudes of the affected recreationists. It is expected that the visitation in areas closed to OHV use will be less than a comparable area under a different OHV use designation. This could affect the ability of the WGFD to reach wildlife population targets for certain areas.

Land tenure adjustments could benefit the overall management of the travel and transportation program. These actions would help to facilitate the location of transportation systems by providing for a more contiguous public land base and encouraging such developments near communities. Negotiating with willing landowners to obtain access across non-BLM-administered lands to isolated public land parcels is critical to meeting the goal of providing accessibility across the planning area. Acquisitions and land exchanges would help the BLM provide seamless recreational opportunities and ensure long-term public access. Access acquisition would be primarily focused on larger parcels of BLM-administered lands (larger than 2 square miles) that are currently without public access. Increased access could result in a wider diversity of recreational opportunities. Access would be acquired only from willing landowners, and the preferred method would be via land exchange; therefore, anticipated effects on private land ownership would be minor.

Improved design and maintenance on BLM roads and easements would result in safer routes that reduce adverse effects on other resources. However, the cost of improved construction and maintenance could become a significant factor in the continued maintenance of routes. Planning for routes based on site-specific objectives would improve the BLM's ability to maintain an operational transportation system. However, if the use of a route exceeds the design standards for that route, the road or trail would need to be reevaluated to ensure safety standards are met.

Establishing TMAs and designating routes would result in a comprehensive travel network that provides access across the planning area while maintaining other resource values. Signs are the most efficient means of providing information to users until the TTM planning is complete. Restricting users to existing roads and trails until travel management planning is complete would result in a short-term continuation of problems with enforcing travel designations. Travel planning would result in the protection of a wide variety of resources while maintaining access across the planning area. While some roads, particularly user-created routes, might be closed, those retained for public use would be better maintained and the overall transportation system would preserve functionality and overall access. Improved access for people with disabilities would benefit both transportation and recreation resources.

Under historic transportation planning methods, travel was restricted through signs that posted prohibited uses in an area. These signs were often vandalized or removed and were costly to maintain. Marking or numbering designated routes, rather than posting non-designated routes with prohibited uses, makes many signs obsolete, and other agencies have had success with this method. Temporary closures are designed to protect the public and land resources. The

effects would be localized and short-term, and would have a negligible adverse effect on travel and transportation program.

Implementing a designated route system is critical to protecting other resources while providing for access. Enforcement and management in areas classified as limited to existing routes is difficult, because user-created routes can legally be traveled by subsequent drivers so long as prohibited uses are not posted. Maintaining a transportation management system in cooperation with other agencies is essential to meet public and resource management needs. The effect of cooperation on the amount of accessible public lands would be beneficial.

Physical Resources

Air Quality

Air quality management common to all alternatives could affect how transportation authorizations are stipulated to alleviate adverse effects on air quality. In general, stipulations would apply to permitted uses and are not expected to affect the general public. However, stipulations could be placed on pipeline or road ROW to reduce cumulative dust emissions and in some cases may impact the BLM's ability to provide access routes to public lands. The overall impact would be negligible; the impacts to TTM from Air Quality management actions do not vary by alternative and the resource will not be discussed further.

Soil and Water Resources

Measures to protect soil and water resources could affect the placement or designation of routes on a local level, but are not expected to reduce public access to public lands. Reclamation requirements related to protecting soil resources could slightly increase the costs associated with road construction, but would ultimately increase the sustainability of transportation projects. Overall, management actions for soil and water resources would have a negligible adverse effect on TTM.

Cave & Karst Resources

The topography of areas with cave and karst resources, not specific management actions, constrain the placement of roads. Management of cave and karst resources would not affect TTM under any alternative and it will not be discussed further.

Mineral Resources

The scale of impacts from mineral resource development is expected to be relatively the same across the various mineral resources. Thus, the section will be discussed as a whole, rather than as separate resources.

Continuing to develop solid and fluid mineral resources would affect the transportation network through a continued increase in roads for mineral development. Salable mineral development is often necessary to provide material for transportation systems, but the scale of impact is dependent upon whether the materials are developed on BLM mineral estate. Mineral management actions, because they are so numerous in specific parts of the planning area, could affect the locations of subsequent transportation systems. Increased mineral actions would contribute to an increase in traffic on designated routes, with a resulting increase in the potential for litter, collisions with wildlife, and the spread of invasive plant species.

Historically, development of roads for mineral activities has not initiated a substantial change in the amount of public access to BLM-administered lands and roads constructed for oil and gas initiatives rarely provide legal public access to parcels that are currently inaccessible. However, roads created for mineral extraction purposes could be evaluated for inclusion in the designated route system, providing additional OHV access for users. Areas closed to mineral leasing, having NSO stipulations, or otherwise identified as unsuitable for surface disturbance or occupancy would likely be managed as avoidance or exclusion areas for transportation. The overall impact across all alternatives would be negligible and beneficial; the impacts to TTM from Mineral Resource management actions do not vary by alternative and the resource will not be discussed further.

Fire and Fuels Management

Fire and fuels projects are generally short term and rarely require road construction. Actions from fire and fuels projects could leave temporary evidence of motorized vehicle use on the landscape (e.g., two-tracks), but are generally reclaimed and are not expected to have any effect on the travel and transportation program and will not be discussed further.

Biological Resources

Vegetation – Forests and Woodlands, Grassland and Shrubland Communities, Riparian/Wetland Resources, Invasive Species and Pest Management

Specific alternatives related to forests and woodlands, grassland and shrubland communities, riparian/wetland resources, invasive species and pest management may affect the placement or amount of use of roads and trails on a local level; however, there are no specific alternatives related to these resources that would directly impact the transportation program. These resources will not be discussed further.

Fish and Wildlife

Similarly, while alternatives for Fish and Wildlife may affect the placement of roads on a local level, most protections for wildlife (such as timing limit stipulations) do not affect public access to or use of public lands. Seasonal closures could have negligible to minor short-term effects on transportation actions in big-game crucial winter ranges and elk calving areas. The overall impact across all alternatives would be negligible and adverse; the impacts to TTM from Fish and Wildlife management actions do not vary by alternative and the resources will not be discussed further.

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Managing SSS habitat would affect uses administered by the travel and transportation program through the implementation of mitigation measures designed to protect species and wildlife habitat. Implementing species-specific protective measures for BLM sensitive plant and wildlife species and prohibiting actions that adversely affect T&E species could result in the relocation of proposed transportation systems to avoid these habitat areas. However, implementation of the “common to all alternatives” for SSS for fish, wildlife or plants would result in no effect to the travel and transportation resource; rather effects would vary by alternative.

Heritage and Visual Resources

Cultural Resources

In general, implementing protective measures for cultural resources could require avoidance and other mitigation measures for transportation systems proposed near these resources. These

measures could result in the relocation or redesign of the proposed transportation system. Because there are known cultural resources throughout the planning area, and additional resources will likely be discovered, there could be substantial effects on TTM to varying degrees throughout the planning area. In general, all effects would be at the local level. Implementation of the “common to all alternatives” for cultural would result in no effect to the travel and transportation resource, and would instead vary by alternative.

Paleontological Resources

While discovery of important paleontological resources may affect the placement of roads and trails on a local level, there are no specific alternatives related to paleontological resources that would directly impact the transportation program. The resource will not be discussed further.

Visual Resources

Managing the planning area to meet VRM objectives could affect the locations and routes of proposed transportation systems. Additional effort would be required to design projects to meet the objectives of the designated VRM class in an area in which a transportation system is proposed. Because transportation systems would generally be compatible with Class IV objectives, this classification would allow for increased opportunities for such authorizations. This is also true for VRM Class III objectives; however, some additional project planning could be necessary for VRM Class III areas to ensure that the landscape is partially retained. Areas designated as VRM Class I in the planning area are addressed under Special Designations. Any transportation systems proposed in VRM Class I or Class II areas would potentially be subject to intensive mitigation and, in some cases, could be precluded. Effects on the travel and transportation program would vary by alternative.

Land Resources

Forest Products

There is some forestry activity within the planning area each year and this activity is generally concentrated on BLM-administered lands in the southern Big Horn Mountains. Under this RMP, the BLM would identify potential commercial harvest areas and high-interest personal use (e.g., firewood cutting and Christmas tree cutting) areas. Historically, timber harvests have not exceeded approximately 500 to 1,000 thousand board feet per year, with little road construction. It is expected that a similar volume of harvest would occur in the foreseeable future. While no major road construction has occurred as a result of timber harvest, it is not inconceivable that temporary roads might be constructed to access parcels of timber in the future. Temporary roads or short access roads for small timber operations could provide new access for OHV use, although on an extremely localized scale. The implementation of any specific forest products alternative is expected to result in no effect to the travel and transportation program and the resource will not be discussed further.

Lands and Realty

Measures to avoid the potential of inadvertent trespass by people accessing public lands through the use of appropriate signage and access authorizations will also benefit the travel and transportation program by providing information related to public access.

Renewable Energy

While renewable-energy development may require additions to the transportation network to

accommodate energy projects, the alternatives related to renewable energy have no effect on public access and will not be discussed further.

Rights-of-Way and Corridors

Alternatives for ROW, particularly related to coordination with other agencies to acquire easement and to meet public and resource management needs will be beneficial to the travel and transportation program. The overall benefit will be contingent on the success of coordination and will vary by alternative.

Recreation

Development of RAMPs, recreational facilities and trails, and provision of recreation information will result in a net benefit to the travel and transportation program.

Lands With Wilderness Characteristics

Evaluation of lands for wilderness characteristics would have no effect on the transportation system. However, measures to protect any existing wilderness characteristics would generally limit motorized vehicle use in areas with wilderness characteristics. This would have no effect on legal access, but would affect motorized travel at the local level and would vary by alternative.

Livestock Grazing Management

Livestock grazing management often requires primitive road networks to access and maintain range improvements. The specific alternatives for livestock management are not expected to affect transportation management or access. Rather, roads on BLM-administered parcels without public access could be designated for administrative use, but this would have no effect on public access. Livestock management will not be discussed further in this section.

Special Designations

Potential effects from all special designations, whether existing or proposed, would usually be minor and vary by management prescriptions associated with each designated area. Intensive management of a special designation area could affect the travel and transportation program by altering the locations available for the placement of roads.

Areas of Critical Environmental Concern

Development of mitigation to protect relevant and important criteria may result in closure of access routes, or even closure to human presence. The impact to the travel and transportation program would be vary by ACEC and by alternative.

Scenic or Back Country Byways

Designation and management of scenic and BCBs would improve public access through better information but could increase the amount of traffic on any designated routes. Increased traffic could increase maintenance needs on byways, litter, and the potential for dispersion of invasive plant species or collisions with wildlife. The effect on public access would be negligible.

Wilderness Study Areas

WSAs cause restrictions on transportation management actions, because those areas would be closed to motorized travel. Transportation management is guided by Manual 6330 – Management of Wilderness Study Areas, and there would be no effect from common to all alternatives on the provision of motorized access or on legal public access.

Wild and Scenic Rivers

Designated WSRs generally include varying degrees of restrictions related to roads within a river corridor, with wild sections of rivers having the greatest restrictions and recreational sections the least. The topography of Middle Fork Canyon, not WSR-specific management actions, would constrain the placement of roads. There would be no effect on the travel and transportation program from WSR management and the resource will not be discussed further.

Socioeconomic Resources

There would be no effect on the travel and transportation program from Socioeconomic resources, Health and Safety and these resources will not be discussed further.

Table 4.59, “Estimated Acreage of OHV Designations by Alternative” (p. 1497) lists the estimated acreages of OHV use designations under each alternative.

Table 4.59. Estimated Acreage of OHV Designations by Alternative

	Alternative A	Alternative B	Alternative C	Alternative D
Open to OHV use	20,386	0	24,103	0
Closed to OHV use	3,650	625,854	28,931	37,389
Limited to Designated Routes	737,166 ¹	137,126	723,497	661,726
Limited by Season	37,646	18,259	6,839	18,259
Source: BLM 2012f				
¹ Includes “Limited to Existing Routes” under Alternative A.				
OHV Off-highway Vehicle				

4.6.5.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. Under Alternative A, effects on the travel and transportation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Travel and Transportation Management

Under Alternative A, approximately 2.5 percent of the public lands in the planning area would be open to all motor vehicle use (Map 65). By continuing the Open designation for stock driveways and stock rests, the utilitarian purposes of the stock driveways would be preserved. In addition, stock driveways are often along county roads. In Open areas, vehicle travel would be permitted both on and off roads if the vehicle is operated responsibly and in a manner that would not be likely to cause significant undue damage to the environment. Even with a responsible use clause, there would be a high potential to significantly increase the number of user-created roads and trails above the number appropriate for protection of other resource values. Although this might benefit OHV enthusiasts, it would generally be detrimental to most other values and uses of the public lands except resource extraction.

At present, areas where OHV use is Closed constitute a small percentage (less than 0.5%) of the planning area. Travel in Middle Fork Canyon is largely prohibited due to the topographical constraints and would likely be prohibited under all alternatives due to steep slopes and other natural resource concerns. Dry Creek Petrified Tree and Cantonment Reno would be closed to

motorized vehicle use to protect the respective paleontological and cultural resources at the sites. The effect of these closures on travel and transportation in the planning area would be negligible.

Areas where OHV use is limited to designated routes constitute approximately 20 percent of the planning area. When coupled with areas previously limited to existing routes, the amount of the planning area limited to designated routes is 92 percent. These areas will undergo a route inventory and a formal route designation plan following the ROD. Until formal designation and implementation, travel will be limited to existing routes. In much of the planning area, land tenure is the primary factor in accessibility, rather than the travel management designation. The effect of the travel restrictions on access in the planning area would be minor. In addition, less than five percent of the planning area would be closed seasonally to protect biological resources. The effect of the travel restrictions on travel and transportation in the planning area would be minor and short-term.

Physical Resources

Soil and Water Resources

Prohibiting surface-disturbing activities includes limitations on construction of roads and could preclude motorized travel within 500 feet of certain water features, in areas of severe erosion hazard, areas with poor reclamation suitability, or on slopes equal to or greater than 25 percent. Alternative A could restrict the placement of certain roads on a local level. The effect on the travel and transportation program would be minor, but long-term. Under this alternative, restricting surface-disturbing activities, such as construction of a trail for nonmotorized travel, could still be considered if the authorized officer waives the prohibition.

Biological Resources

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Mitigation measures to protect riparian areas and wetlands, fish and wildlife resources, T&E species, and critical habitats can affect the travel and transportation program through seasonal closures and placement of roads. Seasonal closures would have minor short-term effects on transportation actions in sensitive areas such as the big-game crucial winter range and Greater Sage-Grouse lek buffer areas. Year-round restrictions, including NSO and CSU stipulations (for wildlife), would affect the locations of transportation actions over the long term. Sensitive wildlife habitats such as leks would be subject to NSO stipulations, thereby limiting the placement of transportation systems and access. These protected areas are typically small and transportation systems can usually be routed around them, resulting in a minor impact to transportation and access.

Heritage and Visual Resources

Cultural Resources

Under Alternative A, transportation actions are analyzed and mitigated on a case-by-case basis. Road construction or placement could be prohibited or require special mitigation in areas of high cultural interest, which could result in the rerouting of transportation systems. The effect on travel and transportation would be negligible.

Visual Resources

Most transportation systems would be compatible with VRM Class III (10% of the planning area)

and Class IV (71% of the planning area). In VRM Class I and Class II areas (19% of the planning area), transportation actions would be limited and require mitigation to ensure that projects or surface disturbances would not attract the attention of the casual observer. The effect on the travel and transportation program would be minor.

Land Resources

Lands and Realty, Rights-of-Way and Corridors

The acquisition of lands from willing landowners would be considered on a project-specific basis. Continued authorizations of ROW and land and easement acquisitions could produce a minimal beneficial effect for travel and transportation on a localized scale given historic BLM acquisition trends.

Recreation

Alternative A for recreation may support opportunities for motorized and nonmotorized access, but the benefit would be minimal.

Lands with Wilderness Characteristics

Alternative A does not propose any special management for lands with wilderness characteristics, thus there would be no effect.

Special Designations

Areas of Critical Environmental Concern and Scenic and Back Country Byways

Alternative A does not designate ACECs or scenic or BCBs, and management is considered sufficient to protect the values of proposed ACECs. Therefore, there would be no effect on travel and transportation from management of ACECs and scenic or BCBs.

Wilderness Study Areas

BLM Manual 6330 – Management of Wilderness Study Areas directs the BLM to manage WSAs as nonmotorized use areas. Alternative A designates portions of these WSAs as “limited to designated routes.” While motorized travel is currently, and would continue to be restricted in WSAs regardless of OHV designation, the Alternative A designation does not accurately reflect the management these areas. Alternatives B, C, and D clarify the closures to motorized access, but do not alter the status of legal public access. There is no effect to travel and transportation and the resource will not be discussed further in this section.

4.6.5.4. Alternative B

Alternative B would emphasize resource conservation. Alternative B effects on the travel and transportation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Travel and Transportation Management

Under this alternative, there would be no open areas for OHV use. The majority of the planning area would be closed to motorized use. While this alternative would increase limitations on where motorized travel may occur, there would be little effect on legal public access; however, reasonable public access could be limited in areas where the average visitor would be unable or unwilling to walk from the nearest public road.

Under Alternative B, the acreages in the “Limited to Designated Roads and Trails” and the “Closed” categories would be increased (Map 66) compared with Alternative A. The Closed areas would include 625,854 acres (approximately 80% of the planning area). However, the closed areas in this analysis include lands with public roads. County roads, state highways, interstate highways, and roads with ROW or perpetual easements on BLM-administered lands would remain available for motorized travel. Therefore, the actual acreage of lands in the “Closed” category would be less but the overall effect on the travel and transportation program would be significant and adverse. In “Limited” areas management of motor vehicle access would be effective and the ability to enforce travel regulations would improve. Beneficial effects would include the ability to prevent the proliferation of roads and trails and protect the natural appearance of the landscape, wildlife habitat, and cultural resources. These benefits would be both short- and long-term.

In addition, the OHV designations under this alternative call for increased acreage with seasonal limitations on motorized access, whereby two percent of the planning area would have some form of seasonal OHV limitation to protect public land and resource values.

Under this alternative, travel off designated routes would be allowed only with a special use permit (e.g., grazing lessee or administrative use) in areas limited to designated routes. Special use permits would not grant the ability to travel in areas closed to motorized use (although emergency travel would be allowed with permission of the authorized officer). Travel off routes for “necessary tasks” would not be permitted. This alternative would have a beneficial effect on the ability to enforce travel regulations, while its adverse effect on the travel and transportation program would be negligible. The overall effect due to the reduced travel and transportation opportunities is major adverse.

Physical Resources

Soil and Water Resources

Under Alternative B, prohibiting surface-disturbing activities would limit construction of roads and could preclude motorized travel in areas of severe erosion hazard, areas with poor reclamation suitability, or on slopes equal to or greater than 25 percent. This alternative could restrict the placement of certain roads on a local level. The same is true for restrictions within 500 feet of water features. The effect on the travel and transportation program would be minor, but long-term. Alternative B does not include a provision for waiver by the authorized officer, which would remove the potential for discretionary approval of transportation projects in areas with sensitive physical resources.

Biological Resources

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Under Alternative B, mitigation measures to protect habitats for sensitive species could affect the travel and transportation program through seasonal or permanent closures and restrictions on the placement of roads. Year-round restrictions to protect sensitive species would affect the locations of transportation actions over the long term and would affect the majority of the planning area (614,557 acres; 78.5% of the planning area).

Effects on the travel and transportation program from Alternative B wildlife and fisheries management would place an emphasis on habitat enhancement and protection and add restrictions on surface-disturbing and disruptive activities. NSO areas and seasonal restrictions would affect

the placement of transportation systems and affect the construction windows for building roads. The overall effect due to the reduced travel and transportation opportunities is moderate adverse.

Heritage and Visual Resources

Cultural Resources

Alternative B cultural resources management would prohibit surface-disturbing activities, including most travel and transportation actions, in or near historic properties. Transportation actions would be prohibited or require special mitigation measures within 5 miles or the visual horizon (whichever is closer) of historic properties, which could result in the rerouting of transportation systems. The effect on access to public lands would be moderate.

Visual Resources

Effects from VRM would be similar to those under Alternative A, except that Alternative B would designate approximately 217,021 acres as VRM Class II. This would increase the level of restrictions designed to protect visual resources and subsequently decrease opportunities for transportation authorizations. The effect on public access would be minor.

Land Resources

Lands and Realty

Under Alternative B, acquiring lands from willing landowners would be considered across the planning area. Land and easement acquisitions could have a minor beneficial effect on travel and transportation on a localized scale, given historic BLM acquisition trends.

Rights-of-Way and Corridors

The effects from ROW on transportation would be similar to the effects from alternatives to protect soil resources. Under Alternative B, prohibiting ROWs would limit construction of roads and could preclude motorized travel in areas with slopes equal to or greater than 25 percent.

Recreation

Under Alternative B, eight SRMAs (55,529 acres; 7.1% of BLM surface) would provide opportunities for intensive travel management (both motorized and nonmotorized) in defined and manageable transportation planning areas. RAMPs for each SRMA would also specifically address TTM and public access to these areas. The overall effect due to the increased travel and transportation opportunities is moderate beneficial.

Lands with Wilderness Characteristics

Effects of alternatives related to lands with wilderness characteristics would be limited to 12,237 acres (1.5% of BLM surface), an area where motorized travel is generally restricted due to topography rather than administrative prescriptions. Much of the areas under review lack legal or reasonable public access. However, it is anticipated that lands with wilderness characteristics that are managed to protect wilderness values would likely include additional restrictions to motorized travel. If these restrictions reduce legal or reasonable access to public lands, the impact to travel and transportation would be minor.

Special Designations

Areas of Critical Environmental Concern

Alternative B would designate eight ACECs (511,000 acres; 60% of BLM surface). The management emphasis for the ACECs would be to protect natural resources, which would likely restrict transportation. Resources would be further protected in ACECs through the development of implementation plans, and these areas would be managed to meet the objectives of the specific ACECs (Appendix S (p. 2531)). In designated ACECs, future area-specific plans could further limit OHV use, including closures, limiting OHV use to designated trails, and seasonal restrictions on OHV use. The uncertainty of these future plans makes the effects on the travel and transportation program largely unknown. ACECs would likely be managed as transportation avoidance or exclusion areas, but there would be no effect on legal access. Given the retention of nonmotorized access, the overall effect due to reduced travel and transportation opportunities is moderate adverse.

Scenic and Back Country Byways

Evaluating routes and roads within the planning area for designation as BCBs could increase opportunities for vehicle touring, public access to public lands and the presence of signage to protect natural resource values, negligible beneficial effects.

4.6.5.5. Alternative C

Alternative C would emphasize resource use. Alternative C effects on the travel and transportation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Travel and Transportation Management

Under this alternative, approximately three percent of the public lands in the planning area would be open to all motor vehicle use (Map 67). By continuing the Open designation for stock driveways and rests, the utilitarian purposes of the stock driveways would be preserved. In addition, stock driveways are often along county roads. In Open areas, vehicle travel would be permitted both on and off roads if the vehicle is operated responsibly and in a manner that would not be likely to cause significant undue damage to the environment. Even with a responsible use clause, there would be a high potential to significantly increase the number of user-created roads and trails above the number appropriate to protect other resource values. Although this might benefit OHV enthusiasts, it would generally be detrimental to most other values and uses of the public lands, except resource extraction.

Under Alternative C, approximately four percent of the planning area would be closed to OHV use. The effect of these closures on access in the planning area would be minor. Less than one percent of the planning area would be closed seasonally to protect biological resources. The effect of these travel restrictions on access in the planning area would be minor and short-term.

Under Alternative C, OHV use would be limited to designated routes in 92 percent of the planning area. These areas would undergo a route inventory and a formal route designation plan following the ROD. Until formal designation and RMP implementation, travel would be limited to existing routes. In much of the planning area, land tenure, not the travel management designation, is the primary factor in accessibility. The effect Alternative C travel restrictions on public access to public lands in the planning area would be negligible.

Under this alternative, travel up to 300 feet off of designated routes for necessary tasks would be permitted. This management would have a adverse effect on the ability to enforce travel

regulations. The overall effect due to the increased travel and transportation opportunities is major beneficial.

Physical Resources

Soil and Water Resources

Alternative C management of physical resources would reduce constraints on the construction or placement of many roads and trails. While measures to protect physical resources would still be in effect, the adverse effect from restrictions related to route development on the travel and transportation program from physical resources management under Alternative C would be negligible, but long-term.

Biological Resources

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Very few restrictions related to fish and wildlife resources are proposed under Alternative C. For areas with habitat that supports sensitive species of plants, restrictions on development would limit the placement of transportation routes only in areas with known populations. Additional restrictions related to sensitive species of fish or wildlife will result in effects similar to Alternative A. These would either decrease opportunities for travel and transportation authorizations or increase the stipulations placed on such authorizations on a localized level.

Heritage and Visual Resources

Cultural Resources

Alternative C for cultural resources essentially removes strict restrictions on surface disturbance in areas with historic properties, however, some NSO and CSU stipulations may still exist. There will be little impact on the travel and transportation program.

Visual Resources

Alternative C effects on the travel and transportation program from management of visual resources would be similar to effects under Alternative A, except that Alternative C would not designate any areas as VRM Class II. This would lead to an overall decrease in the level of restrictions designed to protect visual resources, and subsequently increase opportunities for travel and transportation authorizations. The effect on public access would be negligible beneficial.

Land Resources

Lands and Realty

Under Alternative C, the BLM would not pursue the acquisition of lands or easements from willing landowners, eliminating the ability to consolidate land where it would benefit public access. The inability to pursue adjustments in land tenure would have a major adverse effect on the travel and transportation program.

Rights-of-Way and Corridors

ROWs would not be excluded on slopes exceeding 25 percent resulting in a negligible beneficial effect on transportation planning.

Recreation

Six SRMAs (30,570 acres) would provide opportunities for intensive travel management (both motorized and nonmotorized) in defined and manageable transportation planning areas. RAMPs for each SRMA would specifically address TTM and public access to these areas. The overall effect due to the increased travel and transportation opportunities is moderate beneficial.

Lands with Wilderness Characteristics

Alternative C does not propose any special management for lands with wilderness characteristics, thus there would be no effect.

Special Designations**Areas of Critical Environmental Concern and Scenic and Back Country Byways**

Alternative C does not designate ACECs or scenic or BCBs. Therefore, there would be no effect on travel and transportation from management of ACECs and scenic or BCBs.

4.6.5.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the Proposed RMP. Alternative D effects on the travel and transportation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Travel and Transportation Management

Under this alternative, there would be no open areas for OHV use. Instead, all areas would be limited to designated routes or closed to OHV use. While this alternative would increase limitations on where OHV travel may occur, there would be no effect on legal public access.

The acreage in the limited to designated roads and trails and the Closed categories would be increased (Map 68) under Alternative D. Approximately four percent of the planning area would be closed to motorized vehicle use. In Limited areas (79% of the planning area), management of OHV access would be effective and the ability to enforce travel regulations would improve. This management would prevent the proliferation of roads and trails and protect the natural appearance of the landscape, wildlife habitat, and cultural resources. The beneficial effects would be short-term and long-term.

In addition, the OHV designations under this alternative would increase acreage with seasonal limitations on motorized vehicle access, whereby 17 percent of the planning area would have some form of seasonal OHV limitation to protect public land and resource values.

Under this alternative, travel off designated routes would be allowed only under a special use permit (e.g., grazing lessee or administrative use) in areas limited to designated routes. Special use permits would not grant the ability to travel in areas closed to motorized vehicle use (although emergency travel would be permitted with permission of the authorized officer). Travel off routes for big game retrieval and dispersed camping would be permitted. Alternative D would have a beneficial effect on the ability to enforce travel regulations, while the adverse effect on TTM would be negligible. The overall effect due to the travel and transportation opportunities provided while protecting other resources and resource uses is major beneficial.

Physical Resources

Soils and Water Resources

Alternative D management of physical resources would include constraints on the construction or placement of roads and trails. Allowing surface-disturbing activities on slopes equal to or greater than 25 percent, in areas of severe erosion hazard, and areas with poor reclamation suitability would allow flexibility in providing nonmotorized and motorized access in certain locations. Since measures to protect physical resources would be still be in effect, the adverse effect on the travel and transportation program would be minor, long-term.

Biological Resources

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Under Alternative D, mitigation measures to protect habitats for sensitive species could affect the travel and transportation program through seasonal or permanent closures and restrictions on the placement of roads. Seasonal closures would have short-term effects on transportation actions in sensitive areas. Year-round restrictions, including NSO and CSU stipulations (for SSS wildlife) would affect the locations of transportation actions over the long term. Sensitive wildlife habitats such as leks would be subject to restrictions, thereby limiting the placement of transportation systems and access. The overall effect due to the reduced travel and transportation opportunities is moderate adverse.

Heritage and Visual Resources

Cultural Resources

Alternative D cultural resources management would prohibit surface-disturbing activities, including travel and transportation actions, in or near defined historic properties. Special mitigation would apply to actions proposed on or near these historic properties, which could result in the denial or modification of future additions to the transportation system. The effect on access to public lands would be minor.

Visual Resources

Effects from management of visual resources would be similar to effects under Alternative A, except that 379,429 acres would be categorized as VRM Class III under Alternative D. The effect on public access would be negligible.

Land Resources

Lands and Realty

Under Alternative D, the BLM would consider acquiring lands from willing landowners across the planning area. Land and easement acquisitions could have a minor beneficial effect on travel and transportation on a localized scale, given historic BLM acquisition trends.

Rights-of-Way and Corridors

Alternative D management of ROWs would slightly increase constraints on issuing ROWs on slopes greater than 25 percent or highly erodible soils. Allowing some ROWs would provide flexibility in transportation planning. Measures to avoid steep slopes will produce a negligible adverse effect on the travel and transportation program.

Recreation

Under Alternative D, seven SRMAs (54,160 acres; 7.1% of BLM surface) would provide opportunities for intensive travel management (both OHV and nonmotorized) in defined and manageable transportation planning areas. RAMPs for each SRMA would specifically address travel management and public access to these areas. The overall effect due to the increased travel and transportation opportunities is moderate beneficial.

Lands with Wilderness Characteristics

Effects of alternatives related to lands with wilderness characteristics would be limited to 6,864 acres (<1% of BLM surface), an area where motorized travel is generally restricted due to topography rather than administrative prescriptions. Much of the areas under review lack legal or reasonable public access. However, it is anticipated that lands with wilderness characteristics that are managed to protect wilderness values would likely include additional restrictions to motorized travel. If these restrictions reduce legal or reasonable access to public lands, the impact to travel and transportation would be minor.

Special Designations

Areas of Critical Environmental Concern

Under Alternative D, there would be two designated ACECs (2,849 acres; <1% of BLM surface). The emphasis of the ACECs would be to protect natural resources, which would likely restrict travel and transportation. Resources would be further protected in ACECs through the development of implementation plans, and these areas would be managed to meet the objectives of the specific ACECs (Appendix S (p. 2531)). In designated ACECs, future area-specific plans could further limit OHV, use including closures, limiting OHV use to designated trails, and seasonal restrictions on OHV use. The uncertainty of these future plans makes the effects on the travel and transportation program largely unknown. ACECs would likely be managed as transportation avoidance or exclusion areas, but there would be no effect on legal access.

Scenic and Back Country Byways

Evaluating routes and roads within the planning area for designation as BCBs could increase opportunities for vehicle touring, public access to public lands, and the presence of signage to protect natural resource values, negligible beneficial effects.

4.6.5.7. Cumulative Impacts

Most cumulative impacts to travel and transportation in the planning area would result from actions that restrict land uses. When the combined natural and cultural resource (physical resources, biological resources, heritage and visual resources, and special designations) protection measures are considered for each alternative, the severity of cumulative effects increases. Such restrictions would reduce the potential to acquire access easements and limit the locations available for road development, which would have overall adverse cumulative effects on the travel and transportation program that would vary from minor to moderate, depending on alternative. However, adverse effects would not be considered significant because opportunities to acquire access easements, develop roads, and provide reasonable public access could still be available.

If current trends persist, use of OHVs would continue and increase throughout the planning area as population and the popularity of OHVs increase. Limitations on cross-country travel on public land (which are specifically provided for under alternatives B, C, and D) could increase

cross-country OHV use on private land. As transmission lines, pipelines, and transportation routes are developed off of BLM surface, access roads to these linear facilities for operations and maintenance also could be used by the public for recreational access. If this occurs, it could trigger a proliferation of access throughout the area, including on BLM surface.

Past Actions

Since the 1985 RMP was approved, public access has been acquired in conjunction with the land acquisitions at Burnt Hollow and Welch Ranch. OHV registrations and use have increased substantially in the planning area over the past 10 years, in some cases resulting in a proliferation of routes, particularly during fall when hunters pursue big game.

Present Actions

OHV use also is a popular recreational activity, and under current management is allowed to varying degrees on BLM surface. Other public lands in the planning area provide additional areas for OHV recreation, including lands managed by the USFS Bighorn National Forest, the USFS Thunder Basin National Grassland, the State of Wyoming, and the WGFD. Often, routes that cross lands managed by other agencies provide legal public access to BLM-administered lands. Additional OHV use is expected to occur on private lands to support hunting and livestock management operations, and resource extraction activities.

Reasonably Foreseeable Future Actions

Population growth in the planning area and the surrounding region could lead to increased demand for OHV recreational opportunities. Such demand would increase both the need for designated areas and trails to recreate as well as provisions for mitigating the effects of increased OHV recreation. The ability to incentivize land exchanges or easements may be more feasible as not-for-profit organizations in northeastern Wyoming take interest in public access issues.

4.6.5.8. Conclusion

Alternative D would have the most overall beneficial effect on the travel and transportation program by balancing resource protection with legal public access and motorized vehicle access. Alternative B would impose the greatest restrictions on the program, and Alternative C the least. Alternative A would not adequately address the effects of limiting travel to existing routes. By improving trail and OHV management through land use planning, the BLM would minimize adverse effects on wildlife habitat; reduce the introduction and spread of invasive plant species; decrease conflicts among various motorized and nonmotorized recreation users; and prevent damage to cultural resources from the expansion of roads and trails on public lands. Moving toward a system of a designated network of roads and trails through TTM planning would protect, rather than inhibit, access to recreation on public lands. In support of TTM, roads, trails, byways, and other routes must be identified and/or designated to provide for public access and travel across the planning area. Actual route designation would take place after the ROD for this RMP and EIS.

4.6.6. Recreation

The BLM will ensure the continued availability of public lands for a diversity of outdoor recreation opportunities, while maintaining its commitment to manage public lands as a national resource in harmony with the principle of balanced multiple use (BLM 2007b). The Recreation and Visitor Services (R&VS) program may designate discrete units of public land in RMAs. RMAs are either a SRMA or an ERMA. SRMAs are administrative units where recognize

unique and distinctive recreation values and are managed to enhance a targeted set of activities, experiences, benefits, and recreation setting characteristics (RSC), which becomes the priority management focus of the area. Within a SRMA, R&VS management is recognized as the predominant land use plan focus, where specific recreation opportunities and RSCs are managed and protected on a long-term basis.

ERMAs recognize existing recreation use, demand, or R&VS program investments. These areas are managed to sustain availability of the principal recreation activities and associated qualities and conditions of the ERMA, commensurate with the management with other resources and resource uses. Some public lands, particularly those without legal public lands or of insufficient size to support recreational activities, may not be designated as an RMA. Recreation is not emphasized on these lands; however, recreation activities may occur unless the lands are either permanently or temporarily closed to public use to protect resource values or human health and safety. The R&VS on lands outside of RMAs are managed to allow recreation uses that are not in conflict with the other primary uses of these lands.

Table 4.60, “Proposed SRMAs by Alternative (acres)” (p. 1514) lists the acreages of SRMAs proposed under each alternative. These SRMAs represent areas in which recreation management is the predominant management focus. Recreation management matrices in Appendix T (p. 2543) identify the SRMA objectives, activities, experiences and benefits; RSC descriptions; management actions and allowable use decisions; and implementation decisions for each proposed SRMA (BLM 2011b).

4.6.6.1. Methods and Assumptions

Assumptions and methods used in this analysis might include, but are not limited to:

- Lands within the BFO are open to public recreational use unless they are closed through management alternatives in this land use plan or in accordance with guidance for Temporary Closures and Restrictions under 43 CFR Subpart 8364 (Closures and Restrictions); for Temporary Closures Mandated by 43 CFR Subpart 8341 (Conditions of Use); or for emergency actions under 40 CFR 1506.11.
- The designation of SRMAs is assumed to provide additional benefits to the recreation program compared to managing the planning area as one or more ERMAs.
- Each SRMA will be managed for the management objectives, prescribed setting character, and activity planning framework specified in Appendix T (p. 2543) and in the development of individual RAMPs following the ROD for this RMP.
- RAMP will be prepared for each SRMA and ERMA within five years of the completion of the RMP revision. A site-specific analysis will be performed on the ground as RMP decisions are implemented. RAMPs may be combined with Travel Management Plans where appropriate.
- Traditional (hunting, fishing, hiking, etc.) recreational uses of planning area lands will continue, despite any new recreational activities in the planning area originating from technologies. Both new and traditional recreational uses will be accommodated where they are determined to be appropriate to support the achievement of resource goals.
- The incidence of resource damage and conflicts between OHV users and nonmotorized recreationists will increase as OHV use increases.
- The demand for outdoor recreation opportunities is expected to increase in conjunction with population. Visitation throughout the planning area will continue to increase as resource availability and conditions allow. As the populations of neighboring states and the local area

continue to grow, the need or search for less crowded or more remote recreational opportunities will continue to bring more people to public lands in Wyoming.

- ERMA designations are largely based on the availability of legal public access for this RMP. Should additional public access be acquired, an ERMA may be created or expanded to reflect the changing conditions through an amendment to this RMP.
- For purposes of this analysis, short-term effects occur within five years of a given management action. Long-term effects continue beyond five years or take more than five years to materialize.

Beneficial effects on recreation resources would result from actions that improve the recreational setting and contribute to better recreational experience opportunities. Adverse effects would result from actions that adversely affect the recreational setting, detract from the recreational experience opportunities of users. Adverse effects in the planning area historically occur when resource development actions (e.g., mineral resources recovery and livestock grazing management) displace recreational uses from a given area.

Significance Criteria

Opportunities for recreation are generally related to access to public lands, except for activities under a special recreation permit on lands controlled by adjacent landowners. The true value of the recreation resource is qualitative and is measured in human experiences and reported levels of satisfaction, rather than in acres available for recreation. Satisfaction is directly related to the balance between expectations and actual experiences (Olshavsky and Miller 1972). Visitor surveys provide the best measure of visitor satisfaction in the planning area. The scale of potential effects is based on a variety of factors, including public access, anticipated visitor satisfaction, and the ability to provide diverse recreational opportunities based on management of other resources. In cases where quantitative information is not available, best professional judgement is used. The scale of effects would be the same as identified in the Introduction of Chapter 4. In addition, an adverse effect on R&VS management as a result of project actions would be considered potentially significant if the following were to occur:

- An action would violate objectives associated with recreation resource management, and its magnitude would be such that special mitigation would be warranted, or it would persist indefinitely.
- In a SRMA, an action would negate the ability to manage for the prescribed recreational setting.
- In ERMA, an action would deprive the public of the ability to access a contiguous block of BLM-administered public land for which there was historic legal access.
- An action would negate the ability to manage BLM-administered public lands according to the Recreation Opportunity Spectrum.
- Long-term visitor satisfaction surveys for SRMAs show continually decreasing satisfaction levels.

4.6.6.2. Impacts Common to All Alternatives

Recreation (major beneficial)

Designating SRMAs would increase the ability to apply for funding and recreation-related construction. Designating SRMAs also would refocus attention on emerging public demands for recreation identified in recent years, and during the public scoping process for this RMP. Natural resource-dependent recreation is promoted through the allowance of casual use of public lands for dispersed recreation. Some restrictions, such as prohibiting camps within 200 feet of surface water, are consistent with outdoor ethics principles and could result in the

closure or relocation of site-specific recreational opportunities. Cooperation with other entities would ensure provision of a wide variety of recreational opportunities to meet the demands of a multitude of user groups. Such cooperation also could increase public access, opening a larger portion of the planning area to recreation use. Existing facilities would be maintained for consistency with the recreational setting, improving the visitor experience and often reducing the maintenance workload in the planning area. Minimizing noise and light pollution that would affect recreation facilities and sites would improve the visitor experience at these sites and help realize many of the beneficial outcomes intended for each recreation MZ. Timely completion of RAMP would provide clear direction for recreation management in SRMAs, while opportunities for revision would allow flexibility as unforeseen issues arise.

Imposing a stay limit on camping prevents singular use of portions of BLM-administered public lands. By ensuring that one party would not have long-term exclusive use of a campsite, opportunities for recreation would be extended on a more just and fair basis. Providing information at recreation sites would help prepare visitors for local conditions, inform users of interpretive and regulatory information, and prevent inadvertent trespass onto adjacent lands. Promoting Americans with Disabilities Act compliance at BLM-administered recreation sites would help meet national goals and provide recreational opportunities for a wider segment of the American population.

Physical Resources

Air Quality, Soil, Water Resources, and Cave and Karst Resources

Managing recreational uses to reduce adverse effects on soil or water quality could affect the placement of recreation facilities, but should have a negligible and localized adverse effect on recreation resources. Proper mitigation of the adverse effects of recreation projects would provide recreational opportunities while preserving riparian and wetland systems and the waterways they adjoin. Such management would provide quality habitat to support wildlife for recreational use, and the viewsheds that enhance the quality of recreational setting and subsequent experiences. The degree of adverse effects to the recreation program from soil and water management actions would vary by alternative. Cave Management Plans would balance resource protection with recreational use. Some caves could be closed to human presence in consideration of other resource values. The adverse effect on recreation resources from physical resources management common to all alternatives would be negligible. However, the air quality resource will not produce measurable impacts by alternative and will not be discussed further in this section.

Mineral Resources

Locatable Minerals, Leasable Minerals – Coal and Fluids, and Salable Minerals

The scale of impacts from mineral resource development is expected to be similar across the various mineral resources. Thus, the section will be discussed as a whole, rather than as separate resources. Minerals leasing operations and development would likely alter the recreational setting of any undeveloped areas. The construction of facilities and ROW for pipelines, transmission lines, communications lines, and oil and gas development generally would adversely affect recreation resources. Land clearing, grading, construction, and drilling activities would create dust and noise, and increase traffic. These activities would have an adverse effect on traditional recreational uses because they would be visibly and audibly apparent during the recreational experience. The significance of any effect on recreationists would depend on proximity to the development and compatibility with the recreation setting for a particular activity. Users would be

inconvenienced if such construction impedes access to recreational activities. The visual intrusion of these structures would be site-specific and would not affect the recreational setting outside the viewshed of each facility. Mineral development activities on BLM-administered lands in the planning area would be subject to plans of development and stipulations, which also could alter recreational settings, restrict recreation access to certain areas, and change the availability of recreation resources to the public.

Areas not withdrawn from minerals entry would continue to be susceptible to disturbances from exploration and potential development, which could affect recreational uses in any given area. Continuing to develop solid and fluid minerals resources in areas with legal public access would affect recreation resources through decreased visitor satisfaction with recreational experiences. Management actions that limit development activities (e.g., NSO stipulations and prohibitions on leasing) and minerals withdrawals could benefit recreation by protecting recreation facilities and providing long-term assurance that areas traditionally used for recreational purposes would not be affected by future development activities. Prohibiting surface-disturbing activities related to mineral resources recovery in areas with high recreational value would protect the visitor experience and prevent conflicting uses.

Fire and Fuels Management

Fire promotes vegetation and wildlife diversity, which can enhance opportunities for recreation over the long term. Opportunities for wildlife viewing or hunting could be enhanced by the growth of new vegetation and improved habitat quality. The adverse effects of fire on recreation are generally negligible and short-term, and are directly related to the effect of fires on specific resources used in recreation, such as recreation facilities. The effects on visual resources, wildlife, and vegetation from fire would create immediate and localized impacts for recreation opportunities such as camping, sightseeing, and hunting.

Biological Resources

Vegetation – Forests and Woodlands, Grassland and Shrubland Communities, and Riparian/Wetland Resources and Fish and Wildlife Resources

Measures to promote wildlife and fisheries habitat, including maintenance of sustainable forage levels, habitat improvement projects, mitigation for disruptive activities associated with wildlife habitat management, and restoration of certain species would improve opportunities for wildlife-dependent recreation. Working with stakeholders to provide public access to waters and fisheries and to promote outreach and education would increase opportunities for recreation in the planning area. Conversely, avoiding riparian habitat would have a negligible adverse effect on access to recreation, especially fishing. Proper planning and mitigation can provide opportunities for quality recreation while minimizing adverse effects on riparian areas.

Similarly, managing recreational uses to reduce adverse effects on vegetation would have a negligible effect on access to recreation. Proper mitigation of the effects of recreation projects would provide opportunities for quality recreation while preserving native vegetation. The presence of healthy vegetation benefits the recreation program because it increases the visual appeal of the setting and benefits wildlife-dependent recreation. The grassland and shrubland resource will not produce measurable impacts by alternative and will not be discussed further in this section.

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Specific limits on the ability to issue special recreation permits, provide motorized use and access, or allow campsite occupancy in areas with SSS could affect recreation resources. Proposed or permitted uses would be analyzed through a NEPA document and measures implemented if SSS were encountered or known to be affected. If recreation use would affect SSS, the use often can be relocated to areas where a given species is not likely to be encountered. Land tenure will play the greatest role in determining whether recreation uses can be relocated. In the case of special recreation permits, the timing limitations for SSS such as Greater Sage-Grouse do not currently coincide with the highest-use season, autumn big-game hunting season, and any effects should be negligible. The degree of effects on recreation resources from biological resources management would vary by alternative.

Heritage and Visual Resources**Cultural Resources and Paleontological Resources**

Management of cultural and paleontological resources would provide for the protection of resources of interest to the recreating public, and would provide public education and outreach designed to enhance public appreciation and respect for these resources. Adaptive re-use of historic properties, provided for under Section 110 of the NHPA, would provide opportunities for additional interpretive sites. While the presence of historic properties can affect the placement of recreation facilities or the issuance of special recreation permits, mitigation would be localized and alternative sites for recreation facilities or use would likely be found in the local area.

Visual Resources

Scenic values are consistently identified as one of the most important values for visitors to public lands. Measures to protect visual resources would generally have a beneficial effect on recreation resources.

Land Resources

Under all alternatives, surface-disturbing activities related to development or resource extraction generally result in adverse effects or the displacement of recreational opportunities and the degradation of recreational experiences for the life of those projects. Conversely, some development activities present opportunities to improve legal access to public lands, and to improve roads.

Forest Products

While most forestry actions in the planning area take place in the southern Big Horn Mountains, an area with high recreational value, the two resource uses have historically coexisted with little effect on one another. If forestry actions exceed historic limits, there could be an adverse effect on the recreation resource due to reduced scenic quality. Current levels of firewood cutting, and other permitted special uses (e.g., Christmas tree cutting) on BLM-administered lands have little effect on recreation and could even be considered recreational activities.

Lands and Realty

Considering R&PP applications can benefit the provision of recreational opportunities. Examples of R&PP leases include trail systems and shooting ranges. Additionally, avoiding potential for inadvertent trespass through signage and education will ensure that visitors have a quality and legal recreational experience.

Renewable Energy

Wind-energy development would be allowed except in areas made administratively unavailable to renewable energy. Renewable-energy projects would generally produce an adverse impact to traditional recreational opportunities within the viewshed. The scale of impacts would vary by alternative.

Rights-of-Way and Corridors and Travel and Transportation Management

Maintaining a transportation system in cooperation with other entities to meet public and resource management needs is essential to providing recreational opportunities. Acquisition of easements and ROW is largely contingent on permission from private landowners. Overlapping motorized and nonmotorized forms of recreation would likely cause the greatest amount of conflict among recreation users in the planning area. Limiting OHV use to designated trails in many areas would provide additional areas where recreation users could avoid encounters with OHV. Conversely, there could be areas recreation users have difficulty accessing due to the lack of designated trails. Those who enjoy motorized recreation could perceive limitations on motorized vehicle use in areas where it has been historically supported as an injustice. While route designations could restrict movement in an area, such restrictions would not preclude legal access to contiguous blocks of BLM-administered lands with current public access. These restrictions, coupled with closures, would lead to a more primitive type of recreational experience that certain segments of the population would enjoy. The restrictions also could affect hunter success rates because while OHV use displaces game animals, OHV access also provides the recreation user a larger geographic area in which to pursue game. Overall, these management actions would be minor beneficial.

Lands with Wilderness Characteristics

Lands with wilderness characteristics are generally managed to protect outstanding opportunities for primitive and unconfined recreation or solitude. Evaluating areas with potential wilderness characteristics does not directly affect the provision of recreational opportunities. However, subsequent identification of lands with wilderness characteristics and their impacts to the recreation resource vary by alternative.

Livestock Management

Livestock grazing sometimes temporarily displaces recreational activities from occupied pastures, especially in areas where intensive livestock grazing occurs. Back country areas could be similarly affected by intensive livestock grazing, rendering those areas undesirable for periods of time, especially those most attractive to recreationists. These effects are typically short-term, but often cyclic, depending on the grazing management system (i.e., issues return when the grazing rotation places cattle back in those locations). Conversely, the presence of commercial “dude ranch” operations also provides unique recreational opportunities in certain areas that might decrease in availability if livestock operations were not authorized in the planning area. Closing areas with developed recreation facilities or high recreational potential to livestock grazing would prevent conflicts between users and livestock, and damage to the recreation facilities by trampling, rubbing, etc. (Note: only the developed portions (e.g., picnic areas, campgrounds, potable water sources, trailheads, and parking lots) would be subject to closure). Impacts from the common to all alternatives for livestock grazing would achieve *Standards for Healthy Rangelands*, an overall benefit to the recreation resource.

Special Designations

Areas of Critical Environmental Concern

Designation of ACECs in areas with recreational value could protect the recreation setting and values associated with the relevant and important criteria. However, there is no impact to the recreation resource from common to all alternatives for the ACEC resource; rather impacts would vary by alternative.

Scenic and Back Country Byways

The designation of scenic or BCBs can identify appropriate areas for visitors to enjoy vehicle touring and sightseeing. Providing additional information along these routes would increase visitor awareness of multiple uses and land stewardship in the area, which often results in increased visitor satisfaction. Evaluating areas for designation does not directly affect the provision of recreational opportunities and subsequent designation of byways would not be anticipated to greatly effect recreation use and would result in a negligible beneficial effect.

Wild and Scenic Rivers and Wilderness Study Areas

Continued protection of the Middle Fork Powder River (eligible and suitable for WSR designation) would provide blue-ribbon fishing opportunities. Middle Fork Canyon also contains unique and abundant cultural resources and cave and karst systems.

Managing WSAs (28,931 acres) would provide unique opportunities for a primitive and unconfined type of recreation. The benefit to the recreation program would be moderate and long-term. The designation and required management of WSAs for protection of wilderness values provides some assurance of locations where primitive and semi-primitive recreational opportunities would remain available (unless Congress releases the WSAs from further consideration as wilderness). All three WSAs in the planning area have limited public access and lack developed trail systems, which limits the amount of recreational use in the core of those areas, and therefore a minor beneficial effect.

Socioeconomic Resources

Identifying and mitigating hazards to public health and safety would improve the recreational experience of the visitor by ensuring a safer environment. Mitigating the adverse effects of coal seam fires would improve the BLM's ability to provide safe recreational opportunities and reduce potentially dangerous incidents. The extent of this management is currently limited to the Welch Ranch Management Area. Though socioeconomic resource management may vary by alternative, the effects to the recreation program would not likely vary by alternative and will not be discussed further in this section.

Table 4.60, "Proposed SRMAs by Alternative (acres)" (p. 1514) lists the estimated acreages of SRMAs under each alternative.

Table 4.60. Proposed SRMAs by Alternative (acres)

SRMA	Alternative A	Alternative B	Alternative C	Alternative D
Burnt Hollow	0	17,280	17,280	17,280
Cabin Canyon	0	1,369	0	0
Dry Creek Petrified Tree	0	2,567	2,567	2,567
Hole-in-the-Wall	0	11,952	0	11,952
Middle Fork Powder River	0	10,083	1,294	10,083

SRMA	Alternative A	Alternative B	Alternative C	Alternative D
Mosier Gulch	0	1,026	868	1,026
Welch Ranch	0	1,748	1,748	1,748
Weston Hills	0	9,504	9,504	9,504
Totals	0	55,529	30,570	54,160
Source: BLM 2012f				
SRMA Special Recreation Management Area				

Table 4.61, “Proposed ERMA by Alternative (acres)” (p. 1515) lists the estimated acreages of ERMA under each alternative.

Table 4.61. Proposed ERMA by Alternative (acres)

ERMA	Alternative A	Alternative B	Alternative C	Alternative D
Buffalo	782,102	597,812	0	0
Cabin Canyon	0	0	0	1,369
Face of the Bighorns/North Fork	0	0	0	34,477
Gardner Mountain	0	0	0	55,181
Kaycee Stockrest	0	0	0	2,685
Northern Bighorns	0	0	0	2,926
Powder River Basin	0	0	0	224,483
Southern Bighorns	0	128,761	0	25,535
Walk-In Area	0	0	0	3,007
Totals	0	726,573	0	349,663
Source: BLM 2012f				
ERMA Extensive Recreation Management Area				

4.6.6.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. Alternative A effects on the recreation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Recreation

Camping is limited to 14 days at any one spot to avoid resource damage and prevent exclusive use of public lands. However, Alternative A lacks clarity on how far visitors must move after the 14-day limit is reached and when they may return to an original campsite. Alternative A would not designate any lands as SRMAs. Designated SRMAs enjoy increased eligibility for construction funding, while ERMA normally do not. Managing the entire planning area as an ERMA would place a lower priority on recreation management, management actions would be custodial in nature, and recurring needs would not be as frequently addressed. The absence of designated SRMAs could result in a decreased ability to respond to changing recreation demands for diverse recreation opportunities and prescribed settings within the planning area. Most recreation areas are currently open to mineral development, however, Mosier Gulch has been closed to leasing and an NSO is in effect for lands within 0.5 mile of Dry Creek Petrified Tree. Recreational (target) shooting is generally allowed on BLM-administered lands that have not been administratively closed. Several recreation areas, including Burnt Hollow and Welch Ranch have been closed to target shooting. Thunder Basin National Grassland has closed the USFS administered surface at Weston Hills to target shooting and the BLM issued a supportive joint

decision that resulted in a temporary closure of the area in 2008. Additionally, all developed recreation sites, including the developed facilities at Mosier Gulch and Dry Creek Petrified Tree, are closed to target shooting per 43 CFR 8365.2-5(a) to protect public health and safety.

Physical Resources

Soil

Under Alternative A, prohibiting surface-disturbing activities in areas with severe erosion hazard, on soils with poor reclamation suitability, and on slopes equal to or greater than 25 percent could affect the development of trails for nonmotorized travel in areas with steep slopes. Several proposed or existing trails in the planning area exceed 25 percent side slope. However, under this alternative, the authorized officer may waive the prohibition. Prohibiting surface-disturbing activities in areas with sensitive soil resources could affect the provision of motorized recreational opportunities in some places. The effect on the recreation program would be minor, but long-term.

Water Resources

Restrictions on surface disturbance along waterways may affect the viability or design of recreation projects in or near river corridors or reservoirs, but may be waived by the authorized officer, and therefore a negligible impact.

Cave and Karst Resources

Under Alternative A, no previous decisions have been made related to cave and karst management and Cave Management Plans would not be initiated nor special management prescribed. Thus, there would be little to no effect on recreation from cave and karst resources.

Mineral Resources

Under Alternative A, continuing to develop solid and fluid mineral resources affects the recreation program through decreased visitor satisfaction with traditional recreational activities. If development in the planning area continues as predicted (see Appendix G (p. 1937)), there would be a minor, long-term adverse effect on the recreation program, as typically less than five percent of surface acres would be impacted by mineral development.

Fire and Fuels Management

Overall, the use of unplanned and prescribed fire under Alternative A would benefit the recreation program by protecting developed recreation sites and minimizing of risk of wildfires. Suppressing wildfires in developed recreation sites would be a priority, and would benefit the recreation program. The effect is anticipated to be beneficial as fire is typically be a short-term effect and does not influence long-term recreation use.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative A, most forest and woodland projects would be managed on a project specific basis. However, vegetation projects would be designed to protect or improve biodiversity and water quality, which would indirectly benefit recreation resources and therefore a negligible benefit.

Vegetation – Riparian/Wetland Resources

Effects from alternatives related to riparian and wetland resources would be the same as water resources. This resource will not be discussed further in this section.

Fish and Wildlife Resources – Fish and Wildlife

Under Alternative A, measures to promote wildlife and fisheries habitat, including maintenance of sustainable forage levels, habitat improvement projects, mitigation for disruptive activities associated with wildlife habitat management, and restoration of certain species would improve wildlife-dependent recreational opportunities. Wildlife and fish habitat management actions would continue to provide opportunities for recreational uses, including fishing, hunting, wildlife viewing and photography, and influence the public's preferred camping locations and travel patterns.

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Under Alternative A, there are no identified areas with high recreation value that have been limited or restricted from public use due to SSS; therefore, there would be little to no effect on the recreation program under this alternative. Proposed or permitted uses would be analyzed through the NEPA process and mitigation measures implemented if SSS were encountered or were known to be affected. Effects on the recreation program would be limited to recreation areas that overlap areas with SSS timing or surface occupancy stipulations. For areas without public access, the effects would be limited to recreation in conjunction with a special recreation permit. In areas with public access, alternative routes or camping areas would be designated where possible during periods of seasonal restrictions. Areas where recreation would be affected would be small and therefore a negligible effect.

Heritage and Visual Resources**Cultural Resources**

Under Alternative A, recreation sites in areas subject to Cultural Resource Management/Protection Plans could be subject to additional prohibitions related to facility development and visitor use in the area, creating an adverse effect on the recreation resource. Protection of cultural resources also benefits the recreation program by preserving the natural character of the landscape. However, because recreational opportunities may be limited the overall effect is negligible adverse.

Paleontological Resources

No management decisions have been issued in the current RMP related to paleontological resources. Projects would be considered on a case-by-case basis and there would be no measurable effect on the recreation resource.

Visual Resources (minor adverse)

Alternative A categorizes the majority of the BLM-administered surface as VRM Class IV (559,674 acres), and the minority of the acreage in the more protective VRM Class II (127,594 acres) and Class III (63,583 acres). Alternative A VRM classifications would not adequately address the protection of scenic qualities, which indirectly affects the recreation setting in areas with high recreational value. Several RMAs are currently classified as VRM Class IV (Dry Creek Petrified Tree, Hole-in-the-Wall, Burnt Hollow, Weston Hills, and portions of Mosier Gulch), which allows the greatest amount of change to the landscape. Alternative A management of visual resources would have a minor adverse effect on the recreation program.

Land Resources

Forest Products

Basing timber harvest on a desired production level could adversely affect recreation resources by producing an unsustainable level of forestry activity. The overall adverse impact on the recreation program would be limited to areas with marketable timber and would be minor. A size limitation on individual clear-cuts would benefit recreation resources by restricting the amount of vegetation removal on a local scale.

Lands and Realty

Under Alternative A, priority is given to acquisition of parcels in areas with recreational value such as the southern Big Horn Mountains and easements will be pursued for recreation purposes, a minor benefit to the recreation resource. Negotiating access across non-BLM-administered lands to isolated public land parcels from willing landowners is critical to meeting the goal of providing accessibility across the planning area. Acquisitions and land exchanges would help the BLM provide seamless recreational opportunities and ensure long-term public access to recreation. Increased access could result in a wider diversity of recreational opportunities.

Renewable Energy

Renewable energy development projects are considered on a case-by-case basis. If a renewable energy project were approved, it could affect traditional recreational values within the viewshed of the project. However since recreational opportunities probably would not be reduced the impact would be negligible.

Rights-of-Way and Corridors

Effects from alternatives related to ROWs and corridors would be the same as soil resources. This resource will not be discussed further in this section.

Travel and Transportation Management

TTM under Alternative A would designate the most surface area open for motorized vehicle use compared to any of the other alternatives. Motorized travel in other areas would be managed as limited to designated routes. It should be noted that legal public access to approximately half of BLM surface in the planning area is controlled by owners of adjacent private land. Designating such areas as available to public motorized vehicle use would, in many cases, allow only the owners of adjoining private property, and anyone with their permission, to legally travel on many of those routes. In areas previously designated as limited to existing routes (737,166 acres), the process of designating or closing routes would likely prevent the use of motor vehicles on some previously available roads. This would increase opportunities for solitude and quiet recreation in the planning area, but would reduce opportunities for motorized recreation. It also would make game retrieval more difficult by eliminating roads that might otherwise be legally traveled to recover game. Although motorized hunting access might be reduced, game animals might also return to areas no longer accessible to motorized vehicles.

Seasonal motorized vehicle restrictions (37,646 acres) under this alternative are primarily the result of wildlife management concerns, and would continue to contribute to the viability of these populations, which are important to the recreating public. Less than five percent of the planning area would be seasonally closed to motorized vehicle use. Travel limitations could limit the public's ability to access certain areas of public lands seasonally; however, seasonal closures are designed to protect the wildlife resources and indirectly benefit recreation resources.

Closing or limiting OHV use in certain areas (3,650 acres) would limit the availability of lands for motorized forms of recreation, while maintaining opportunities for traditional forms of recreation. The effect of closures on access in the planning area would be negligible because nonmotorized

access would still be provided. Limiting OHV access to designated routes in the planning area could concentrate motorized vehicle use on these routes. However, comprehensive travel management would provide adequate opportunities for motorized recreation, while preserving other resource values. The overall beneficial effect of the travel management alternatives on the diversity of recreation opportunities in the planning area would be minor.

Lands with Wilderness Characteristics

Alternative A would not propose special management related to wilderness characteristics. There would be no effect from lands with wilderness characteristics alternatives on the recreation resource under Alternative A.

Livestock Management

Opportunities in developed recreation sites and certain activities (e.g., fishing near riparian areas) sometimes conflict with livestock grazing management. Alternative A would prohibit livestock grazing on less than two percent of BLM surface in the planning area, however, there is significant overlap between the areas currently closed to livestock grazing and areas with high recreation value. At present, the limitations apply to certain areas in the southern Big Horn Mountains (approximately 4,000 acres), including Middle Fork Canyon, and several developed recreation sites, including Dry Creek Petrified Tree (22 acres exclosed), Mosier Gulch (approximately 800 acres closed or unsuitable), Outlaw Cave campground (approximately 10 acres), and the parking areas at Burnt Hollow (approximately 5 acres). These limitations benefit the recreation program, but the relative effect on the program is minor as an estimated 4,840 acres within proposed SRMAs is closed, constituting approximately 8.7 percent of high value recreation resources. Dispersed recreation in Wyoming has historically been compatible with livestock operations except in areas of intensive grazing, developed recreation sites, or in riparian areas with public stream access.

Special Designations

Areas of Critical Environmental Concern, Scenic and Back Country Byways, and Wild and Scenic Rivers

Alternative A would not designate or prescribe special management related to ACECs, BCBs, or WSRs and would therefore produce no effect on the recreation resource.

Wilderness Study Areas

Automatically leasing WSAs if Congress releases them from designation would adversely affect the availability of primitive recreation opportunities, specifically in the Fortification Creek area.

4.6.6.4. Alternative B

Alternative B would emphasize resource conservation. Alternative B effects on the recreation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Recreation

Alternative B would designate 55,529 in eight SRMAs (7.1% of the planning area). Though the RSCs within SRMAs would be recognized for the unique value and distinctiveness, protection of natural and cultural resources would be emphasized over provision of consumptive recreational opportunities where conflicts arise. Accordingly, the BLM would be able to respond to the need for more intensive management efforts in SRMAs. Recreation management activities

under this alternative would include additional emphasis on addressing crowding issues and maintaining the quality of recreational experiences on public lands. Management of the southern Big Horn Mountains, in coordination with adjacent BLM field offices (Casper and Worland), would provide additional opportunities for seamless recreation, including multiple-use trails. However, limiting development of additional recreation facilities to SRMAs and other high-use areas could reduce the opportunity to construct or designate trails in remote areas. Evaluation of fees for access to high-use areas under the Federal Lands Recreation Enhancement Act could provide additional funding for improvements in SRMAs. However, fees can exclude those unable to afford fees and could displace recreationists to non-fee sites.

Alternative B would restrict minerals resource development and other surface-disturbing activities in designated SRMAs unless the disturbance would benefit recreation resources (i.e., a campsite or trail construction) and be compatible with natural and cultural resource protection. Similarly, salable minerals development in SRMAs would be allowed only for the benefit of the recreation program (i.e., procuring gravel for access roads and parking areas) where development resulted in a net benefit to other public land resources. Restrictions on mineral development would benefit the provision of traditional recreational opportunities, particularly nonmotorized activities. However, even motorized recreation would benefit from closures through a reduction of conflicts between recreational traffic and industrial traffic.

Campers would be required to relocate 5 miles away after reaching the 14-day stay limit. Due to land tenure and topography, this would likely preclude visitors from camping within the same SRMA or general area once the stay limit is reached. All SRMAs (7% of the planning area) would be closed to recreational shooting, which would reduce noise, user conflicts between shooters and other recreationists, and would improve safety in areas without proper backdrops. Because the SRMAs and other developed recreational facilities are often the most easily accessible lands within the planning area, there would likely be a substantial reduction in opportunities for target shooting on BLM-administered lands. However, target shooting opportunities are readily available on other public lands in the planning area and at several private shooting ranges.

Designation of SRMAs (55,529 acres) would prioritize recreation resources and natural and cultural resource protection in areas experiencing high recreation use and demand. ERMA designation on the remaining 726,573 acres of BLM administered surface would ensure consideration of recreation resources and values on all BLM administered lands in the planning area. The diversity of recreation opportunities provided by Alternative B would be a major benefit to nonmotorized and non-consumptive recreational opportunities. Opportunities for motorized and/or consumptive recreation could be substantially constrained under Alternative B.

Physical Resources

Soil

Under Alternative B, prohibiting surface-disturbing activities in areas with a severe erosion hazard, on soils with poor reclamation suitability, and on slopes equal to or greater than 25 percent could affect the development of trails for nonmotorized travel use in areas with steep slopes. Several proposed or existing trails in the planning area exceed a 25 percent side slope. Prohibiting surface-disturbing activities in areas with sensitive soil resources could affect the provision of motorized recreational opportunities in some places. The overall effect of these limitations would be moderate.

Water Resources

Prohibitions on surface disturbance along waterways may affect the viability or design of recreation projects in or near river corridors or reservoirs. The effect on the recreation program would be minor as recreation facilities are typically located to protect water resources while providing for recreational opportunities.

Cave and Karst Resources

Human activity in caves with significant resources, including recreational activity, would be managed under a Cave Management Plan. Such plans may impose additional restrictions on recreationists, but would also protect the recreation setting by preserving significant resources that draw these recreationists. The effect on the recreation resource would be negligible beneficial.

Mineral Resources

Under Alternative B, increasing restrictions on minerals development would reduce adverse effects on recreation settings and available recreation opportunities by limiting the areas available for minerals resource development. SRMAs, ACECs, WSAs and WSR corridors, and lands with wilderness characteristics, areas with the highest recreational value in the planning area, would all be closed to mineral development under this alternative. This would reduce the intensity of the adverse effect on the recreation program over the long term, resulting in a negligible adverse effect overall.

Fire and Fuels Management

Under Alternative B, the use of full protection strategies and tactics in the WUI and developed recreation sites could increase the adverse effects on visual resources from fire and fuels management in these areas. Generally, the short-term adverse effects from fire and fuels management lead to long-term beneficial effects on visual resources, vegetation, wildlife, and recreation settings.

Biological Resources**Vegetation – Forests and Woodlands**

Under Alternative B, management of forest and woodlands would specifically emphasize recreation, which would benefit recreation resources in forest and woodland environments, creating a beneficial effect to the recreation resource. However, allowing insect, disease and wildland fire (see *Fire and Fuels Management* section) to run their natural course would reduce scenic values and could disrupt recreational opportunities over the long term. The combination of these actions would produced a minor beneficial effect.

Fish and Wildlife Resources – Fish and Wildlife and Special Status Species – Fish and Plants

Fish habitat management under Alternative B would include more emphasis on actions to improve blue-ribbon trout fisheries and fish habitats for special status fish species. Improving fish habitats and fisheries, especially sport fisheries, would expand and diversify fishing opportunities for recreational anglers. Other wildlife management activities under this alternative would provide for enhanced opportunities for wildlife viewing and bird watching by improving habitats for all birds and sensitive wildlife species. While increased restrictions on surface disturbance may affect the ability to construct or maintain recreational facilities, the protection of suitable wildlife habitat would result in a net benefit to the recreational resource to a minor degree.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Under this alternative, additional restrictions would be applied to areas that contain SSS. Effects on the recreation program limited to areas that overlap areas with SSS timing or occupancy restrictions. For areas without public access, the effects would be limited to recreation in conjunction with a commercial special recreation permits. In areas with public access, alternative routes or camping areas could be designated where possible during seasonal restrictions. Wildlife prohibitions could limit recreation facility construction within SRMAs and therefore recreational opportunities to a moderate degree.

Heritage and Visual Resources**Cultural Resources**

Prohibiting surface disturbance in areas containing historic properties, or within five miles of the visual horizon, would adversely impact the ability to develop recreational facilities in all SRMAs. There would be a major adverse impact to the recreation program.

Paleontological Resources

Under Alternative B, special management for areas with high-quality paleontological specimens would likely cause a negligible adverse effect on facility development for the Dry Creek Petrified Tree SRMA. Casual collection areas would not be identified.

Visual Resources

VRM class designations under this alternative would place emphasis on maintenance of the scenic values by managing 258,866 acres as VRM Class IV, and moving most of the acreage into the more protective VRM Class II (217,021 acres) and VRM Class III (276,107 acres). Management actions, including VRM Class II designation for all SRMAs, to preserve the scenic character in PRB viewsheds would ensure long-term enjoyment for recreationists and residents in the area.

Land Resources**Forest Products**

Limiting timber harvests to 5 acres per select harvest group and designing timber projects to have meandering boundaries, follow topography, and avoid natural barriers would help mitigate adverse effects on recreation resources.

Lands and Realty

Realty management activities under Alternative B would establish “acquisition criteria” for lands and public access easements that would increase opportunities for recreational use of public lands. The amount of actual change would depend on the availability of “willing parties” during the planning period. While acquisition of access and easements is provided for under Alternative B, priority would no longer be given to areas with high recreational potential. While there is a possibility that all available funding could be used to procure access in other areas, it is not likely that such an action would have a substantial effect on the recreation program. The overall impact to the recreation program from the lands and realty program would be negligible and beneficial.

Renewable Energy

Renewable energy would be excluded from SRMAs under Alternative B, a major beneficial impact on the recreation resource.

Travel and Transportation Management

Travel management under Alternative B would not designate any BLM-administered lands as open to motorized travel and would close the majority of the planning area (625,854 acres). With nearly 80 percent of the planning area closed to motorized travel (with the exception of public roads under a ROW), motorized recreational opportunities would be severely limited. Alternative B would limit motorized travel to designated routes on 137,126 acres. Approximately 18,259 acres of the planning area would be seasonally closed to motorized vehicle use. The adverse effect of the travel management alternatives on the diversity of recreation opportunities in the planning area would be major.

The 1985 RMP does not address issues related to over-snow travel. While most of the planning area currently receives very little over-snow vehicle use due to insufficient snow cover, the southern Big Horn Mountains (predominantly on USFS-administered lands) attract snowmobilers during winter. While several areas of BLM-administered lands in the planning area might be appropriate for over-snow vehicle use (consistent with travel management designations), other parcels have resource values that would be inconsistent with such use. Officially closing those areas to over-snow vehicle use would guarantee future opportunities for quiet winter recreation use, such as cross-country skiing, snowshoeing, winter camping, and wildlife-viewing, provided compliance and enforcement of the closure was effective. Because nonmotorized recreation is often displaced by the presence of motorized recreation, where the inverse is generally not true, maintaining suitable areas with official closures to motorized recreation would ensure the long-term protection of the diversity of recreation opportunities in the planning area. These management actions combine to create an overall minor beneficial effect for the recreation resource.

Lands with Wilderness Characteristics

Considering and protecting areas with wilderness characteristics would ensure the continued availability of primitive recreational opportunities. A 12,237 acre area would be managed for wilderness characteristics. This represents 1.5 percent of BLM surface within the planning area and therefore a minor beneficial effect.

Livestock Management

Limiting or prohibiting livestock grazing where it has been determined to be incompatible with other resource values, particularly in the riparian area of Welch Ranch SRMA, would beneficially affect the recreation program. Areas with developed recreation facilities and trails could selectively reduce opportunities for grazing to reduce conflicts between users and livestock. Similarly, prioritizing any permanent increases in forage allocations for wildlife habitat and watershed protection, rather than livestock grazing, would indirectly benefit wildlife-dependent recreational opportunities. Opportunities in developed recreation sites and certain activities (e.g., fishing near riparian areas) sometimes conflict with livestock grazing management. Public comments have indicated a preference for reduction of grazing opportunities in the riparian area at Welch Ranch SRMA. Alternative B would prohibit livestock grazing on 372 acres of the Welch Ranch SRMA, in addition to the developed sites already closed in Alternative A. The total acreage within SRMAs excluded from livestock management would total approximately 5,210 (9.3% of SRMAs). Excluding livestock from the riparian area at Welch would be a major benefit at the site-specific level, but the overall beneficial effect on the recreation program across the planning area would remain within the moderately beneficial threshold.

Special Designations

Areas of Critical Environmental Concern

Under Alternative B, the BLM would designate eight ACECs (511,000 acres). Resource values would be afforded additional protections, and wildlife-dependent recreational opportunities and the scenic values that comprise the recreation setting would likely increase. Four of the ACECs would also be SRMAs (Burnt Hollow, Dry Creek Petrified Tree, Hole-in-the-Wall, and Welch Ranch). Measures to protect the relevance and importance of resources in these areas also would benefit the recreation settings in these areas. In designated ACECs, future area-specific plans could further limit surface-disturbing activities, including OHV use. The uncertainty of these future plans makes the effects on recreation largely unknown and therefore a minor benefit.

Scenic and Back Country Byways

Considering routes for Scenic and BCB designation could promote opportunities for vehicle touring in the planning area. Use would not be anticipated to increase substantially and therefore the benefit would be negligible.

Wild and Scenic Rivers

If Congress releases the Middle Fork Powder River from consideration for designation as a WSR, Alternative B would retain the free-flowing conditions and outstanding resource values. Because the Middle Fork Powder River is a destination for anglers in the region, protection of WSR values would be beneficial to the recreation program.

Wilderness Study Areas

Should Congress act to designate or release WSAs, a plan amendment would take place. There would be no effect on the recreation resource for the life of this plan. Prohibiting mechanized equipment in WSAs would displace any potential opportunities (which are limited at best) within these areas, but would improve nonmechanized recreational opportunities in those areas. Overall, the decision to limit mechanized use in WSAs would have little to no effect on the ability to provide diverse recreational opportunities across the planning area.

4.6.6.5. Alternative C

Alternative C would emphasize resource use. Alternative C effects on the recreation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Recreation

Alternative C would designate six SRMAs (30,570 acres). The BLM would be able to respond to the need for more intensive management efforts in these areas. Alternative C would not restrict mineral resources development and other surface-disturbing activities in designated SRMAs, which would likely result in conflicts between industrial uses and recreational opportunities. It is feasible that extractive actions would be proposed within the boundaries of SRMAs, which would have an adverse effect on the recreation settings in those areas.

Allowing recreation facilities in areas where they are supported by recreational use and are consistent with other resource values would expand the BLM ability to provide recreational opportunities outside SRMAs. Failure to evaluate areas under the Federal Lands Recreation Enhancement Act could restrict the ability to provide additional funding for improvements in SRMAs. Campers would be required to relocate 1-mile away after reaching the 14-day stay limit. Due to land tenure and topography, this could preclude some visitors from camping within the same SRMA or general area once the stay limit is reached but would generally allow them to

continue camping in the planning area. The ability to camp in the same general area would benefit recreationists, particularly during hunting season. Under Alternative C, the entire planning area would be open to target shooting. This would likely increase user conflicts between shooters and other recreationists, particularly in areas with easy access, and result in a moderate adverse effect to the recreation program.

Alternative C would not designate any ERMAs. Approximately 751,532 acres of BLM-administered lands would not be designated within an RMA. Legal public access is unavailable to approximately 296,320 acres in the field office and the effects of recreation management would likely be negligible on lands outside of RMAs. Recreational use may still occur on lands outside of RMAs that are open to public use, but the BLM would not prioritize recreation resources in these areas and recreation may or may not be considered an affected resource in subsequent site-specific analyses. For the approximately 455,212 acres outside of RMAs that do have public access, failure to designate recreation management objective would reduce the ability to protect RSCs and promote R&VS, creating a major adverse effect on recreation resources.

Physical Resources

Soil, Water Resources, and Cave and Karst Resources

Under Alternative C, surface-disturbing activities in areas with severe erosion hazard, on soils with poor reclamation suitability, steep slopes or water features would be allowed. This could benefit the development of nonmotorized vehicle trails and provision of visitor services in certain areas. However, this alternative also could adverse effect the recreation program by allowing projects for resource development in areas with recreational values that would not be allowed under other alternatives. The effect on the recreation program would be negligible, but long-term. Human activity in caves with significant resources, including recreational activity, would be managed under a Cave Management Plan. Such plans may impose additional restrictions on recreationists, but would also protect the recreation setting by preserving significant resources that draw these recreationists. The effect on the recreation resource would be negligible.

Mineral Resources

Under Alternative C, continuing to develop solid and fluid minerals resources would affect recreation resources by decreasing visitor satisfaction with traditional recreation activities. SRMAs, ACECs, and lands with wilderness characteristics would not be closed to mineral resource development. Alternative C would expand the areas available for mineral resource development would increase adverse effects on recreation settings and available recreation opportunities. If minerals development in the planning area continues as predicted (see Appendix G (p. 1937)), the adverse effect on the recreation program would be moderate and long-term.

Fire and Fuels Management

Under Alternative C, the use of full protection strategies could increase adverse effects on visual resources in affected areas. Generally, the short-term adverse effects of fire and fuels management actions lead to long-term beneficial effects for visual, vegetation, and wildlife resources and recreation settings.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative C, management of forest and woodlands would emphasize the forest resource. Utilizing intensive management tactics such as clear cuts would reduce scenic values and could disrupt recreational opportunities over the long term. The adverse impact to the recreation program would be minor.

Fish and Wildlife Resources – Fish and Wildlife

Alternative C measures to promote wildlife habitat would be less proactive than under Alternative B. While Alternative C SSS management would be similar to management under Alternative A, but often to a lesser extent given the flexible language. The limited fish and wildlife protections result in a negligible beneficial effect for recreation opportunities.

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Alternative C would incorporate restrictions in areas with SSS. Effects on the recreation program would be limited to areas that overlap with areas with SSS timing or occupancy limitations. In addition, this alternative would apply a timing restriction to Greater Sage-Grouse winter concentration areas, which might coincide with big-game hunting seasons in some areas. These restrictions would prohibit surface disturbing activities and thus prevent displacement not only of SSS but of big-game as well, a negligible benefit.

Heritage and Visual Resources**Cultural Resources**

Alternative C does not propose any special provisions or restrictions on surface disturbance related to cultural resources. There would be no effect on recreation resources related to the cultural resource.

Paleontological Resources

Under Alternative C, designating casual collection areas for common invertebrate, plant, and petrified wood fossil collection could help meet public demand for such activities. However, identifying collection areas could concentrate use and reduce the presence of paleontological specimens, which are often an attraction for non-consumptive recreationists. The adverse effect would likely be negligible.

Visual Resources

VRM class designations under this alternative would place limited emphasis on maintenance of scenic values by managing 167,334 acres as Class III, and assigning most of the acreage in the planning area the less protective Class IV (584,500 acres). SRMAs would be managed as VRM Class III. The impact to the recreation resource through the reduction of scenic values would be minor and adverse.

Land Resources**Forest Products**

Under Alternative C, allowing timber harvests without limits on the sizes or shapes of harvest areas could adversely affect recreation resources. The overall adverse impact on the recreation program would be limited to areas with marketable timber and therefore would be minor.

Lands and Realty

Under Alternative C, the BLM would not consider the acquisition of lands or easements from

willing landowners, which would prevent the consolidation of land where it would be beneficial for public access. This would have a major adverse effect on the recreation program.

Renewable Energy

Renewable energy would be allowed within the planning area where consistent with other resource values. Recreation resources would be considered in renewable energy project development, but protection of recreation values could not be guaranteed. The overall effect to the recreation program would be adverse and moderate.

Travel and Transportation Management

Travel management under Alternative C would designate 24,103 acres as open to motorized vehicle use. Motorized travel in other areas would be managed as limited to designated routes (718,704 acres), except where areas are closed to motorized travel. Only WSAs (28,931 acres) would be closed to OHV use under Alternative C, which would maintain opportunities for primitive forms of recreation in these areas. The effect of closures on access in the planning area would be negligible because nonmotorized access would still be provided. Approximately 6,839 acres in the southern Big Horns would be seasonally closed to motorized vehicle use to protect elk winter and calving areas. The beneficial effect of the travel management alternatives on the diversity of recreation opportunities in the planning area would be minor.

Few areas in the planning area have enough snowfall to make over-snow travel practical. However, there are parcels, particularly in the southern Big Horn Mountains, that could be appropriate for over-snow vehicle use (consistent with travel management designations). Opening such areas to over-snow vehicle use could offer a unique opportunity for over-snow travel on BLM-administered lands. This would benefit motorized recreationists, but would be detrimental to human-powered winter recreational activities.

Lands With Wilderness Characteristics

Alternative C would not propose special management related to wilderness characteristics. There would be no effect from wilderness characteristics alternatives on the recreation resource under Alternative C.

Livestock Management

Effects of livestock management on recreation under Alternative C would be largely the same as Alternative A. Authorizing permanent increases in forage allocations to livestock grazing, rather than to wildlife habitat and watershed protection, would negate any potentially beneficial effects on wildlife-dependent recreational opportunities. The overall adverse impact to the recreation resource for forage allocation would be negligible to minor. Coupled with the overall objectives for accommodating uses of public lands other than recreation, the overall benefit of livestock management alternatives in Alternative C would be minor beneficial.

Special Designations

Areas of Critical Environmental Concern, Scenic and Back Country Byways, and Wild and Scenic Rivers

Under Alternative C, the BLM would not designate any ACECs. In general, resource values would be afforded less protection and wildlife-dependent recreational opportunities and the scenic values that comprise recreation settings could decrease without the protective measures offered by these designations. Under this alternative, the BLM would not consider designating Scenic or BCBs and would not expend additional effort on promoting vehicle touring on potential routes.

Alternative C would not prescribe special management related to WSR and would therefore produce no effect on the recreation resource.

Wilderness Study Areas

Should Congress act to designate or release WSAs, a plan amendment would take place. There would be no effect on the recreation resource for the life of this plan. Mechanized equipment would not be prohibited in WSAs, which would improve any potential opportunities (which are limited at best) within these areas, but could displace nonmechanized recreational opportunities in those areas. Overall, the decision to limit mechanized use in WSAs would have little to no effect on the ability to provide diverse recreational opportunities across the planning area.

4.6.6.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the **Proposed RMP**. Alternative D effects on the recreation program would be similar to effects described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Recreation

Alternative D would designate seven SRMAs comprising 54,160 acres (6.9% of the planning area). Accordingly, the BLM would be able to respond to the need for more intensive management efforts in SRMAs to protect the RSCs and recreation management objectives. Recreation management activities under this alternative would include additional emphasis on addressing crowding issues and maintaining the quality of recreational experiences on public lands. Management of the southern Big Horn Mountains, in coordination with adjacent BLM field offices (Casper and Worland), would provide additional opportunities for seamless recreation, including multiple-use trails. However, limiting development of additional recreation facilities to SRMAs and other high-use areas could reduce the opportunity to construct or designate trails in remote areas. Evaluation of fees for access to high-use areas under the Federal Lands Recreation Enhancement Act could provide additional funding for improvements in SRMAs. However, fees can exclude persons unable to afford such fees and could displace recreationists to non-fee sites.

Alternative D would apply restrictions on mineral resources development and other surface-disturbing activities in six of the SRMAs unless the disturbance would benefit recreation resources (i.e., campsite or trail construction). In the Weston Hills SRMA, limited minerals development activity would be compatible with the recreation setting. Salable minerals development in all SRMAs would be allowed only for the benefit of the recreation program (i.e., procuring gravel for access roads and parking areas). Restrictions on mineral development would benefit the provision of traditional recreational opportunities, particularly nonmotorized activities. However, even motorized recreation would benefit from closures through a reduction of conflicts between recreational traffic and industrial traffic.

Campers would be required to relocate 1-mile away after reaching the 14-day stay limit. Due to land tenure and topography, this could preclude some visitors from camping within the same SRMA or general area once the stay limit is reached, but would generally allow them to continue camping in the planning area. The ability to camp in the same general area would benefit recreationists, particularly during hunting season. Welch Ranch and Burnt Hollow SRMAs

(19,028 acres, 2.4% of the planning area surface) would be permanently closed to recreational shooting, which would reduce noise, user conflicts between shooters and other recreationists, and would improve safety in areas without proper backdrops. Closures in both areas are supported by the public. A recreational shooting closure for Burnt Hollow was recommended by an interagency and public Coordinated Resource Management team; a closure was analyzed and selected as the preferred alternative in the 2005 Burnt Hollow Management Plan. A closure was analyzed and selected as the preferred alternative in the 2005 Welch Ranch Management Plan as well. Target shooting opportunities are readily available on other public lands in the planning area and at several private shooting ranges. In five other SRMAs and three ERMAs, target shooting would be addressed through education, encouragement of minimum impact skills (i.e., Respected Access campaign) and enforcement of violations of CFRs during the implementation of this RMP. If over the mid term conditions related to target shooting do not improve, such as the shooting and explosives vandalism at Weston Hills, temporary or permanent closures may be necessary. The USFS-managed portions of Weston Hills are permanently closed to recreational shooting. Any subsequent permanent closures would require a land use plan amendment.

Alternative D would designate 349,663 acres in eight distinct ERMAs. In ERMAs, recreation would be recognized as an important resource value and would likely be considered in impact analyses in subsequent site-specific analyses.

Approximately 378,275 acres of BLM administered lands would not be designated within an RMA. Legal public access is unavailable to approximately 296,320 acres in the field office, and these lands comprise the majority of the lands outside of RMAs. For the approximately 82,000 acres outside of RMAs that do have public access, the majority of the parcels are too small to manage for high quality recreational opportunities or located far enough away (3 or more miles) from public roads that reasonable public access is not available. Recreational use may still occur on lands outside of RMAs that are open to public use, but the BLM would not prioritize recreation resources in these areas and recreation may or may not be considered an affected resource in subsequent site-specific analyses. The overall effect of Alternative D recreation management alternatives will result in a major benefit to recreation resources. Appendix T (p. 2543) includes objectives for each SRMA and ERMA.

Physical Resources

Soil and Water Resources

Alternative D would slightly increase constraints on the construction or placement of recreational facilities and trails compared to Alternative A. This alternative would allow surface-disturbing activities in areas of severe erosion hazard, on soils with poor reclamation suitability, on slopes equal to or greater than 25 percent if they adequately conserve the soil and water resource. This would allow flexibility in providing nonmotorized and motorized access in certain locations. While measures to protect physical resources would still be in effect, the adverse effect of this management on the recreation program would be negligible and long-term.

Cave and Karst Resources

Human activity in caves with significant resources, including recreational activity, would be managed under a Cave Management Plan. Such plans may impose additional restrictions on recreationists, but would also protect the recreation setting by preserving significant caves that draw these recreationists. The effect on the recreation resource would be negligible.

Mineral Resources

Under Alternative D, continuing to develop solid and fluid minerals resources would affect recreation resources by decreasing visitor satisfaction with traditional recreation activities. However, Alternative D would increase restrictions on minerals development, which would reduce adverse effects to recreation settings and available recreation opportunities by limiting the areas available for mineral resources development. Most SRMAs, ACECs and lands with wilderness characteristics would be closed to mineral development under this alternative. This would reduce the intensity of the adverse effect on the recreation program, resulting in a minor adverse effect overall.

Fire and Fuels Management

Alternative D effects from fire and fuels management will be generally the same as effects under Alternative B. Use of full protection strategies and tactics in the WUI and developed recreation sites could increase adverse effects on visual resources in these areas. Generally, the short-term adverse effects from fire and fuels management actions tend to have long-term negligible beneficial effects on visual, vegetation, and wildlife resources and recreation settings.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative D, management of forest and woodlands would emphasize multiple resource values, which would include recreation. Utilizing intensive management tactics (which may include clear cuts), which would reduce scenic values and could disrupt recreational opportunities over the long term. The adverse impact to the recreation program would be negligible.

Fish and Wildlife Resources – Fish and Wildlife

Fish habitat management under Alternative D would place more emphasis on actions to improve blue-ribbon trout fisheries and fish habitats for SSS. Improvements in fish habitats and fisheries, especially sport fisheries, would enhance recreational fishing opportunities through expanding and diversifying fishing opportunities for recreational anglers. Other wildlife management activities under this alternative would provide for enhanced opportunities for wildlife viewing and bird watching by improving habitats for all birds and sensitive wildlife species, a minor beneficial effect.

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Under this alternative, restrictions would be applied in areas with SSS. Effects on the recreation program would be limited to areas recreation potential would overlap areas with SSS timing or occupancy limitations. In addition, this alternative would impose a seasonal disturbance prohibition for Greater Sage-Grouse winter concentration areas. For areas without public access, the effects would be limited to recreation in conjunction with a commercial special recreation permit. In areas with public access, alternative routes or camping areas could be designated where possible during seasonal restrictions. If the timing limitation reduced opportunities for big-game hunting, which is one of the predominant recreational activities in the planning area, that could not be mitigated through alternative means of access, the effect on the recreation program would be minor.

Heritage and Visual Resources

Cultural Resources

Prohibiting surface disturbance in certain areas containing historic properties, specifically rock art shelters/sites or Native American burial sites could adversely impact the ability to develop recreational facilities in affected areas. Some SRMAs, specifically in the southern Big Horn Mountains, may be slightly affected, but the overall adverse impact to the recreation program would be minor.

Paleontological Resources

Under Alternative D, special management for areas with high-quality paleontological specimens would likely cause a negligible adverse effect on facility development for the Dry Creek Petrified Tree SRMA. Casual collection areas would not be identified.

Visual Resources

VRM class designations under this alternative would place emphasis on maintenance of scenic values by managing 260,238 acres in VRM Class IV, and moving most of the acreage into the more protective VRM Class III (379,429 acres) and Class II (112,329 acres). Management actions, including VRM Class II designation for all SRMAs, to preserve the scenic character of these areas would ensure moderate beneficial long-term enjoyment for recreational users and local residents.

Land Resources**Forest Products**

Forest products sales would remain within ecologically sustainable limits while maximizing economic return and projects would consider other resource values, including recreation. The harvest area size, which may include clear-cut areas, would not be limited, but the design would incorporate recreation resource values. The overall impact to the recreation resource from forest products is expected to be adverse, but negligible.

Lands and Realty

Realty management activities under this alternative would establish acquisition criteria for lands and public access easements that would increase opportunities for recreational use of public lands. The degree of actual change would depend on the availability of willing parties during the planning period. While Alternative B provides for acquisition of access and easements, Alternative D would not give priority to areas with high recreational potential. While there is a possibility that all available funding could be used to procure access in other areas, it is not likely that such an action would have any substantial effect on the recreation program.

Renewable Energy

Renewable energy would be excluded from the southern Big Horn Mountains and excluded or avoided in SRMAs under Alternative D, a major beneficial impact on the recreation resource.

Travel and Transportation Management

Travel management under Alternative D would not designate any BLM-administered lands as open to motorized travel and would close 37,389 acres (4% of the planning area). The combined effect on motorized recreation opportunities would be minor (661,726 acres would be limited to designated routes). Big-game crucial seasonal ranges would be seasonally closed to motorized vehicle use. Effects from over-snow travel under Alternative D would be the same as effects under Alternative B. The overall beneficial effect of travel management alternatives on the diversity of recreational opportunities in the planning area would be moderate.

Lands with Wilderness Characteristics

Under Alternative D, 6,864 acres would be managed for wilderness characteristics and would ensure the continued availability of primitive and unconfined recreational opportunities in the lands with wilderness characteristics unit. The overall impact to the recreation program would be negligible, as the resource comprises less than one percent of the BLM surface.

Livestock Management

Allowing livestock grazing except where it has been determined to be incompatible with other resource values would not be likely to have additional beneficial effects on the recreation program when compared with Alternative A. Areas with developed recreational facilities and trails could still selectively reduce opportunities for grazing to reduce conflicts between users and livestock. Allowing livestock grazing within the riparian area of Welch Ranch SRMA (372 acres), would require intense coordination between the recreation program and livestock management to minimize user conflicts within the area. The total acreage within SRMAs excluded from livestock management would be approximately 4,840 acres (8.9% of SRMAs under Alternative D). The overall beneficial effect on the recreation program across the planning area would remain within the moderately beneficial threshold.

Special Designations

Areas of Critical Environmental Concern

Alternative D would designate three ACECs (2,849 acres). Under Alternative D, the Welch Ranch would be designated as both an SRMA and an ACEC. Measures to protect the relevance and importance of resources in these areas also would benefit recreation settings in these areas. In designated ACECs, future area-specific plans could further limit surface disturbance or development.

Scenic or Back Country Byways

Considering routes for scenic or BCB designation would promote opportunities for vehicle touring in the planning area. Use is not anticipated to increase substantially, therefore a negligible benefit.

Wild and Scenic Rivers

If Congress releases the Middle Fork Powder River from consideration for designation as a WSR, Alternative D would retain the free-flowing conditions and outstanding resource values. Because the Middle Fork Powder River is a destination for anglers in the region, protection of WSR values would be beneficial to the recreation program.

Wilderness Study Areas

Should Congress act to designate or release WSAs, a plan amendment would take place. There would be no effect on the recreation resource for the life of this plan. Prohibiting mechanized equipment in WSAs would displace any potential opportunities (which are limited at best) within these areas, but would improve nonmechanized recreational opportunities in those areas. Overall, the decision to limit mechanized use in WSAs would have little to no effect on the ability to provide diverse recreational opportunities across the planning area.

4.6.6.7. Cumulative Impacts

Past Actions

According to U.S. Census Bureau data, all three counties have shown positive growth trends since 1990 (U.S. Census Bureau 2013). The BLM has developed campgrounds and other recreation

facilities in several locations throughout the planning area. OHV registrations have increased substantially in the planning area over the last 10 years, in some cases resulting in a proliferation of routes, particularly during fall and winter when hunters pursue big game.

Present Actions

Recreation opportunities in the planning area are provided on BLM-administered lands and in the Bighorn National Forest, Thunder Basin National Grassland, three game ranges managed by the WGFD, and lands managed by the State of Wyoming. Recreation activities include developed recreational sites for hunting, fishing, camping, picnicking, and other activities; OHV use areas; and primitive settings for backpacking and wildlife viewing. There is a variety of opportunities for both developed and dispersed recreation. Hunting licenses are managed by the WGFD; data available between 1990 and 2009 show an increase in hunting as a recreational use.

Walk-in areas are private lands for which the WGFD has leased rights for public hunting access. Walk-in areas provide access to public lands that otherwise have no legal public access. This reduces hunter concentrations on contiguous federal lands, which are preferred by many hunters because landowner permission is no longer a requirement. Hunters displaced by oil and gas development could increase the use of walk-in areas that have not experienced as much development. The WGFD has several projects underway that would improve wildlife habitat. These include vegetative treatments, livestock grazing management, and native fish restoration. All of these projects, when combined with similar BLM actions on federal lands, would maintain or improve the quality of habitat and visual resources, and therefore recreation settings.

Reasonably Foreseeable Future Actions

Increased tourism and population growth in the planning area and the surrounding region could lead to increased demand for recreational opportunities. Visitor satisfaction could be diminished if an area receives higher levels of visitation that are incompatible with the objectives for SRMA and ERMA management referenced in Appendix T (p. 2543). Increased demand for a variety of recreation uses also would increase the possibility of user conflicts. Actions on lands managed by other government agencies that alter travel patterns, runoff, visitation, or environmental conditions could affect the recreation settings on adjacent BLM-administered lands. Potential effects on recreation would result primarily from surface disturbance, energy development, and other industrial activities on federal and non-federal lands. Such activities would reduce the quality of most recreational experiences because of increased roads, night lighting, industrial traffic, noise, and the degradation of visual resources associated with development.

Current oil and gas development projects in the PRB have had substantial effects on recreational resources and settings. Large portions of the PRB are dominated by roads, well pads, tanks, and drill rigs that impact the natural character of the landscape, resulting in displacement of recreationists to other areas. These development areas are no longer desirable for dispersed primitive to semi-primitive recreational activities such as hiking, camping, backpacking, wildlife viewing, or hunting because of the long-term industrial setting. This is a long-term elimination of recreational use in these areas, and therefore a major effect on recreation resources. Wind-energy facilities could affect recreational settings because of the visibility of the turbines, the presence of roads, road closures, safety restrictions, and noise. Large-scale wind-energy developments would greatly detract from the typical middle- to front-country Recreation Opportunity Spectrum settings by creating obvious and dominating visual intrusions on the horizon that would displace some recreationists from the area. Forest product harvests on private or state lands are expected in the southern Big Horn Mountains and could affect recreation resources and visitor experiences with erosion, new roads, ROW, sedimentation, habitat fragmentation, noise, traffic, and dust.

4.6.6.8. Conclusion

Selection of Alternative D will have the most overall beneficial impact to recreation resources by balancing resource protection with opportunities for diverse recreational experiences. Alternative B results in similar effects to recreation resources, but increased restrictions for natural resource protection and travel management result in difficulty in providing diverse recreational opportunities. Alternative A does not designate SRMAs, resulting in one of the greatest restrictions to recreation management compared with other alternatives. Alternative C includes the least restrictions on development, which might facilitate recreation site development, but also includes the least protection for natural resources and viewsheds.

4.6.7. Lands with Wilderness Characteristics

Wilderness characteristics, which include naturalness and outstanding opportunities for solitude or primitive and unconfined recreation, are expected to remain in demand from local residents and visitors who want to experience the primitive nature of portions of the planning area. Businesses that depend on natural landscapes (e.g., ecotourism, guided hunting, and fishing) could benefit from the protection of areas that possess wilderness characteristics. Recreationists who seek back country experiences will prefer lands with wilderness characteristics. Following the wilderness characteristics inventory for the BFO, one unit located along the spine of the southern Big Horn Mountains and totaling 12,237 acres was determined to comprise the lands with wilderness characteristics resource (Map 73). Because the presence of wilderness characteristics is defined by a lack of indicators of human presence, any surface-disturbing activities or placement of above ground structures can adversely affect the lands with wilderness characteristics resource.

4.6.7.1. Methods and Assumptions

To allow for a consistent analysis, the full wilderness characteristics unit proposed under Alternative B (12,237 acres) is used as the area of analysis for all alternatives. The BLM analyzed impacts to wilderness characteristics on the management actions listed in Chapter 2. For example, the BLM would not manage any lands for wilderness characteristics under Alternative C. However, to ensure the analysis is comparable across alternatives, Alternative C analyzes effects to wilderness characteristics for the same geographic area as the other alternatives.

Analysis assumptions may include, but are not limited to:

- The analysis in this section assesses impacts to BLM-administered surface on 12,237 acres determined to meet the criteria for lands with wilderness characteristics (Map 73).
- Parcels determined to lack wilderness characteristics are not analyzed or further considered as lands with wilderness characteristics (unless new information is presented). Lands that were analyzed but do not contain wilderness characteristics are not subject to the alternatives related to the *Lands with Wilderness Characteristics* resource.
- Lands with wilderness characteristics are not subject to BLM Manual 6330 – Management of Wilderness Study Areas (BLM 2012c) or other policies or guidance applicable to WSAs or Wilderness areas. Lands with wilderness characteristics are administrative units.

Significance Criteria

An adverse effect on wilderness characteristics as a result of project actions would be considered potentially significant if:

- An action would violate objectives associated with wilderness characteristics resource management and its magnitude would be such that it could not be mitigated.
- A parcel with wilderness characteristics would be affected to the point that the wilderness characteristics (size, naturalness or outstanding opportunities) would be removed.

Scale of Impacts

The scale of impacts has been slightly modified for the lands with wilderness characteristics resource to more accurately reflect the potential impacts under current forecasts for development. The following terms are used to define the extent of environmental consequences:

- Negligible: The effect on the resource would be barely detectable; the impact from the management actions would not directly affect the presence or absence of lands with wilderness characteristics. This level of effect is considered to be not significant.
- Minor: The impact of the management actions would not be significant and would not be likely to occur under reasonably foreseeable development forecasts.
- Moderate: The impact of the management actions would be likely to occur under reasonably foreseeable development forecasts and would not produce a significant effect or the impact of management actions would be unlikely to occur under reasonably foreseeable development forecasts but would produce a significant effect.
- Major: The impact of the management actions are likely to occur under reasonably foreseeable development forecasts and would produce a significant effect.

4.6.7.2. Impacts Common to All Alternatives

Lands with Wilderness Characteristics

The only management action common to all alternatives is to inventory acquired parcels, a component of the BLM policy to maintain the wilderness characteristics inventory. However, the inventory requirement in itself would not affect management of lands with wilderness characteristics.

Physical Resources

The lands with wilderness characteristics unit contains sensitive soils, water resources, and caves. Generally, management actions that protect physical resources without creating a need for surface disturbance (related to monitoring or reclamation) would have a beneficial effect on the wilderness characteristics resource. The impacts to the wilderness characteristics resource from Physical Resource management actions would have no or indiscernible effects that do not vary across the alternatives; therefore, Physical Resources are not further discussed in this section.

Mineral Resources

Leasable-Coal and Leasable-Other

There is no coal potential or identified Leasable-other resources within the lands with wilderness characteristics unit, therefore no effect is anticipated from these resources and they will not be discussed further in this section.

Locatable, Leasable-Fluids and Salable Minerals

Construction and operation of mines or oil and gas wells and associated infrastructure, including roads, pipelines, and powerlines would disturb soil and vegetation, and would introduce structures that would degrade the naturalness of lands with wilderness characteristics. Noise from construction and operation of producing wells or mines, including the presence of work crews, vehicles, and equipment, would degrade opportunities for solitude and conflict with primitive recreational opportunities near industrial development. Mineral extraction could affect areas with wilderness characteristics that are not withdrawn from mineral entry, closed to oil and gas leasing or subject to a NSO. Effects from mineral extraction would also vary depending on the methods used and size of operations. The slopes within the unit would likely make extraction of mineral resources difficult and less than economically feasible.

The potential for CBNG is very low and there is no potential for conventional oil and gas. No locatable minerals are known to occur in this area in currently commercially viable quantities. Sand and gravel are present within the unit, but the steep slopes within the lands with wilderness characteristics make development of these resources unlikely as other nearby areas may offer more economically viable options for salable mineral development. Should mineral development activity occur within the unit, the impacts to wilderness characteristics would likely be significant and adverse. However, under current development forecasts, the impacts from management actions are considered moderate using the defined scale of impacts for this resource.

Fire and Fuels Management

Firefighting activities and prescribed fire may affect wilderness characteristics. Lightning-caused wildland fire is a naturally occurring phenomenon and considered a part of the natural ecosystem. Prescribed fire may potentially affect the naturalness of the landscape. When persons are physically present during fire and fuels management activities, or when persons leave evidence of their presence (skid roads, burn piles, etc.), there may be an effect on solitude, and to a lesser degree, on primitive and unconfined recreation. Such effects on solitude and primitive and unconfined recreation would likely be short-term. However, hazardous fuels reduction projects and environmental restoration efforts involving fire often benefit wilderness characteristics by restoring the landscape to desired condition classes. The degree of beneficial or adverse effects to lands with wilderness characteristics from fire and fuels management would depend heavily on the methods and mitigation measures implemented at the project level. The fire and fuels management actions common to all alternatives encourage stabilization of burned areas and consideration of affected natural resources and produce a negligible benefit to the lands with wilderness characteristics resource.

Biological Resources**Vegetation – Forests and Woodlands**

While managing healthy forests and woodlands and restoring native vegetative communities would benefit the natural character of lands with wilderness characteristics, use of mechanical equipment to accomplish the objective could diminish naturalness. Also, over the short term, the presence and noise of people and equipment could eliminate opportunities for solitude and primitive forms of recreation near treatment areas. The degree of beneficial or adverse effects to lands with wilderness characteristics from vegetation manipulation associated with forest and woodland resource management would depend heavily on the methods and mitigation measures implemented at the project level. There are no management actions common to all alternatives for

the Forest and Woodland Resources; however, management actions do vary by alternative for this resource and are discussed below.

Vegetation – Grassland and Shrubland Communities, Vegetation – Riparian/Wetland Resources, Invasive Species and Pest Management, Fish, Wildlife and Special Status Species (including Greater Sage-Grouse)

Controlling or prohibiting the introduction of non-native species within an lands with wilderness characteristics unit generally benefits the naturalness of an area over the long term. However, the impacts from grassland and shrubland communities and invasive species and pest management actions to the wilderness characteristics resource would have no or indiscernible effects that do not vary across the alternatives; therefore, these resources are not further discussed in this section. The impacts from riparian/wetland resources are negligible under all alternatives as they produce indirect impacts on a small portion of the lands with wilderness characteristics unit and are not discussed further in the text.

The lands with wilderness characteristics area contains a diversity of vegetation, fish, wildlife, and SSS resources. Management alternatives that improve habitat for endemic wildlife populations would enhance the natural character of lands with wilderness characteristics. Furthermore, sustainable and healthy wildlife populations could expand opportunities for primitive and unconfined recreational opportunities, including wildlife viewing, hunting, and natural history study. The biological resources management actions when considered together have a minor beneficial effect on wilderness characteristics. Prohibitions on development for protection of biological resources (such as near fish-bearing streams, within elk security habitat and special status plant habitat) and an emphasis on provision of quality wildlife habitat would affect the entire lands with wilderness characteristics unit and produce a benefit to the wilderness characteristics resource. However, the impacts from fish, wildlife and SSS management actions to the lands with wilderness characteristics resource do not directly affect the naturalness or outstanding opportunities and the impacts do not substantially vary across alternatives. Therefore, these resources are not further discussed in this section.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Generally, management actions that protect heritage resources would have a beneficial effect on the wilderness characteristics resource. The BLM may provide for legitimate field research by qualified scientists and institutions. These activities could involve temporary surface-disturbing activities like digging and excavation. If these activities occurred in areas with wilderness characteristics, they would create a loss of naturalness and temporarily disturb opportunities for solitude and primitive recreation in the immediate area. Over the long term, however, gaining knowledge about the cultural and paleontological resources of an area, interpreting the resource appropriately, and viewing cultural or paleontological resource sites in the lands with wilderness characteristics would add to the enjoyment of these areas for primitive recreational purposes. Protecting heritage resources also adds to the character of settings that support these recreational opportunities.

Paleontological management alternatives focus on protecting resources of high quality or importance; as none are presently identified within the lands with wilderness characteristics unit, paleontological resources will not be discussed further in this section. The impacts from cultural resource management actions to the lands with wilderness characteristics resource do not directly

affect the naturalness or outstanding opportunities and the impacts do not substantially vary across alternatives. Therefore, cultural resources are not further discussed in this section.

Visual Resources

Land use planning decisions to designate and manage areas under VRM Class I or II objectives would preserve the characteristic landscape. At present, only WSAs and WSR are managed under VRM Class I. VRM Class II objectives would retain the characteristic landscape, allowing for minor changes to the landform and vegetation. This objective would generally protect the natural condition of lands with wilderness characteristics. The objective of VRM Class III is to partially retain the existing character of the landscape, allowing for moderate changes to land and vegetation. This objective is not compatible with preserving the natural character of lands with wilderness characteristics. VRM Class IV objectives allow major modification of the landscape, and is clearly incompatible with preservation of the natural character of lands with wilderness characteristics. In keeping with VRM Class I and II objectives, preserving the natural character of the non-WSA lands with wilderness characteristics also would preserve the undeveloped settings needed to support opportunities for solitude and primitive forms of recreation. Because VRM Class III and IV objectives would not preserve undeveloped settings, naturalness and opportunities for solitude and primitive recreation would be diminished. The visual resources management actions when considered together have a moderate beneficial effect on wilderness characteristics.

Land Resources

Forest Products, Renewable Energy, Rights-of-Way and Corridors, Travel and Transportation Management

Commercial timber operations can adversely affect the presence of naturalness through the creation of logging roads and the presence of heavy machinery. Effects of timber operations on solitude and primitive and unconfined recreation would likely be short-term. Often, environmental restoration efforts or disease control are cost-prohibitive if the project is not part of a commercial timber sale. Thus, timber sales can assist in protection of the natural ecosystem over the long-term. However, the degree of beneficial or adverse long-term effects to lands with wilderness characteristics from forest product management would depend heavily on the method of recovery and mitigation implemented at the project level.

Land use authorizations to approve renewable energy development or to issue ROW such as pipelines and utilities and communication sites would adversely affect wilderness characteristics. Aboveground structures would diminish the naturalness of the immediate area, and in the surrounding areas solitude and primitive and unconfined recreation would be reduced. Burying lines would temporarily affect the naturalness of an area on a localized scale, and through maintenance actions for below-ground facilities. The steep slopes would generally preclude Renewable Energy and ROW development; however, should the construction of wind turbines, roads or transmission lines occur within the unit, the impacts to wilderness characteristics would be significant and adverse. Given the steep slopes and difficulty in accessing the area, and in the context of the scale of impacts described in this section, the impact has been assessed as moderate and adverse.

Allowing cross-country motorized travel in lands with wilderness characteristics would disturb soils and vegetation, which would alter the landscape and diminish the natural character of such lands. Designations that permanently or seasonally close areas to motorized travel would have a beneficial effect on the wilderness characteristics resource. Additionally, portions of the lands with wilderness characteristics unit where motorized travel was previously limited to

existing routes would now limit motorized travel to designated routes, which would have a beneficial effects on the wilderness characteristics resource. The travel management actions, when considered together, have a moderate adverse effect on wilderness characteristics.

Lands and Realty, Recreation, Livestock Grazing Management

No lands within the lands with wilderness characteristics have been identified for disposal under any alternative. Recreation management actions that encourage the development of recreational facilities or motorized vehicle use could affect the naturalness, solitude, and recreation setting in presently undeveloped areas containing wilderness characteristics. However, some facilities (e.g., trailheads and parking lots) might be necessary on the periphery of an area with wilderness characteristics to provide adequate access and opportunities for recreational use of such areas. Proper design and construction techniques can reduce adverse effects from adjacent recreation facilities and help maintain a more natural viewshed. The unit does not overlap any SRMAs under any alternative. The unit overlaps with an ERMA in alternatives A, B and D, but the management of ERMAs does not contain specific land use allocations and is not expected to produce a discernible impact across the alternatives.

Livestock grazing is guided by livestock objectives set in the *Wyoming Standards for Health Rangelands*. Proper levels of livestock use are guided by these standards; therefore, it is not anticipated that livestock grazing would affect lands with wilderness characteristics under any alternative because meeting these standards would promote healthy rangelands. For some visitors, the presence of livestock would be an adverse effect on the desired experience (connection with the natural world and experiences of solitude). However, this effect would be seasonal. At other times of the year, livestock would not be present, and soils and vegetation would recover, decreasing effects on the visitor experience. Much of the lands with wilderness characteristics unit is considered unsuitable for grazing due to steep slopes.

There are no or indiscernible effects to the lands with wilderness characteristics resource across alternatives from the lands and realty, recreation, and livestock grazing management actions, and therefore, these resources will not be discussed further in this section.

Special Designations

Designation of an ACEC or WSR in an area with wilderness characteristics benefits the resource. However, there are no proposed ACECs in the lands with wilderness characteristics unit and the area is not contiguous to a WSA or WSR. Therefore, there would be no effect from ACECs, WSAs or WSR. Designating scenic or BCBs in an area with wilderness characteristics could be detrimental to the resource due to the increased motorized use vehicle use associated with such a designation and the subsequent effect on naturalness and opportunities for solitude. Currently, no roads within the lands with wilderness characteristics unit are being considered for BCB designation, therefore there would be no effect to the lands with wilderness characteristics resource. Special designations will not be considered further in this section.

Socioeconomic Resources

There are no discernible effects from socioeconomic or health and safety management actions common to all alternatives or across the alternatives; therefore, these resources will not be discussed further in this section.

4.6.7.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. Alternative A effects on the wilderness characteristics resource would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Lands with Wilderness Characteristics

Alternative A does not provide any previous decision for the lands with wilderness characteristics unit, thus, protection of this resource would not be provided. The overall management under Alternative A would generally allow for some development within the lands with wilderness characteristics unit, which could significantly impact wilderness characteristics. The resources or management actions with impacts to lands with wilderness characteristics that vary by alternative include locatable, leasable-fluid mineral and salable mineral development, fire and fuels management, forest and woodlands management, forest products, visual resources management, ROWs, renewable energy development, travel management. The discussion of the environmental consequences for the lands with wilderness characteristics resource is limited to these resources for brevity.

Mineral Resources

Locatable Leasable – Fluids and Salable Minerals

The potential for fluid or locatable mineral development is very low and would be unlikely to occur under reasonably foreseeable development forecasts; however the unit would not be recommended for withdrawal from mineral entry, would not be closed to leasing nor subject to an NSO, and would not be closed to salable mineral development under Alternative C. Mineral development could potentially occur and any development would produce a significant effect. Thus, the impact to the lands with wilderness characteristics resource from Locatable, Leasable-Fluids and Salable Minerals under Alternative A is defined as moderately adverse.

Fire and Fuels Management

Under Alternative A, priority is given to suppressing fires in or threatening higher value resources, which would generally include the northern portion of the lands with wilderness characteristics unit as it contains a developed recreation site and WUI. Alternative A also encourages rehabilitation of fire-damaged lands to meet resource objectives, which could benefit lands with wilderness characteristics. The degree of beneficial or adverse effects to Lands with Wilderness Characteristics from fire and fuels management would depend heavily on the methods and mitigation measures implemented.

Biological Resources

Vegetation – Forests and Woodlands

Under Alternative A, many action alternatives had no previous decision or management was determined on a project specific basis. However, designing vegetation projects to protect or improve biodiversity and water quality would benefit the lands with wilderness characteristics resource. The overall benefit to the wilderness characteristics resource is negligible and beneficial.

Heritage and Visual Resources

Visual Resources

Under Alternative A, the lands with wilderness characteristics unit would be classified as VRM Class II on the western portion of the unit and VRM Class IV on the eastern side of the unit. Areas with wilderness characteristics that overlap VRM Class II areas would receive an appropriate level of protection for visual resources in an area with wilderness characteristics, while the portion of the lands with wilderness characteristics unit in VRM Class IV could receive inadequate protection, resulting in a minor adverse impact to the lands with wilderness characteristics resource.

Land Resources

Forest Products

Under Alternative A, allowing sale of minor forest products could encourage surface disturbance and impact naturalness. Conversely, encouraging regeneration within 5 years within a forest management area could benefit naturalness over the long term. Additionally, individual clear-cuts were limited to 20 acres. The degree of beneficial or adverse effects to lands with wilderness characteristics from forest product management would depend heavily on the methods and mitigation measures implemented at the project level. When the management actions for Alternative A are considered in context historic forest product sales, the overall impact to the lands with wilderness characteristics resource from forest and woodland resource alternatives is minor and adverse.

Renewable Energy

Under Alternative A, renewable energy action alternatives had no previous decision. As there are no management actions to analyze for the renewable energy program under Alternative A, there is no effect to the lands with wilderness characteristics resource. However, management actions do vary by alternative for this resource and are discussed below.

Rights-of-Way and Corridors

Alternative A prohibits authorizing ROW on slopes that exceed 25 percent, which includes the majority of the lands with wilderness characteristics unit. Given the steep topography, extensive development of the lands with wilderness characteristics unit is not reasonably foreseeable. The benefit to the lands with wilderness characteristics resource is moderate and beneficial.

Travel and Transportation Management

Alternative A classifies the area as limited to existing routes; under current guidance this area would now be managed as limited to designated routes once travel management has been completed. Motorized travel within the unit would reduce outstanding opportunities for solitude and primitive and unconfined recreation and could impact naturalness. There are no existing routes identified within the unit, thus, the adverse effect on wilderness characteristics is negligible.

4.6.7.4. Alternative B

Alternative B would emphasize resource conservation. Alternative B effects on the wilderness characteristics resource would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Lands with Wilderness Characteristics

Under Alternative B, managing lands with wilderness characteristics (Map 73) to emphasize

ecosystem health, natural values, and primitive recreational opportunities would benefit the wilderness characteristics resource. All 12,237 acres of the lands with wilderness characteristics unit will be managed to protect wilderness characteristics. Management of the lands with wilderness characteristics unit would include closing the area to motorized use; managing the area as VRM Class II; closing the area to mineral leasing (fluid and solid); recommending withdrawal to locatable mineral entry; closing the area to salable mineral development; excluding ROW development; prohibiting commercial woodcutting unless it is a by product of an environmental restoration effort, and prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the area's natural values. The protection of an additional 12,237 acres of lands with wilderness characteristics would be a major beneficial impact to the lands with wilderness characteristics resource.

Mineral Resources

Locatable, Leasable-Fluids and Salable Minerals

Under Alternative B, the lands with wilderness characteristics unit would be recommended for withdrawal from mineral entry, closed to the leasing of solid and fluid minerals and closed to salable mineral development. The preclusion of mineral development is a substantial benefit to the wilderness characteristics resource; given the low development forecast, the benefit is classified as moderate.

Fire and Fuels Management

Under Alternative B, fire could be managed for multiple resource objectives, including allowing fire for resource benefit. Limiting heavy equipment usage to areas near existing roads and trails would also decrease the impacts to naturalness within the unit.

Biological Resources

Vegetation – Forests and Woodlands

Keeping silvicultural treatments to a minimum and encouraging natural processes to run their course without intervention would directly benefit the naturalness criteria within the lands with wilderness characteristics unit. Managing forests/woodlands to emphasize recreation and wildlife could also encourage outstanding opportunities for primitive and unconfined recreation and habitat for sensitive plant and wildlife species.

Heritage and Visual Resources

Visual Resources

Under Alternative B, the lands with wilderness characteristics unit would be managed as VRM Class II management. This would benefit wilderness characteristics by maintaining the natural values of the landscape.

Land Resources

Forest Products, Renewable Energy, Rights-of-Way and Corridors, Travel and Transportation Management

Under Alternative B, the lands with wilderness characteristics unit would be closed commercial

woodcutting unless the project was for environmental restoration, excluded from authorization of ROW grants, closed to renewable-energy development, closed to motorized use, and any other related surface-disturbing activities would be prohibited. Selection of Alternative B would be a major benefit to wilderness characteristics as impacts from forest products, renewable energy, ROWs and corridors or TTM activities would be precluded within the lands with wilderness characteristics unit.

4.6.7.5. Alternative C

Alternative C would emphasize resource use. Alternative C effects on the wilderness characteristics resource would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Lands with Wilderness Characteristics

There would be no special provisions related to protection of wilderness characteristics would not be imposed on lands with wilderness characteristics unit resulting in a major adverse impact to the wilderness characteristics resource.

Mineral Resources

Locatable, Leasable – Fluids and Salable Minerals

The potential for fluid or locatable mineral development is very low would be unlikely to occur under reasonably foreseeable development forecasts; however the unit would not be recommended for withdrawal from mineral entry, would not be closed to leasing nor subject to an NSO, and would not be closed to salable mineral development under Alternative C. Mineral development could potentially occur and any development would produce a significant effect. Thus, the impact to the lands with wilderness characteristics resource from Locatable, Leasable-Fluids and Salable Minerals under Alternative C is defined as moderately adverse.

Fire and Fuels Management

Under Alternative C, full suppression strategies and use of heavy equipment would be encouraged, which could impact naturalness over the long term.

Biological Resources

Vegetation – Forest and Woodland Resources

Using intensive management tactics, such as large clear-cuts, to manage forest and woodland resources could impact the naturalness criteria within the lands with wilderness characteristics unit. Considering the presence of steep slopes and limited historic project proposals in the area, the likelihood of large-scale vegetation manipulation within the lands with wilderness characteristics unit is limited. Thus the benefit is classified as moderate and adverse.

Heritage and Visual Resources

Visual Resources

Under Alternative C, the lands with wilderness characteristics unit would be managed under VRM Class III. This would reduce protections for scenic values in the lands with wilderness

characteristics area. The effect on the wilderness characteristics resource would be minor and adverse.

Land Resources

Forest Products, Renewable Energy, Rights-of-Way and Corridors

Under Alternative C, forest product sales would be managed for maximized economic return, which could encourage surface disturbance and impact naturalness. There would be no limit on the size of individual clear-cuts and forest management would be maintained to minimum stocking levels. The degree of beneficial or adverse effects to lands with wilderness characteristics from forest product management would depend heavily on the methods and mitigation measures implemented at the project level. When the management actions for Alternative C are considered in context with reasonably foreseeable development forecasts and the other selected management actions for Alternative C, the overall impact to the lands with wilderness characteristics resource from mineral resource alternatives is moderate and adverse.

Under Alternative C, renewable energy would be avoided but not excluded. Wind energy projects within the lands with wilderness characteristics unit are not expected as more economically viable options exist in nearby areas. Thus, the impact is expected to be moderate and adverse.

Alternative C allows ROW on slopes that exceed 25 percent, and categorizes the lands with wilderness characteristics unit as open to ROW authorizations. ROW within the majority of the lands with wilderness characteristics unit are not expected as more economically viable options exist in nearby areas. The impact to the lands with wilderness characteristics resource is moderate and adverse.

Travel and Transportation Management

Alternative C classifies the area as limited to designated routes. There are no existing routes identified within the unit, and it is not reasonably foreseeable that any would be designated for motorized use, thus, the adverse effect on wilderness characteristics is negligible.

4.6.7.6. Alternative D

Alternative D may allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the **Proposed RMP**.

Lands with Wilderness Characteristics

Under Alternative D, managing a portion (6,864 acres) of the lands with wilderness characteristics resource (Map 74) to emphasize ecosystem health, natural values, and primitive recreational opportunities would benefit the wilderness characteristics resource.

Several factors affect potential manageability of lands with wilderness characteristics, including the configuration of the unit and the interspersed summer homes at the northern tip of the unit. The narrowness of the unit (0.25 mile in some areas) presents difficulty in managing the southern and western portion of the unit as BLM-administered lands essentially subdivide private lands and lands owned by the State of Wyoming. In this area, the BLM must consider the needs for potential access or services by adjacent landowners. The practicality of managing a narrow strip of land for protection of wilderness characteristics is tenuous. Additionally, lands along the Billy Creek Access road are located within the WUI and forest management activities are desirable to

decrease fuel loads in this region. Additionally, defining the boundaries by section and township lines creates a clear legal description of the unit that is easily identifiable and manageable. The portions of the lands with wilderness characteristics unit meeting manageability criteria (6,864 acres) will be managed to protect lands with wilderness characteristics.

Management of the unit would include closing portion of the area (6,864 acres) to motorized use; managing the area as VRM Class II; applying an NSO for fluid mineral development; recommending withdrawal to locatable mineral entry; closing the area to salable mineral development; excluding ROW development; prohibiting commercial woodcutting unless it is a by product of an environmental restoration effort; and prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the area's natural values. The remaining acres (5,373 acres) within the unit will be managed for multiple use pursuant to the management actions identified for other resources under Alternative D and no special management related to protect the lands with wilderness characteristics resource will be applied. Overall, these management actions will produce a moderate beneficial effect on the wilderness characteristics resource.

Mineral Resources

Locatable, Leasable-Fluids and Salable Minerals

Under Alternative D, a portion of the lands with wilderness characteristics unit (6,864 acres) would be recommended for withdrawal from mineral entry and closed to salable mineral development. Additionally, the portion of the lands with wilderness characteristics unit selected for special management would be available to leasing, but subject to a NSO which would preclude any surface disturbance or above-ground structures in the unit. This would allow for horizontal drilling from outside of the unit while still offering protection of the wilderness characteristics resource. The preclusion of mineral development is a substantial benefit to the wilderness characteristics resource; given the low development forecast, the benefit is classified as moderate.

The remaining portion of the lands with wilderness characteristics unit (5,373 acres) would be open to oil and gas development with moderate constraints and there would be a moderate adverse effect to the wilderness characteristics on this portion. When the management actions for Alternative D are considered in context with reasonably foreseeable development forecasts and the other selected management actions for Alternative D, the overall impact to the lands with wilderness characteristics resource from mineral resource alternatives is minor and beneficial.

Fire and Fuels Management

Under Alternative D, fire could be managed for multiple resource objectives, including allowing fire for resource benefit. Alternative D specifically prohibits heavy equipment usage in lands with wilderness characteristics, which would affect 6,864 acres. In the remaining portion of the lands with wilderness characteristics unit (5,373 acres), heavy equipment usage would be limited to areas near existing roads and trails, decreasing the impacts to naturalness within the unit.

Biological Resources

Vegetation – Forests and Woodlands

Designing and implementing silvicultural treatments for forest health could benefit the naturalness criteria within the lands with wilderness characteristics unit, but to a lesser extent than in

Alternative B. However, encouraging more intensive management of forest and woodland resources could impact naturalness. Similarly, managing forests/woodlands for multiple resources, including recreation, could encourage outstanding opportunities for primitive and unconfined recreation but to a lesser extent than in Alternative B. The degree of beneficial or adverse effects to lands with wilderness characteristics from forest and woodland management would depend heavily on the methods and mitigation measures implemented at the project level. When the management actions for Alternative D are considered in context historic vegetation manipulation and the other selected management actions for Alternative D, the overall impact to the lands with wilderness characteristics resource from forest and woodland resource alternatives is minor and beneficial.

Heritage and Visual Resources

Under Alternative D for VRM management, the entire lands with wilderness characteristics unit (12,237 acres) is proposed for management as VRM Class II. This would benefit wilderness characteristics by maintaining the natural values of the landscape.

Land Resources

Forest Products, Renewable Energy, Rights-of-Way and Corridors, Travel and Transportation Management

Under Alternative D, a portion (6,864 acres) of the lands with wilderness characteristics unit would be closed commercial woodcutting unless the project was for environmental restoration, excluded from authorization of ROW grants, closed to renewable-energy development, closed to motorized use, and any other related surface-disturbing activities would be prohibited. Selection of Alternative D would be a major benefit to the portion managed to protect wilderness characteristics as impacts from forest products, renewable energy, ROWs and corridors or TTM activities would be precluded within the lands with wilderness characteristics unit.

The remaining portion of the lands with wilderness characteristics unit (5,373 acres) would be managed as limited to designated routes or seasonally closed. This portion would also not have specific prohibitions on production of forest products, but project design would encourage protection of natural and aesthetic values. The portion of the lands with wilderness characteristics not managed under Alternative D for LWC-6002 would still be excluded from renewable energy development or granting of ROW. When the management actions for Alternative D are considered in context with reasonably foreseeable development forecasts and the other selected management actions for Alternative D, the overall impact to the lands with wilderness characteristics resource from land resource alternatives is moderate and beneficial.

4.6.7.7. Cumulative Impacts

The lands with wilderness characteristics unit is located in a remote area with steep topography. The majority of the LWC unit is unsuitable for grazing due to steep slopes and the area has very low development potential for minerals. While timber blowdown events have occurred in the past, harvesting of commercially valuable timber has been limited to the periphery of the lands with wilderness characteristics unit, adjacent to the existing road network. Currently, no other projects in the vicinity have been identified.

4.6.7.8. Conclusion

Selection of Alternative D will result in a balanced approach to management of lands with wilderness characteristics resources by focusing protection of wilderness characteristics in areas where such management is most feasible and allowing for flexible management in areas near existing roads and allowing for protection of residences in the WUI. Alternative B results in the most protection of lands with wilderness characteristics resources, but increased restrictions for natural resource protection and travel management result in difficulty in providing quality forest management. Alternative A does not address lands with wilderness characteristics. Alternative C includes the least restrictions on development, which would produce adverse effects on the lands with wilderness characteristics resource.

4.6.8. Livestock Grazing Management

This section describes potential effects on livestock grazing from management actions for other resource programs. Existing conditions concerning livestock grazing management are described in Chapter 3. Management actions and allowable uses that prohibit, limit, or reduce livestock grazing or reduce AUMs in the planning area would have an adverse effect on livestock resources. Deterioration in rangeland health also would be adverse to livestock grazing. Restrictions on livestock grazing or AUM to protect resource values would have an adverse effect. Conversely, beneficial effects on livestock grazing include allowable uses or actions that would improve land health, increase AUM, or decrease restrictions on and costs for livestock grazing operations. For purposes of this analysis, short-term effects on livestock grazing would result from activities that change the AUM allocations or land health within five years of when the activity occurs. Long-term effects remain or occur after five years. Livestock grazing can have beneficial and adverse effects on the health and productivity of vegetative communities in rangelands. Native grasslands evolved with grazers and many grass species respond positively to leaf removal by propagating, which increases vegetative cover. Other beneficial effects of grazing include reduced competition by removing encroaching woody plant cover; hoof action that keeps topsoil loose, increases litter and precipitation penetration, and incorporates seeds into soil; nutrient recycling; removal of wildfire fuels; and control of invasive plant and weed species with properly timed grazing rotations and species (e.g., goats). Adverse effects include direct mortality of native plants through trampling or herbivory, soil compaction and erosion, changes in plant community composition and structure, and increased invasive species spread. Prolonged grazing during the growing season or summer could result in reduced vigor of desired species, changes in species richness, and increased potential for invasion by annual grasses and invasive plant species. Areas where land health is most likely to be adversely affected are areas where livestock congregate. These include areas with water, shade, and more palatable forage. Therefore, rangeland management often is geared toward improving the overall distribution of livestock within an allotment. This is accomplished through implementing BMPs, and developing AMPs or coordinated RMPs, changing grazing systems, and implementing range improvement projects (i.e., fencing, water-development projects, and salt and mineral licks). A recurring effect on livestock grazing is surface-disturbing activities as they relate to energy development. Where allowed, these disturbances would have a direct adverse effect on livestock grazing through vegetative forage removal for the duration of the project or permit, usually over the long term (10 or more years). Reclamation could require short-term (2 to 5 years) removal of livestock on all or a portion of project areas to help achieve reclamation objectives.

4.6.8.1. Methods and Assumptions

Land use activities in the planning area affect livestock grazing management. Effects on livestock grazing are generally the result of activities that affect management of forage levels for individual grazing allotments. This impact analysis and its conclusions are based on interdisciplinary team knowledge of resources and the planning area, review of existing literature, and information provided by specialists within the BLM or other agencies. Effects are quantified where possible. In the absence of quantifiable data, best professional judgment was used.

Assumptions

To determine potential effects on livestock grazing management, certain assumptions were made concerning the level of land use activities, resource conditions, and resource responses, as follows:

- Livestock grazing will continue on public lands in the planning area. Allotments will be managed to improve ecological site condition in coordination and cooperation with other resource uses, including but not limited to, SSS, crucial wildlife habitats, and riparian and wetland systems.
- The Wyoming Standards for Healthy Rangelands (Appendix P (p. 2501)) provide standards and guidelines designed to maintain or improve land health. The BLM will continue to use these standards and guidelines to assess land health and determine appropriate management actions.
- Lands currently designated for stock driveways will remain as designated for that purpose.
- Reserve common allotments will serve as a tool in the management of timber sales, unplanned and prescribed fires, and drought.
- Range improvement projects would continue to be used to achieve management goals.
- Disposal of Category custodial (C) allotments is a priority to reduce administrative requirements. Disposing of these parcels of public land should not substantially affect the overall available AUM.
- The BLM works with grazing lessees to identify and accomplish management objectives.
- Management of invasive plants and pests will continue on the rangelands.
- Minerals development, and its associated surface-disturbing activities, SSS habitats, and the continued expansion of annual bromes will have the greatest future effects on rangelands.
- Allowable uses and management actions that could impact livestock grazing include surface-disturbing activities, fire and fuels management, recreational opportunities, restrictions to protect resource values, restoration and reclamation projects and success, invasive plant and pest management, special status species management, and proactive livestock grazing management. These uses and actions are anticipated to result in short- or long-term changes to land health and AUM allocation.

Significance Criteria

Adverse effects on livestock grazing would be considered potentially significant if the following were to occur:

- Resource management actions substantially reduce or eliminate the availability of public land for grazing.

4.6.8.2. Impacts Common to All Alternatives

Livestock Grazing Management

Livestock grazing would continue in most of the planning area under all alternatives. While livestock grazing management is designed to prevent overgrazing, localized and short-term overutilization is possible. Riparian and wetland systems, in particular, are vulnerable to overgrazing by livestock and wildlife. Grazing strategies, including implementing the Wyoming Standards for Healthy Rangelands, AMP and grazing agreement implementation, proper livestock management, and installation of range improvement projects, are designed to help achieve appropriate levels of forage consumption by livestock and wildlife. AMP and grazing agreements include defined rotations, deferments, periods of rest from grazing, manipulation of season of use, and grazing intensity. These have the ability to alter the amounts and types of vegetation present on the landscape; therefore, they can be used as tools to directly and indirectly manipulate and improve plant community composition, plant structure, plant cover, and vigor of vegetation for over the short and long terms. Designated stock driveways will continue to be used and managed as they currently are. Any changes to stock driveway designations will be evaluated on a project-specific basis and analyzed through an environmental assessment. Areas of concentrated livestock use within stock rests are usually small and isolated. Each year the numbers and types of livestock using the trails vary.

Range improvements would result in localized short-term disturbances, including the flattening or loss of vegetative cover due to construction activities. Placement of water, salt or other supplements results in trampling and small bare areas of vegetation around these livestock concentration sites. In locations where containers are not used, there would be changes in soil chemistry that would delay long-term recovery of vegetation. Construction of reservoirs, wells, troughs and pipelines to provide water will assist in dispersing grazing use. The grazing lessee or other cooperator will be required to maintain water in some troughs located on public land during the frost-free period (April through October) for wildlife. Long-term loss of vegetation would occur near water troughs, pits, and reservoirs, and along fence lines where there are roads or animal trails. However, overall plant composition and vigor would potentially be improved as a result of newly available water sources, fences, and grazing management.

Physical Resources

Air Quality

There are no air quality management actions common to all alternatives or that would vary by alternative that would have an effect on livestock grazing management. Therefore, this section does not further address air quality.

Soil

Using soil surveys and onsite investigations would ensure proper use of soil resources. Soils management actions common to all alternatives would have a major beneficial effect on livestock grazing.

Water Resources

Water management actions common to all alternatives include managing surface-disturbing activities to prevent degradation of water quality, including reducing channel and bank erosion, providing “off-source” water supply in locations where the source is fenced out, and managing water to meet Wyoming Standards for Healthy Rangelands. These actions are designed to reduce

or prevent soil erosion and improve water quality across the entire planning area, and therefore would have a moderate beneficial effect on livestock grazing management.

Cave and Karst Resources

Inventorying, mapping and determining significance of caves and karsts will have no effect on livestock grazing management.

Mineral Resources

Locatable Minerals, Leasable Minerals – Coal and Fluids, and Salable Minerals

Rangeland health and forage production can be directly and indirectly affected by surface disturbance by all four types of mineral development through the loss of forage, spread of invasive plant species, and soil erosion.

Even though few areas are withdrawn from development of locatable minerals, the acres that would be realistically affected is minor (less than 5% of the acres open to livestock grazing). Coal and oil and gas development are anticipated to cause the most long-term surface disturbance and, therefore, the greatest adverse effect on livestock grazing in the planning area. The degree of effect would depend on the rate of development, production success, and how quickly disturbed areas are reclaimed. The effect on AUM allocations could be substantial for individual allotments, but the overall effect of disturbance from oil and gas development on AUMs in the planning area should be moderate. In some cases, oil and gas development can benefit livestock and wildlife by increasing the number of water wells available for livestock watering, thereby improving livestock distribution in an allotment. As with locatable mineral development, the majority of the planning area is open to salable mineral developments. However, it is anticipated that development will only occur on less than 5 percent of the acres available for livestock grazing. Therefore, the effects would be minor adverse. Given the extent of the coal, oil and gas development the overall the effects of mineral resources development on livestock grazing management will be moderate adverse. Overall, the management actions requiring treatment and the use of certified weed seed-free products will have a moderate beneficial effect on livestock grazing.

Fire and Fuels Management

Fire can have beneficial and adverse effects on livestock grazing management. Over the short term, fire and fuels management actions reduce canopy and forage that livestock depend on and can damage facilities such as fences. This damage can have a substantial adverse economic effect on grazing operations by requiring leasing of additional pasture, supplemental feeding of livestock for longer periods, building or repairing fences, and reducing herd size. Long-term, direct, and adverse effects include “livestock grazing strategies on vegetative areas generally include rest the first year following treatments and deferment of livestock grazing the second year” (BLM 2001a). Another long-term and direct effect is that fire could improve the quality and quantity of forage, thereby improving flexibility in managing livestock. This would have a beneficial effect.

Prescribed fire can benefit livestock grazing by improving the quality, quantity, and availability of forage for livestock. Prescribed fire also can help meet specific management objectives, such as improving livestock distribution or removing dense stands of brush. Both wildland and prescribed fire can increase the likelihood of invasive species establishment and spread on the site(s), including cheatgrass. This effect would be long-term, direct, and adverse. The long-term effect of continuous fire suppression is the buildup of hazardous fuels and the increased risk of

severe or catastrophic wildland fires. Overall, the effect of fire and fuels management on livestock grazing management would be minor adverse.

Biological Resources

Vegetation – Forests and Woodlands

There are no forest and woodlands management effects on livestock grazing common to all alternatives or that would vary by alternative. Therefore, forest and woodlands management is not further addressed in the *Livestock Grazing Management* section.

Vegetation – Grassland and Shrubland Communities

Management of vegetative communities, includes determining land health in accordance with the Wyoming Standards for Healthy Rangelands and applying an integrated management approach (e.g., mechanical, chemical, and biological treatments, prescribed fire, and grazing management techniques) to maintain, restore, and enhance the health and diversity of plant communities to achieve resource or multi-resource objectives. These applications to maintain or improve vegetative health would have indirect, beneficial, and long-term effects on livestock grazing. Managing to protect, preserve, or enhance plant communities, including habitat for SSS, could have long-term, indirect, adverse and beneficial effects on livestock grazing because these areas could be protected from surface-disturbing activities. This could benefit livestock grazing management, or could have an adverse effect if these areas become no longer available for grazing.

Managing the siting of facilities and related infrastructure to reduce the number of disturbed sites and acres would result in less disturbance. This would have a direct beneficial effect on livestock grazing management over the long term.

Developing a contingency plan to address catastrophic natural events such as drought, wildfires, and large-scale pest infestations by incorporating strategies that best protect vegetative resources would have a direct adverse effect on livestock grazing over the short term of the events, and an indirect beneficial effect over the long term once sustainable levels of vegetation were reestablished.

Overall, the management actions that are common to all alternatives for grassland and shrubland vegetation communities would have a major beneficial effect because they would maintain or improve the health, vigor and diversity of the vegetation community.

Vegetation – Riparian/Wetland Resources

Developing and implementing activity plans to manage riparian systems to be at or above, or continue to be improving toward, PFC while achieving the Wyoming Standards for Healthy Rangelands would benefit livestock grazing. Managing riparian and wetland systems to enhance forage conditions and improve water quality, and to prevent degradation, loss, or destruction of riparian/wetland habitat also would indirectly benefit livestock grazing over the long term. Riparian areas are more susceptible to the effects of grazing during the hot season (July and early August). Livestock are naturally attracted to areas with water and thermal cover, which requires intensive management to reduce the potential for overgrazing. The use of livestock exclosures to protect seeps and springs would preclude livestock grazing, but would not necessarily stop other animals from grazing in these areas. Developed water sources on uplands would be used to improve distribution of livestock in riparian/wetland areas. This would help to improve species composition, plant densities, and plant vigor in riparian/wetland habitat.

Overall, the management actions that are common to all alternatives for riparian/wetland vegetation communities would have a minor beneficial effect.

Invasive Species and Pest Management

One of the primary indirect and adverse effects on land health and productivity from surface disturbances is the spread of invasive plant species. Surface-disturbing activities typically include mechanical disturbance, mining, and vegetative treatments. Invasive species can out compete native vegetation for water, space, and soil nutrients. These invasive plants can lessen the amount and quality of native forage. They usually are less palatable and less nutritious thereby reducing livestock weight and condition. Managing invasive species and pests to minimize their adverse effects on native plants is a direct benefit to livestock management.

Pest species such as grasshoppers can have an adverse effect on native forage species. Pest directly consume native plants for nutrition and when pest populations exceed their natural threshold, natural and economic injury can occur. This has an indirect adverse effect on livestock grazing by reducing the quantity of forage, and the nutrient content and palatability of the native plants over the short term of the infestation or that year's growing season. Managing invasive species and pests to minimize their adverse effects on native plants can keep forage healthy and available for grazing by livestock and wildlife. This is a direct benefit to livestock management.

Fish and Wildlife Resources – Fish

Improving fish habitat and the health of associated riparian and wetland systems could have a direct adverse effect on livestock grazing over the long term by limiting or excluding livestock grazing in those areas to meet management objectives. However, the acres of fish habitat in grazing allotments within the planning area is less than one percent, therefore a negligible adverse effect.

Fish and Wildlife Resources – Wildlife

Mitigation for surface-disturbing and disruptive activities associated with wildlife habitat management could have an indirect beneficial or adverse effect livestock grazing over the long term, depending on the types, degrees, and locations of the mitigation.

Maintaining or improving important wildlife habitats through vegetative manipulations, habitat improvement projects, and livestock grazing strategies would directly affect livestock. Effects could be adverse or beneficial depending on the type of project, the rest prescription following the treatment, and the types and extents of livestock strategies implemented; effects would be long-term. Exclusions or rest from grazing would be adverse; rotational or deferred grazing could be beneficial. Providing, to the extent possible, suitable habitat and forage to support wildlife population objectives as defined by the WGFD could be adverse if forage demands to support wildlife population objectives and habitat requirements would make less forage available for livestock grazing. Overall, the management actions that are common to all alternatives for wildlife resources would have a minor adverse effect because of the greater limitations to livestock grazing.

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Livestock grazing could maintain or create habitat for sensitive plants by reducing vegetation competition. However, livestock grazing could reduce the occurrence of some species through trampling, consumption, and general site degradation. Implementing actions in recovery plans, conservation measures, terms and conditions, and appropriate BMPs and reasonable and prudent measures in biological opinions for T&E plant species could be adverse or beneficial to livestock grazing. Adverse effects from implemented actions would include, but not be limited to, limiting,

restricting, or excluding livestock grazing, and decreased stocking rates. Beneficial effects could include, but not be limited to, improving forage quality and quantity.

Special considerations for the management of SSS as they are discovered, or if critical habitat is designated, could affect livestock grazing. Limiting the placement or timing of constructing range improvement projects would have a direct adverse effect on livestock grazing by encumbering management flexibility over the long term. Permanent water sources may have to be treated to reduce carriers of WNV; this could increase costs and management. Overall, the effects of SSS management on livestock grazing would be minor adverse.

Heritage and Visual Resources

Cultural

Avoiding cultural resource sites eligible for listing or listed on the National Register, or applying protection provisions to areas adjacent to historic trails could limit the ability to construct rangeland improvement projects that would facilitate improved management of livestock. In addition, cultural resources management could delay construction of range improvement projects by requiring additional surveys and design changes for projects to avoid important cultural sites. These constitute minor adverse effects.

Paleontological Resources

Retaining lands with significant paleontological resources will have no effect on livestock management.

Visual Resources

Management actions common to all alternatives for visual resources will have no effect on livestock management. Grazing livestock and range improvements typically do not attract the attention of casual observers, and therefore are compatible with VRM. The differences in visual resources management by alternative will have no discernible effects on livestock grazing management, and therefore, will not be discussed further in this section.

Land Resources

Forest Products

Forest products harvesting and sales could affect available forage for grazing. Harvesting crews, machinery, and transports associated with permitted commercial or private harvesting of forest products in active grazing allotments likely would have direct, adverse and short-term effects on livestock grazing by displacing or disturbing livestock, increasing the potential for vehicle collisions with animals, and reducing available forage through trampling. However, post-harvest conditions would have a short-term, indirect beneficial effect by opening the canopy, which could then support a greater abundance of available forage in the form of early seral grasses and forbs. The overall effect from forest product management on livestock grazing is anticipated to be negligible adverse.

Lands and Realty

Land disposal acreage has been identified throughout the planning area. Most of the lands identified for consideration for disposal are isolated and generally surrounded by private land. Most land disposed of likely will continue to be grazed under different (e.g., private) ownership. However, the BLM would no longer collect grazing fees. Frequently, land disposal is tied to land exchanges, resulting in no net change in AUMs or only a slight increase or decrease in

AUMs. If lands are only disposed of, this would have a direct adverse effect over the long term because grazing fees from public land grazing would decrease. Land acquisitions would have a direct beneficial effect over the long term because available AUM and associated grazing fees would increase slightly. Overall management actions for lands and realty would have a minor beneficial effect on livestock grazing.

Renewable Energy

The management actions common to all alternatives for renewable energy will have no effect on livestock grazing management.

Rights-of-Way and Corridors

Construction that would result from ROW grants and land use authorizations could create noise that would disturb livestock, limit the area available for livestock distribution, and reduce available forage near project sites. However, the development of access and maintenance roads associated with ROW and other land use authorizations could indirectly affect rangeland management by providing better access to allotments and range projects (e.g., water sites, fences, and corrals) and could be used by lessees to guide or retrieve livestock. The preferred location for new ROW would be in or adjacent to existing disturbed areas associated with existing ROW, constructed roads, or highways, therefore minimizing the amount of surface-disturbing activities that would require reclamation. Minimizing the amount of disturbance would directly benefit livestock grazing over the long term. However, the construction of ROW would have a direct adverse effect on livestock grazing over the long term. The overall effect from ROW and corridor management on livestock grazing is anticipated to be minor adverse.

Travel and Transportation Management

Under all alternatives, the BLM would design, construct, and maintain roads or trails based on the specific objectives for each trail or road in consideration of other resources. Management actions that reduce erosion of soil that in turn affects vegetation would indirectly benefit forage. Minimizing surface disturbance, minimizing surface water runoff to reduce erosion, and restricting travel to posted/designated roads would directly benefit livestock grazing over the long term by minimizing forage loss and reclamation projects. Limiting access or closing roads could affect grazing lessees and management of livestock; this effect would be indirect and long-term. The beneficial effects would outweigh the adverse effect.

Recreation

Closing developed recreation sites such as picnic areas, campgrounds, and EEAs to livestock grazing would have a direct adverse effect on livestock grazing over the long term. However, development of recreation sites is expected to remove only small acreages in various locations.

Lands with Wilderness Characteristics

Evaluating newly acquired lands for wilderness characteristics will have no effect on livestock grazing management.

Special Designations

Areas of Critical Environmental Concern, Scenic or Back Country Byways, Wild and Scenic Rivers, and Wilderness Study Areas

Special designations would directly and adversely affect livestock grazing if they removed livestock grazing from designated areas for the long term. Limitations or restrictions associated with roads could inconvenience grazing lessees in the performance of general ranch maintenance,

including checking fences and water sources. Physical interaction between recreationists and livestock could stress animals; this would have a direct and adverse, but short-term, effect.

Socioeconomic Resources

Social and Economic Conditions

Social and economic resources management actions could affect livestock in a way that could increase or decrease grazing activities. The levels of livestock grazing are integrally linked to supply and demand for livestock, which involves local, national, and international economics and politics, and is therefore difficult to predict on the scale of the planning area. The BLM will refer to socioeconomic monitoring plans for, and remain sensitive to, the economic and social health of affected areas, quantify socioeconomic effects associated with BLM actions to the extent possible, and manage in consideration of these resources.

4.6.8.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. The effects described under Impacts Common to All Alternatives would be in addition to the effects described below for management actions under Alternative A.

Livestock Grazing Management

Under Alternative A, livestock grazing would not be authorized on approximately 4,000 acres of public land in the canyons and slopes of the southern Big Horn Mountains because of the rough terrain and steep slopes. Livestock grazing would be allowed on all public lands in the planning area except on approximately 6,000 acres (1%) where it has been determined to be incompatible with other resource uses or values. Most of these areas produce little vegetation and have fragile soil surfaces and steep slopes. Any permanent increases in the amount of forage produced would be considered for wildlife and watershed protection before additional livestock use is authorized. Providing increases in forage toward habitat and watershed protection before making it available for livestock consumption helps maintain healthy ecological conditions for these resources, but would have a direct adverse effect on livestock grazing over the long term. To benefit livestock grazing, increases in forage produced would be allocated to livestock as the first priority. Alternative A addresses rest periods from livestock grazing following prescribed fire and other vegetative treatments, including rest the first year following treatment and deferment the second year.

Estimations of surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbance. Fences would disturb approximately 70 acres (80 miles), with successful reclamation on approximately 50 acres (57 miles) and approximately 30 acres disturbed over the long term. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1937)).

Physical Resources

Soil

Alternative A soils management actions limit surface-disturbing activities on slopes, badlands,

rock outcrops, and slopes susceptible to mass movement; on soils with poor reclamation suitability; and in areas of severe erosional hazard with timing season restrictions. Actions also include reclaiming roads and trails if they are heavily eroded or washed out, or if other access roads in better condition are available. Surface disturbance on public lands can result in the direct removal of forage available to livestock. Projected surface disturbance under Alternative A is anticipated to result in short- and long-term removal of forage. Surface disturbances can have major direct and indirect adverse effects on land health and forage production through the loss of forage, the spread of invasive plant species, and soil erosion.

Water Resources

Alternative A does not include water management actions that would affect livestock grazing.

Cave and Karst Resources

Alternative A does not include cave and karst management actions.

Mineral Resources

Locatable Minerals

Alternative A locatable minerals entry would be available on all but 43,089 acres of BLM surface. For the planning area overall it is estimated that BLM actions would disturb less than one percent of public land over the next 20 years. This is a negligible adverse effect on livestock grazing management.

Leasable Minerals – Coal and Fluids

Coal development would occur only on a small portion of this acreage, but where it does occur, livestock grazing would be excluded. For oil and gas development, only the WSAs (28,931 acres) would be closed for leasing. Out of approximately 480 allotments, there are 198 allotments in areas considered as having a very high to moderate potential for conventional oil and gas development, and 43 allotments in high-potential areas for coal development, and 198 allotments in areas with very high to moderate potential for CBNG development. Therefore, all or portions of these allotments would likely be affected by coal and oil and gas development under Alternative A. It is estimated that surface disturbance associated with conventional oil development (vertical and horizontal wells) will have a major adverse impact (10.6%) in the short term. However in the long term due to reclamation it will be a minor adverse impact (3.5%). Minerals development that removes the vegetative layer to extract the minerals, and the possible removal of livestock to achieve successful reclamation, would directly and adversely affect livestock grazing over the long term. Short-term, indirect, adverse effects on the livestock animals include, but are not limited to, respiratory ailments from road dust, vehicle collisions with animals, separation of mothers from calves, noise, and movement of livestock from gates left open. These are short-term events, but they occur over the long term of the leases or permits.

Salable Minerals

Alternative A would exclude salable minerals entry on 28,873 acres. For the planning area overall it is estimated that BLM actions would disturb less than 1 percent of public land over the next 20 years. This is a negligible adverse effect on livestock grazing management.

Fire and Fuels Management

Alternative A fire and fuels management actions include suppressing wildfires in high-value areas, rehabilitating fire and suppression damage, and conducting prescribed fires to improve

vegetative health and wildfire habitat. Wildfires affect livestock primarily by direct removal of forage until the next growing season, and displacement of livestock in the burn areas for the short term of the fires (days to weeks). Rehabilitation after wildfires also can displace cattle for up to two years. This would have a direct adverse effect on livestock grazing. Rehabilitation also would have a long-term, indirect beneficial effect because it would help replace dead or damaged forage with new seedlings. Prescribed fire would have an indirect beneficial effect by improving the ecological state of vegetation. However, prescribed fire would have an indirect adverse effect, because treated areas would be rested from livestock grazing for a minimum of two years. Long-term estimates for the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives include approximately 14,000 acres from BLM actions. All acres would be successfully reclaimed (Appendix G (p. 1937)).

Biological Resources

Vegetation – Grassland and Shrubland Communities

Alternative A does not include management decisions for grassland and shrublands. Not having management actions guiding these resources has a direct and adverse effect on the vegetation which directly and adversely effects livestock management.

Vegetation – Riparian/Wetland Resources

Under Alternative A, prohibiting surface disturbance within 500 feet of springs and perennial streams, if the authorized officer waives the prohibition it would still allow actions in those areas. This management would allow disturbance on approximately 23,831 acres of public land (approximately 3.0% of BLM-administered lands in the planning area). The loss of forage, the need for reclamation, the potential to remove livestock, and the opportunity for invasive species to establish and spread, that might occur from surface-disturbing activity all would have a direct moderate adverse effect on livestock grazing.

Invasive Species and Pest Management

Under Alternative A, controlling invasive plant species on public lands in cooperation with county weed and pest control districts would have an indirect beneficial effect on livestock grazing by removing invasive species and improving the ecological state of vegetation, thereby improving the quality and quantity of forage for livestock and wildlife over the long term. Current management has not addressed the invasion of cheatgrass. This annual grass has a direct, adverse, and long-term effect on vegetative communities and is found in all land-type associations. Exact acreages are not known due to a lack of vegetative inventory, but BLM specialists' professional judgment estimates the cheatgrass canopy cover to be 20 to 25 percent of the planning area, making it a major problem. Control treatments have not been pursued because the plant is not listed on the Wyoming Weed and Pest Control Act Designated List and a lack of funding. Livestock grazing is indirectly and adversely affected because cheatgrass is so competitive with native species, repeatedly outcompeting natives for soil nutrients and available water. It has spread and overtaken thousands of acres. Other than in early spring and late fall, cheatgrass is nutrient deficient and increases grazing pressure on adjacent plant communities from livestock and wildlife.

Fish and Wildlife Resources – Fish and Wildlife

Under Alternative A, designating areas where surface-disturbing and disruptive activities are not allowed would have a direct beneficial effect on livestock grazing because these areas would be protected from removal of vegetative forage.

Special Status Species – Plants, Fish, and Wildlife (including Greater Sage-Grouse)

Providing and managing habitat for T&E and special status plant, animal and fish species on all public lands in compliance with the ESA, approved recovery plans, and BLM policy associated with management of habitat would have direct adverse effects on livestock grazing. Actions that would close areas to grazing, limit control efforts for invasive species, and restrict vegetative treatments would have direct adverse effects on livestock grazing over the long term. Protecting SSS habitat would have a direct effect on livestock grazing, beneficial or adverse depending on the species. If management actions and the species habitat requirements favor habitat protection over livestock grazing, protective measures would have a direct adverse effect on livestock grazing. If protecting SSS habitat improves ecological conditions, effects would be indirect and beneficial over the long term. The overall effect from SSS management on livestock grazing is anticipated to be minor adverse.

Heritage and Visual Resources

Under Alternative A, there would be no effects from cultural and visual resources on livestock grazing management.

Land Resources**Forest Products**

Alternative A management includes considering fencing regeneration areas to prevent livestock from damaging seedlings. Livestock could graze young saplings to the degree where fencing or some type of protective device might be needed. Fences would have a direct adverse effect on livestock over the short term, and would be constructed on a project-specific basis. The percentage of acres impacted would be less than one, therefore a negligible effect.

Lands and Realty

Under Alternative A, approximately 108,243 acres of BLM-administered land are identified for disposal. Most are isolated and generally surrounded by private land, and have no access; many of these parcels would be associated with a category C allotment. Land disposals have a direct adverse effect on livestock grazing because such actions would reduce the number of public land acres available for grazing over the long term. Land exchanges would have a direct beneficial effect on livestock grazing. However, public land acreages would likely decline because more acres of public lands would be exchanged for fewer acres. Net loss of public lands would be less under land exchanges than land disposals. Land tenure adjustments on Category C allotments would have a direct beneficial effect on the overall grazing program over the long term because there would be less administration for these small isolated parcels.

Renewable Energy

There is no previous decision so there will be no effect on livestock grazing management.

Rights-of-Way and Corridors

ROW grants and land use authorizations are anticipated to disturb 38,562 acres (14,000 acres of pipelines, 18,550 acres of roads, 4,916 acres of powerlines, 56 acres of communication sites, and 1,040 acres of other disturbances) of BLM surface (4.9%). Prompt reclamation will encourage forage recovery. The effect of ROWs and corridors on livestock grazing would be minor adverse.

Travel and Transportation Management

Alternative A limits motorized vehicle use to existing roads and vehicle routes. Prohibiting vehicular travel in certain areas (approximately 3,650 acres), limiting vehicular travel to designated roads and trails (737,166 acres) in other areas, and seasonally closing areas to vehicular travel (approximately 37,646 acres) would have a direct, minor, beneficial effect on livestock management over the long term. Over 10 percent of the acres open to grazing would benefit from limiting motorized vehicles, therefore a major beneficial effect.

Recreation

Livestock could be disturbed by recreational activity and trampling or soil compaction could reduce available forage and promote noxious and invasive plants establishment. Most of the impacts from dispersed recreation would be direct, adverse, site-specific and short-term. Recreational site development is anticipated to disturb about 5 acres with 100 percent successful reclamation.

Lands with Wilderness Characteristics

There are no public lands, outside of WSAs, presently be managed for wilderness characteristics, so there will be no effect on livestock grazing management.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways, Wild and Scenic Rivers and Wilderness Study Areas

Under Alternative A, special designations, including ACECs, BCBs, WSRs or WSAs, generally would not result in adverse impacts to livestock grazing. All areas historically open to grazing are open under this alternative. However, special designations adversely impact livestock grazing by limiting or closing roads and trails. These closures could have a direct adverse effect on the grazing lessee for access to perform maintenance activities. Special designation areas under Alternative A affect less than one percent of the planning area, and include one recommended WSR and three WSAs, but no ACEC or BCB.

Socioeconomic Resources

There are no anticipated effects from socioeconomic resource management actions.

4.6.8.4. Alternative B

This section describes management actions under Alternative B, which would emphasize resource conservation, and the likely effects on livestock grazing due to their implementation. The impacts described above under Impacts Common to All Alternatives would be in addition to the effects described below for management actions under Alternative B.

Livestock Grazing Management

Alternative B livestock grazing management actions include: (1) prohibiting increases in livestock stocking rates as a result of vegetative treatments; (2) providing a minimum of 2 years rest following prescribed fire, wildfire (in lieu of an approved plan), and other vegetative treatments, with additional rest where necessary; (3) limiting or prohibiting livestock grazing where it has been determined to be incompatible with other resource values; (4) locating livestock salt or mineral supplements a minimum of 0.5 mile from water sources, riparian areas, and aspen stands; (5) designating and managing future reserve **common** allotments as needed and developing

management criteria for the reserve common allotments at the time of designation; (6) authorizing permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority, and livestock grazing as a second priority; (7) reducing or eliminating the potential effects of grazing to meet timber harvest regeneration objectives; and (8) Category M allotments would be managed to achieve multiple resource objectives, Category I allotments would have AMP goals/objectives based on multiple resource and livestock grazing, and Category C allotments would continue with minimal input of resource planning and improvements. These allotments are given consideration for land realty sales or exchanges to reduce overall management of small acreage adjacent to private and State of Wyoming lands. Management actions for Category C allotments are common to all alternatives. Prohibiting increases in livestock stocking rates would ensure that benefits to vegetative treatments would not be lost to increased grazing pressure. This would also reduce the incentive of grazing lessees to support vegetative treatments, and treatments would likely be limited to just the public lands. Locating salt or mineral supplements away from water sources would alleviate grazing pressure and entice livestock to move away from accessible water sources. On specific allotments, the number of riparian systems and location of aspen stands could make the 0.5 mile salt and mineral buffer difficult to administer. reserve common allotments would allow other pastures and allotments to be rested from natural disasters or vegetative treatments if needed. Additional rest allows vegetation to complete two life-cycles, or more if needed, before resuming livestock grazing. This would complicate grazing management since treated locations and pastures would be rested and unavailable for grazing for a minimum of two years. Deferment instead of rest would allow these area to be grazed outside the growing system. Increases in forage would be allocated to watershed protection and wildlife habitat to meet rangeland health standards before making it available to livestock. This could serve as a disincentive for grazing lessees to apply good rangeland management since their livestock would not be the priority to benefit from increases in forage. Protecting new generations of timber species from livestock and wildlife would improve seedling establishment and growth. Other than designating resource reserve common allotments, all these actions would put other resource needs as a higher priority than livestock grazing management and they would have an adverse effect over the long term.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and approximately 30 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1937)).

Physical Resources

Soil

Soils management actions under Alternative B would prohibit surface-disturbing activities on sensitive soils. This would have an indirect beneficial effect on livestock grazing over the long term, because there would be no loss of forage, no reclamation, and no increased opportunities for invasive species to establish and spread.

Water Resources

All Alternative B water management actions would directly benefit livestock management over

the long term. Maintaining water supplies to meet needs includes having adequate water for livestock. Powering water sources with alternative energy could allow water sources to be established in remote locations or in areas without a nearby power source, which would open areas to livestock that are seldom grazed. Prohibiting surface-disturbing activities would prevent disturbance of vegetative forage. Not converting abandoned oil and gas wells to water supply wells for livestock use would have direct adverse effect over for the long term; conversion of wells could help with livestock management and use existing water.

Cave and Karst Resources

Alternative B cave and karst management actions include restricting livestock from entrances to significant caves. This would keep livestock from going into caves and rock shelters, where they could rub on cave and shelter and possibly affect historical pictographs and other significant rock art. Keeping livestock out of these areas would have a direct adverse effect over the long term. However, the restriction would cover a minimal amount of acreage because it would apply only the entrances. Because there has been no completed cave inventory, the number of caves requiring restrictive actions is not known.

Mineral Resources

Locatable Minerals , Leasable Minerals – Coal and Fluids, and Salable Minerals

Any surface-disturbing activity associated with minerals development, including well pads, coal exploration and leasing, areas of extraction, roads, pipelines, and utility corridors, would require removal of vegetation. These disturbances would have a direct adverse effect on livestock until successful reclamation is achieved. The reclamation process itself also would have a direct adverse effect if livestock were removed from reclamation projects to achieve objectives. Alternative B management would reduce the acreage available for exploration and development by 65 percent compared to Alternative A. For locatable, salable, and other leasable minerals, the disturbance level and subsequent effects on livestock grazing would be negligible to minor. For leasable fluid minerals and coal, the disturbance level and associated effects would be moderate.

Fire and Fuels Management

Unplanned fire management actions have an indirect and adverse effect on livestock grazing. Vegetative communities infested with cheatgrass will respond with more cheatgrass due to the additional nitrogen put into the soil by the fire. Suppression efforts would directly benefit livestock grazing by limiting the sizes and locations of the unplanned fires. Allowing unplanned fires to burn in areas where fire can be used as a management tool would have a direct adverse effect over the short term due to the loss of the forage. Over the long term, unplanned and prescribed fire could help improve the vegetative ecological condition, which would translate to improved forage quality and increased quantity. This would have an indirect beneficial effect on livestock grazing. Management actions to rehabilitate all fire-related damage would have a direct, short-term adverse effect if livestock were removed to achieve reclamation objectives. Rehabilitation would have a direct, long-term beneficial effect if the ecological state of the rehabilitated sites was improved and there was an improvement in forage quality and quantity. Overall, the effects from fire and fuels management would have a minor adverse effect on managing livestock grazing.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Under Alternative B, authorizing only native plant species for all reclamation activities would promote native species and eliminate or reduce opportunities for non-native species to be introduced. Use of non-native species could have an indirect beneficial effect on livestock grazing by establishing vegetation on sites quickly and reducing opportunities for erosion and invasive plant establishment.

Vegetation – Riparian/Wetland Resources

Alternative B management actions to prohibit surface-disturbing and disruptive activities within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains would affect approximately 23,831 acres BLM-administered lands in the planning area, and does not include the provision for the authorized officer to waive the prohibitions. This would have a direct beneficial effect on livestock grazing over the long term.

Invasive Species and Pest Management

Alternative B management actions that do not limit aerial application of pesticides and would treat annual brome species throughout the planning area would indirectly benefit livestock grazing. Aerial application of herbicide allows treatment of large areas and in remote areas. Large-scale treatments of invasive plant species would allow native species to prosper in treated areas. Treating cheatgrass also would reduce or eliminate this nutrient-deficient and less palatable invasive species that has affected thousands of federal, state, and private lands. These effects would be minor for noxious weeds and major for cheatgrass, and the effects would be long term for both.

Fish and Wildlife Resources – Fish

Alternative B management actions would consider fish and fish habitat in reservoirs, riparian and wetland systems. Alternative B would apply constraints on surface disturbing and disruptive activities on one percent of acres open to grazing would provide protection of vegetation, soils and forage. If livestock were excluded from these areas, there would be an adverse effect on grazing. Overall, there would be a negligible adverse effect on livestock grazing management.

Fish and Wildlife Resources – Wildlife

Alternative B management actions include not allowing surface disturbance and disruptive activity in crucial elk winter range (50,586 acres) between November 15 and April 30, and in elk calving areas (37,549 acres) from May 1 to June 30 (Map 29). Also no surface disturbance and occupancy within 0.25 mile of all sharp-tailed grouse leks at any time has a negligible effect on livestock grazing. Prohibiting surface disturbance and disruptive activities within 0.5 mile of a big game migration corridor affects 9,587 acres. Traditional migration and travel corridors would be maintained for big game species. Alternative B avoids constrictions of big game corridors and restricting facility development and occupancy within elk crucial winter range and calving areas. Migration and travel corridors would be maintained for big game; this would be done in cooperation with adjacent private land owners due to the mixed land status in these areas. Management of these areas primarily for wildlife could impact the management of livestock by limiting or restricting activities in these areas during stated time periods. Excluding surface-disturbing activities would have a direct benefit to livestock management since forage plants would be available for grazing and opportunities for invasive plants to establish would be limited. The actions that promote wildlife management would have direct adverse effects on livestock management over the long term.

Special Status Species – Plants

Alternative B would restrict livestock grazing to prevent trampling by livestock, and would not allow water developments or mineral, salt, or forage supplements in special status plant species habitat or in other sensitive areas. These restrictions would have a direct adverse effect on livestock grazing over the long term. The allotments where there are special status plant species are a mixture of federal, State of Wyoming, and private ownerships. Protecting special status plant habitat on public lands would likely require the construction of fences to keep livestock out. Protecting potential habitat could require special management or no presence of livestock on hundreds of acres based on the possibility that one plant could be present. SSS plant management would likely have a moderate adverse effect on managing livestock grazing.

Special Status Species – Fish

Alternative B would apply constraints on surface-disturbing and disruptive activities on one percent of acres open to grazing would provide protection of vegetation, soils and forage. If livestock were excluded from these areas, there would be an adverse effect on grazing. Overall, there would be a negligible adverse effect on livestock grazing management.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Increasing the visibility of existing fences to avoid collision from upland game birds would slightly increase costs of range improvement fences. Requiring anti-perching devices in Greater Sage-Grouse habitat would protect young livestock, especially lambs, from raptor predation. Protecting special status wildlife species could conflict with livestock grazing if habitat requirements are contrary to typical habitat requirements, such as those of prairie dogs and mountain plover (approximately 6,156 acres). These habitats are associated with short-grass prairie dominated by blue grama, and these species require an early seral vegetation state to thrive. Prohibiting surface disturbance would have a direct beneficial effect on livestock grazing; however, maintaining current levels of prairie dog populations and not encouraging improvement of the ecological state would have a direct adverse effect on livestock grazing. Prohibiting surface-disturbing activities and disruptive activities could alter locations and timing of installation of range improvements and general ranch management of livestock (e.g., livestock roundups, timing and ability of maintenance/repair of range improvements). Inventories to determine the presence or absence of species could increase costs and affect timeframes of project planning and completion.

Closing grazing within 4.0 miles of Greater Sage-Grouse leks or winter concentration areas would have a major adverse impact on livestock grazing (approximately 467,897 acres of the total 782,102 acres (60%) would be affected. There are no fences or natural barriers separating BLM and non-BLM-administered lands. If the public lands are not leased, the operator must keep livestock off public lands through herding or fencing, or else be in violation of federal grazing regulations. The mixed ownership pattern in the BFO resource area makes herding difficult, in addition to the fact that herding does not ensure that public lands are not grazed. Fences will likely be constructed on private land, fragmenting the area and making BLM unable to stipulate wire spacing to facilitate wildlife movement. In the absence of fences, the BLM must constantly supervise the public lands to assure they are not being grazed.

Restoration of disturbed sagebrush communities due to range improvement projects such as stock water pipelines within nesting, brood-rearing and winter habitat would have a minor adverse impact.

Prohibiting surface disturbance and disruptive activities, and the establishment of disturbance-free zones for Greater Sage-Grouse, raptors, amphibians and reptiles would adversely affect livestock management since these only apply (unless it is associated with mineral leasing) to public land parcels which are usually small in acreage and locations are scattered among private lands. Maintaining the integrity of traditional wildlife migration and travel corridors could also impact management of livestock; these also would comprise a mixture of land statuses. Overall these management actions would have a major adverse impact on livestock management for the long term.

Overall these management actions would have a major adverse impact on livestock management for the long term.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Alternative B cultural resources management actions that restrict or prohibit surface-disturbing activities related to energy development (approximately 330,592 acres, or 42% of the BLM surface in the planning area) would have a direct beneficial effect on livestock grazing. Management actions that require paleontological field surveys on all PFYC Class 3, 4, and 5 formations (approximately 754,668 acres, or 96% of BLM surface in the planning area) would have an indirect adverse effect on livestock grazing. Those surveys and the identification of cultural or paleontological resources could prohibit the placement of a range improvement project, or cause the project to be moved such that it would greatly increase the cost of or cancel the project.

Land Resources

Forest Products

Alternative B management actions would address conflicts between livestock grazing and forest species regeneration. Livestock can graze young saplings, so fencing or other types of barriers would be required. This would have a direct adverse effect on livestock grazing over the short term until regeneration objectives were met.

Lands and Realty

Alternative B management actions to pursue land tenure adjustments or sales on lands with custodial grazing allotments to improve management of the public lands would directly benefit livestock grazing over the long term. Land disposal would have a direct adverse effect on livestock grazing because it would reduce the amount of public land acres available for grazing. Land exchanges would directly benefit livestock grazing. However, public land acreages would likely decline because more acres of public lands would be exchanged for fewer acres. Net loss of public lands would be less under land exchanges than land disposals. Land tenure adjustment on Category C allotments could affect up to 202,012 acres of federal land. This would directly benefit the overall grazing program over the long term by reducing the administration effort necessary to manage 293 custodial allotments that encompass these small isolated parcels of federal lands.

Renewable Energy

Under Alternative B, development of renewable energy would be excluded on approximately 730,530 acres of public land and avoided on an additional 45,441 acres of public land. Less than two percent of BLM-administered lands within grazing allotments could possibly be affected by renewable energy development. Under this alternative, there could be renewable-energy development in areas not presently disturbed by other energy development. With the reduction in

available forage either through surface-disturbance or fencing, this management action has a minor adverse effect on livestock grazing management.

Travel and Transportation Management

Alternative B management actions would limit motorized vehicle use to designated routes within stock driveways. This would reduce adverse effects on forage and potential interactions between livestock and human activities. Closing areas to motorized travel in SSS habitat would adversely affect grazing lessees. Prohibiting vehicular travel and implementing seasonal closures or limitations would reduce disturbance from livestock and adverse effects on forage from trampling or soil compaction. This management would directly benefit livestock grazing over the long term. Administratively closing areas to motorized travel would preclude permitted access for grazing purposes unless such access is determined to be necessary. This would have a direct and adverse impact to management of livestock for the long term. The benefits of protecting forage vegetation outweigh the inconvenience of reduced motor vehicle access, resulting in an overall minor beneficial effect.

Recreation

Alternative B designates seven SRMAs (55,529 acres; 7%) of the BLM-administered land within the planning area and eight ERMAs (726,573 acres). Only small portions of a few of the SRMAs have areas that livestock grazing is currently excluded. Prohibiting surface disturbance in designated SRMAs, unless the disturbance is for administrative purposes, would generally help protect, maintain, and enhance vegetative resources. However, promoting visitor use and access in the SRMAs, would increase the areas' popularity and visitation. This would increase vegetation disturbance from trampling, increase the potential for invasive species introduction and spread, and could result in conflicts between recreationists and livestock. Designation of the ERMAs will not have any effects on livestock grazing.

Alternative B also proposed to close 372 acres along the Tongue Rive of the Welch Ranch Recreation Area to grazing. This would result in a reduction of approximately 144 AUMs of the total 476 authorized AUMs. This closure would have an overall negligible (<1%) adverse effect on livestock grazing management. However, to the individual grazing allotment on the Welch Ranch it would be a major adverse effect. Management actions would have an overall minor adverse effect on livestock grazing management.

Lands with Wilderness Characteristics

Alternative B actions would include managing the full lands with wilderness characteristics area to emphasize vegetative health, natural values, and primitive recreational opportunities on 12,237 acres. With limited surface-disturbing activities, this area would conserve vegetation on the acres open to grazing in the planning area. Managing for wilderness characteristics generally does not preclude livestock grazing. Managing these lands to those standards would have an indirect, negligible, beneficial effect over the long term.

Special Designations

Special designations could affect livestock grazing by limiting or closing roads and trails. This would indirectly benefit livestock, but could have a direct adverse effect on the grazing lessee for access to perform ranch maintenance activities. Effects would be long-term, but negligible. Special designation areas under Alternative B include eight ACECs, six potential byways, one recommended WSR, and three WSAs.

Socioeconomic Resources

There are no anticipated effects from socioeconomic resource management actions.

4.6.8.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource utilization, and the likely resulting effects on livestock grazing due to its implementation. The effects described above under Impacts Common to All Alternatives would be in addition to the effects described below for management actions under Alternative C.

Livestock Grazing Management

Alternative C management actions include taking no action to reduce or eliminate the effects of livestock grazing impacts on timber regeneration following timber harvests. Alternative C management actions would support increases in livestock stocking rates as a result of vegetative treatments. This Alternative would provide a maximum two years of rest following vegetative treatments or wildfire (if no rehab plan of its own). Under Alternative C, growing-season rest would allow vegetation to complete two life-cycles, but pastures or allotments would be available for late summer, fall, and winter grazing. Alternative C limits or prohibitions on livestock grazing in certain areas would be the same as Alternative A; closing areas to livestock grazing would reduce conflicts with other uses. These areas would generally be small, ranging from two to 20 acres, and likely would not affect permitted use on the grazing lease. Locating livestock mineral or salt supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands, would directly benefit livestock grazing by ensuring livestock would not be stressed in obtaining these dietary requirements, but could promote overgrazing and potential trampling of vegetation on these sensitive sites, including habitat for special status plant species. Under Alternative C, not establishing reserve common allotments would prevent flexibility in planning vegetative treatments and addressing droughts and pest invasions. If reserve common allotments were not available, adjustments in livestock numbers, season of use, and grazing periods would be necessary. Alternative C would authorize permanent increases in forage allocations to livestock grazing as the first priority and wildlife habitat and watershed protection as a second priority. Authorizing increases in forage to livestock would be an incentive for grazing lessees to enhance grazing practices. Category M allotments would be managed to achieve livestock management objectives only. Category I allotments would have AMP goals/objectives based livestock management only.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and approximately 30 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1937)).

Physical Resources

Soil

Alternative C soil management actions would not constrain surface-disturbing activities.

Allowing surface-disturbing activities on more than 50 percent of BLM-administered lands available for grazing would decrease available forage and increase opportunities for invasive species to establish and spread throughout the planning area. This would have direct, major adverse effect on livestock grazing.

Water Resources

Alternative C management actions include allowing on-channel reservoirs in the most productive forage sites. Surface discharge would be authorized when permitted by the State of Wyoming, which would allow upland sites to convert to hydric and invasive species. Allowing surface disturbance within 500 feet of springs, perennial streams, and riparian habitat would have a direct adverse effect on livestock grazing by removing or decreasing the quality and quantity of forage.

Cave and Karst Resources

Alternative C cave and karst management would not constrain livestock grazing in those areas.

Mineral Resources

Locatable Minerals, Leasable Minerals – Coal and Fluids, and Salable Minerals

Alternative C mineral resources management would not include new withdrawal from minerals entry. All coal lands would be open to coal exploration and leasing (approximately 195,700 acres of predicted disturbance). Although all acres would be available for coal exploration, leasing history shows only a small portion would actually be developed. Alternative C would make approximately 3,356,010 acres of federal mineral estate available for fluid minerals leasing. It is estimated that surface disturbance associated with conventional oil development (vertical and horizontal wells) will have a major adverse impact (11.6%) in the short term. However in the long term due to reclamation it will be a minor adverse impact (3.8%). Exploration would disturb soils, which would result in lost forage. Removing vegetation would have a direct adverse effect on livestock grazing until disturbed areas were successfully reclaimed. The reclamation process itself also would have a direct and adverse effect if livestock were removed from reclamation projects to achieve reclamation objectives.

Fire and Fuels Management

Full protection of resources would limit size of wildfires, not allowing historical fire patterns to return and would not limit heavy equipment impacts on forage. Management actions to rehabilitate all fire related damage is a direct and adverse impact for the short term if livestock are removed to achieve reclamation objectives. Rehabilitation is a direct benefit long-term if the ecological state of the rehab sites is enhanced and there is an improvement in forage quality and quantity. Use wildfire and other vegetative treatments (prescribed fire) to enhance forage for commodity production is a direct benefit for the long term. Overall the effect of the management action for fire and fuels would have a minor adverse effect on livestock grazing.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Under Alternative C, allowing non-native plant species for initial reclamation could introduce species that out compete native plants; such plant species also could be less palatable and less

nutritious for livestock. This would have a direct adverse effect on livestock grazing over the long term.

Vegetation – Riparian/Wetland Resources

Alternative C management actions would allow surface-disturbing and disruptive activities within 500 feet of riparian/wetland systems, which would remove any protective buffer from these vegetative systems. This would have a direct adverse effect on livestock grazing over the long term. Managing riparian/wetland systems to achieve DFC could affect livestock grazing because the priority management actions would focus on the health and functioning of the systems. Overall, this management would likely have a direct adverse effect on livestock grazing.

Invasive Species and Pest Management

Alternative C management would limit aerial application to insecticides only, which would eliminate the opportunity to treat invasive plant species in large areas, remote locations, and on topography difficult to traverse. The most effective method of herbicide application on cheatgrass and leafy spurge would be eliminated. This would have an indirect adverse effect on livestock grazing. Effects would be minor for most invasive plant species, moderate for leafy spurge in the PRB, and major for cheatgrass throughout the planning area; all effects would be long-term. Over the next 20 years, BLM actions are predicted to treat approximately 10,000 acres.

Fish and Wildlife Resources – Fish

Alternative C would not apply constraints on surface-disturbing and disruptive activities on 1 percent of acres open to grazing and would not provide protection of vegetation, soils and forage. Since livestock will not be excluded from these areas, there would be a negligible beneficial effect on grazing. Overall, there would be a negligible beneficial effect on livestock grazing management.

Fish and Wildlife Resources – Wildlife

Alternative C wildlife management actions, including upland game birds, amphibians and reptiles, migratory birds, special status fish, and special status amphibians and reptiles would not be implemented on a project-specific basis. There would be no prohibitions or limitations on surface-disturbing and disruptive activities except in areas with known populations of species, in designated areas, and during designated periods. Migration and travel corridors composed of mixed land status would be managed consistent with other resource values rather than primarily for big game. Management actions for special status fish would prohibit surface-disturbing and disruptive activities if adverse effects could not be mitigated. Prohibiting or limiting surface-disturbing activities would have a beneficial effect on livestock grazing. Management actions that are consistent with other resource values have an indirect and direct, moderate, beneficial effect on livestock management for the long term.

Special Status Species – Plants

Under Alternative C, the BLM would manage livestock grazing to protect known populations of special status plant species. Possible tools to accomplish this include exclosures, barriers, and timing of grazing. This would have a direct, negligible adverse effect on grazing, but protected areas would incorporate small acreages overall. Over time, as populations of listed species are identified, protected areas would increase.

Special Status Species – Fish

Alternative C management actions would prohibit surface-disturbing activities in less than one percent of the acres open for livestock grazing, this would improve the amount of forage available in those areas. If livestock was eliminated in the areas where stream segments are restored for special status fish species, there would be a negligible adverse effect.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative C management would maintain current levels of prairie dog populations and not encourage improvement of the ecological condition. This would have a direct adverse effect on livestock grazing. Allowing surface-disturbing and disruptive activities in all prairie dog colonies would affect 6,156 acres. Such activities could displace the prairie dogs to another location, where they likely would affect the vegetation to a lower ecological state. This would increase the area of vegetative disturbance and would have a direct, negligible adverse effect on livestock grazing over the long term.

There would be no emphasis to increase visibility of fences to avoid collision from upland game birds. Anti-perching devices in Greater Sage-Grouse habitat would only be required for new powerlines and would protect young livestock, especially lambs, from raptor predators. Prohibiting surface-disturbing activities and disruptive activities could alter locations and timing of installation of range improvements and general ranch management of livestock (e.g., livestock roundups, timing and ability of maintenance/repair of range improvements). Inventories to determine the presence or absence of species could increase costs and affect timeframes of project planning and completion. Prohibiting surface disturbance, disruptive activities, and the establishment of disturbance-free zones would exist for Greater Sage-Grouse and raptors, not amphibians and reptiles; these limitations are smaller in acreage and time span. This would adversely affect livestock management since these only apply to public land parcels (unless it is associated with mineral leasing) which are usually small in acreage and locations are scattered among private lands. Managing traditional wildlife migration and travel corridors consistent with other resources could also impact timing, numbers, and presence or absence of livestock; managing livestock in these localized areas would also be difficult because of the mixture of land status. These management actions would have a minor adverse impact on livestock management for the long term.

Heritage and Visual Resources**Cultural Resources and Paleontological Resources**

Alternative C management actions would not restrict or prohibit surface-disturbing activities related to energy development and would have a direct, minor adverse effect on livestock grazing. Management actions would require field surveys for paleontological resources. This could have a direct adverse effect on livestock grazing if identifying resources prohibited range improvement projects or caused projects to be moved or cancelled.

Land Resources**Forest Products**

Alternative C management would not address conflicts between livestock grazing and forest species regeneration. Livestock could graze young saplings, and fencing or other type of barriers would not be required. This would directly benefit livestock grazing over the long term.

Lands and Realty

Alternative C management would not pursue land tenure adjustments and sales for lands with custodial grazing allotments to improve management of the public lands. This would have a direct, major adverse effect on the administration of livestock grazing on public land over the long term. This would have a direct adverse effect on the overall grazing program over the long

term by not reducing the administrative effort necessary to manage 293 custodial allotments that encompass these small isolated federal parcels.

Renewable Energy

Under Alternative C, renewable energy could affect all but 28,551 acres (less than 10%) of BLM surface. If large tracts of public land were disturbed and vegetation removed or fenced out long term, this management would have a direct, major adverse effect on livestock grazing over the long term. Renewable energy could be developed in areas not presently disturbed by other energy development.

Travel and Transportation Management

Alternative C management actions would allow motorized vehicles within the stock driveways, on saturated soils and on slopes greater than 25 percent, and in special species habitat. Management actions would close or limit travel to designated routes to motorized vehicle use and would implement winter closures (November 15 to April 30) on designated big game ranges. These actions would have a direct, long-term, minor, adverse effect by not protecting the protecting the soil or vegetation resources.

Recreation

Alternative C management actions include designation of six areas as SRMAs with no consideration to additional lands for SRMA designation, leasing minerals in accordance with management for areas surrounding SRMAs, and allowing surface disturbance and salable minerals development in the six designated SRMAs. This would have a direct, minor adverse effect.

Lands with Wilderness Characteristics

There are no special restrictions related to lands with wilderness characteristics so there will be no effect on livestock grazing management.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways, and Wild and Scenic Rivers and Wilderness Study Areas

Special designations under Alternative C could affect livestock grazing by limiting or closing roads and trails. This would indirectly benefit livestock, but could have a direct adverse effect on the grazing lessee for access to perform ranch maintenance activities. Effects would be long-term, but negligible. Special designation areas under Alternative C include one recommended WSR and three WSAs. There would be no effect from ACECs or byways.

Socioeconomic Resources

There are no anticipated effects from socioeconomic resource management actions.

4.6.8.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the Proposed RMP.

This section describes management actions under Alternative D and the likely resulting effects on livestock grazing due to their implementation. The effects described above under Impacts Common to All Alternatives would be in addition to the effects described below for management actions under Alternative D.

Livestock Grazing Management

Alternative D management actions include timber restoration treatments as described under Alternative B; reducing or eliminating potential grazing impacts on timber restoration treatments until regeneration objectives are met, rather than suspending or adjusting livestock grazing use in areas where timber harvest have occurred. Alternative D management of Category M allotments would be the same as under Alternative B. Any permanent increases in forage allocations are considered for watershed protection, livestock grazing, wildlife habitat, and other resource values; allocation would be dependent upon resource goals and objectives of management plans or resource needs. Alternative D would continue to not authorize livestock grazing on approximately 4,000 acres of public land in the canyons and slopes of the southern Big Horn Mountains because of the rough terrain and steep slopes. Livestock grazing would be allowed on all public lands in the planning area except on approximately 6,000 acres (1%) where it has been determined to be incompatible with other resource uses or values. Most of these areas produce little vegetation and have fragile soil surfaces and steep slopes. Preferred management actions would allow livestock grazing on all public lands except where an evaluation has determined it would be incompatible with other resource uses or values, e.g., established campgrounds, entrances of caves. These authorized livestock grazing restrictions are limited to small acreages, estimated to be between 1 and 20 acres. Mineral and salt placement would be managed as described under Alternative C. Reserve common allotments will be managed as described under Alternative B. Rest and deferment following prescribed fires or other vegetative treatments would continue until resource objectives were met. Livestock stocking rates would be allowed to increase based on these vegetative treatments. Management actions have a direct moderate beneficial effect on livestock grazing for the long term.

Physical Resources

Soil

Alternative D soils management actions would allow surface-disturbing activities on sensitive soils when resource objectives can be met. This would have an adverse effect on livestock grazing because areas of disturbance would have to be reclaimed and surface-disturbing activities would promote the establishment and spread of invasive species. These adverse effects would be indirect and long-term.

Alternative D would restrict development on more than 50 percent of BLM surface. Alternative D would work toward ensuring that projects are capable of being reclaimed before the BLM would approve them. Alternative D soils management would have a moderate adverse effect on livestock grazing.

Water Resources

Alternative D water management actions would allow abandoned oil and gas wells to be converted to water supply wells if a beneficial use can be demonstrated. Existing water supply sources would be maintained where possible, and the development of new water supply sources would be allowed to meet demand, consistent with management of other resources. Alternative D would encourage the use of alternative sources of energy (e.g., solar and wind) rather than overhead power or petroleum-based power to power new water resource developments. Actions

to make water available would directly benefit livestock grazing over the long term. Alternative D water management actions would have a minor beneficial effect on livestock grazing.

Cave and Karst Resources

Alternative D management actions would restrict livestock from entrances to significant caves. This would have a direct, long-term, but negligible adverse effect on livestock grazing because it would incorporate minimal total acreage.

Mineral Resources

Locatable Minerals

Alternative D would open 4,720,586 acres of mineral estate to locatable minerals entry (greater than 80% of lands with a grazing lease). It is doubtful that mineral development would occur on all of those acres. For the planning area overall it is estimated that BLM actions would disturb approximately 1,252 acres of public land over the next 20 years. This is a negligible adverse effect (less than 1%) on livestock grazing management.

Leasable Minerals – Coal

All coal lands would be open to coal exploration and leasing (approximately 195,700 acres of predicted disturbance). Although all acres would be available for coal exploration, leasing history shows only a small portion would actually be developed.

Leasable Minerals – Fluids

Under this alternative, there would be 3,314,254 acres of federal mineral estate open for exploration, and 72,276 acres federal mineral estate closed to fluid minerals leasing. This management would have a direct adverse effect on livestock grazing. Specifically, it is estimated that surface disturbance associated with conventional oil development (vertical and horizontal wells) will have a moderate adverse impact (9.4%) in the short term. However in the long term due to reclamation it will be a minor adverse impact (3.1%). There is no anticipated disturbance from geothermal related activity.

Salable Minerals

Alternative D would open 2,725,060 of federal mineral estate to salable minerals exploration and development and close 623,061 acres. For salable minerals development over the next 20 years, the estimated areas of surface disturbance would total 1,193 acres; 224 acres would be reclaimed, leaving 969 acres long-term disturbance (0.1%). Therefore there would be a negligible adverse effect by reducing available forage for livestock grazing.

Fire and Fuels Management

Alternative D response to wildland fires would be the same as described under Alternative B. Alternative D would prohibit heavy equipment use in specified areas except when human safety would be at risk or if the expected effects of the fire would cause more resource damage than the use of heavy equipment. Prohibiting heavy equipment would directly benefit vegetation over the short and long terms. Full protection strategies and tactics would be used in designated areas on approximately 38,760 acres; all protective measures would directly benefit vegetation over the long term, unless allowing a fire to burn would improve vegetative health. Alternative D would use wildfire and other vegetative treatments to meet fire and fuels management objectives. These actions would have an indirect minor beneficial effect on livestock grazing over the long term.

Biological Resources

Vegetation – Grassland and Shrubland Communities

Alternative D would allow the use of non-native species for initial reclamation, as incorporated in an approved reclamation plan. Achieving successful reclamation would remove possible restrictions on livestock grazing and help control invasive species. This would indirectly benefit livestock grazing over the long term.

Vegetation – Riparian/Wetland Resources

Alternative D would allow surface-disturbing activities in riparian/wetland areas when resource objectives can be met and vegetation in CBNG-supported wetland/riparian systems is restored to ecological site potential. In the short term, surface-disturbing activities on 23,831 acres (less than 3% of the acres open to grazing) will cause a minor adverse effect due to the loss of forage. In the long term, with the restoration of most of the riparian vegetation, this would have an indirect negligible adverse effect on livestock grazing.

Invasive Species and Pest Management

Alternative D would authorize aerial applications of pesticides in areas where topography, extent of infestation, target species, and timing limit other application methods. Annual brome areas would be designated and prioritized for treatment. Both these actions would directly benefit vegetative communities in the planning area over the long term, and would have a direct moderate benefit effect on livestock grazing.

Fish and Wildlife Resources – Fish

Alternative D management actions would consider fish and fish habitat in reservoirs, riparian and wetland systems. Alternative D would apply constraints on surface-disturbing and disruptive activities on 6 percent of acres open to grazing would provide protection of vegetation, soils and forage. If livestock were excluded from these areas, there would be an adverse effect on grazing. Overall, there would be a negligible adverse effect on livestock grazing management.

Fish and Wildlife Resources – Wildlife

Alternative D wildlife management would include prohibiting disruptive activity in crucial big game winter range (81,437 acres) during WGFD specified dates, and in elk calving areas (37,549 acres) during WGFD specified dates (Map 29). Historic uses, including livestock grazing, would be exempted. Management actions also include maintaining and reestablishing identified traditional priority travel corridors for big game species and include prohibiting construction of new travel barriers within 0.5 mile of identified big game priority travel corridors (9,587 acres), reducing barriers with cooperation of other agencies, and avoiding constrictions of big game corridors. Allowing above ground facility development within elk crucial winter range and calving areas in when resource objectives can be met. Management actions that exempt historic uses such as livestock grazing are beneficial, other management actions would have direct and indirect minor adverse effects on management of livestock over the long term.

Special Status Species – Plants

Alternative D management actions for special status plant species include allowing the placement of water developments and mineral or salt supplements in SSS habitat, but not in areas with known populations these species. This would have a direct, negligible adverse effect on livestock grazing over the long term by slightly limiting the areas where water developments and supplements can be placed.

Special Status Species – Fish

Alternative D would apply constraints on surface-disturbing and disruptive activities on less than one percent of acres open to grazing and would provide protection of vegetation, soils and forage. If livestock were excluded from these areas, there would be an adverse effect on grazing. Overall, there would be a negligible adverse effect on livestock grazing management.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative D would allow surface-disturbing and disruptive activities in active prairie dog colonies on BLM surface in accordance with identified criteria, if those activities would not adversely affect suitable habitat for SSS that depend on prairie dog colonies. Both the surface disturbance and the protection of the black tailed prairie dog towns would have a direct and adverse effect on livestock grazing for the long term. Existing fences will be prioritized for modification and new fences will meet visibility requirements. Anti-perching devices would be required on new powerline in occupied Greater Sage-Grouse habitat; these also would protect young livestock, especially lambs, from raptor predation.

Prohibiting surface-disturbing activities and disruptive activities in Greater Sage-Grouse Core Population Areas and Core Population Connectivity Corridor, and certain areas outside of them could alter locations and timing of installation of range improvements and general ranch management of livestock. The extent of the effects would vary slightly between the different areas, but all would be moderately adverse. Prohibiting surface disturbance and disruptive activities, and the establishment of disturbance-free zones would exist for Greater Sage-Grouse and raptors. These activities would be avoided for amphibians, reptiles, and bats and their habitats. Prohibitions and avoidances would adversely affect livestock management since these only apply to public land parcels (unless it is associated with mineral leasing) and could be difficult to administer due to land status. Traditional wildlife corridors will be maintained or enhanced, travel corridors will be managed consistent with other resource values. These could affect location and timing of grazing by livestock, livestock numbers, and increase the complexity of grazing livestock in these localized areas of mixed land status. Managing for SSS habitat objectives would have mixed effects depending on species; mountain plover habitat objectives could allow for increased forage utilization while Greater Sage-Grouse habitat objectives might decrease grazing opportunities in localized situations such as nesting habitat to maintain residual cover. Overall, Alternative D management actions would have a moderate adverse impact on livestock management for the long term.

Heritage and Visual Resources

Alternative D management action would prohibit surface disturbances on identified cultural resources sites and would allow disturbance and infrastructure on other identified sites if they would result in a weak visual contrast with the surrounding area. This would have a direct adverse effect on livestock grazing. Alternative D management actions would require paleontological field surveys, which could have an indirect adverse effect if those surveys and identified locations of paleontological resources would prohibit the placement of range improvement projects or cause projects to be cancelled. Overall, Alternative D management of cultural, paleontological, and visual resources would have a minor adverse effect on livestock grazing.

Land Resources

Forest Products

Alternative D management actions include protecting forest regeneration areas, but would not require fencing. Protective measures would include keeping livestock out of these areas. This would have a direct, negligible adverse effect on livestock grazing over the long term.

Lands and Realty

Alternative D management actions to address land tenure adjustments on lands with custodial grazing allotments would be the same minor beneficial effect as management under Alternative B.

Renewable Energy

Alternative D management actions would exclude renewable-energy development in the southern Big Horn Mountains, areas closed to mineral leasing for fluids and solids, locatable minerals, salable minerals, ROW enclosures areas, and other areas where surface disturbance is prohibited for a total exclusion acreage of 352,068 public land acres. Renewable energy development would also be avoided on 374,518 public land acres, leaving less than 6 percent of public land available for development. Overall it is estimated that BLM actions would disturb approximately 75,240 acres over the next 20 years. Reclamation would occur on 50,240 acres of BLM, leaving 25,000 acres (approximately 3% of the public land) of long-term disturbance (Appendix G (p. 1937)). Development where it is allowed would have a direct and minor adverse effect on the vegetation and on livestock grazing over the long term.

Travel and Transportation Management

Alternative D would close special designation areas to motorized vehicle use. Motorized vehicle use in stock driveways would be allowed on designated routes. Motorized vehicle use would be allowed with travel management designations in SSS habitat and on saturated soils or on slopes 25 percent or greater. Alternative D would limit motorized vehicle travel to designated roads and trails, consistent with management of other resources and would seasonally prohibit travel in game ranges. Alternative D management actions would have a direct, minor beneficial effect over the long term.

Recreation

Alternative D designates seven areas as SRMAs (54,160 acres) and eight ERMAs (349,663 acres). Prohibiting surface disturbance in designated SRMAs unless for administrative use would generally help protect, maintain, and enhance vegetative resources. Alternative D allows additional recreation facilities consistent with other resource values which would have a direct adverse effect on vegetation in and around the facilities and could possibly prohibit livestock grazing in these facilities, the effect would be long term. Only small portions of a few of the SRMAs have areas that livestock grazing is currently excluded. Visitor use and access is promoted in SRMAs which would increase popularity and visitation. Increased human activity could promote vegetation disturbance from trampling, increase livestock animal and human interactions, and increase the potential for introduction and spread of invasive plant species; these would have an adverse effect. However, designated SRMAs would also provide increased education opportunities to reduce conflicts. Designation of the ERMAs will not have any effects on livestock grazing. Overall, these management actions would have a minor adverse effect on livestock grazing over the long term.

Lands with Wilderness Characteristics

Alternative D actions would include managing to emphasize vegetative health, natural values, and primitive recreational opportunities on about 6,864 acres in the **lands with wilderness characteristics** unit. With limited surface-disturbing activities, this area would conserve

vegetation on less than one percent of the acres open to grazing in the planning area. Managing for wilderness characteristics generally does not preclude livestock grazing. Managing these lands to those standards would have an indirect, negligible, beneficial effect over the long term.

Special Designations

Areas of Critical Environmental Concern, Scenic or Back Country Byways, Wild and Scenic Rivers, and Wilderness Study Areas

Special designation areas under Alternative D include two ACECs, six potential byways, one recommended WSR, and three WSAs. These special designations generally would not result in adverse impacts to livestock grazing. All areas historically open to grazing are open under this alternative. However, special designations adversely impact livestock grazing by limiting or closing roads and trails. These closures could have a direct adverse effect on the grazing lessee for access to perform ranch maintenance activities. This management would affect less than one percent of the planning area resulting in a negligible adverse effect on the livestock grazing program.

Socioeconomic Resources

There are no anticipated effects from socioeconomic resource management actions.

4.6.8.7. Cumulative Impacts

Chapter 4 describes effects to livestock grazing management from past and present actions, federal and non-federal as part of the affected environment. Non-federal actions will affect livestock grazing management similar to federal actions but mitigation for effects to vegetation resources would differ between federal and non-federal actions. Current management of livestock, vegetation, and wildlife is intended to facilitate achievement of the standards for public land health. Guidelines for livestock grazing management set the parameters for mitigation, restoration, or other measures needed to improve land health. Changing levels of livestock use on public lands could cause changes in grazing practices on private land. A reduction of the time or numbers of livestock allowed on public lands could lead to increased or longer duration of use on private lands which could lead to a decline in the ecological state of these lands and reduce wildlife habitat quality provided by them. The need for land development associated with energy development is expected to increase in the future. As the amount of land required for these types of development or uses increase, impacts on vegetation and other resources from land development, including expanded transportation corridors, utility corridors, and others also are likely to increase. Based on the emphasis for Special Designations and recreational opportunities and the availability of maintained roads, there is a high probability that recreation use would continue to increase in the future. The increased public use in and around the area could lead to more human-caused wildfires, augmented dispersal of invasive plant and noxious weed species, and increased degradation of native plant communities, which could potentially reduce access to and the amount of available forage. As these types of resource uses increase and public perceptions or needs shift, conflicts between new uses and historic livestock grazing could occur. Limitation and prohibitions of surface disturbing activities will facilitate rangelands remaining intact for the benefit of all forage and habitat users.

4.6.8.8. Conclusion

In general, Alternative B management actions would be more conservative than Alternative A management actions for the following resources: soils, water, riparian/wetland communities, SSS, fish, wildlife, cultural and paleontological resources, ROW, livestock grazing, recreation, and special designations. This is primarily because Alternative B would not allow the authorized officer to waive prohibitions on surface-disturbing and disruptive activities for multiple conservation management actions as under Alternative A. In addition, Alternative B would include a number of restrictions (e.g., timing and location).

Treatment of invasive plant species including cheatgrass and other annual grasses, as stated under alternatives B and D, would benefit vegetation systems and improve the habitat and forage for wildlife and livestock species that inhabit these plant communities.

Livestock management would emphasize the allocation of additional forage to habitat and watershed protection before livestock grazing as compared to Alternative C which emphasized livestock grazing. Periods of deferment and rest following wildfires or planned vegetation treatments would allow sufficient rest to achieve the desired ecological condition. Placement of salt or mineral supplements would be a minimum of 500 feet from water sources, riparian areas, and aspen stands under alternatives C and D and a minimum of 0.5 mile under Alternative B.

Livestock management would emphasize the allocation of additional forage to habitat and watershed protection before livestock grazing as compared to Alternative C which emphasized livestock grazing. Periods of deferment and rest following wildfires or planned vegetation treatments would allow sufficient rest to achieve the desired ecological condition. Placement of salt or mineral supplements would be a minimum of 500 feet from water sources, riparian areas, and aspen stands under alternatives C and D and a minimum of 0.5 mile under Alternative B.

SRMAs and other special designation areas would in most cases protect and enhance vegetative resources. More restrictive management under Alternative B and Alternative D with qualifiers, would reduce surface disturbance, which would reduce the opportunity for invasive species to be introduced or spread. Under Alternative C, these areas would be available for minerals leasing and permitting thus subverting invasive species and pest management. The greater the number of recreational facilities and opportunities, the higher the probability of livestock and recreationist confrontation.

Although Alternative B management would result in the fewest acres of surface disturbance and would reduce AUMs the least of all alternatives, it would be the most restrictive on livestock grazing and would have the greatest adverse effects on livestock grazing management compared to the other alternatives. Alternative C management would result in the most long-term acres of surface disturbance and would be the least restrictive on livestock grazing. Alternative D management would result in the second highest acreage of surface disturbance and would be less restrictive on livestock grazing compared to Alternative B. Alternative D's relatively higher surface disturbance is associated with fisheries and wildlife enhancements and range management improvements; these enhancements and the greater management flexibility associated with Alternative D would have the most beneficial effects on livestock grazing compared to the other alternatives.

4.7. Special Designations

4.7.1. Areas of Critical Environmental Concern

This section describes impacts to proposed ACECs in the planning area. ACECs are designated to provide special management for relevant and important values, resources, natural systems, and natural hazards (referred to herein as values of concern). The discussion of ACECs focuses on the values of concern and impacts to those values from other programs. Many of the values of concern in ACECs are also resources with management independent of ACEC designation; this non-ACEC management is addressed under the relevant sections of this chapter. For example, impacts to wildlife values in the proposed Fortification Creek Elk ACEC are discussed below, while the overall impacts to wildlife from management under the alternatives appear in the *Biological Resources* section. The ACECs that would be designated in each alternative are identified in Table 4.62, “Proposed ACEC BLM Surface Acres” (p. 1578).

Table 4.62. Proposed ACEC BLM Surface Acres

Name	Alternative A	Alternative B	Alternative C	Alternative D
Cantonment Reno	0	523	0	0
Burnt Hollow	0	17,280	0	0
Dry Creek Petrified Tree	0	2,567	0	0
Fortification Creek Elk Area	0	32,602	0	0
Hole in the Wall	0	11,952	0	0
Pumpkin Buttes	0	1,731	0	1,731
Sagebrush Ecosystem	0	467,897	0	0
Welch Ranch	0	1,748	0	1,116
Source: BLM 2012f				
ACEC Area of Critical Environmental Concern				
BLM Bureau of Land Management				

4.7.1.1. Methods and Assumptions

Generally, an ACEC designation will result in additional prescriptions for other land use activities in the ACEC to protect the associated relevant and important features. Degradation of relevant and important values would primarily occur from surface-disturbing activities. Other activities, such as vegetation manipulation and OHV use, could affect relevant and important values by removing soil and vegetation. Protecting relevant and important values in proposed ACECs would result from the implementation of management actions designed to protect physical, biological, and heritage resources. Management actions for soils, water, vegetation, and fish and wildlife usually limit the extent of surface-disturbing activities and associated vegetation removal. This is generally achieved through the designation of protective buffers, area closures, restrictions on surface use, and other measures.

Scale of impacts:

- Negligible – Less than 1 percent of proposed ACECs would be affected; only a small portion of a single evaluated ACEC would be affected.
- Minor – 1 percent to 5 percent of proposed ACECs would be affected; a moderate portion of a single evaluated ACEC or small portions of two to three evaluated ACECs would be affected.

- Moderate – 5 percent to 10 percent of proposed ACECs would be affected; the majority of a single evaluated ACEC or moderate portions of two to four evaluated ACECs would be affected.
- Major – 10 percent of proposed ACECs would be affected; the majority of several evaluated ACECs or moderate portions of most evaluated ACECs would be affected.

To protect the values for which each ACEC is designated, the BLM will formulate specific management decisions and mitigation measures for each ACEC (Appendix S (p. 2531)). While non-BLM-administered lands may appear within ACEC administrative boundaries, management prescriptions will only apply to BLM actions. ACEC designation would not affect valid existing rights.

To allow for a consistent analysis, the ACEC boundaries proposed under Alternative B are used as the area of analysis for all alternatives. Using Alternative B boundaries, the analysis compares the impacts of management actions to ACEC values in these areas. The BLM based the determination of impacts to ACEC values on the management actions listed in Chapter 2. For example, the BLM would not designate any ACECs under Alternative C. However, to ensure the analysis is comparable across alternatives, Alternative C analyzes effects to ACEC values for the same geographic area as the other alternatives. The adverse and beneficial impacts to ACEC values are discussed under Alternative C just as they are under the other alternatives.

Significance Criteria

An adverse effect on ACECs as a result of project actions would be considered potentially significant if the following were to occur:

- Management actions would result in long-term elimination or reduction of the “relevant and important values” for which the ACEC was proposed.
- The intensity of development would not be compatible with the stated objectives of an ACEC.

4.7.1.2. Impacts Common to All Alternatives

Areas of Critical Environmental Concern

Common to all alternatives, BLM activities would be mitigated to protect the integrity and characteristics of designated ACECs. There are presently no ACECs within the planning area (Alternative A), Alternative B would designate eight ACECs, no ACECs would be designated under Alternative C, and three ACECs would be designated with Alternative D.

Physical Resources

Air Quality

Managing prescribed burns, and implementing mitigation measures to reduce emissions would beneficially affect ACECs by protecting the air quality and visibility within and surrounding ACECs. These management actions would be applied throughout the planning area and could affect all ACECs, therefore the level of effect is major beneficial.

Soil

Soil management actions common to all alternatives include mitigating surface-disturbing activities and requiring reclamation plans. Soil typically is one of, or supports, ACEC resource

values. These actions would be applied to BLM actions across the entire planning area, which could have a major beneficial effect on ACECs.

Water Resources

Water management actions common to all alternatives include providing alternative or “off-source” water, installing flow-control devices, managing surface-disturbing activities to prevent degradation of water quality, minimizing impacts to groundwater, reducing channel and bank erosion, and managing water to meet Wyoming Standards for Healthy Rangelands. Water typically is one of, or supports, ACEC resource values. These actions would be applied to BLM actions across the entire planning area, which could have a major beneficial effect on ACECs.

Cave and Karst Resources

The cave and karst program does not have any management actions common to all alternatives that would effect ACEC management. Common to all management actions relate to inventories and not cave protection.

Mineral Resources

Under management actions common to all alternatives, almost the entire planning area would be available for exploration and development of locatable, leasable fluid, and salable minerals.

Locatable Minerals

There is likely to be minimal overlap between locatable minerals activities and potential ACECs. There are no active or proposed mines within or adjacent to potential ACECs. The maximum foreseeable locatable minerals development is 1,455 acres of BLM surface (0.2%) in the planning area. Therefore, the potential for locatable minerals development to affect ACEC resource values would be negligible.

Leasable Minerals - Coal

Areas identified as acceptable for further coal leasing consideration occur in central Campbell County and northern Sheridan County, which would include the Welch Ranch and western edge of the Burnt Hollow evaluation areas. There are currently no active coal mines within Sheridan County. Coal has been leased for mining within 3.5 miles of the proposed Burnt Hollow ACEC. There is not an existing lease or a lease application that includes or is adjacent to Burnt Hollow. Coal mining within or adjacent to proposed ACECs is not foreseeable during the planning period, therefore effects to ACEC resources would be negligible across all alternatives. Therefore, the impacts to ACECs will not be discussed further.

Leasable Minerals - Fluids

The federal oil and gas mineral estate within the planning area is available for leasing, including for geothermal activity, unless administratively closed. Lessees would be required to minimize adverse resource impacts. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, and Pumpkin Buttes have high potential for CBNG development; Fortification Creek has moderate potential for conventional development. Fluid mineral surface-disturbing activities and production operations within ACECs could have major adverse impacts on ACEC values.

Salable Minerals

BLM-authorized salable mineral development is taking place adjacent to the Dry Creek Petrified Tree and Welch Ranch proposed ACECs. In addition to these two proposed ACECs, sand and gravel deposits occur within three additional proposed ACECs: Burnt Hollow, Cantonment Reno, and Fortification Creek. Salable mineral operations are generally localized and confined;

occurring in discrete locations, not widespread such as oil and gas wells. Salable mineral activities within ACECs could have moderate adverse impacts on ACEC values.

Fire and Fuels Management

Unplanned Fire (Wildfire)

Common to all alternatives, a resource advisor would be consulted or assigned to any wildland fires potentially affecting ACECs, fire retardant would be restricted or prohibited to protect rock art or surface water, and fire lines would be rehabilitated to prevent or control erosion. These actions would be applied to across the entire planning area, which could have a major beneficial effect on ACECs.

Planned Fire (Prescribed Fire)

Management actions common to all alternatives include: reducing hazardous fuels within WUIs, and ensuring prescribed burning activities comply with air quality and smoke management rules. These management actions would benefit ACECs by reducing the potential for catastrophic wildfire and by protecting the air quality and visibility within the ACECs. Planned fire has occurred historically only within the proposed Fortification Creek ACEC. There are no foreseeable planned fire activities within any of the proposed ACECs, therefore the level of beneficial effect is negligible.

Biological Resources

Management actions for biological resources are designed to protect those resources typically by limiting surface-disturbing activities which would likely benefit ACEC values.

Vegetation – Forests and Woodlands

There are no management actions common to all alternatives for forest and woodland resources that would affect ACEC values.

Vegetation – Grassland and Shrubland Communities

Grass and shrub communities are the predominant vegetation types within the planning area. Relevant management actions include managing vegetation communities for healthy rangelands; using an integrated management approach to enhance the health and diversity of plant communities; managing the location of facilities, routes, and uses to reduce impacts to vegetation; and cooperatively managing plant communities to maintain healthy rangelands. These actions would be applied across the entire planning area, which would have a major beneficial effect on potential ACECs.

Vegetation – Riparian/Wetland Resources

Management actions common to all alternatives that could affect ACECs include managing riparian and wetland habitats to improve water quality, to manage towards properly functioning condition, to cooperatively enhance riparian/wetland systems, and to prevent the loss or degradation of riparian/wetland habitat. All potential ACECs except Pumpkin Buttes, contain riparian and/or wetland communities. Riparian/wetland management actions could have a major beneficial effect on ACEC values.

Invasive Species and Pest Management

Management actions common to all alternatives that could affect ACECs include an integrated approach to pest management, limiting surface disturbance, use of certified weed seed-free

products, and requiring invasive species treatment. These actions would benefit native vegetative communities, an ACEC value. These actions would be applied to across the entire planning area, which would have a major beneficial effect on potential ACECs.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

There are several fisheries management actions that could affect ACECs including developing mitigation for surface-disturbing and disruptive activities, managing barriers to fish passage, providing public access to fish-bearing waters, managing non-native vegetation, and providing cooperative fisheries education. These management actions would benefit fish, an ACEC value. All potential ACECs except Pumpkin Buttes, contain streams capable of supporting fish. Fisheries management actions could have a major beneficial effect on ACEC values. Welch Ranch is the only potential ACEC capable of supporting current special status fish species (Yellowstone cutthroat trout), therefore the beneficial effect of special status fish management actions on ACEC values is negligible.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Wildlife and SSS management actions common to all alternatives include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing, maintaining, and restoring Greater Sage-Grouse habitat; and a permanent disturbance-free buffer for bald eagle nests. Collectively, these actions could have a major beneficial effect on ACECs by promoting habitat protection while causing the relocation, modification, or redesign of surface disturbing activities. These actions would be applied across the entire planning area, where the appropriate wildlife resources are present, which would have a major beneficial effect on potential ACECs.

Special Status Species – Plants

SSS plant management actions common to all alternatives include implementing conservation measures and BMPs, and allowing vegetation treatments that would benefit the species. These actions would benefit ACECs by protecting special status plant habitat and native vegetation communities. However, Hole in the Wall is the only potential ACEC containing special status plant habitat (11,952 acres), therefore the level of beneficial effect on potential ACECs would be minor.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources

Public lands containing areas important to Native Americans or significant paleontological resources would be retained. Pumpkin Buttes is a proposed ACEC important to Native Americans and Dry Creek Petrified Tree is a potential ACEC containing significant paleontological resources. These management actions would have a moderate beneficial effect on ACECs as they would be limited to two of the eight potential ACECs.

Visual Resources

A management action common to all alternatives is the requirement for permanent facilities to blend with the surrounding landscape. This requirement is secondary to managing within the VRM class, meaning that although facilities might be visible within VRM Class II through IV areas, mitigation for adverse effects on visual resources should be included wherever possible. Blending permanent facilities would help mitigate visual impacts, however development activities

would likely still be readily visible and therefore the beneficial effect of the management action on ACEC values is likely to be negligible.

Land Resources

Forest Products

Forests and woodlands of the planning area would be available for the collection and harvest of forest products, except within 200 feet of surface waters. The harvest of forest products could adversely affect ACEC resource values such as fragile soils and watersheds, and visual resources. Burnt Hollow, Fortification Creek, Hole in the Wall, Pumpkin Buttes, and Welch Ranch potential ACECs all contain forest or woodland vegetation that could be available for forest product use. However, the commercial timber areas where forest product use would be most foreseeable does not overlap any proposed ACEC, therefore the anticipated level of adverse effect on ACEC values would be negligible.

Lands and Realty

Management actions common to all alternatives affecting ACEC values include the consideration of land withdrawal or disposal and signage to aid access and avoid trespass. Withdrawal of surface-disturbing activities such as mineral development and reducing trespass would benefit ACEC values. Disposal of public lands containing ACEC values would be an adverse effect. Increased access could also be an adverse effect if the ACEC values are not protected from the increased use. It is unlikely that public lands containing ACEC values would be disposed of. ACEC specific management plans would reduce the potential for adverse effects from facilitated access to the ACECs. Overall, the level of effect from lands and realty actions on ACEC values is expected to be minor adverse.

Renewable Energy

The renewable-energy program does not have any management actions common to all alternatives that would affect ACEC management. Effects will vary by alternative.

Rights-of-Way and Corridors

Management actions common to all alternatives affecting ACEC values include designating ROW corridors to minimize impacts to other resources, with the preferred ROW location being within or adjacent to existing disturbance; providing access to public lands; and maintaining a transportation system. ROW within ACECs would adversely affect ACEC values. However, the management actions common to all alternatives are designed to minimize impacts to other resources including ACECs, therefore the level of anticipated effect is minor adverse.

Travel and Transportation Management

Management actions common to all alternatives relate to standards for the location, design, and maintenance of roads. Roads within ACECs would adversely affect ACEC values. However, the management actions common to all alternatives are designed to provide a safe transportation network while minimizing impacts to other resources including ACECs, therefore the level of anticipated effect is minor adverse.

Recreation

Management actions common to all alternatives encourage and provide for the recreational use of public lands. Management actions are included for the protection of riparian areas and surface water. Most potential ACECs are also desirable for recreation opportunities; however access to Cantonment Reno, Fortification Creek, and Pumpkin Buttes is limited. ACEC-specific

management plans would reduce the potential for adverse effects from recreation use. Overall, the level of effect of recreation management actions on ACEC values is expected to be minor adverse.

Lands With Wilderness Characteristics

Management actions common to all alternatives would not affect ACEC values as they pertain to inventory rather than direct physical land management. Additionally, wilderness characteristic inventories identified one area with wilderness characteristics, which is not contiguous with or adjacent to any proposed ACECs. Therefore, lands with wilderness characteristics will not be discussed further in the ACEC section.

Livestock Grazing Management

Livestock grazing would be managed to achieve healthy rangelands and special habitats. Poorly managed grazing can impair ACEC values by over utilizing native vegetation, increasing erosion and stream sedimentation. Properly managed grazing can avoid these impacts and be beneficial to some resources. Overall, the level of anticipated effect is negligible adverse, as not all adverse effects can be avoided or mitigated such as inadvertent trampling of cultural artifacts or temporary over utilization.

Special Designations

Scenic or Back Country Byways

Presently there are no byways within the planning area. The potential Tipperary/Thompson Creek Roads byway access the potential Dry Creek Petrified Tree ACEC. If the Tipperary/Thompson Creek Roads byway were to be designated, it would be managed to encourage responsible use while protecting resource values. Increased byway use could lead to increased use of the potential Dry Creek Petrified Tree ACEC. An ACEC specific management plan would reduce the potential for adverse effects from recreation use. Overall the level of effect on ACEC values is expected to be negligible adverse, as only one potential ACEC would be affected and the site-specific management plan would reduce adverse effects.

Wild and Scenic Rivers

There are no management actions for WSRs that would affect ACEC values as the Middle Fork Powder River suitable WSR segment is not contained within a potential ACEC. WSRs will not be discussed further in this section.

Wilderness Study Areas

The Fortification Creek evaluation area is the only evaluation area to contain a WSA. Common to all alternatives, WSAs would be managed to preserve natural conditions and processes. WSA management would benefit ACEC values. Since Fortification Creek is the only evaluation area containing a WSA, the level of beneficial effect would be negligible. The effects of WSA management actions on ACECs do not vary by alternative and the resources will not be discussed further.

Socioeconomic Resources

Social and Economic Conditions

There are no social or economic management actions common to all alternatives or by alternative that would have a measurable effect on ACEC values. Therefore, these topics are not addressed further in this section.

Health and Safety

Management actions common to all alternatives control, manage, and mitigate health and safety hazards. Environmental hazards such as the coal fire at Welch Ranch can benefit ACEC values. While these management actions are primarily designed for the protection of human health and safety they often protect other resources such as soil, vegetation, and wildlife. The application of these actions is generally limited in time and space, therefore the level of beneficial effect is minor.

Health and safety does not have any management actions that vary by alternative, therefore there is no effect to ACECs and will not be discussed further in this section.

4.7.1.3. Alternative A**Areas of Critical Environmental Concern**

There are presently no ACECs within the planning area and no additional ACECs would be designated. The PRB Final EIS (BLM 2003c) analyzed all of the ACECs that would be designated under Alternative B with the exception of the Welch Ranch. The PRB Final EIS concluded that present management was sufficient to protect the relevant and important ACEC values. The PRB Final EIS was an oil and gas project and therefore did not analyze all potential land use activities affecting ACEC values. Land uses such as renewable-energy development, ROWs, and other mineral development could adversely affect ACEC values. However, since oil and gas development is one of the primary land uses within the planning area and other land uses are often correlated with oil and gas (such as ROW) the level of adverse effect is anticipated to be minor.

Physical Resources**Air Quality**

Alternative A would analyze the effects of activities on air quality and may include modeling. Data analysis and modeling do not directly relate to ACEC management, therefore there would be no effect to ACEC values.

Soil and Water Resources

Management actions regulate surface disturbing activities on sensitive soils and near water resources while allowing for exceptions. The intent of the management actions are to allow for resource use while protecting sensitive soils and water. However management has been applied inconsistently, adversely affecting soil and water resources and therefore ACEC values in many situations. Sensitive soils and water resources are present within all the areas being evaluated resulting in an overall moderate adverse effect.

Cave and Karst Resources

Cave and karst resources are associated with the Big Horn Mountains. Only the Hole-in-the-Wall evaluation area contains karst-bearing formations. There are no cave and karst management actions in the 1985 RMP, therefore management in cave and karst areas are considered on a project-specific basis; which has led to inconsistent management of surface-disturbing activities. The potential for surface-disturbing activities in cave and karst areas is relatively low, related both to the difficult topography and limited potential for mineral resources. Because of the limited foreseeable activity, the lack of previous management actions to consistently protect cave and karst resources, and only one evaluation area being affected, overall there would be a negligible adverse effect on ACEC values.

Mineral Resources

Under management actions common to all alternatives, almost the entire planning area would be available for exploration and development of locatable, leasable fluid, and salable minerals.

Locatable Minerals

Locatable minerals have been withdrawn from three WHMAs and locatable mineral activities are restricted within the three WSAs. The only ACEC evaluation area to benefit from these withdrawals and restrictions is Fortification Creek. There is potential for locatable mineral activity within the other evaluation areas and within Fortification Creek outside the WSA. However, there are no active or proposed mines within or adjacent to ACEC evaluation areas. The maximum foreseeable locatable minerals development is 1,455 acres (0.2%) of BLM surface in the planning area. Therefore, the potential for locatable minerals development to affect ACEC resource values would be negligible.

Leasable Minerals - Fluids

Nearly the entire federal oil and gas mineral estate within the planning area is available for leasing, including for geothermal activity. Lessees would be required to minimize adverse resource impacts. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, and Pumpkin Buttes have high potential for CBNG development; Fortification Creek has moderate potential for conventional development. Fluid mineral surface-disturbing activities and production operations within ACECs would have major adverse impacts on ACEC values.

Salable Minerals

Mineral material activity is prohibited within WSAs, which would benefit a portion of the proposed Fortification Creek ACEC. BLM-authorized salable mineral development is taking place adjacent to the Dry Creek Petrified Tree and Welch Ranch evaluation areas. In addition to these two areas, sand and gravel deposits occur within three additional evaluation areas: Burnt Hollow, Cantonment Reno, and Fortification Creek. Salable mineral operations are generally localized and confined; occurring in discrete locations, not widespread such as oil and gas wells. Salable mineral activities within ACECs would have moderate adverse impacts on ACEC values.

Fire and Fuels Management

Unplanned Fire (Wildfire)

Present management of unplanned fires takes resource values into consideration during suppression activities. There are no existing ACECs, therefore ACECs would not be considered as an independent resource value but the relevant and important resource values (physical, biological, cultural, etc.) would be. Designation could heighten the awareness and therefore the protection of ACEC values, the lack of designation could result in resource values being overlooked. However, since all resource values should be considered during suppression, the adverse effect would be negligible.

Planned Fire (Prescribed Fire)

Prescribed fire would be used to support vegetation and wildlife habitat objectives. These management actions could benefit ACEC evaluation areas as vegetation and wildlife are often the relevant and important ACEC values. There are no foreseeable planned fire activities within any of the evaluation areas, therefore the level of beneficial effect is negligible.

Biological Resources

Management actions for biological resources are designed to protect those resources typically by limiting surface-disturbing activities which would likely benefit ACEC values.

Vegetation – Forests and Woodlands

Forest and woodland treatments would be designed to improve forest health, biodiversity, and water quality. Five evaluation areas (Burnt Hollow, Fortification Creek, Hole-in-the-Wall, Pumpkin Buttes, and Welch Ranch) contain forest and woodland communities. The evaluation areas should benefit from these management actions. Designation would heighten the awareness and therefore the protection of ACEC values, the lack of designation could result in resource values being overlooked. However, since all resource values should be considered, ACEC values should benefit, but to a minor degree.

Vegetation – Grassland and Shrubland Communities

The only management action which varies by alternative relates to the use of non-native plant species for reclamation. The present RMP did not address the issue, therefore non-native plants are used in accordance with the BLM reclamation policy and are considered on a project-specific basis. There is development potential within all evaluation areas particularly without ACEC-specific management, which would regulate development activities. The presence of non-native species would detract from naturalness values for knowledgeable public land users. However, since reclamation areas would be limited in scale and duration, the adverse effect would be negligible.

Vegetation – Riparian/Wetland Resources

Current management prohibits surface-disturbing activities within 500 feet of surface water unless the prohibition is waived. All evaluation areas except Pumpkin Buttes contain riparian and/or wetland communities. Management has been applied inconsistently, adversely effecting riparian and wetland resources and therefore ACEC values in many situations. The inconsistent management results in a moderate adverse effect to ACEC values.

Invasive Species and Pest Management

Invasive species are currently managed in cooperation with the county weed and pest districts. ACEC evaluation areas and ACEC values benefit from invasive species management. Invasive species decrease biodiversity, ecosystem health, and visual naturalness. The evaluation areas would be more likely to receive treatment through ACEC designation as designation would be an additional factor considered in determining treatment areas. The benefit to ACEC values would likely be minor, as without designation few evaluation areas would likely be targeted for invasive species management.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Hole-in-the-Wall and Welch Ranch are the evaluation areas most likely to benefit from current fisheries management. However, the other evaluation areas could also benefit if reservoirs were to be constructed as enhancing fisheries would be encouraged. There are no current management decisions for special status fish species. Welch Ranch is the only evaluation area capable of supporting Yellowstone cutthroat trout. Fisheries has not been a management priority or forecasted to become one. The beneficial effect of fish and SSS fish management actions on ACEC values is negligible.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Current management provides seasonal and in some cases year-round spatial buffers from surface-disturbing activities for raptor nests, big game calving areas and crucial winter range, and

sharp-tailed grouse leks. Similar buffers are provided for SSS such as bald eagles and Greater Sage-Grouse. Exceptions to these protections are allowed. Exception criteria was not defined in the current RMP and therefore exceptions have not been consistently applied which has lead to localized adverse effects to wildlife and therefore ACEC values. In the case of Greater Sage-Grouse, the best available science clearly indicates that current management has not been sufficient to sustain the Greater Sage-Grouse populations within the planning area (Doherty et al. 2010). All ACEC evaluation areas contain Greater Sage-Grouse habitat. Alternative A SSS management would not sustain Greater Sage-Grouse populations within the evaluation areas or the planning area as a whole, and therefore have a major adverse effect on ACEC values.

Special Status Species – Plants

The current RMP does not address special status plants, therefore they are managed on a project-specific basis. The absence of direction can lead to inconsistent management and adverse effects to the plants and therefore ACEC values. Hole-in-the-Wall is the only evaluation area containing mapped special status plant habitat. Since special status plants are unlikely in the remaining evaluation areas, the level of adverse effect on ACEC values would be negligible.

Heritage and Visual Resources

Cultural Resources

Current management includes a NSO stipulation on fluid mineral leases associated with the Bozeman Trail, which includes the Cantonment Reno evaluation area. Otherwise cultural resources would be considered on a project-specific basis. The absence of management direction can lead to inconsistent management and adverse effects to the cultural resources and therefore ACEC values. The anticipated level of effect is moderate adverse as all ACECs outside of Cantonment Reno would not be guaranteed protection.

Paleontological Resources

There are no paleontological resources management decisions in the current RMP, paleontological resources are considered on a project-specific basis. The Dry Creek Petrified Tree evaluation area is an area containing paleontological resources of high quality or importance. The Hole-in-the-Wall evaluation area contains areas of PFYC 5 and likely contains paleontological resources. Paleontological resources are likely not present or rare within the other evaluation areas. The absence of management direction can lead to inconsistent management and adverse effects to the paleontological resources and therefore ACEC values. The resources at Dry Creek Petrified Tree are well known and therefore not likely to be affected as surface-disturbing activities would be avoided. The opportunity for adverse effects within the other evaluation areas is greater as their paleontological resources are unknown. But since Hole-in-the-Wall is the only other evaluation area likely to contain high quality paleontological resources, the anticipated level of effect is minor adverse.

Visual Resources

The Welch Ranch and western half of the Hole-in-the-Wall evaluation areas are currently managed as VRM Class II where management activities may be seen but should not attract attention. All of Pumpkin Buttes and portions of the Burnt Hollow and Fortification Creek evaluation areas are managed as VRM Class III, where management activities may attract attention but should not dominate the view. The remainder of the evaluation areas are managed as VRM Class IV where management activities may dominate the view. Scenic quality is an ACEC value. With the potential for development activities to dominate throughout all or large portions of five evaluation areas, the anticipated effect to ACEC values would be major adverse.

Land Resources

Forest Products

Forests and woodlands of the planning area would be available for the collection and commercial harvest of minor forest products. The harvest of forest products could adversely affect ACEC resource values such as fragile soils and watersheds, and visual resources. Burnt Hollow, Fortification Creek, Hole-in-the-Wall, Pumpkin Buttes, and Welch Ranch evaluation areas all contain forest or woodland vegetation that could be available for forest product use. However, the commercial timber areas where forest product use would be most foreseeable does not overlap any proposed ACEC, therefore the anticipated level of adverse effect on ACEC values would be negligible.

Lands and Realty

Current management actions for the lands and realty program mostly relate to the acquisition and disposal of public lands. Lands with resource values are generally not disposed of and are desirable for acquisition. The absence of designated ACECs would be one less resource value assessed during land and realty actions. It is unlikely any of the evaluation areas would be disposed of as their resource values are known. Acquisition within or adjacent to the evaluation areas would be beneficial. Acquisition must be from, and is typically initiated by, a willing land owner. There has been recent interest in exchanges by private land owners within the Welch Ranch, Burnt Hollow, and Hole-in-the-Wall evaluation areas. Burnt Hollow and Welch Ranch are both products of recent land exchanges. The effects of current management on ACEC values are moderate beneficial.

Renewable Energy

The 1985 RMP does not contain any management decisions for renewable energy, projects are considered on an individual basis. Pumpkin Buttes is the only evaluation area with wind-power potential of good or better. It is not foreseeable for any of the six other evaluation areas to be affected by renewable energy. Wind-power development near Pumpkin Buttes would impair the scenic qualities of the evaluation area. As adverse impacts would likely be limited to one evaluation area, the level of effect is minor.

Rights-of-Way and Corridors

ROW are analyzed and authorized on a project-specific basis under the present RMP. Pumpkin Buttes contains communication sites on the South Middle Butte with provisions for expansion to North Middle Butte, if absolutely necessary. Communication sites and surface-disturbance from ROW within evaluation areas adversely affects ACEC values. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, Pumpkin Buttes, and Welch Ranch are within the CBNG development area and given the mixed ownership pattern of both surface and mineral estate ROW applications are likely. The level of anticipated effect to ACEC values is major adverse.

Travel and Transportation Management

TTM actions define where, when, and how motorized vehicles can be used within the planning area. Current management prohibits motorized use within portions of the Burnt Hollow, Cantonment Reno and Dry Creek Petrified Tree evaluation areas. There are seasonal vehicle restrictions within portions of the Fortification Creek evaluation area. Where open to motorized vehicles, including seasonally, motorists are limited to existing or designated routes. Limiting vehicle use to defined routes limits impacts to soil, water, vegetation, and other resources including ACEC values. The level of anticipated effect is minor adverse.

Recreation

Current management recognizes all of the evaluation areas, with the exception of Pumpkin Buttes, as important recreation areas. Proposals for surface-disturbing or disruptive activities are mitigated to protect the recreation and related resources such as soil, water, vegetation, wildlife habitat, and therefore ACEC values. Recreation use itself can have adverse effects, although typically localized, from compacting soil and vegetation which increases vegetation, wildlife displacement, and the development of recreation facilities. Overall, the level of effect recreation management actions on ACEC values is expected to be minor adverse.

Livestock Grazing Management

Livestock grazing would be allowed within the evaluation areas and managed to achieve healthy rangelands and special habitats. Properly managed grazing can avoid adverse impacts and be beneficial to some resources. Overall, the level of anticipated effect is minor adverse as not all adverse effects can be avoided or mitigated, such as inadvertent trampling of cultural artifacts or temporary over utilization. ACEC designation could also have provided heightened awareness and further minimized the adverse effects.

Special Designations**Scenic or Back Country Byways**

Presently there are no byways within the planning area. The potential Tipperary/Thompson Creek Roads byway accesses the Dry Creek Petrified Tree evaluation area. If the Tipperary/Thompson Creek Roads byway were to be designated it would be managed to encourage responsible use while protecting resource values. Without designation this beneficial effect would not occur. Increased use of Tipperary/Thompson Creek Roads and the Dry Creek Petrified Tree area would also likely not occur. Alternative A would likely have no effect on ACEC values.

4.7.1.4. Alternative B**Areas of Critical Environmental Concern**

Alternative B emphasizes resource conservation and would designate eight ACECs totalling 511,000 acres (65%) of BLM surface. Appendix S (p. 2531) lists the objectives and management prescriptions for each ACEC. ACEC-specific prescriptions would protect the integrity of the characteristics for which each ACEC was designated. Management prescriptions could vary dependent on the relevant and important values present at each site.

Designation of ACECs would establish these areas as priority areas and management efforts would focus such that problems and issues could be addressed more effectively, thereby serving to better protect the relevant and important resources. Management actions common to all ACECs would include: closing or limiting motorized vehicle use; managing visual resources as VRM Class II; restricting mineral development; ROW; and other surface-disturbing activities. It is important to note that an ACEC designation would not affect present leases or valid existing rights. However, when current leases expire, they would become **closed to** future leasing.

Physical Resources**Air Quality**

Alternative B would analyze the effects of activities on air quality and would include modeling to identify mitigation strategies. Air quality mitigation would beneficially effect ACEC

values. Burnt Hollow is the most likely ACEC to benefit as it is the eastern most ACEC and the closest to the coal mines which is a primary emissions source within the planning area. ACECs within the center of the planning area are influenced by oil and gas emissions including Cantonment Reno, Fortification Creek, and Pumpkin Buttes. Air quality mitigation would have a major beneficial effect on ACEC values.

Soil and Water Resources

Alternative B management actions prohibit surface-disturbing activities on sensitive soils and near water resources which protects ACEC values. Sensitive soils and water resources are present within all the areas being evaluated resulting in a major beneficial effect for ACEC values.

Cave and Karst Resources

Surface-disturbing activities and forest product sales would be prohibited within karst areas benefitting ACEC values. The Hole-in-the-Wall evaluation area contains bands of karst-bearing formations. Because limited portions of one evaluation area would be affected, overall there would be a negligible beneficial effect on ACEC values.

Mineral Resources

Locatable Minerals

In addition to the present mineral withdrawals, another 618,256 acres would be recommended for withdrawal from mineral entry including the ACECs. This management action would have a major beneficial effect on ACEC values by preventing locatable mineral development.

Leasable Minerals - Fluids

The ACECs would be unavailable for additional leasing. Seventy-five percent (2,544,512 acres leased, 3,386,530 acres federal estate) of the federal fluid mineral estate has already been leased, including within the ACECs. Existing leases would be honored. There has been fluid mineral development within all ACECs except Cantonment Reno. Dry Creek Petrified Tree, Hole-in-the-Wall, and Welch Ranch each contain one plugged and abandoned well, abandoned between 1962 (Welch) and 1978 (Hole-in-the-Wall). Fortification Creek and Pumpkin Buttes leases are currently producing. Applications (APDs) are pending within Fortification Creek, Pumpkin Buttes, and Sagebrush Ecosystem ACECs. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, and Pumpkin Buttes have high potential for CBNG development; Fortification Creek also has moderate potential for conventional development. Development of the existing leases during the planning period is likely and is considered under Impacts Common to All Alternatives. ACECs would be closed to leasing under Alternative B, which would have a major beneficial impact on ACEC values.

Salable Minerals

Mineral material activity would be prohibited within the ACECs. BLM-authorized salable mineral development is taking place adjacent to the Dry Creek Petrified Tree and Welch Ranch ACECs. Existing rights would be honored, expansion of permit areas into the ACECs would not be authorized. Sand and gravel deposits occur within three additional ACECs: Burnt Hollow, Cantonment Reno, and Fortification Creek. Salable mineral operations are generally localized and confined; occurring in discrete locations, not widespread such as oil and gas wells. The prohibition of salable mineral activities within ACECs is beneficial to ACEC values, however the existing activities adjacent to two ACECs would temper the beneficial effects to minor.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Unplanned fire management would be cognizant of resource goals, including ACECs, and respond accordingly including limiting heavy equipment use. Wildland and planned fire would be used to restore fire-adapted ecosystems. ACEC designation would heighten the awareness and therefore the protection and management of ACEC values. These management actions would be a major benefit to the ACECs.

Biological Resources

Vegetation – Forests and Woodlands

Alternative B would emphasize natural processes and keep silviculture treatments to a minimum. The lack of intensive management would benefit ACEC values as the ACECs would visually be more natural. Aspen and limber pine communities would likely continue to decline. Insect and disease outbreaks would be allowed to run their course. Hole-in-the-Wall contains limber pine and potentially aspen, otherwise these species and threat of disease are not widespread in the other four ACECs containing forest and woodland vegetation. Because four of the eight ACECs would benefit from these management actions and only one would likely be adversely affected, the overall level of effect to ACEC values would likely be moderate beneficial.

Vegetation – Grassland and Shrubland Communities

Native plant species would be required for all reclamation activities. ACEC management which would regulate development activities and keep surface-disturbing activities to a minimum. The presence of only native species would increase naturalness values for knowledgeable public land users. Since reclamation areas would be limited in scale and duration, the beneficial effect would be negligible.

Vegetation – Riparian/Wetland Resources

Alternative B prohibits surface-disturbing activities within 500 feet of surface water. All evaluation areas except Pumpkin Buttes, contain riparian and/or wetland communities. The prohibition of surface-disturbing activities is a major benefit to ACEC values.

Invasive Species and Pest Management

ACEC designation would likely factor into determining treatment areas. The highest priority would be given to BLM-administered lands threatened by invasion from adjacent lands. Few ACECs are likely to be the highest priority for treatment. Therefore benefit to ACEC values would likely be minor.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Surface-disturbing activities would be prohibited within 0.25 mile of fish-bearing water bodies. This management action would be a major benefit as all ACECs except Pumpkin Buttes, contain fish-bearing waters. Welch Ranch is the only ACEC capable of supporting Yellowstone cutthroat trout, therefore the benefits of special status fish species management actions on ACEC values is negligible.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative B would provide seasonal and permanent spatial buffers where surface-disturbing and disruptive activities are prohibited for the protection of raptor nests, big-game calving areas and

crucial winter range, and sharp-tailed grouse leks. These management actions would be applied across the planning area where applicable and therefore be a major benefit to ACEC values. Similar buffers are provided for SSS such as bald eagles. Surface-disturbing and disruptive activities would be prohibited within prairie dog colonies. Greater Sage-Grouse management would apply prohibitions on surface-disturbing and disruptive activities within four miles of lek sites and winter concentration areas and therefore be a major benefit to ACEC values.

Special Status Species – Plants

Surface-disturbing and disruptive activities would be prohibited within special status plant habitat under Alternative B. Hole in the Wall is the only evaluation area containing mapped special status plant habitat. Since special status plants are unlikely in the remaining evaluation areas the level of beneficial effect on ACEC values would be minor.

Heritage and Visual Resources

Cultural Resources

Mineral development and other surface-disturbing activities would be prohibited near historic properties that retain their historic setting and areas that contain sensitive cultural sites. These management actions would protect cultural resources, and therefore ACEC values, within the Cantonment Reno, Hole in the Wall, Pumpkin Buttes, and Welch Ranch ACECs. The anticipated level of effect is major beneficial.

Paleontological Resources

Mineral development and other surface-disturbing activities would be prohibited in areas containing paleontological resources of high quality or importance such as the Dry Creek Petrified Tree ACEC. Paleontological surveys would be required prior to surface-disturbing activities in all PFYC Class 3, 4, and 5 formations; this management action would include all eight ACECs. Monitoring of surface-disturbing activities would be required in PFYC Class 4 and 5 areas. The Hole in the Wall ACEC contains areas of PFYC 5. Surface-disturbing activities within PFYC Class 3 areas would be monitored on a project specific basis, this would include the six remaining ACECs and remainder of the Hole in the Wall ACEC. Surveying provides the opportunity to identify paleontological resources but would not be expected to discover all paleontological resources, and therefore monitoring could be required or recommended. Likewise, monitoring reduces adverse effects to paleontological resources, by identifying the resources as they are uncovered, but does not prevent all adverse effects. However, through the survey and monitoring requirements adverse effects should be negligible.

Visual Resources

The eight ACECs would be managed as VRM Class II where management activities may be seen but should not attract attention. This management would be a major benefit to visual resources and ACEC values.

Land Resources

Forest Products

Commercial timber activities would be limited to specified forest areas that do not overlap any ACEC. Vegetation, soil, water, and visual resources would be protected from surface-disturbing activities a major benefit to ACEC values.

Lands and Realty

Alternative B would include an active land acquisition program. Acquisitions, from willing land owners, within or adjacent to the ACECs could be actively sought. There has been recent interest in exchanges by private land owners within the Welch Ranch, Burnt Hollow, and Hole in the Wall ACEC areas. Under Alternative B these exchanges would be pursued. An active acquisition program would be a major benefit to ACEC values.

Renewable Energy

ACECs would be designated as renewable energy exclusion areas under Alternative B. Pumpkin Buttes and portions of the Sagebrush Ecosystem ACECs are the only evaluation area with wind power potential of good or better. It is not foreseeable for any of the six other ACECs to be affected by renewable energy. As renewable energy development would likely be proposed within the Pumpkin Buttes ACEC, and therefore only one ACEC truly benefits from the exclusion area, the beneficial effect is minor.

Rights-of-Way and Corridors

New ROW, including new communication sites on the Pumpkin Buttes, would be prohibited within ACECs under Alternative B. The absence of new surface disturbance and visual intrusion would be a major benefit to ACEC values.

Travel and Transportation Management

Alternative B would prohibit motorized use within the Burnt Hollow, Cantonment Reno, and Dry Creek Petrified Tree ACECs. There are seasonal vehicle restrictions within the elk crucial seasonal ranges within the Fortification Creek ACEC. Where open to motorized vehicles, including seasonally, motorists would be limited to designated routes. Limiting vehicle use to defined routes limits impacts to soil, water, vegetation and other resources including ACEC values. The level of anticipated effect is minor adverse.

Recreation

Alternative B would designate four of the ACECs as SRMAs including Burnt Hollow, Dry Creek Petrified Tree, Hole in the Wall, and Welch Ranch. Surface-disturbing activities, except for administrative use, would be prohibited within the SRMAs. Proposals for surface-disturbing activities would consider relevant and important values in the other ACECs and would be mitigated to protect such values. Recreation use can have adverse effects, although typically localized, from compacting soil and vegetation which increases vegetation, wildlife displacement, and the development of recreation facilities. Overall the level of effect recreation management actions on ACEC values is expected to be negligible adverse as non-recreation related surface-disturbing activities would be minimized.

Livestock Grazing Management

Livestock grazing would be allowed within the ACECs where compatible with other resource values and managed to achieve healthy rangelands and special habitats. Properly managed grazing can avoid adverse impacts and be beneficial to some resources. ACEC designation would provide a heightened awareness and further minimize the adverse effects of grazing on other resources including ACEC values. Overall the level of anticipated effect is negligible adverse as not all adverse effects can be avoided or mitigated such as inadvertent trampling of cultural artifacts or temporary over utilization.

Special Designations

Scenic or Back Country Byways

Alternative B would evaluate six routes for national byway status. The potential Tipperary/Thompson Creek Roads byway accesses the Dry Creek Petrified Tree ACEC. If the Tipperary/Thompson Creek Roads byway were to be designated it would be managed to encourage responsible use while protecting resource values. Increased byway use could lead to increased use of the Dry Creek Petrified Tree ACEC. Educational efforts would reduce the level of adverse effects on ACEC values from increased use to negligible.

4.7.1.5. Alternative C

Areas of Critical Environmental Concern

Alternative C would emphasize resource use and would not designate any ACECs. Management decisions would be applied on a project-specific basis to protect relevant and important values when activities are proposed. This could result in additional restrictions or design requirements for certain uses or activities, thereby mitigating impacts to ACEC values, however adverse effects to ACEC values are likely to occur. Overall, Alternative C would likely have minor adverse effects on ACEC values.

Physical Resources

Air Quality

Alternative C would not model air quality effects or identify mitigation strategies. The absence of air quality mitigation would have a major adverse effect on ACEC values.

Soil and Water Resources

Management actions allow surface-disturbing activities on sensitive soils and near water resources where consistent with other resource values. The intent of the management actions are to allow for resource use without permanently impairing sensitive resources including soil, water, and other resources. Sensitive soils and water resources are present within all the areas being evaluated resulting in a major adverse effect.

Cave and Karst Resources

Surface-disturbing activities and forest product sales would be restricted near significant caves benefitting ACEC values. The Hole-in-the-Wall evaluation area contains bands of karst-bearing formations. Because limited portions of one evaluation area would be affected, overall there would be a negligible beneficial effect on ACEC values.

Mineral Resources

Locatable Minerals

No additional mineral withdrawals would be recommended. There is potential for locatable mineral activity within all evaluation areas including Fortification Creek outside the WSA. However, there are no active or proposed mines within or adjacent to ACEC evaluation areas. The maximum foreseeable locatable minerals development is 1,455 acres (0.2%) of BLM surface in the planning area. Therefore, the potential for locatable minerals development to affect ACEC resource values would be negligible.

Leasable Minerals - Fluids

The entire federal oil and gas mineral estate within the planning area would be available for leasing, including for geothermal activity. Lessees would be required to mitigate

adverse resource impacts. There has been fluid mineral development within all ACECs except Cantonment Reno. Leases within Fortification Creek and Pumpkin Buttes are currently producing. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, and Pumpkin Buttes have high potential for CBNG development; Fortification Creek has moderate potential for conventional development. Fluid mineral surface-disturbing activities and production operations within ACECs would have major adverse impacts on ACEC values.

Salable Minerals

Mineral material activity would be allowed where compatible with other resources. Alternative C does not designate any ACECs, therefore ACEC values would not be a resource taken into consideration. BLM-authorized salable mineral development is taking place adjacent to the Dry Creek Petrified Tree and Welch Ranch evaluation areas. In addition to these two areas, sand and gravel deposits occur within three additional evaluation areas: Burnt Hollow, Cantonment Reno, and Fortification Creek. Salable mineral operations are generally localized and confined; occurring in discrete locations, not widespread such as oil and gas wells. Salable mineral activities within ACECs would have moderate adverse impacts on ACEC values.

Fire and Fuels Management

Unplanned Fire (Wildfire)

Full protection strategies, with few constraints on heavy equipment use, would be used during suppression activities. There would not be any ACECs, therefore ACECs would not be considered as an independent resource value. Designation could heighten the awareness and therefore the protection of ACEC values. Given the aggressive nature of suppression activities and no ACEC designation, the effects to ACEC values would be major adverse.

Planned Fire (Prescribed Fire)

Prescribed fire would be used to restore fire-adapted ecosystems for commodity production. These management actions could benefit ACEC evaluation areas as vegetation is often a relevant and important ACEC value. However, the additional vegetation would likely be used for livestock forage or other commodities thereby negating the ecosystem restoration. The end result is a negligible adverse effect.

Biological Resources

Vegetation – Forests and Woodlands

Forest and woodland treatments would be designed to maximize forest health and resource use. Intensive management would detract from the naturalness of the evaluation areas and reduce their biodiversity. Alternative C management would have major adverse effects on ACEC values.

Vegetation – Grassland and Shrubland Communities

Non-native plants could be used for interim reclamation activities in accordance with the BLM reclamation policy. There is development potential within all evaluation areas particularly without ACEC-specific management which would regulate development activities. The presence of non-native species would detract from naturalness values for knowledgeable public land users. However, since reclamation areas would be limited in scale and duration, the adverse effect would be negligible.

Vegetation – Riparian/Wetland Resources

Surface-disturbing activities would be allowed within 500 feet of surface water where consistent

with other resource values. All evaluation areas except Pumpkin Buttes contain riparian and/or wetland communities. There would not be any ACECs, therefore ACECs would not be considered as an independent resource value. Designation could heighten the awareness and therefore limit surface-disturbing activities. Development would be likely within the evaluation areas and result in a moderate adverse effect to ACEC values.

Invasive Species and Pest Management

Fewer species would be treated under Alternative C and priority would be given to infestations on public lands which threaten adjacent private lands. Few if any evaluation areas are likely to be the highest priority for treatment. Therefore benefits to ACEC values would likely be negligible.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Surface-disturbing activities would be allowed within 0.25 mile of fish-bearing water bodies where consistent with other resource values. There would not be any ACECs therefore ACECs would not be considered as an independent resource value. Designation could heighten the awareness and therefore limit surface-disturbing activities. Development would be likely within the evaluation areas and result in a major adverse effect to ACEC values as all ACECs except Pumpkin Buttes contain fish-bearing waters. Welch Ranch is the only ACEC capable of supporting Yellowstone cutthroat trout therefore the impacts of special status fish species management actions on ACEC values is negligible.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Alternative C would apply a seasonal spatial buffer from surface disturbing activities for raptor nests but otherwise allow surface-disturbing and disruptive activities within, big-game calving areas and crucial winter range, and near sharp-tailed grouse leks. These management actions would result in major adverse effects to wildlife and therefore ACEC values.

Seasonal and permanent buffers prohibiting surface-disturbing activities are provided for SSS such as bald eagles and Greater Sage-Grouse. Raptors are a seasonal buffer only. Surface-disturbing and disruptive activities could be authorized within prairie dog colonies. These management actions would be unlikely to sustain black-tailed prairie dog, Greater Sage-Grouse, and raptor populations within the evaluation areas. Alternative C SSS management would have a major adverse effect on ACEC values.

Special Status Species – Plants

Alternative C would allow surface-disturbing and disruptive activities within special status plant habitat but not within known populations. While this management would protect known populations there are likely undocumented populations that would not be protected as surveys that could identify additional populations would not be required. Hole in the Wall is the only evaluation area containing mapped special status plant habitat. Since special status plants are unlikely in the remaining evaluation areas the level of beneficial effect on ACEC values would be negligible.

Heritage and Visual Resources

Cultural Resources

Surface-disturbing activities would be allowed near historic properties and other sensitive sites when appropriate mitigation is accomplished. Four evaluation areas (Cantonment Reno, Hole in the Wall, Pumpkin Buttes, and Welch Ranch) are known to contain sensitive cultural resources

and they are likely present in the other evaluation areas as well. The absence of management direction can lead to inconsistent management and adverse effects to the cultural resources and therefore ACEC values. The anticipated level of effect is moderate adverse.

Paleontological Resources

Mineral development and other surface-disturbing activities would not be prohibited in areas containing paleontological resources of high quality or importance such as the Dry Creek Petrified Tree evaluation area. Paleontological surveys would be required prior to surface-disturbing activities in all PFYC Class 4, and 5 formations; this management action would include a portion of the Hole in the Wall evaluation area. Surface-disturbing activities would be monitored on a project specific basis. Surveying provides the opportunity to identify paleontological resources but would not be expected to discover all paleontological resources, and therefore monitoring could be required or recommended. Likewise, monitoring reduces adverse effects to paleontological resources, by identifying the resources as they are uncovered, but does not prevent all adverse effects. Since only PFYC Class 4 and 5 area would be surveyed and therefore likely to be monitored it is likely some paleontological resources would be impacted therefore the level of adverse effects would be minor.

Visual Resources

All of Pumpkin Buttes and most of the Hole in the Wall evaluation areas as well as smaller portions of the Fortification Creek and Welch Ranch evaluation areas would be managed as VRM Class III. The remainder of the evaluation areas are managed as VRM Class IV. With the potential for development activities to dominate throughout all or large portions of five evaluation areas the anticipated effect to ACEC values would be major adverse.

Land Resources

Forest Products

Forests and woodlands of the planning area would be available for the collection and commercial harvest of forest products. Forest products would be managed to maximize economic return which includes no limitations on the size or shape of harvest areas. The harvest of forest products could adversely affect ACEC resource values such as fragile soils and watersheds, and visual resources. Burnt Hollow, Fortification Creek, Hole in the Wall, Pumpkin Buttes, and Welch Ranch evaluation areas all contain forest or woodland vegetation that could be available for available for forest product use. Commercial timber areas do not overlap any evaluation area. With the focus on economic return forest product activities are foreseeable within the evaluation areas and could be a major adverse effect to ACEC values.

Lands and Realty

Alternative C would focus on the disposal of public lands and would not acquire any additional lands. Lands with resource values including ACEC values would be candidates for disposal. The inability to acquire additional lands and the emphasis on public land disposal would have a major adverse effect on ACEC values.

Renewable Energy

The ACEC evaluation areas would be available for renewable energy development under Alternative C. Pumpkin Buttes is the only evaluation area with wind power potential of good or better. It is not foreseeable for any of the six other evaluation areas to be affected by renewable energy. Wind power development near the Buttes would impair the scenic qualities

of the evaluation area. As adverse impacts would likely be limited to one evaluation area the level of effect is minor.

Rights-of-Way and Corridors

ROW would be considered within the ACEC evaluation areas, including additional communication sites on the South Middle Butte. Communication sites and surface-disturbance from ROW within evaluation areas adversely effects ACEC values. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, Pumpkin Buttes, and Welch Ranch are within the CBNG development area and given the mixed ownership pattern of both surface and mineral estate ROW applications area likely. The level of anticipated effect to ACEC values is major adverse.

Travel and Transportation Management

Alternative C, without ACEC designation, could allow motorized use within Burnt Hollow, Cantonment Reno and Dry Creek Petrified Tree evaluation areas. There would continue to be seasonal vehicle restrictions within the elk crucial winter range of the Fortification Creek evaluation area. Where open to motorized vehicles, including seasonally, motorists are limited to existing or designated routes. Limiting vehicle use to defined routes limits impacts to soil, water, vegetation and other resources including ACEC values. However, since motor vehicle use would be present within all eight evaluation areas the level of anticipated effect is moderate adverse.

Recreation

Alternative C would designate three of the ACEC evaluation areas as SRMAs including Burnt Hollow, Dry Creek Petrified Tree, and Welch Ranch. Surface-disturbing activities would be allowed within the SRMAs when consistent with resource values. Proposals for surface-disturbing or disruptive activities within the SRMAs and four remaining evaluation areas could be mitigated to protect the recreation and related resources such as soil, water, vegetation, wildlife habitat, and therefore ACEC values. Recreation use can have adverse effects, although typically localized, from compacting soil and vegetation which increases vegetation, wildlife displacement, and the development of recreation facilities. Considering Alternative C's emphasis on resource use, the overall level of effect recreation management actions would have on ACEC values is moderate adverse as surface-disturbing activities within the evaluation areas would be likely.

Livestock Grazing Management

Livestock grazing would be allowed within all evaluation areas. Increases in livestock stocking rates could be allowed with any increases in forage production allocated to livestock as the first priority. With the overall emphasis of Alternative C on resource uses the level of anticipated effect is moderate as there could be increased stocking rates and therefore grazing pressure within the ACEC evaluation areas.

Special Designations

Scenic or Back Country Byways

Alternative C would not designate any byways within the planning area. Increased use of Tipperary/Thompson Creek Roads and the Dry Creek Petrified Tree area would likely not occur. Alternative C would likely have no effect on ACEC values.

4.7.1.6. Alternative D

Areas of Critical Environmental Concern

Alternative D would designate two ACECs: Pumpkin Buttes (1,731 acres) and a portion of

Welch Ranch (1,116 acres) for a total of 2,849 acres. The other six evaluation areas would not be designated. Appendix S (p. 2531) lists the objectives and management prescriptions for each ACEC. Designation of ACECs would establish these areas as priority areas and management efforts would focus such that problems and issues could be addressed more effectively, thereby serving to better protect the relevant and important resources. Prescriptions specific to the relevant and important criteria at each ACEC would protect the integrity of the characteristics for which each ACEC was designated. Management prescriptions would vary dependent on the relevant and important values present at each site.

ACEC designation would not affect present leases or valid existing rights. However, when current leases expire, they could become closed to future leasing.

Physical Resources

Air Quality

Alternative D would involve stakeholders to model air quality effects and identify mitigation strategies. Air quality mitigation would beneficially affect ACEC values. Pumpkin Buttes ACEC and the Fortification Creek evaluation area are located within the center of the planning area and are substantially influenced by oil and gas emissions. Air quality mitigation would have a minor beneficial effect on ACEC values as only two ACECs totaling 2,849 acres would benefit.

Soil and Water Resources

Alternative D management actions allow surface-disturbing activities on sensitive soils and near water resources where resource management objectives can be met through project design or mitigation. The intent of the management actions are to allow for resource use while protecting soil, water, and other resources. Soil and water resource action alternatives would have a minor beneficial effect on all evaluation areas.

Cave and Karst Resources

Surface-disturbing activities and forest product sales would be restricted near significant caves benefitting ACEC values. The Hole-in-the-Wall evaluation area contains bands of karst-bearing formations. Because limited portions of one evaluation area would be affected, overall there would be a negligible beneficial effect on ACEC values.

Mineral Resources

Locatable Minerals

In addition to the present mineral withdrawals, another 82,691 acres would be recommended for withdrawal from mineral entry, including within designated ACECs. This management action would have a minor beneficial effect on ACEC values as locatable mineral development would be prohibited on less than 5 percent of the acreage being evaluated.

Leasable Minerals - Fluids

Additional leasing would be contingent on ACEC specific management plans. Pumpkin Buttes leases would be subject to NSO, and the portion of Welch Ranch containing federal fluid mineral estate would be closed to leasing under Recreation management alternatives. All other ACEC evaluation areas would be available for leasing and development. Existing leases would be honored, which could adversely affect the relevant and important criteria in ACECs that are not designated. Fortification Creek and Pumpkin Buttes leases are currently producing. Applications (APDs) are pending within Fortification Creek, Pumpkin Buttes, and Sagebrush

Ecosystem. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, and Pumpkin Buttes have high potential for CBNG development; Fortification Creek also has moderate potential for conventional development. Development of the existing leases during the planning period is likely.

Salable Minerals

Mineral material activity would be prohibited within the two ACECs. Salable mineral development would be allowed only for administrative use in Burnt Hollow, Dry Creek Petrified Tree, and Hole-in-the-Wall SRMAs under recreation management alternatives and precluded at Cantonment Reno under cultural resource alternatives. Salable mineral development would be available within the Fortification Creek and Sagebrush Ecosystem evaluation areas. BLM-authorized salable mineral development is taking place adjacent to the Dry Creek Petrified Tree evaluation area and the Welch Ranch ACEC. Existing rights would be honored, expansion of permit areas into Welch Ranch would not be authorized. Salable mineral operations are generally localized and confined; occurring in discrete locations, not widespread such as oil and gas wells. The prohibition of salable mineral activities within ACECs is beneficial to ACEC values and affects six of the eight ACECs.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire)

Unplanned fire management would be cognizant of resource goals, including ACECs, and respond accordingly including limiting heavy equipment use. Wildland and planned fire would be used to restore fire-adapted ecosystems. ACEC designation would heighten the awareness and therefore the protection and management of ACEC values in the three designated ACECs. The lack of designation within the other four evaluation areas could result in ACEC resource values being overlooked. These management actions would be a moderate benefit to the ACECs.

Biological Resources

Vegetation – Forests and Woodlands

Alternative D would use silvicultural treatments to maximize forest health. Management of old growth, aspen, and limber pine communities would be emphasized. These species are not widespread in Fortification Creek or Welch Ranch. Pumpkin Buttes does not contain forest or woodland vegetation. Other ACEC evaluation areas, most notably Hole-in-the-Wall may benefit from these management actions, but without designation the relevant and important ACEC values may be overlooked. The overall level of effect to ACEC values would likely be negligible beneficial.

Vegetation – Grassland and Shrubland Communities

Non-native plants could be used for short-term reclamation activities in accordance with the BLM reclamation policy. There is development potential within the three ACECs and four evaluation areas. ACEC-specific management which would regulate development activities within the two ACECs, but not the five evaluation areas. The presence of non-native species would detract from naturalness values for knowledgeable public land users. However, since reclamation areas would be limited in scale and duration the adverse effect would be negligible.

Vegetation – Riparian/Wetland Resources

Alternative D allows surface-disturbing activities within 500 feet of surface water where resources can be adequately protected. ACEC designation and management would further regulate

development activities within the two ACECs containing riparian or wetland communities, but not within the four non-designated evaluation areas. Since surface-disturbing activities would be minimal in the ACECs and regulated within the evaluation areas, the result would be a moderate benefit to ACEC values.

Invasive Species and Pest Management

ACEC designation would likely factor into determining treatment areas. The highest priority would be given to BLM-administered lands threatened by invasion from adjacent lands. Few ACECs or evaluation areas are likely to be the highest priority for treatment. Therefore, the benefit to ACEC values would likely be minor.

Fish and Wildlife Resources – Fish and Special Status Species – Fish

Surface-disturbing activities would be allowed within 0.25 mile of fish-bearing water bodies where impacts are determined to be acceptable. Other management actions include incorporating fisheries enhancement into reservoir design, maintaining or enhancing fish habitat, and designing water crossings to support fish passage. These management actions would be a moderate benefit as although they allow for development, the adverse impacts would be mitigated to maintain a sustainable fisheries. Welch Ranch is the only ACEC capable of supporting Yellowstone cutthroat trout, therefore the benefits of special status fish species management actions on ACEC values is negligible.

Fish and Wildlife Resources – Wildlife

Alternative D would provide seasonal and permanent-spatial buffers where surface-disturbing and disruptive activities would be allowed with adequate protection of raptor nests, big game calving areas and crucial winter range, and sharp-tailed grouse leks. The allowance for development and disruptive activities would result in localized impacts but overall should be moderately beneficial to wildlife, and therefore ACEC values.

Special Status Species – Wildlife (including Greater Sage-Grouse)

Similar buffers are provided for SSS such as bald eagles and Greater Sage-Grouse. Greater Sage-Grouse management would be based on the Wyoming BLM Policy (WY-2012-019) and Wyoming EO (2011-05). Pumpkin Buttes and Welch Ranch ACECs and the Fortification Creek evaluation area are outside of Priority Habitat Area. Four evaluation areas are wholly (Cantonment Reno, Dry Creek Petrified Tree, and Hole-in-the-Wall) or partially (Burnt Hollow) within Priority Habitat Area. The BLM and Wyoming Greater Sage-Grouse strategies are statewide strategies. While associated prescriptions will conserve Greater Sage-Grouse populations within Wyoming as a whole, they may not be sufficient to sustain the Greater Sage-Grouse population within the planning area, and therefore have a significant adverse effect on ACEC values for the Sagebrush Ecosystem evaluation area (467,897 acres). However, other ACECs would receive a negligible beneficial impact from SSS alternatives. Overall, the impact from SSS alternatives to ACECs are considered moderate adverse.

Special Status Species – Plants

Alternative D would allow surface-disturbing and disruptive activities within special status plant habitat but not within known populations. Surveys would be required that could identify and therefore protect additional populations. Hole-in-the-Wall is the only evaluation area containing mapped special status plant habitat. Since special status plants are unlikely in the remaining evaluation areas, the level of beneficial effect on ACEC values would be minor.

Heritage and Visual Resources

Cultural Resources

Mineral development and other surface-disturbing activities would be prohibited or restricted near specific historic properties and sensitive cultural sites. These management actions would protect cultural resources, and therefore ACEC values, within the Pumpkin Buttes, and Welch Ranch ACECs and the Cantonment Reno and Hole-in-the-Wall evaluation areas. The anticipated level of effect is major beneficial.

Paleontological Resources

Mineral development and other surface-disturbing activities would avoid areas containing paleontological resources of high quality or importance such as the Dry Creek Petrified Tree evaluation area. Paleontological surveys would be required prior to surface-disturbing activities in all PFYC Class 4, and 5 formations and Class 3 formations as needed. This management action would include all two ACECs and the five evaluation areas. Monitoring of surface-disturbing activities would be required based on survey results. The Hole-in-the-Wall ACEC contains areas of PFYC 5. Surveying provides the opportunity to identify paleontological resources, but would not be expected to discover all paleontological resources, and therefore monitoring could be required or recommended. Likewise, monitoring reduces adverse effects to paleontological resources, by identifying the resources as they are uncovered, but does not prevent all adverse effects. However, through the survey and monitoring requirements adverse effects should be negligible.

Visual Resources

Under Alternative D, Pumpkin Buttes and Welch Ranch ACECs, Dry Creek Petrified Tree and Hole-in-the-Wall SRMAs, and Cantonment Reno would be managed as VRM Class II. The Fortification Creek evaluation area outside of the WSA would be managed as VRM Class III. The Sagebrush Ecosystem would be managed as VRM Class III and IV. Management activities should not attract attention within six of the eight areas evaluated, therefore visual resources and ACEC should only be impaired to a minor degree.

Land Resources

Forest Products

Forests and woodlands of the planning area would be available for the collection and commercial harvest of forest products. Forest products would be managed to remain within ecologically sustainable limits and could include limitations on the size or shape of harvest areas. The harvest of forest products could adversely affect ACEC resource values such as fragile soils and watersheds, and visual resources. Burnt Hollow, Fortification Creek, Hole-in-the-Wall, Pumpkin Buttes, and Welch Ranch evaluation areas all contain forest or woodland vegetation that could be available for forest product use. Commercial timber areas do not overlap any evaluation area. Forest product activities are foreseeable within the evaluation areas and could be a moderate adverse effect to ACEC values.

Lands and Realty

Alternative D would allow land acquisition from willing land owners and actively seek to dispose of public lands which are difficult to manage and do not contain resource values. Acquisitions, from willing land owners, within or adjacent to the two ACECs and five evaluation areas would be desirable. There has been recent interest in exchanges by private land owners within the Burnt Hollow, and Hole-in-the-Wall evaluation areas and near the Welch Ranch ACEC. Under Alternative D, these exchanges would be pursued. The allowance for acquisitions would be a major benefit to ACEC values.

Renewable Energy

ACECs would be designated as renewable-energy exclusion areas under Alternative D. Pumpkin Buttes is the only ACEC with wind-power potential of good or better. It is not foreseeable for any of the six other evaluation areas to be affected by renewable energy. As renewable-energy development would likely be proposed within one ACEC, and therefore only one ACEC truly benefits from the exclusion area, the beneficial effect is minor.

Rights-of-Way and Corridors

New ROW, including new communication sites on the Pumpkin Buttes, would be prohibited within the two ACECs under Alternative D. ROWs would also be excluded within Dry Creek Petrified Tree and Hole-in-the-Wall SRMAs and Cantonment Reno under recreation or cultural alternatives. Within the Fortification Creek and Sagebrush Ecosystem evaluation areas, ROW would be considered but subject to stipulations to protect wildlife and sensitive species. Given the likelihood of new surface disturbance and visual intrusion within the evaluation areas, impacts from ROW alternatives would have a minor adverse effect on ACEC values.

Travel and Transportation Management

Alternative D would prohibit motorized use within Cantonment Reno, the EEA at Dry Creek Petrified Tree and the WSA portion of Fortification Creek evaluation areas. There would be seasonal vehicle restrictions within the elk crucial seasonal ranges within the Fortification Creek area, which would limit impacts to the relevance criteria. In all other evaluation areas and both designated ACECs, motorists would be limited to designated routes. Limiting vehicle use to defined routes limits impacts to soil, water, vegetation, and other resources including ACEC values. The level of anticipated effect is minor beneficial.

Recreation

Alternative D would designate the Welch Ranch ACEC as aSRMA. In addition, three of the ACEC evaluation areas would be designated as SRMAs including Burnt Hollow, Dry Creek Petrified Tree and Hole-in-the-Wall. Surface-disturbing activities, except for administrative use, would be prohibited within the SRMAs. Some protection of relevant and important values would be afforded in SRMAs that were not designated as ACECs in Alternative D due to the surface use restrictions. Recreation use itself can have adverse effects, although typically localized, from compacting soil and vegetation which increases vegetation and wildlife displacement, and the development of recreation facilities. Recreational use within ACECs may be mitigated to protect the ACEC values. Overall, the level of effect of recreation management actions on ACEC values is expected to be minor adverse as non-recreation-related surface-disturbing activities would be minimized within the four ACEC evaluation areas (including one designated ACEC) designated as SRMAs and reduced in the remaining evaluation areas.

Livestock Grazing Management

Livestock grazing would be allowed within the two ACECs and five evaluation areas where compatible with other resource values. Properly managed grazing can avoid adverse impacts and be beneficial to some resources. ACEC designation would provide a heightened awareness and further minimize the adverse effects of grazing on other resources including ACEC values. Overall, the level of anticipated effect is negligible adverse, as not all adverse effects can be avoided or mitigated such as inadvertent trampling of cultural artifacts or temporary over utilization, and not all evaluation areas would be designated.

Special Designations

Scenic or Back Country Byways

Alternative D would evaluate six routes for byway status. The potential Tipperary/Thompson Creek Roads byway accesses the Dry Creek Petrified Tree ACEC. If the Tipperary/Thompson Creek Roads byway were to be designated, it would be managed to encourage responsible use while protecting resource values. Increased byway use could lead to increased use of the Dry Creek Petrified Tree ACEC. Educational efforts would reduce the level of adverse effects on ACEC values from increased use to negligible.

4.7.1.7. Cumulative Impacts

The Proposed RMP designates Pumpkin Buttes and Welch Ranch as ACECs, a total of 2,849 acres (0.3% of the planning area). In these two areas, the ACEC will overlap with other designations, such as a TCP and SRMA. ACEC designation and management applies only to BLM actions. Actions on adjacent parcels such as CBNG development may affect the ability to manage for wildlife, visual resources, and other ACEC values.

4.7.1.8. Conclusion

Alternative B has the most beneficial effect on ACECs as eight ACECs would be designated and they would be managed to protect their relevant and important resource values. Alternative D is the second most beneficial alternative as two ACECs would be designated. Neither alternatives A or C would designate any ACECs. Alternative C emphasizes resource use and would therefore be the most adverse to ACEC values.

4.7.2. Scenic or Back Country Byways

This section describes the impacts of each alternative to National Byways, which are an important recreational resource on BLM-administered lands. Byways enhance motorized recreation, wildlife viewing, and heritage tourism.

4.7.2.1. Methods and Assumptions

Six potential byways, totalling 205 miles, are evaluated in alternatives B and D. There are no designated National Byways within the planning area (Alternative A) and none are proposed in Alternative C. The resource evaluated is the 9,765 acres of BLM surface within 0.25 mile of the evaluated byways. Adverse impacts to National Byways result from management actions that substantially limit or prevent public use of byways. Beneficial impacts result from actions that enhance the use of the byways. Assumptions used in this analysis, include, but are not limited to, the following:

- Designating a byway will increase use of the road and increase human presence in the area.
- Byways will be designated in cooperation with the affected counties, adjacent landowners, and other stakeholders.
- No formal land use constraints, land-use closures, are associated with the designation of byways. Any regulations or restrictions related to byway designation will affect BLM-administered lands only.
- Management prescribed for designated byways would provide opportunities for motor touring while enhancing understanding of the multiple uses of public lands.

Scale of impacts:

- Negligible: Less than 1 percent of proposed BCBs would be affected; only a small portion of a single evaluated BCB would be affected.
- Minor: 1-5 percent of proposed BCB would be affected; a moderate portion of a single evaluated BCB or small portions of 2-3 evaluated BCB would be affected.
- Moderate: 5-10 percent of proposed BCB would be affected; the majority of a single evaluated BCB or moderate portions of 2-4 evaluated BCB would be affected.
- Major: 10 percent of proposed BCB would be affected; the majority of several evaluated BCB or moderate portions of most evaluated BCB would be affected.

Significance Criteria

An adverse effect on Scenic or BCBs as a result of project actions would be considered potentially significant if the action would violate objectives associated with byway resource management and could not be mitigated.

4.7.2.2. Impacts Common to All Alternatives

Scenic or Back Country Byways

Managing byways to encourage responsible motorized recreational use while protecting other resource values would preserve the natural features for which the byway was designated. Allowing for multiple use along byways would increase local support for byway designation. Coordination with local residents is critical for successful designation and maintenance of any designated byway.

Physical Resources

The **Air Quality, Soil, and Cave and Karst Resources** programs do not have any management actions common to all alternatives that would affect byway use or management. There are also no air management actions by alternative that would affect byway use or management; air quality will not be addressed further in this section.

Water Resources

Water management actions common to all alternatives include managing surface-disturbing activities to prevent degradation of water quality, and managing water to meet Wyoming Standards for Healthy Rangelands. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by protecting the water quality and water based recreational opportunities along the byways.

Mineral Resources

Under management actions common to all alternatives, almost the entire planning area would be available for exploration and development of locatable, leasable fluid, and salable minerals.

Locatable Minerals

There is likely to be minimal overlap between locatable minerals activities and potential byways. The maximum foreseeable locatable minerals development is 1,455 acres (0.2%) of BLM surface in the planning area. Therefore, the potential for locatable minerals development to effect byway use would be negligible.

Leasable Minerals – Coal

Coal leasing would be limited to the high development potential areas of central Campbell County and northern Sheridan County, which are not traversed by any of the evaluated byways. Coal activity in the planning area would have no effect on byway management and is not further addressed in this section.

Leasable Minerals – Fluids

The foreseeable development predicts moderate to high CBNG development and moderate conventional development along the Lower Powder River Road. There are 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways along the Lower Powder River Road. Fluid mineral activities could have a major adverse effect on byway use.

Salable Minerals

The foreseeable development scenarios for all alternatives predict that salable minerals development would disturb less than one percent of BLM surface in the planning area. Overall, salable minerals development would likely have a negligible adverse effect on byway use.

Fire and Fuels Management

Fire and fuels management does not have any management actions common to all alternatives or by alternative that would affect byway management or use. There are also no fire and fuels management actions by alternative that would effect byway use or management; fire and fuels management will not be addressed further in the *Scenic or BCBs* section.

Biological Resources

Management actions for biological resources are designed to protect those resources typically by limiting surface-disturbing activities which would likely increase byway use.

Vegetation – Forests and Woodlands

The forests and woodland resource does not include any management actions common to all alternatives that would affect use of the evaluated byways. The effects from the forests and woodlands program on scenic or BCBs will vary by alternative.

Vegetation – Grassland and Shrubland Communities

Grass and shrub communities are the predominant vegetation types within the planning area. Relevant management actions include protecting plant communities, and cooperatively managing plant communities to maintain healthy rangelands. Surface-disturbing activities would be sited to reduce adverse effects to vegetation. These management actions would have a major beneficial effect on potential byway use.

Vegetation – Riparian/Wetland Resources

The primary byway that would be affected by riparian and wetland management is the Lower Powder River Road which parallels the Powder River; the Hazelton Road crosses multiple riparian areas. Management actions common to all alternatives that could affect byway management and use include managing riparian and wetland habitats to improve water quality, to manage towards properly functioning condition, to cooperatively enhance riparian/wetland systems, and to prevent the loss or degradation of riparian/wetland habitat. The Lower Powder River Road byway includes 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways. Riparian/wetland management actions could have a major beneficial effect on byway use.

Invasive Species and Pest Management

Invasive species and pest management does not have any management actions common to all alternatives or by alternative that would affect byway management or use. Invasive species and pest management will not be addressed further in the *Scenic or BCBs* section.

Fish and Wildlife Resources – Fish

There are several fisheries management actions that could potentially increase use along the Lower Powder River and Hazelton Roads including developing mitigation for surface-disturbing and disruptive activities, managing barriers to fish passage, providing public access to fish-bearing waters, and providing cooperative fisheries education. These management actions would likely have a major beneficial effect on byway use by increasing opportunities for water-based recreation.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Wildlife and SSS management actions common to all alternatives include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing, maintaining, and restoring Greater Sage-Grouse habitat; and a permanent disturbance-free buffer for bald eagle nests. Collectively, these actions could have a major beneficial effect on byway use by promoting habitat protection while causing the relocation, modification, or redesign of surface-disturbing activities.

Special Status Species – Plant

SSS plant management does not include any management actions common to all alternatives that would affect use of the evaluated byways. The effects from the SSS plant management program on scenic or BCBs will vary by alternative.

Special Status Species – Fish

Evaluated byways do not intersect with potential or occupied SSS fish habitat, therefore special status fish management would have no effect on byways and are not further addressed in this section.

Heritage and Visual Resources

There are no management actions common to all alternatives for cultural or paleontological resources that would affect byway management or use.

Visual Resources

A management action common to all alternatives is the requirement for permanent facilities to blend with the surrounding landscape. This requirement is secondary to managing within the VRM class, meaning that although facilities might be visible within VRM Class II through IV areas, mitigation for adverse effects on visual resources should be included wherever possible. Blending permanent facilities would help mitigate visual impacts however development activities would likely still be readily visible, therefore the beneficial effect of the management action on byway use is likely to be negligible.

Land Resources

Forest Products

Forest product management does not include any management actions common to all alternatives

that would affect use of the evaluated byways. The effects from the forest product program on scenic or BCBs will vary by alternative.

Lands and Realty

The lands and realty management actions common to all alternatives and which vary by alternative do not effect byway management or use and will not be addressed further in the *Scenic or BCBs* section.

Renewable Energy

Renewable-energy development does not include any management actions common to all alternatives that would affect use of the evaluated byways. The effects from the renewable-energy program on scenic or BCBs will vary by alternative.

Rights-of-Way and Corridors

The designation of ROW corridors adjacent to roads and other disturbance corridors could have a major adverse effect on byway use.

Travel and Transportation Management

Management actions common to all alternatives relate to standards for the location, design, and maintenance of roads and would have a major beneficial effect on byway use by providing a safe transportation network.

Recreation

Management actions common to all alternatives that would benefit byway use include providing diverse recreational opportunities, cooperatively developing recreational facilities and trails, and pursuing access to public lands for recreational purposes. These management actions would likely have a major beneficial effect.

Lands With Wilderness Characteristics

None of the evaluated byways traverse areas containing wilderness characteristics; this resource will not be addressed further in this section.

Livestock Grazing Management

Livestock are seen by some recreational motorists as an integral component of the rural pastoral setting while to others they are a detriment. Livestock grazing would be managed to achieve healthy rangelands and special habitats, a benefit to byway users. Overall, these management effects are likely to have a minor beneficial effect.

Special Designations**Area of Critical Environmental Concern**

There are no management actions common to all alternatives for ACECs that affect scenic or BCBs, the effects of ACEC management on the scenic or BCB resource will vary by alternative.

Wild and Scenic Rivers and Wilderness Study Areas

Management of WSRs or WSAs would not affect byway use. None of the evaluated routes directly access WSAs or the proposed Middle Fork suitable WSR segment; they will not be addressed further in the *Scenic or BCBs* section.

Socioeconomic Resources

There are no social, economic, or health and safety management actions common to all alternatives or by alternative that would have a measurable effect on byway management or use. Therefore, these topics are not addressed further in this section.

4.7.2.3. Alternative A

Scenic or Back Country Byways

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. Under Alternative A, there are no designated Scenic or BCBs. Mineral and other land use activities could occur along the potential byways reducing user satisfaction and safety. Development is likely along the Powder River Road, Trabing/Sussex Roads, an Tipperary/Thompson Roads; a major adverse effect.

Physical Resources

Soil

Soil management actions for Alternative A prohibit surface-disturbing activities on steep slopes and fragile soils with exception provisions. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by limiting development activities thereby enhancing recreational opportunities along the byways. However, inconsistent application of exceptions reduces the benefit to moderate.

Water Resources

Water management actions prohibit surface-disturbing activities within 500 feet of perennial streams and reservoirs with exception provisions. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by protecting the water quality and water based recreational opportunities along the byways. However, inconsistent application of exceptions reduces the benefit to moderate.

Cave and Karst Resources

While the 1985 does not contain any cave management decisions, surface-disturbing activities would likely be prohibited near significant caves. Much of the southern Big Horn Mountains is comprised of cave-bearing karst formation. Surface-disturbing activities could be prohibited near any significant caves along the Hazelton, Rome Hill, and Slip Roads proposed byways. This would likely include only a few caves and therefore a limited area of the byway evaluation area, a minor beneficial effect.

Mineral Resources

Locatable Minerals

There is likely to be minimal overlap between locatable minerals activities and potential byways. The potential for locatable minerals development to effect use within the byway evaluation areas would be negligible.

Leasable Minerals – Fluids

The foreseeable development predicts moderate to high CBNG development and moderate conventional development along the Lower Powder River Road. 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways are along the Lower Powder river Road. Fluid mineral activities could have a major adverse effect on byway use.

Salable Minerals

The foreseeable development scenario predicts that salable minerals development would disturb less than one percent of BLM surface in the planning area. There is likely to be minimal overlap between salable minerals activities and potential byways. Overall, salable minerals development would likely have a negligible adverse effect on byway use.

Biological Resources**Vegetation – Forests and Woodlands**

The Hazelton and Slip Roads potential byways provide access to commercial forest management areas. Alternative A management actions are designed to promote biodiversity and healthy forests. These management actions would provide for management activities in the Hazelton and Slip Road evaluation areas which could cause short term reduction in users but overall diverse healthy forests and woodlands should promote byway use. Therefore, forest and woodland management actions would have a moderate beneficial effect.

Vegetation – Grassland and Shrubland Communities

The present RMP does not have any grass and shrub community management actions. Non-native species could be used in reclamation activities, which may have an adverse effect on knowledgeable byway users. However, most users would not notice therefore the impact would be negligible.

Vegetation – Riparian/Wetland Resources

The primary byway that would be affected by riparian and wetland management is the Lower Powder River Road which parallels the Powder River; the Hazelton Road crosses multiple riparian areas. The Lower Powder River Road byway includes 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways. Surface-disturbing activities would be prohibited within 500 feet of riparian and wetland areas with exception provisions. Inconsistent application of exceptions and only one evaluation area being affected reduces the benefit to minor.

Fish and Wildlife Resources – Fish

The BLM cooperatively works with the WGFD to manage fish habitat. Fish habitat is present along the Lower Powder River and Hazelton Roads. Cooperative management would likely have a moderate beneficial effect on byway use by increasing opportunities for water-based recreation along these two routes.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Wildlife and SSS management actions include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing Greater Sage-Grouse habitat; and a seasonal disturbance-free buffer for bald eagle nests. These management actions all include provisions for exceptions that have been inconsistently applied in the past. Collectively, these actions could have a moderate beneficial effect on byway use by promoting habitat protection while providing exceptions for surface-disturbing activities.

Special Status Species – Plants

There are presently no management actions for special status plant species. The potential byways are all existing roads and therefore would likely not be affected by any special status plant management actions.

Heritage and Visual Resources

Cultural Resources

Alternative A would prohibit surface-disturbing activities near certain historic sites including the Bozeman Trail and Crazy Woman Battle Site. This management action would affect nearly all of the Trabling/Sussex byway which follows the Bozeman Trail. Small portions of the Hazelton, Powder River, and Slip Road byways would also be affected. This management action could have a moderate beneficial effect on byway use by limiting development activities thereby enhancing recreational opportunities along the byways.

Paleontological Resources

The 1985 RMP prohibited mineral activities within the Dry Creek Petrified Tree EEA. The Tipperary/Thompson Creek Roads byway provides access to Dry Creek. This management action would have a negligible beneficial effect on byway as it effects a limited portion of one potential byway.

Visual Resources

Alternative A manages the Big Horn Mountains as VRM Class II which includes the Hazelton, Slip, and Rome Hill byway evaluation areas. VRM Class II management would restrict development so that activities should not attract the attention of the casual observer. The remainder of the evaluation areas are primarily within VRM Class IV, with small sections within VRM Class II or III. VRM Class IV allows management activities to dominate the view. The effect is moderate beneficial as approximately one-third of the evaluation area is within VRM Class II, which restricts but does not prohibit development which detracts from byway user satisfaction.

Land Resources

Forest Products

The Hazelton and Slip Roads evaluation areas provide access to the commercial forest areas. Current management forecasts 6,000 acres of development during the planning period, clear cuts are limited to 20 acres in size. Commercial forestry activities would reduce user safety and detract from user enjoyment of the potential byways. The effect is moderate adverse as only two evaluation areas would be affected.

Renewable Energy

Renewable energy development would be possible along the Hazelton and Slip Roads evaluation areas. Renewable energy activities would reduce user safety and detract from user enjoyment of the potential byways. The effect is moderate adverse as only two evaluation areas would be affected.

Rights-of-Way and Corridors

The designation of ROW corridors adjacent to roads and other disturbance corridors could have a major adverse effect on byway use.

Travel and Transportation Management

The byway evaluation areas are all public roads which would not be affected by the Alternative A management actions.

Recreation

The Dry Creek Petrified Tree EEA, along the Tipperary/Thompson Creek byway evaluation area is an established recreation site which is likely to not have any additional effect on byway use.

Livestock Grazing Management

Livestock are seen by some recreational motorists as an integral component of the rural pastoral setting while to others they are a detriment. Livestock grazing would be managed to achieve healthy rangelands and special habitats a benefit to byway users. Overall these management effects are likely to have a minor beneficial effect.

Special Designations**Areas of Critical Environmental Concern**

Presently, there are no ACECs within the planning area, therefore they have no effect on potential byway use.

4.7.2.4. Alternative B**Scenic or Back Country Byways**

Alternative B would emphasize resource conservation. Under this alternative, the BLM would evaluate six routes in the planning area for Scenic or BCB designation. This would help provide opportunities for the public to learn about the multiple uses of public lands, which would have a major benefit on any designated byway.

Physical Resources**Soil**

Soil management actions for Alternative B prohibit surface-disturbing activities on steep slopes and fragile soils. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by limiting development activities, thereby enhancing recreational opportunities along the byways.

Water Resources

Water management actions would prohibit surface-disturbing activities within 500 feet of perennial streams and reservoirs, and manage riparian areas to restore perennial flows. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by protecting the water quality and water based recreational opportunities along the byways.

Cave and Karst Resources

Surface-disturbing activities would be prohibited within the karst formation. Much of the southern Big Horn Mountains is comprised of karst formation. Surface-disturbing activities would be prohibited along the Hazelton, Rome Hill, and Slip Roads proposed byways. This could have a moderate beneficial effect on byway use by limiting development activities, thereby enhancing recreational opportunities along the three byways.

Mineral Resources

Locatable Minerals

There is likely to be minimal overlap between locatable minerals activities and potential byways. The maximum foreseeable locatable minerals development is 1,455 acres (0.2%) of BLM surface in the planning area. Therefore, the potential for locatable minerals development to affect byway use would be negligible.

Leasable Minerals - Fluids

The foreseeable development predicts moderate to high CBNG development and moderate conventional development along the Lower Powder River Road. There are 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways along the Lower Powder River Road. There is also moderate to high CBNG potential along the Tipperary/Thompson Creek proposed byway. Fluid mineral activities could have a major adverse effect on byway use.

Salable Minerals

The foreseeable development scenarios for all alternatives predict that salable minerals development would disturb less than one percent of BLM surface in the planning area. Overall, salable minerals development would likely have a negligible adverse effect on byway use.

Biological Resources**Vegetation – Forests and Woodlands**

The Hazelton and Slip Roads potential byways provide access to commercial forest management areas. Alternative B management actions are designed to promote natural processes and minimize silvicultural treatments. These management actions would have a major beneficial effect on potential byway use by maintaining the natural ecosystems which the byways traverse.

Vegetation – Grassland and Shrubland Communities

Native plant species would be required for all reclamation activities. This may have a beneficial effect on byway users sensitive to non-native species.

Vegetation – Riparian/Wetland Resources

Riparian management actions would prohibit surface-disturbing activities within 500 feet of perennial streams and manage riparian areas to achieve DFC. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by protecting the water quality and water based recreational opportunities along the byways.

Fish and Wildlife Resources – Fish

There are several fisheries management actions that could potentially increase use along the Lower Powder River and Hazelton Roads including enhancing fisheries potential by prohibiting surface-disturbing and disruptive activities near fish-bearing water bodies, cooperating with the WGFD in stocking operations, designing and managing reservoirs for fisheries, and designing crossings to support fish passage. These management actions would likely have a major beneficial effect on byway use by increasing opportunities for water-based recreation.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Wildlife and SSS management actions under Alternative B prohibit surface-disturbing and disruptive activities within important habitat for many species including big game, raptors, upland game birds, herptiles, and bats. Collectively, these actions could have a major beneficial effect

on byway use by promoting habitat protection while causing the relocation, modification, or redesign of surface-disturbing activities.

Special Status Species – Plants

Surface-disturbing activities that could adversely impact special status plant habitat would be prohibited under Alternative B. Much of the Hazelton, Slip, and Rome Hill potential byways traverse special status plant habitat. These management actions would have a major beneficial effect on potential byway use by providing undisturbed SSS plant habitat that would be attractive to byway users.

Heritage and Visual Resources

Cultural Resources

Alternative B would prohibit surface-disturbing activities within 5 miles of historic properties. This management action would affect nearly all of the Trabing/Sussex byway which follows the Bozeman Trail. Small portions of the Hazelton, Powder River, and Slip Roads byways would also be affected. This management action could have a major beneficial effect on byway use by limiting development activities, thereby enhancing recreational opportunities along the byways.

Paleontological Resources

Alternative B would prohibit mineral development in areas containing paleontological resources of high quality or importance. The Tipperary/Thompson Creek Roads byway provides access to the Dry Creek Petrified Tree [EEA](#). Mineral activities are already precluded within the education area. This management action would have a negligible beneficial effect on byway as it effects a limited portion of one potential byway.

Visual Resources

Approximately one-third of the Powder River Road and 2 miles of the Hazelton Road traverse areas that would be managed as VRM Class II under Alternative B. There are 1,784 acres of BLM surface within 0.25 mile of the evaluated byways; 18 percent of the 9,765 acres of BLM surface in total within 0.25 mile of the evaluated byways. In VRM Class II areas, management activities would be regulated to not attract the attention of byway users. VRM could have a major beneficial effect on byway use by limiting development activities thereby enhancing recreational opportunities along the byways.

Land Resources

Forest Products

The Hazelton and Slip Roads potential byways provide access to commercial forest management areas. Alternative B management actions limit the area from which and the amount of commercial saw timber sold, to remain within ecologically sustainable limits. Commercial timber sales discourage byway use due to the truck traffic and vegetation disturbance along the byways. Limiting the size of treatment areas, designing treatment areas to have meandering boundaries, and limiting the available sales quantity would keep the impacts to byway use at a negligible level.

Renewable Energy

Renewable-energy development would be discouraged within the southern Big Horn Mountains reducing potential development along the Hazelton and Slip Roads. Renewable-energy activities could reduce user safety and detract from user enjoyment of the potential byways. The effect is moderate adverse, as development is possible along the byways.

Rights-of-Way and Corridors

Under Alternative B, ROW would be excluded from nearly all of BLM surface along the byways evaluated. The exclusion areas are for the protection of physical, biological, and heritage resources. Excluding ROW would have a major beneficial effect on byways by protecting resources important to byway users and enhancing recreational opportunities along the byways.

Travel and Transportation Management

Alternative B would prohibit motorized travel within big game crucial winter range and calving areas during the appropriate periods. These management actions would only affect the Slip Road which is not maintained for winter travel anyway; therefore these management actions would have a negligible impact on byway use as the amount of time during the seasonal closures when the Slip Road would be clear of snow and available for use is short. Travel off designated routes would be prohibited without a special use permit, this would likely affect some byway users but since few byway users are likely to be off-road recreationists, the effect is likely minor.

Recreation

The Dry Creek Petrified Tree **EEA**, along the Tipperary/Thompson Creek byway would be designated a SRMA under Alternative B. This is the only SRMA that would be accessed by an evaluated byway. As the Dry Creek Petrified Tree **EEA** is already an established site the additional SRMA designation is likely to have no effect on byway use.

Livestock Grazing Management

Livestock are seen by some recreational motorists as an integral component of the rural pastoral setting while to others they are a detriment. Livestock grazing would be managed to achieve healthy rangelands and special habitats, a benefit to byway users. Overall, these management effects are likely to have a minor beneficial effect.

Special Designations

Areas of Critical Environmental Concern

Cantonment Reno, along the Trabing/Sussex byway would be designated an ACEC under Alternative B. This is the only ACEC that would be accessed by an evaluated byway. Although Cantonment Reno is an established site with interpretive signs, the additional ACEC designation could bring additional attention to the historic fort and increase use of the byway. As only one byway would be affected, the effect would likely be negligible.

4.7.2.5. Alternative C

Scenic or Back Country Byways

Alternative C would not designate any Scenic or BCBs. Mineral and other land use activities could occur along the potential byways reducing user satisfaction and safety. Development is likely along the Powder River Road, Trabing/Sussex Roads, an Tipperary/Thompson Roads; a major adverse effect.

Physical Resources

Soil and Water Resources

Soil management actions for Alternative C allow surface-disturbing activities on steep slopes, fragile soils, and within 500 feet of perennial streams and reservoirs. These actions

would have a major adverse effect on byway use by enabling development activities thereby reducing recreational opportunities along the byways.

Cave and Karst Resources

Surface-disturbing activities would be prohibited near any significant caves along the Hazelton, Rome Hill, and Slip Roads. This would likely include only a few caves and therefore a limited area of the byway evaluation area, a minor beneficial effect.

Mineral Resources

Locatable Minerals

There is likely to be minimal overlap between locatable minerals activities and potential byways. The potential for locatable minerals development to effect use within the byway evaluation areas would be negligible.

Leasable Minerals - Fluids

The foreseeable development predicts moderate to high CBNG development and moderate conventional development along the Lower Powder River Road. 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways are along the Lower Powder river Road. Fluid mineral activities could have a major adverse effect on byway use.

Salable Minerals

The foreseeable development scenario predicts that salable minerals development would disturb less than one percent of BLM surface in the planning area. There is likely to be minimal overlap between salable minerals activities and potential byways. Overall, salable minerals development would likely have a negligible adverse effect on byway use.

Biological Resources

Vegetation – Forests and Woodlands

The Hazelton and Slip Roads potential byways provide access to commercial forest management areas. Alternative C management actions are designed to maximize forest health through intensive management. Commercial activity would decrease user safety and satisfaction within these two byway evaluation areas, a moderate adverse effect.

Vegetation – Grassland and Shrubland Communities

Non-native species could be used in reclamation activities, which may have an adverse effect on knowledgeable byway users. However, most users would not notice therefore the impact would be negligible.

Vegetation – Riparian/Wetland Resources

The primary byway that would be affected by riparian and wetland management is the Lower Powder River Road which parallels the Powder River; the Hazelton Road crosses multiple riparian areas. The Lower Powder River Road byway includes 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways. Surface-disturbing activities would be allowed within 500 feet of riparian and wetland areas. Development activity would reduce byway user safety and satisfaction, a minor adverse effect as a portion of two evaluation areas would be affected.

Fish and Wildlife Resources – Fish

Development activities would be allowed within fish habitat where resource objectives could be met. Fish habitat is present along the Lower Powder River and Hazelton Roads. Alternative C management would likely have a minor beneficial effect on byway use as although development could detract from user satisfaction opportunities for water-based recreation along these two routes would be maintained.

**Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife
(including Greater Sage-Grouse)**

Wildlife and SSS management actions include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing Greater Sage-Grouse habitat; and a seasonal disturbance-free buffer for bald eagle nests. Collectively, these actions could have a moderate beneficial effect on byway use by promoting habitat protection.

Special Status Species – Plants

Surface-disturbing activities that could adversely impact special status plant populations would be prohibited under Alternative C. While much of the Hazelton, Slip, and Rome Hill Roads traverse special status plant habitat there are few documented populations and populations are typically of limited size. These management actions would have a minor beneficial effect on potential byway use as there are few documented sensitive species plant populations along the routes that might attract byway users.

Heritage and Visual Resources**Cultural Resources**

Alternative C would allow surface-disturbing activities near historic and sites with mitigation. This management action could affect nearly all of the Trabing/Sussex byway which follows the Bozeman Trail. Small portions of the Hazelton, Powder River, and Slip Road byways could also be affected. This management action would have a minor beneficial effect on byway use by mitigating development activities within the evaluation areas thereby enhancing recreational opportunities.

Paleontological Resources

High-quality paleontological resource sites would not be designated. This could potentially allow development activities within the Dry Creek Petrified Tree EEA. The Tipperary/Thompson Creek Roads byway provides access to Dry Creek. This management action would have a negligible adverse effect on byway use as it effects a limited portion of one potential byway.

Visual Resources

The byway evaluation areas are mostly within VRM Class IV, with some VRM. Class III. VRM Class IV allows management activities to dominate the view. The effect is major adverse as the amount of development that could be authorized would detract from byway user satisfaction.

Land Resources**Forest Products**

The Hazelton and Slip Roads evaluation areas provide access to the commercial forest areas; management would maximize economic return. Commercial forestry activities would reduce user

safety and detract from user enjoyment of the potential byways. The effect is moderate adverse as only two evaluation areas would be affected.

Renewable Energy

Renewable energy development would be possible along the Hazelton and Slip Roads evaluation areas. Renewable energy activities would reduce user safety and detract from user enjoyment of the potential byways. The effect is moderate adverse as only two evaluation areas would be affected.

Rights-of-Way and Corridors

The designation of ROW corridors adjacent to roads and other disturbance corridors could have a major adverse effect on byway use.

Travel and Transportation Management

The byway evaluation areas are all public roads which would not be affected by the Alternative C management actions.

Recreation

No SRMAs would be designated. The Dry Creek Petrified Tree **EEA**, along the Tipperary/Thompson Creek byway evaluation area is an established recreation site which is likely to not have any additional effect on byway use.

Livestock Grazing Management

Livestock are seen by some recreational motorists as an integral component of the rural pastoral setting while to others they are a detriment. Livestock grazing would be managed to achieve healthy rangelands and special habitats a benefit to byway users. Overall these management effects are likely to have a minor beneficial effect.

Special Designations**Areas of Critical Environmental Concern**

Presently, there are no ACECs within the planning area, therefore they have no effect on potential byway use.

4.7.2.6. Alternative D**Scenic or Back Country Byways**

Alternative D promotes resource use while conserving physical, biological, and heritage resources. Under this alternative, the BLM would evaluate six routes in the planning area for scenic or BCB designation. This would help provide opportunities for the public to learn about the multiple uses of public lands, which would have a major benefit on any designated byway.

Physical Resources**Soil**

Soil management actions for Alternative D would allow surface-disturbing activities on steep slopes and fragile soils where the BLM determines the soil resource could be adequately protected. These actions while providing for development along the byways also conserve areas with fragile soils that would be attractive to byway users. Overall, there would likely be a moderate beneficial effect on byway use.

Water Resources

Water management actions would allow surface-disturbing activities within 500 feet of perennial streams and reservoirs where the water resource could be adequately protected. These actions while providing for development along the byways also conserve water quality and water-based recreational opportunities that would be attractive to byway users. Overall, there would likely be a moderate beneficial effect on byway use.

Cave and Karst Resources

Much of the southern Big Horn Mountains, accessed by the Hazelton, Rome Hill, and Slip Roads proposed byways, is comprised of cave-bearing karst formations. Surface-disturbing activities would be prohibited in the vicinity of significant caves. While Hazelton and Rome Hill Roads help provide access to cave areas, only the Slip Road has identified significant caves in close proximity to the potential byway, therefore the effect of cave and karst management on byway use is likely to be minor.

Mineral Resources**Locatable Minerals**

There is likely to be minimal overlap between locatable minerals activities and potential byways. The maximum foreseeable locatable minerals development is 1,455 acres (0.2%) of BLM surface in the planning area. Therefore, the potential for locatable minerals development to affect byway use would be negligible.

Leasable Minerals - Fluids

The foreseeable development predicts moderate to high CBNG development and moderate conventional development along the Lower Powder River Road. The 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways are along the Lower Powder River Road. There is also moderate to high CBNG potential along the Tipperary/Thompson Creek proposed byway. Fluid mineral activities could have a major adverse effect on byway use.

Salable Minerals

The foreseeable development scenarios for all alternatives predict that salable minerals development would disturb less than one percent of BLM surface in the planning area. Overall, salable minerals development would likely have a negligible adverse effect on byway use.

Biological Resources**Vegetation – Forests and Woodlands**

The Hazelton and Slip Roads potential byways provide access to commercial forest management areas. Alternative D management actions are designed to promote forest and woodland health; particularly aspen communities and old growth forest stands. While these management actions provide for intensive management they also support healthy ecosystems attractive to byway users. These management actions would have a moderate beneficial effect on potential byway use.

Vegetation – Grassland and Shrubland Communities

Non-native plant species would be allowed only for short-term reclamation activities. This should not effect byway users sensitive to non-native species as their presence would be short duration.

Vegetation – Riparian/Wetland Resources

Riparian management actions would allow surface-disturbing activities within 500 feet of riparian and wetland areas where they could be adequately protected. These actions while providing for development along the byways also conserve riparian/wetland resources and water based recreational opportunities that would be attractive to byway users. Overall, there would likely be a moderate beneficial effect on byway use.

Fish and Wildlife Resources – Fish

There are several fisheries management actions that could potentially increase use along the Lower Powder River and Hazelton Roads including enhancing fisheries potential by limiting surface-disturbing and disruptive activities near fish-bearing water bodies, considering fish when designing and managing reservoirs, and designing crossings to support fish passage. These management actions would likely have a moderate beneficial effect on byway use by increasing opportunities for water-based recreation.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (including Greater Sage-Grouse)

Wildlife and SSS management actions under Alternative D regulate surface-disturbing and disruptive activities within important habitat for many species including big game, raptors, upland game birds, reptiles, and bats. Collectively, these actions could have a moderate beneficial effect on byway use by promoting habitat conservation attractive to byway users while allowing development protective of the wildlife resource.

Special Status Species – Plants

Surface-disturbing activities that could adversely impact special status plant populations would be prohibited under Alternative D. While much of the Hazelton, Slip, and Rome Hill potential byways traverse special status plant habitat where there are few documented populations and populations are typically of limited size. These management actions would have a minor beneficial effect on potential byway use as there are few documented sensitive species plant populations along the routes that might attract byway users.

Heritage and Visual Resources**Cultural Resources**

Alternative D would prohibit surface-disturbing activities near identified historic properties. This management action would affect portions of the Trabing/Sussex byway which follows the Bozeman Trail and individual sites along the Hazelton, Powder River, and Slip Road byways. This management action could have a moderate beneficial effect on byway use by limiting development activities, thereby enhancing recreational opportunities along the byways.

Paleontological Resources

Mineral development under Alternative D would avoid areas containing paleontological resources of high quality or importance. The Tipperary/Thompson Creek Roads byway provides access to the Dry Creek Petrified Tree **EEA**. Mineral activities are already precluded within the education area. This management action would have a negligible beneficial effect on byway as it affects a limited portion of one potential byway.

Visual Resources

Short stretches of Tipperary/Thompson Creek and Hazelton byways traverse areas that would be managed as VRM Class II under Alternative D. In VRM Class II areas management

activities would be regulated to not attract the attention of byway users. Most of the remaining BLM surface traversed by the byways evaluated would be managed as VRM Class III where management activities may attract attention but should not dominate the view of byway users. VRM would likely have a minor beneficial effect on byway use as development activities could be readily visible along much of the byways, while in limited areas development activities would not attract the attention of byway users.

Land Resources

Forest Products

Alternative D management actions limit the amount of commercial saw timber sold to remain within ecologically sustainable limits. Commercial timber sales discourage byway use due to the truck traffic and vegetation disturbance along the byways. Designing treatment areas to have meandering boundaries, and limiting the available sales quantity would keep the impacts to byway use at a negligible level.

Renewable Energy

Renewable-energy development would be prohibited within the southern Big Horn Mountains preventing potential development along the Hazelton and Slip Roads. Renewable-energy activities could reduce user safety and detract from user enjoyment of the potential byways. The effect is moderate beneficial as only two evaluation areas are protected from development.

Rights-of-Way and Corridors

Alternative D excludes or regulates ROW on much of BLM surface along the byways evaluated. The avoidance and exclusion areas are for the protection of physical, biological, and heritage resources. Avoiding and excluding ROW would have a major beneficial effect on byways by protecting resources important to byway users and enhancing recreational opportunities along the byways.

Travel and Transportation Management

Alternative D would prohibit motorized travel within big game crucial winter range and calving areas during the appropriate periods. These management actions would only affect the Slip Road which is not maintained for winter travel anyway; therefore these management actions would have a negligible impact on byway use as the amount of time during the seasonal closures when the Slip Road would be clear of snow and available for use is short. Limited travel off designated routes would be allowed without a special use permit, this would likely have a minor beneficial effect on byway users. As the allowance for limited off-road use effects all of the byways whereas the big game timing limitations only affect the Slip Road, the overall effect of these management actions on byway use is likely to be minor beneficial.

Recreation

The Dry Creek Petrified Tree **EEA**, along the Tipperary/Thompson Creek byway would be designated a SRMA under Alternative D. This is the only SRMA that would be accessed by an evaluated byway. As the Dry Creek Petrified Tree **EEA** is already an established site the additional SRMA designation is likely to have no effect on byway use.

Livestock Grazing Management

Livestock are seen by some recreational motorists as an integral component of the rural pastoral setting while to others they are a detriment. Livestock grazing would be managed to achieve

healthy rangelands and special habitats a benefit to byway users. Overall these management effects are likely to have a minor beneficial effect.

Special Designations

Areas of Critical Environmental Concern

There are no ACECs under Alternative D that would be accessed from an evaluated byway; therefore there would be no effect from ACEC management on byway use.

4.7.2.7. Cumulative Impacts

Public use of any designated Scenic or BCBs could affect landowners and residents adjacent to the routes. In particular, increased traffic in fairly remote areas could result in requests for assistance, especially in times of bad weather. All evaluated Scenic or BCBs are county roads. The roads may require additional maintenance above the current level of county maintenance.

4.7.2.8. Conclusion

Alternatives B and D evaluate six potential byways. Alternative B would be the most protective of the scenic values for which byways are proposed. Alternative D provides for more land use activities and development than Alternative B which could be visible from designated byways. No byways are proposed in alternatives A or C.

4.7.3. Wild and Scenic Rivers

Protecting and enhancing scenic qualities, fisheries, recreation, wildlife values, and the relatively unmodified character of the area in a near-natural setting are the primary objectives for managing waterway segments eligible and suitable for inclusion in the WSR system. Because Manual 6400 - Wild and Scenic Rivers provides clear guidance on prohibited versus allowable uses in WSR corridors, the range of alternatives or discretionary actions regarding WSRs is limited. There would be no or undetectable effects on WSRs from the proposed management of the following: **Physical Resources, Mineral Resources, Biological Resources, Lands and Realty, Renewable Energy, Rights-of-Way and Corridors, Travel and Transportation Management, Livestock Grazing Management, Scenic or Back Country Byways, or Wilderness Study Areas.**

Management of several other resources or resource uses, including recreation, could have effects on recreational uses of public lands and waters. Water, fire and fuels, and vegetation management activities could influence the distribution of fish and wildlife and cause variations in the function and appearance of the landscape and river corridor. Other activities (including development of historic mining claims) that could affect ORVs in WSRs would be due to grandfathered or valid existing rights. Manual 6400 - Wild and Scenic Rivers provides guidance on the level of activity allowed, and adverse effects on ORVs are minimized as much as possible. In addition, there are no identified proposed actions contrary to managing the river to protect the ORVs and free-flowing condition.

4.7.3.1. Methods and Assumptions

The methods and assumptions used in the WSR analysis include, but are not limited to, the following:

- The management of suitable and eligible WSRs is guided by policy that supersedes the administrative flexibility and management alternatives in this document.
- Recreational use of river corridors eligible and suitable for WSR designation will increase. If the proposed corridors are designated, prescribed management will protect the ORVs for which the rivers were designated, requiring a mix of education and regulatory measures.
- Actions approved by the BLM will not affect the eligibility or suitability status of the subject waterways.
- Because the Middle Fork Powder River is currently the only waterway in the planning area that meets the requirements for eligibility and suitability, the extent of environmental consequences is limited to the area adjacent to that waterway. (Note: Corridor boundaries for the Middle Fork of the Powder River suitable segment are delineated by the canyon rims, except in cases where “rim-to-rim” exceeds an average of a half mile).
- The analysis will discuss the ability to protect the outstanding remarkable values, eligibility or suitability of the waterway, and to manage the river in a free-flowing condition.
- If Congress designates the Middle Fork Powder River as a WSR, the BLM will manage it in accordance with the National Wild and Scenic Rivers Act of 1968 and BLM Manual 6400–Wild and Scenic Rivers.
- Management prescribed for rivers found suitable for designation in the National Wild and Scenic Rivers System would protect the identified ORVs, tentative classification, and free-flowing condition of those segments.

Significance Criteria

An adverse effect on an WSR as a result of federal actions would be considered potentially significant if the following were to occur:

- Any action that would impact the identified ORVs for the Middle Fork Powder River suitable segment or lead to a determination of nonsuitability for WSR designation.
- An action that changes the tentative classification of the segment from “wild” to either “scenic” or “recreation.”

4.7.3.2. Impacts Common to All Alternatives

Interim management requires protection and/or enhancement of the ORVs, free-flowing condition, and water quality of the river corridor and maintenance of the tentative classification until Congress designates the river or releases it for other uses. The adverse effects of proposed actions would be mitigated to protect the existing values upon which suitability is based. The Middle Fork Powder River will be managed in cooperation with stakeholders to meet the requirements specified in Manual 6400 and will maintain the tentative “wild” classification of the suitable segment. Management action VRM-5005 specifies that Congressional designation of the Middle Fork Powder River WSR would designate the corridor as VRM Class I, it would not be necessary to amend the RMP. The alternative prescriptions below indicate the VRM Class that would be assigned if Congress releases the suitable segment to other uses.

4.7.3.3. Alternative A

No previous decision has been made regarding continued management of the Middle Fork Powder River should Congress choose to release the river from further consideration. Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. The Middle Fork Powder River canyon is currently managed as a VRM Class II,

offering adequate protection of scenic values in the canyon to maintain eligibility for designation as a WSR. Middle Fork Canyon is currently closed to motorized use and livestock grazing. Given the topographical restraints in Middle Fork Canyon and the relatively low mineral potential, land uses, including minerals extraction and ROW, would be unlikely. Under Alternative A, project proposals for resource development (e.g., mineral resources, ROW, road construction) or extraction would be managed on a case-by-case basis pursuant to Manual 6400. The protection of the free-flowing condition and outstanding remarkable values could not be guaranteed.

4.7.3.4. Alternative B

Alternative B would emphasize resource conservation. If Congress releases the Middle Fork Powder River suitable segment to other uses, management under Alternative B would protect and enhance the free-flowing condition and identified ORVs of the river. Alternative B provides for continued protections of the river corridor even if Congress does not designate the Middle Fork Powder River as a WSR. The area would continue to be managed as VRM Class II, rather than VRM Class I, if released from consideration. Middle Fork Canyon would be included in the SRMA designation, which would increase protections from the effects of overuse or damage from recreationists. In addition, the SRMA would be unavailable for leasing and withdrawn from minerals entry, further protecting the WSR resource. Other land use activities would be managed on a case-by-case basis.

4.7.3.5. Alternative C

Alternative C would emphasize resource use. Under this alternative, if Congress releases the Middle Fork Powder River suitable segment to other uses, special provisions or restrictions would not be imposed on the river corridor. Project proposals for resource development or extraction would be managed on a case-by-case basis. The canyon of the Middle Fork Powder River would be managed as a VRM Class III area, which would reduce protections for scenic values. The Middle Fork Powder River would be included in the SRMA designation, which would increase protections from the effects of overuse or damage from recreationists. However, the area would not be closed to minerals leasing. Due to the low mineral potential in the area coupled with the rough topography and distance to market, the anticipated demand for mineral development is low. Thus, the adverse effect of allowing minerals leasing may not affect the river corridor's ORVs, as development is not reasonably foreseeable. Alternative C could conceivably allow for future dams along the river should the river be released from consideration, which would damage the river's free-flowing condition.

4.7.3.6. Alternative D

Alternative D would allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the Proposed RMP. If Congress releases the Middle Fork Powder River suitable segment to other uses, management under Alternative D would retain the free-flowing condition and identified ORVs of the river. This alternative would provide for continued protection of the river corridor. The area would be managed as VRM Class II. Middle Fork Powder River would be included in the SRMA designation, which would increase protections from the effects of overuse or damage from recreationists. In addition, the SRMA would be unavailable for leasing and withdrawn

from minerals entry, which would further protect the WSR resource. Other land use activities would be managed on a case-by-case basis.

4.7.3.7. Cumulative Impacts

The section of Middle Fork Powder River that is suitable for WSR designation is surrounded by BLM-administered public lands with no private inholdings. Private land intersects the river both upstream and downstream of suitable segments recommended for WSR designation. The river corridor does briefly cross through a corner of land managed by the WGFD in the Ed O. Taylor Winter Game Range. The placement of a dam on private lands in the vicinity of Middle Fork Powder River has been proposed in the past; a dam would affect the river's free flowing condition. Such an action would require a permit through the State of Wyoming. There are currently no RFAs in the WSR corridor that would impact identified ORVs, change the tentative classification, result in a determination of nonsuitability, and/or disqualify the river from potential designation.

4.7.3.8. Conclusion

The impacts from each alternative will be contingent on whether or not Congress acts to release the Middle Fork Powder River from consideration or to designate as a WSR. Table 4.63, "Summary of Ability to Protect Characteristics of Wild and Scenic Rivers" (p. 1626) summarizes the ability of each alternative to protect the free-flowing condition and outstanding remarkable values of WSRs.

Table 4.63. Summary of Ability to Protect Characteristics of Wild and Scenic Rivers

	Alternative A	Alternative B	Alternative C	Alternative D
Free-flowing Characteristic	Insufficient protection	Sufficient protection	Insufficient protection	Sufficient protection
Outstanding Remarkable Values	Insufficient protection	Sufficient protection	Insufficient protection	Sufficient protection

4.7.4. Wilderness Study Areas

Because BLM Manual 6330 - Management of Wilderness Study Areas provides clear guidance on prohibited versus allowable uses in WSAs, the range of alternatives or discretionary actions regarding WSAs is limited. There would be no effects on WSAs from the proposed management of the following: physical resources, mineral resources, fish and wildlife resources, lands and realty, renewable energy, ROW and corridors, Scenic or BCBs, or WSRs. Management of several other resources or resource uses, including recreation and livestock grazing, could have indirect, often minor, effects. Water, fire and fuels, and vegetation management activities could influence the distribution of fish and wildlife and cause variations in the function and appearance of the landscape. This could influence recreational use patterns and preferences in the planning area, but would not substantially alter the demand for or distribution of activities in the planning area as a whole, and are not further discussed in this section. Other activities (including range improvements and development of historic mining claims) that could affect wilderness values in WSAs would be due to grandfathered or valid existing rights. The WSA Manual provides guidance on the level of activity allowed, and adverse effects on wilderness values are minimized as much as possible.

4.7.4.1. Methods and Assumptions

The methods and assumptions used in the impact analysis for WSAs include but are not limited to the following:

- The extent of environmental consequences is limited to the BLM-administered lands in the North Fork, Gardner Mountain, and Fortification Creek WSAs.
- All WSAs in the planning area will continue to be managed under the BLM Manual 6330 - Management of Wilderness Study Areas until such time as Congress either designates all or portions of the WSAs as wilderness or releases the WSAs or portions of the WSAs from further consideration for wilderness.
- Should Congress release a WSA from further consideration for designation as wilderness, the lands within the WSA will be subject to consideration as lands with wilderness characteristics.
- Any resource-dependent activity approved in a WSA will be rigorously managed to ensure that it would not impair the area's wilderness characteristics or its suitability for designation as wilderness.
- Wilderness interim management is subject to Valid Existing Rights and the Grandfather Clause (see Manual 6330) under all of the alternatives.
- WSA designation helps protect air quality and watersheds, soil and water quality, ecological stability, plant and animal gene pools, archeological and historical sites, habitats for wildlife, and quality of forage.
- Although areas considered or proposed for withdrawal from mineral entry would require approval by Congress, this analysis assumes the area would be approved and withdrawn.
- The analysis will focus on the ability of the BLM to protect the wilderness characteristics (naturalness; opportunities for outstanding primitive and unconfined recreation and solitude; and identified supplemental values).

4.7.4.2. Impacts Common to All Alternatives

Restrictions on solid and fluid minerals development and motorized vehicle use in WSAs would be consistent with BLM Manual 6330 - Management of Wilderness Study Areas and protect the pristine character of these areas. Managing WSAs under VRM Class I objectives is mandated through WO-IM-2000-096 (BLM 2000b) and helps to meeting BLM Manual 6330 - Management of Wilderness Study Areas goals and objectives.

Under BLM Manual 6330 - Management of Wilderness Study Areas, the wilderness characteristics of WSAs and the areas' opportunities for solitude and primitive, unconfined recreation, as well as any special features that further qualify them for consideration as wilderness, would be preserved. At the same time, activities that would adversely affect the wilderness character of the areas would be prohibited.

4.7.4.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. Under Alternative A, if Congress does not designate the WSAs as wilderness, automatically leasing these areas for oil and gas development would not protect the wilderness characteristics in each of the WSAs. An estimated 150 CBNG wells could be developed in the Fortification Creek WSA. Mineral potential in Gardner Mountain and North Fork WSAs is low; therefore, it is not likely that these WSAs would be developed. Under Alternative A, the WSAs are designated as "limited to designated routes" and most of the WSAs

are seasonally closed to motorized use. While no routes have been designated within any WSA, the possibility for route designation exists and clarification is necessary to meet the objectives set forth in BLM Manual 6330 - Management of Wilderness Study Areas. Mechanized vehicle use is often considered inconsistent with wilderness values, however, no specific decisions related to mechanized use have been made within the planning area. The protection of the wilderness characteristics from motorized or mechanized uses could not be guaranteed.

4.7.4.4. Alternative B

Alternative B would emphasize resource conservation. Should Congress release a WSA from further consideration, a plan amendment would be necessary. Designating an ACEC for the Fortification Creek elk herd would provide additional protections for the fauna that inhabit the Fortification Creek WSA, but may not specifically protect wilderness characteristics. The protection of the wilderness characteristics from other resource uses would be subject to policy regarding lands with wilderness characteristics and dependent on a future RMP amendment. Current policy (Secretarial Order 3310) directs the BLM to protect the naturalness of **Lands with Wilderness Characteristics**. Should policy change during the life of the plan, protection of wilderness characteristics in released WSAs could not be guaranteed. Prohibiting motorized and mechanized vehicle use would be consistent with management of designated wilderness areas and would be appropriate in WSAs.

4.7.4.5. Alternative C

Alternative C would emphasize resource use. Should Congress release a WSA from further consideration, a plan amendment would be necessary. The protection of the wilderness characteristics from other resource uses would be subject to policy regarding **lands with wilderness characteristics** and dependent on a future RMP amendment. Current policy (Secretarial Order 3310) directs the BLM to protect the naturalness of **lands with wilderness characteristics**. Should policy change during the life of the plan, protection of wilderness characteristics in released WSAs could not be guaranteed. Prohibiting motorized use would be consistent with BLM Manual 6330 - Management of Wilderness Study Areas. This alternative would not prohibit mechanized use in WSAs, which could result in reduced opportunities for primitive and unconfined recreation or solitude from the perspective of “traditional” back country visitors.

4.7.4.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the **Proposed RMP**. The impacts to WSAs of implementing Alternative D would be the same as Alternative B.

4.7.4.7. Cumulative Impacts

There is a 640-acre section owned by the State of Wyoming in the Fortification Creek WSA, while not presently leased for mineral development, it has been leased (but not developed) in the past and could be leased and potentially developed. However, adverse effects on the WSA resource are not anticipated from **RFAs**. There are no other inholdings within the boundaries of any of the WSAs; therefore, there would be no non-BLM actions in the Gardner Mountain or North Fork

WSA. There are private and state parcels adjacent to each of the WSAs, but activities outside of WSA boundaries would not affect the eligibility of a WSA for Wilderness designation.

4.7.4.8. Conclusion

The impacts from each alternative will be contingent on whether or not Congress acts to release the WSAs from consideration or to designate as Wilderness.

4.8. Socioeconomic Resources

4.8.1. Social Conditions

This section addresses the potential for the alternatives to affect social conditions in the planning area, including direct, indirect, short-term, and long-term effects. Appendix A (p. 1771) identifies the laws, regulations, policies, and guidance considered in this analysis of effects on social conditions.

Potential effects on social conditions include changes in population, such as fluctuations caused by economic boom and bust cycles; changes in the demand for housing and community services, along with community fiscal conditions, which can affect the ability of state, regional, and local governments to supply community services such as education; and changes in community character, culture, and social trends. The BLM does not directly manage social conditions in the planning area. However, BLM management actions have the potential to indirectly affect social conditions. For example, a decision to prohibit future oil and gas exploration or leasing on BLM-administered mineral estate could adversely affect the availability of job opportunities in the planning area, which could lead to reductions in populations in parts of the planning area as residents move away to find jobs elsewhere (or as fewer people move to the planning area for jobs).

4.8.1.1. Methods and Assumptions

Effects on social conditions associated with each of the alternatives were compared to existing conditions and trends in the planning area to establish a context for comparison. Effects on social conditions were broadly classified into three categories: effects on population; effects on housing and community services; and effects on customs, culture, and social trends. This section also describes each alternative's consistency with local land use plans.

Assumptions used in this analysis include:

- Economic conditions, especially jobs, labor earnings, and economic output, will continue to drive population growth in the planning area.
- Any population change that could reasonably be associated with the alternatives will likely be due to changes in employment opportunities.
- Federal, state, and local taxes will continue to be collected on minerals produced in the planning area.
- While BLM management actions will have some influence on the pace and timing of economic development in the planning area, the pace and timing of development also depends and will continue to depend on many factors, most notably the price of coal, oil, gas, and mineral

products on regional, national, and international markets, and national and world economic conditions (e.g., business cycles).

4.8.1.2. Impacts Common to All Alternatives

Any population change that could reasonably be associated with the alternatives would likely be due to changes in employment opportunities. Employment opportunities related to activities on BLM surface and federal mineral estate include jobs in exploration, development, and production of minerals, including oil and gas, coal, and locatable and salable minerals; jobs in livestock production; jobs related to various recreation activities and OHV use; and other types of jobs that rely on BLM-administered lands, such as management of wildlife and plant species that use BLM-administered lands. The economic analysis provides quantitative estimates of employment in the planning area due to oil and gas, grazing, and recreation activities on BLM surface and federal mineral estate. These quantitative estimates are used to aid in the analysis of effects on population.

The analysis that follows focuses on the effects of BLM actions. It is important to note that many other events outside BLM control could alter economic and social trends. For example, oil and gas prices could change as a result of an expansion or contraction of world or national economic activity, and that could affect the pace of development or the quantity of development. Similarly, state and local laws regulating the subdivision of land could alter land ownership and development patterns, which could affect open space and physical landscapes. Where the analysis finds that BLM actions would result in minimal or no change in social conditions, it does not necessarily mean there would be no change. Other forces frequently result in changes to complex economic and social trends.

The economic and social analysis incorporates variations in pace of development over time, where that information can be predicted with reasonable certainty. However, under all alternatives, the pace of development could differ from the rate assumed in the analysis. The BLM has limited control over the pace of development because it only authorizes economic activities such as oil and gas drilling, and does not perform these activities. An abrupt shift in the pace of development could result in short-term effects (beneficial or adverse) on demand for housing and community services, and on the supply of tax revenues from residences or businesses to support community services, due to short-term changes in job opportunities and the resulting change in immigration or outmigration trends. Any such effects would likely be more severe for smaller communities, which are less likely to be able to absorb a sudden influx of new residents, or to continue to support existing infrastructure if outmigration suddenly increased.

Under all alternatives, the BLM would continue to consider effects on socioeconomics from site-specific actions, and incorporate socioeconomic issues into the analyses of environmental, social, and economic effects, such as the NEPA analyses required for certain future site-specific actions.

4.8.1.3. Alternative A

Effects on Population

Under Alternative A, activities on BLM surface and federal mineral estate related to oil and gas development, livestock grazing, and recreation would support an average of 3,478 full-time and part-time jobs per year, which represents approximately 6.0 percent of total employment in the

planning area as of 2011. It is important to note that this does not constitute an increase of 3,478 jobs per year over current employment; it more closely represents an estimate of the contribution of certain activities on BLM surface and federal mineral estate to overall employment in the planning area. In addition, as noted in the *Economic Conditions* section, this does not include activities not modeled in Impact Analysis for Planning Model (IMPLAN), including coal, renewable-energy, and locatable and salable minerals exploration and production.

The economic analysis is performed at a regional level and integrates across all producing sectors; thus, these job opportunities would occur throughout the planning area. This is also true because oil and gas developers, livestock producers, and recreation providers operate throughout the planning area. However, job opportunities would concentrate in population centers. This would not represent a shift in the current distribution of employment opportunities. Indeed, because Alternative A would continue current management actions, it would not alter the overall trend of development in the planning area, nor would it alter current trends in population growth and decline.

Effects on Housing and Community Services

Changes in population have the potential to change the demand for housing and community services, such as roads, schools, and police and fire protection. County-wide vacancy rates in 2010 were 9.4 percent in Campbell County, 16.9 percent in Johnson County, and 11.3 percent in Sheridan County. These percentages, which include rental units as well as units for purchase, represent approximately 1,800 vacant units in Campbell County, 770 vacant units in Johnson County, and 1,600 in Sheridan County (U.S. Census Bureau 2011a). Vacancy rates for rental properties have been on the order of 7 to 8 percent in recent years according to the data from the Wyoming Housing Database Partnership presented in Chapter 3. However, because Alternative A would not result in a change in BLM management actions, management under this alternative should not result in a change in either the total demand for housing and community services or its geographic distribution.

If development is slower or faster than the relatively steady pace assumed in this analysis, there could be short-term effects on the demand for housing and community services and on the supply of tax revenues from residences or businesses to support community services. It would likely be more difficult for smaller communities to absorb sudden changes of this nature. If national and international energy prices, operator business strategies, or other factors lead to a rapid pace of development, there could be sudden short-term increases in demand for community services as a result of new jobs and increased population. However, local and state tax revenues collected from energy production could help mitigate short-term increases in demand for services, because tax revenues help pay for community services.

Consistency with Adopted County Land Use Plans

As noted in Chapter 3, BLM **RMPs** must be consistent with adopted local land use plans, and the BLM must take practical steps to resolve any identified conflicts between federal and local plans. The *Social Conditions* section in Chapter 3 summarizes adopted land use plans for each of the counties in the planning area. Alternative A would maintain existing policies for BLM-administered land management and therefore would not result in any inconsistencies or conflicts with existing county land use plans.

Land use plans for the three counties in the planning area emphasize the importance of coordinating with the BLM and other federal land management agencies. Under Alternative A,

the BLM would continue current policies of coordinating with county and municipal land use planners. Alternative A also would continue current policies related to livestock grazing, which would be consistent with the adopted Johnson County land use plan. That plan identifies three key concerns related to BLM-administered lands and resources, all related to the continued availability of public lands for livestock grazing, the policies that affect the management of federal grazing allotments, and the continued financial viability of livestock grazing operators (Johnson County 2005).

Effects on Quality of Life and Local Culture

Historically, the communities in the planning area developed around a combination of resource-based industries, including resource extraction, ranching, trade and commerce, and providing supplies and services to visitors. Quality of life for the people who live in the planning area depends on continued economic opportunities and features of the natural landscape. Alternative A would maintain existing BLM policies. Historically, these policies have contributed – along with other government policies and the actions of private firms and residents – to economic viability and resilience. But it should be noted that under Alternative A there could be other forces at play that would drive changes in the economic, physical, and social conditions in the planning area.

Although there are specific groups with particular interests regarding specific land uses (e.g., oil and gas, recreation interests), based on current land use plans, there is local support for both conservation of natural resources and the economic viability of resource-based industries. This is consistent with multiple uses of BLM-administered lands, including the development of mineral and energy resources, livestock grazing authorizations, continued access to BLM-administered lands for recreation, and conservation of wildlife and native vegetation. Alternative A would continue the current BLM practice of allowing multiple uses. The BLM also would continue to incorporate socioeconomic considerations into the planning process and perform socioeconomic analyses as required for site-specific actions.

4.8.1.4. Alternative B

Effects on Population

Under Alternative B, activities on BLM-administered lands and mineral estate related to oil and gas development, livestock grazing, and recreation would support an average of 109 full-time and part-time jobs per year, which represents approximately 0.2 percent of total employment in the planning area as of 2011. Compared to Alternative A, which represents the continuation of current trends, this represents a decrease of 3,373 jobs, or approximately 5.8 percent of employment in 2011. Most of these job losses would be related to restrictions on development of oil and gas from federal surface. The BLM predicts that oil and gas development on nearby state or fee surface land would partially compensate for the projected employment decrease (see the analysis of cumulative impacts for more information).

A decrease in employment opportunities could result in a decrease in population in the planning area because people might leave the area to seek employment elsewhere. The expected magnitude of any such decrease would be similar to the magnitude of employment loss, but would be lower because some people (e.g., those who are retired) live on unearned income and therefore do not depend directly on employment for their economic wellbeing. In other words, if 5.8 percent of employed people and their families leave the planning area, the population would decrease by

less than 5.8 percent because some residents in the planning area are in retired or otherwise nonworking families.

There would be job opportunities related to BLM actions throughout the planning area. Oil and gas developers, livestock producers, and recreation providers operate throughout the planning area. However, job opportunities would concentrate in population centers. This would likely produce a shift in the current geographic distribution of employment opportunities within the planning area depending on the communities' dependence on oil and gas development. Based on the county distribution of oil and gas production and employment (described in the *Socioeconomic Resources* section of Chapter 3), the reduced direct employment supported by oil and gas activities on BLM-administered lands would be more likely felt in Johnson and Campbell counties, than in Sheridan County, although indirect employment impacts could be more broadly distributed. Moreover, Alternative B would result in employment moving away from jobs related to oil and gas development and into other sectors. One result would be lower average wages because jobs related to oil and gas tend to have relatively higher average earnings per job than jobs related to services and agriculture. As a result, the implementation of Alternative B would likely produce a decline in population that would be noticeable in regional statistics.

Under Alternative B, job opportunities, and therefore job losses, would concentrate in population centers. Because the job losses under Alternative B would be primarily related to oil and gas development, any population changes would concentrate in areas that service oil and gas companies, such as Gillette.

Effects on Housing and Community Services

Alternative B management could result in decreased population and therefore would result in decreased demand for housing and community services. Alternative B management also would result in a reduced tax base for providing these services. Areas that service oil and gas production companies, such as Gillette, would experience the greatest reductions in reduced tax base.

If the decline in the oil and gas sector occurs slower or faster than the relatively steady pace assumed in this analysis, there could be short-term effects on demand for housing and community services, and on the supply of tax revenues from residences or businesses to support community services. It would likely be more difficult for smaller communities to absorb sudden changes of this nature.

Consistency with Adopted County Land Use Plans

BLM RMPs must be consistent with adopted local land use plans, and the BLM must take practical steps to resolve any identified conflicts between federal and local plans. The *Social Conditions* section in Chapter 3 summarizes adopted land use plans for each of the counties in the planning area. Alternative B would result in a measurable reduction in employment opportunities, amounting to about 5.8 percent of current employment, with the reduction attributable to direct, indirect, and induced effects related to oil and gas exploration and production (see "Effects on Population" above, and "Effects on Employment" in the *Economic Conditions* section). Accordingly, it could be argued that Alternative B would result in a conflict with the adopted land use plan of Campbell County, which indicates that the social stability of the county is based on "high-paying direct and indirect jobs related to mineral extraction in the county and depends on these industries being stable and viable." BLM management actions in Alternative B would not affect the long-term viability of mineral extraction activities on state and private land, but it would decrease the number of job opportunities available related to oil and gas over the life of the RMP.

Land use plans for the three counties in the planning area emphasize the importance of coordinating with the BLM and other federal land management agencies. Under this alternative, the BLM would continue current policies of coordinating with county and municipal land use planners. The adopted Johnson County land use plan identifies three key concerns related to BLM-administered land and resources, all related to the continued availability of public lands for livestock grazing, the policies that affect the management of federal grazing allotments, and the continued financial viability of livestock grazing operators (Johnson County 2005). In this context, it is notable that Alternative B would result in less available acres for livestock grazing.

Effects on Quality of Life and Local Culture

Historically, the communities in the planning area developed around a combination of resource-based industries, including resource extraction, ranching, trade and commerce, and providing supplies and services to tourists. Quality of life for the people who live in the planning area depends on continued economic opportunities and features of the natural landscape. Alternative B would reduce economic opportunities overall, but also would result in lower air pollution and other adverse environmental effects associated with oil and gas development.

Although there are specific groups with particular interests regarding specific land uses (e.g., oil and gas, recreation interests), based on current land use plans, there is local support for both conservation of natural resources and the economic viability of resource-based industries. This is consistent with multiple uses of BLM-administered lands, including the development of mineral and energy resources, livestock grazing authorizations, continued access to BLM-administered lands for recreation, and conservation of wildlife and native vegetation. Alternative B would continue the current BLM practice of allowing multiple uses, but would prioritize other uses over oil and gas development and livestock grazing. This would be inconsistent with the culture advocated by others (e.g., oil and gas developers) and would promote the culture advocated by others (e.g., wilderness advocates). Based on the analysis of impacts to recreation in the Chapter 4 *Recreation* section, Alternative B would favor groups associated with nonmotorized and non-consumptive recreational opportunities, as opposed to groups associated with motorized and consumptive recreation.

4.8.1.5. Alternative C

Effects on Population

Under Alternative C, activities on BLM-administered land and mineral estate related to oil and gas development, livestock grazing, and recreation would support an average of 4,201 full-time and part-time jobs per year, which represents approximately 7.2 percent of total employment in the planning area as of 2011. This total figure is somewhat higher than that for Alternative A. The IMPLAN model predicts a very small decrease in jobs related to livestock grazing, and more jobs related to oil and gas exploration, development, and production.

Because the economic analysis is performed at a regional level and integrates across all producing sectors, the job opportunities under Alternative C would occur throughout the planning area. Although this alternative would result in a slight shift away from jobs related to livestock grazing and toward jobs related to oil and gas development, this shift would not likely be noticeable in regional statistics for agriculture given the magnitude of the figures involved (i.e., three fewer jobs related to livestock grazing, but approximately 700 more related to oil and gas development). However, it is important to note that these figures reflect not just the sectors directly affected,

but also indirectly related sectors such as product wholesalers and distributors. The geographic distribution of job opportunities would not change substantially from current conditions, and jobs would continue to concentrate in population centers.

An increase in employment opportunities could result in an increase in population in the planning area as people are drawn to the new jobs. The expected magnitude of any such increase would be similar to the magnitude of employment gained, as new employees move to the area with their families. Because this alternative would not result in a measurable increase in employment overall, it would not result in a change in population.

Effects on Housing and Community Services

Alternative C may result in a small increase in population and therefore could result in higher demand for housing and/or community services. The current vacancy rates for housing units in the three counties (reported in the analysis for Alternative A) indicate that housing would likely be available for people migrating into the community, if that were to happen as a result of BLM actions in Alternative C. Alternative C would also result in a slightly greater tax base for providing these services than is presently available (see the *Economic Conditions* section). This would likely be perceived as a beneficial effect on community governments.

As noted under Impacts Common to All Alternatives, if development occurs slower or faster than the relatively steady pace assumed in this analysis, there could be short-term effects on demand for housing and community services, and on the supply of tax revenues from residences or businesses to support community services. It would likely be more difficult for smaller communities to absorb sudden changes of this nature.

Consistency with Adopted County Land Use Plans

BLM **RMPs** must be consistent with adopted local land use plans, and the BLM must take practical steps to resolve any identified conflicts between federal and local plans. The *Social Conditions* section in Chapter 3 summarizes adopted land use plans for each of the counties in the planning area. Alternative C would not result in any inconsistencies or conflicts with existing county land use plans.

Land use plans for the three counties in the planning area emphasize the importance of coordinating with the BLM and other federal land management agencies. Under Alternative C, the BLM would continue current policies of coordinating with county and municipal land use planners. The adopted Johnson County land use plan identifies three key concerns related to BLM-administered land and resources, all related to the continued availability of public lands for livestock grazing, the policies that affect the management of federal grazing allotments, and the continued financial viability of livestock grazing operators (Johnson County 2005). In this context, it is notable that Alternative C would result in slightly more surface disturbance that could adversely affect livestock grazing operators (approximately 1.3 times as much as under Alternative A). Although the reduction in available AUMs for grazing operators could adversely affect their financial viability, there is a potential that some operators would benefit from offsetting financial benefits from surface agreements and leasing their mineral development rights to oil and gas producers. However, it is unclear on balance whether or not the financial gain would fully compensate for all the oil and gas related impacts.

Effects on Quality of Life and Local Culture

Historically, the communities in the planning area developed around a combination of resource-based industries, including resource extraction, ranching, trade and commerce, and providing supplies and services to tourists. Quality of life for the people who live in the planning area depends on continued economic opportunities and features of the natural landscape. Alternative C would increase economic opportunities, but also would result in more air pollution and other adverse environmental effects associated with oil and gas development.

Although there are specific groups with particular interests regarding specific land uses (e.g., oil and gas, recreation interests), based on current land use plans, there is local support for both conservation of natural and the economic viability of resource-based industries. This would be consistent with multiple uses of BLM-administered lands, including the development of mineral and energy resources, livestock grazing authorizations, continued access to BLM-administered lands for recreation, and conservation of wildlife and native vegetation. Alternative C would continue the current BLM practice of allowing multiple uses, but would prioritize oil and gas development over other uses. This would be consistent with the culture advocated by some interest groups (e.g., oil and gas interests) and would be inconsistent with the culture advocated by others (e.g., wilderness advocates). Based on the analysis of impacts to recreation in the Chapter 4 *Recreation* section, Alternative C would be less favorable to nonmotorized and non-consumptive recreational users.

4.8.1.6. Alternative D

Effects on Population

Under Alternative D, activities on BLM surface and federal mineral estate related to oil and gas development, livestock grazing, and recreation would support an average of 3,557 full-time and part-time jobs per year, which represents approximately 6.1 percent of total employment in the planning area as of 2011. This total is a slight increase over Alternative A, with about 82 more jobs. The distribution of jobs under Alternative D would be essentially the same as Alternative A.

Because the economic analysis is performed at a regional level and integrates across all producing sectors, the job opportunities under Alternative D would occur throughout the planning area. The geographic distribution of job opportunities would not change substantially from current conditions, and jobs would continue to concentrate in population centers.

An increase in employment opportunities could result in an increase in population in the planning area as people are drawn to the new jobs. The expected magnitude of any such increase would be similar to the magnitude of employment gained as new employees move to the area with their families. Because this alternative would result in a barely measurable increase in employment overall, it would not result in a change in population.

Effects on Housing and Community Services

Alternative D would not likely result in a measurable increase in population and therefore would not result in higher demand for housing or community services. To the extent that there would be in-migration, recent housing vacancy rates suggest that the current housing stock could accommodate newcomers. Alternative D would also result in a slightly greater tax base for providing community services than is presently available (see the *Economic Conditions* section). This would likely be perceived as a beneficial effect on community governments.

As noted under Impacts Common to All Alternatives, if development occurs slower or faster than the relatively steady pace assumed in the analysis, there could be short-term effects on demand for housing and community services, and on the supply of tax revenues from residences or businesses to support community services. It would likely be more difficult for smaller communities to absorb sudden changes of this nature.

Consistency with Adopted County Land Use Plans

BLM RMPs must be consistent with adopted local land use plans, and the BLM must take practical steps to resolve any identified conflicts between federal and local plans. The *Social Conditions* section in Chapter 3 summarizes adopted land use plans for each of the counties in the planning area. Alternative D would not result in any inconsistencies or conflicts with existing county land use plans.

Land use plans for the three counties in the planning area emphasize the importance of coordinating with the BLM and other federal land management agencies. Under this alternative, the BLM would continue current policies of coordinating with county and municipal land use planners. The adopted Johnson County land use plan identifies three key concerns related to BLM-administered land and resources, all related to the continued availability of public lands for livestock grazing, the policies that affect the management of federal grazing allotments, and the continued financial viability of livestock grazing operators (Johnson County 2005). In this context, it is notable that Alternative D would result in slightly more surface disturbance that could adversely affect livestock grazing operators (approximately 1.3 times as much as under Alternative A). Although the reduction in available AUMs for grazing operators could adversely affect their financial viability, there is a potential that some operators would benefit from offsetting financial benefits from surface agreements and leasing their mineral development rights to oil and gas producers. However, it is unclear on balance whether or not the financial gain would fully compensate for all the oil and gas related impacts.

Effects on Quality of Life and Local Culture

Historically, the communities in the planning area developed around a combination of resource-based industries, including resource extraction, ranching, trade and commerce, and providing supplies and services to tourists. Quality of life for the people who live in the planning area depends on continued economic opportunities and features of the natural landscape. Alternative D would increase economic opportunities, but also would result in more air pollution and other adverse environmental effects associated with oil and gas development.

Although there are specific groups with particular interests regarding specific land uses (e.g., oil and gas, recreation interests), based on current land use plans, there is local support for both conservation of natural resources and the economic viability of resource-based industries. This would be consistent with multiple uses of BLM-administered lands, including the development of mineral and energy resources, livestock grazing authorizations, continued access to BLM-administered lands for recreation, and conservation of wildlife and native vegetation. Alternative D would continue the current BLM practice of allowing multiple uses, but would prioritize oil and gas development over other uses. This would be consistent with the culture advocated by some interest groups (e.g., oil and gas interests) and would be inconsistent with the culture advocated by others (e.g., wilderness advocates). Based on the analysis of impacts to recreation in Chapter 4 *Recreation* section, Alternative D would manage resources to also benefit recreation users, both of nonmotorized and motorized recreation.

4.8.1.7. Cumulative Impacts

See the *Cumulative Impacts* section in the *Economic Conditions* section for a discussion of cumulative impacts to social conditions.

4.8.1.8. Conclusion

Social conditions relate primarily to economic conditions that can influence the growth or development of employment and income. The economic sectors in the planning area most likely to be directly affected by BLM management actions are related to the service sector and resource development activities (e.g., oil and gas). That is not to imply that grazing, ranching, and other agricultural activities are unaffected or unimportant. However, based on their economic contribution to the overall economy, changes in this sector would be expected to produce relatively minor economic effects on the overall economy. Nevertheless, the agricultural sector in this area is quite influential in terms of community character and identity. Therefore, land management decisions affecting the agricultural sector have the potential to have far-reaching effects on the social structure in the planning area, even though the economic effect is not expected to be substantial. Adverse effects on the agricultural sector are expected primarily under Alternative B.

Table 4.64, “Overall Impacts on Social Conditions by Alternative” (p. 1638) summarizes effects on social conditions as described in this section for alternatives B, C, and D compared to Alternative A. Although the table attempts to summarize effects and characterize them as low, medium, or high, it does not classify these impacts as beneficial or adverse. Effects on social conditions seen as beneficial by some interest groups could be seen as adverse by other interest groups. For example, increased emphasis on resource conservation under Alternative B would result in a change from the current balance of uses, which wilderness advocates would likely see as a beneficial effect, but oil and gas development interests would see as an adverse effect. In the table, high impacts are those that would result in substantial changes to an existing condition in a way that would affect a large number of people and/or endure for a long period; low impacts are those that would be felt by a limited number of people and for a limited period; and medium impacts are intermediate.

Table 4.64. Overall Impacts on Social Conditions by Alternative

Impact	Alternative A	Alternative B	Alternative C	Alternative D
Impact on Population	Low Impact	Medium Impact (likely reductions focused in oil/gas service areas, which generally correspond to population centers)	Low Impact	Low Impact
Impact on Housing and Community Services	Low Impact	Medium Impact (due to likely population reductions)	Low Impact	Low Impact
Consistency with Adopted County Land Use Plans	No effect	Medium impact (due to loss of employment opportunities from oil and gas and loss of grazing land)	No effect	No effect

Impact	Alternative A	Alternative B	Alternative C	Alternative D
Impacts on Quality of Life and Local Culture	Low Impact (continued policy of balanced use; no change from current conditions)	Low to Medium Impact (change from recent trends would constitute greater emphasis on resource conservation)	Low Impact (change from recent trends would constitute greater emphasis on resource development)	Low Impact (continued policy of balanced use, with some change from current conditions)
Source: Based on the analysis of impacts to social conditions, as described in the text.				

4.8.2. Economic Conditions

This section addresses the potential for the alternatives to affect economic conditions in the planning area, including direct, indirect, induced, short-term, and long-term effects. Appendix A (p. 1771) identifies the laws, EOs, regulations, policies, and guidance considered in the analysis of economic conditions.

Potential effects include changes in regional economic output, employment and earnings, and tax revenues for local, state, and federal governments. In terms of economic modeling analysis, direct and indirect effects are assumed to occur simultaneously, even though in reality these effects could take time to work their way through the economic sectors in the analysis area. For example, an action to permit gas exploration and production could result in the direct infusion of money into several economic sectors and indirect infusions into related sectors. In economic modeling, these effects would be assumed to occur instantaneously. Moreover, continued direct infusion of money into the planning area's economy created by the decision to lease oil and gas would be analyzed over the life of the project, which in this case is likely to represent a multi-year period of production. Therefore, the analysis is designed to account for the economic activity produced by planning decisions over time. The effects are estimated on an annual basis from 2009 through 2028, based on the estimated annual direct effect of the alternatives.

4.8.2.1. Methods and Assumptions

The BLM used the IMPLAN model to estimate the economic effects of BLM management actions under the alternatives. IMPLAN is a regional economic model that provides a mathematical accounting of the flow of money, goods, and services through a region's economy. The model provides estimates of how a specific economic activity translates into jobs and income for the region. It includes the "ripple effect" (or "multiplier effect") of changes in sectors that might not be directly affected by management actions, but are linked to industries that are directly affected. In IMPLAN, these ripple effects are called indirect impacts (for changes in industries that sell inputs to the industries that are directly affected) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

For example, an increase in oil and gas production implies more money would be spent on the maintenance of existing oil and gas equipment or new oil and gas equipment; this implies more money would be spent in sectors that provide inputs to oil and gas support services or equipment sectors. These production and consumption, or input-output, relationships allow IMPLAN to estimate the indirect and induced effects based on changes in production that might result from implementing an alternative. Appendix U (p. 2589) provides technical assumptions and additional information about the IMPLAN model.

Assumptions used in this analysis include:

- Employment, earnings, and output continue to be drivers of economic and population growth in the planning area.
- Economic benefits to the planning area accrue from BLM-influenced activities, such as oil and natural gas development, livestock grazing, and recreation. Economic benefits to the analysis area also accrue from wildlife grazing, to the extent that wildlife grazing contributes to the availability of and demand for recreational activities.
- The IMPLAN model can reasonably estimate indirect and induced benefits due to minerals, livestock grazing, and recreation. (The IMPLAN production coefficients were modified to reflect the interaction of producing sectors in the planning area.)
- Recreation-related expenditures by residents occur in the region, but do not represent new money coming into the study area; therefore, analysis of the economic effects of recreation considers only recreation expenditures of nonresidents in the three-county planning area. In other words, there is a multiplier effect associated with nonresident recreation-related spending because it results in an input of new money into the study region.
- The analysis of direct and indirect effects associated with oil and gas activities considers only activities on BLM surface and federal mineral estate, whereas the cumulative impacts analysis considers activities on state and fee land and mineral estate.
- For livestock grazing, the analysis reflects a “worst-case” assumption that all acres affected by surface-disturbing activities (from all the sources listed in Appendix G (p. 1937)) are lands currently authorized for grazing. Therefore, the number of acres available for grazing in 2028 is the number of acres currently available, minus acres that are affected long term by surface-disturbing activities. In addition, the analysis of grazing reflects the assumption that surface-disturbing activities occur at a constant rate over time.

While BLM management actions influence the pace and timing of economic development in the planning area, the pace and timing of development also depends and will continue to depend on many factors. These include national and international energy demand, supply, and prices; operator business strategies; production conditions in the planning area; and demand and supply for agricultural products. Because the pace of development in the planning area is not known, this analysis assumes a relatively constant rate of development. Therefore, actual effects could differ (e.g., there could be boom and bust type short-term effects that would differ from long-term effects) if the rate of development changes substantially.

The IMPLAN production coefficients were modified to reflect the interaction of producing sectors in the planning area. As a result, the calibrated model does a better job of generating multipliers and the subsequent effects that reflect the interaction between and among the sectors in the planning area compared to a model using unadjusted national coefficients. Specifically, worker productivity in oil and gas production is higher in Wyoming than nationally, and more of the hay used for livestock feed is produced in the region, compared with national averages. Key variables used in the IMPLAN model were filled in using data specific to Wyoming, including employment estimates, labor earnings, and total industry output.

Changes in economic activity have an effect on federal, state, and local tax revenues. While all sectors of the economy contribute to tax revenues, the analysis of tax revenue effects focuses on oil and gas production because almost all of the measurable variation in economic activity among alternatives is in oil and gas. Tax revenues assessed include those from federal royalties, state severance taxes and from local ad valorem taxes. Counties would also receive revenues from the distribution of lease rents and bonus payments for oil and gas leases. These were not included in the calculations but would represent a relatively small amount of additional revenues to the state and counties.

The focus of the analysis is on regional earnings and output, employment, and tax revenue, with the region defined as the three-county planning area. Because the regional economic model relies on interlinkages among sectors that are aggregated over the entire planning area, it is not possible to predict total (direct, indirect, and induced) economic effects for individual communities in the three-county area. However, to the extent possible, geographical areas of likely concentration of impacts are discussed.

4.8.2.2. Impacts Common to All Alternatives

The focus of this analysis is on the resource activities most likely to be affected by land management decisions and that have an economic value to the study area, including oil and gas development, livestock grazing, and recreation. Actions from resource programs or constraints (as described for each alternative) that affect oil and gas development, livestock grazing, and recreation (e.g., surface-disturbing activities that affect the amount of land available for grazing) are included by implication. Also included by implication are restrictions on ROW and corridors, because the BLM RFD Scenario for oil and gas, which provides estimated numbers of oil and gas wells and production, incorporates the restrictions on ROW and corridors. Restrictions on new ROW would tend to be a negligible factor in the decision to develop additional oil and gas wells in fields that are already producing, but could be a more important factor in a decision to develop a new field. Seasonal closures would not apply to existing oil and gas permits, although scheduled activities would be expected to be performed outside of restriction period when possible. Seasonal closures could add costs to future leases and permits, if these were to be displaced to nearby areas to circumvent the seasonal closures.

Economic effects related to other resources, such as coal, locatable and salable minerals, and renewable energy, are addressed outside the framework of the IMPLAN model. Running the IMPLAN model requires extensive quantitative data on each sector, such as unit costs of production broken into categories that can be assigned to individual economic sectors, and these data are not available for all types of economic activities. In addition, the BLM focused its use of IMPLAN on those resources for which economic impacts would be substantively different across the alternatives in the RMP. Economic activity related to coal, renewable energy, locatable minerals, and salable minerals, would be similar across all the alternatives, at least in the first 5 to 10 years of the planning period. In latter half of the planning period, economic activity from renewable energy could be somewhat higher under alternatives A, C, and D compared to Alternative B, but there are many uncertainties. Therefore, the discussions for each alternative do not include quantitative estimates of earnings, jobs, or output related to coal, locatable and salable minerals, and renewable energy. However, the discussions do identify differences in expected levels of economic activity associated with these resources.

Payments in Lieu of Taxes to counties would likely not be impacted by the choice of management alternative, although Alternative C could be conducive to lower payments over time, if the amount of federal lands in each county is reduced.

4.8.2.3. Alternative A

Effects on Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative A for the modeled sectors (oil and gas, grazing, and recreation) would average approximately \$202.8 million per year between 2009 and 2028, and regional output would average approximately \$909.9 million per

year, due to activities on BLM surface and federal mineral estate. The net present value of the stream of regional output, discounted at a 7 percent real discount rate (Office of Management and Budget 2002), would be approximately \$8.6 billion over 20 years. Table 4.65, “Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area” (p. 1643) lists sector-level breakouts for earnings and output.

As noted above, data are insufficient to develop quantitative estimates of direct, indirect, and induced effects associated with the production of locatable and salable minerals in the planning area. Uranium and bentonite are the only locatable minerals currently being developed in the planning area, although gypsum also is present in commercial quantities. The primary salable minerals mined in the planning area are scoria and sand and gravel, both primarily used to support road building for oil, gas, and coal development, county road maintenance, and general construction. Under Alternative A, lands not formally withdrawn or segregated from locatable minerals entry would be open for the exploration and development of locatable minerals. Among the alternatives, Alternative A would withdraw from locatable minerals development and restrict minerals development activities on the fewest number of acres.

Locatable and salable minerals would continue to contribute to economic activity in the planning area. The U.S. Census Bureau estimated employment for mining and support activities, for minerals other than oil, gas, and coal, at between 20 and approximately 180 people in the three-county study area (Bureau of Labor Statistics 2012b). Earnings information was not provided, and the range of employment reflects restrictions on release of confidential business information. The BLM expects to respond to plans of operation to develop locatable minerals and applications for disposals [contract sales and free use permits] for salable minerals in the planning area in a way that the operations would continue to meet market demand. Therefore, production of these minerals would not vary across the alternatives (with the possible exception of Alternative B as indicated in that section), and with this possible exception the BLM does not expect differences in the economic activity associated with each alternative. Variations in employment and earnings would likely be driven more by market fluctuations than by BLM management decisions.

Among renewable-energy sources, wind and solar energy are the most promising resources in the planning area. There have not been any formal inquiries associated with renewable-energy development in the planning area, nor has the area experienced any development of renewable energy other than some solar panels that provide supplemental electricity to some individual oil and gas development sites. The planning area is considered to have a moderate potential for wind-energy development and a low potential for solar-energy development. Alternative A would not restrict renewable-energy development in any areas based on existing resource conditions or management designations, but would consider renewable-energy development on a project-specific basis. Given that renewable-energy development in the planning area is in its infancy, it is not possible to estimate the level of economic activity, jobs, or labor earnings that could be associated with renewable energy development under this alternative.

Regarding coal, Alternative A would allow exploration on all federal coal lands, subject to license restrictions necessary to protect other resource values, and the BLM predicts 65 new exploration licenses would be issued during the planning period. Sixty of these licenses would be issued for areas with high potential for coal development, and five would be for other areas. Under Alternative A, the BLM could allow new development technologies, such as in situ gasification and CH₄ farming on federal coal lands. Economic activity from coal exploration and development under Alternative A would likely be similar to the current level of activity, based on the BLM forecast for leasing rate and production. According to this forecast, leasing would continue at a

rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study through 2020; from 2020 to 2030, the rate of production increase is conservatively predicted to be one percent per year (see the *Leasable Minerals – Coal* section for more information).

Effects on Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Therefore, effects on employment are closely related to effects on economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative A for the modeled sectors would average approximately 3,482 jobs per year between 2009 and 2028 due to activities on BLM surface and federal mineral estate. Note that the number of jobs is expressed as “annual job equivalents,” where one annual job equivalent represents 12 months of employment. For example, one annual job equivalent could represent 2 jobs for 6 months each, or one job for 12 months. Annual job equivalents can represent full-time or part-time jobs. Table 4.66, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1644) provides information on how these jobs break out by sector.

Table 4.65. Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area

Sector	Alternative A	Alternative B	Alternative C	Alternative D
Impacts on Annual Average Earnings (millions of 2011 \$)				
Oil and Gas	\$199.2	\$1.3	\$239.5	\$202.9
Livestock Grazing Management	\$3.4	\$2.4	\$3.3	\$3.3
Recreation	\$0.2	\$0.2	\$0.2	\$0.2
Total	\$202.8	\$3.9	\$243.0	\$206.4
Impacts on Annual Average Output (millions of 2011 \$)				
Oil and Gas	\$899.6	\$11.0	\$1,306.0	\$1,012.6
Livestock Grazing Management	\$9.7	\$7.0	\$9.5	\$9.5
Recreation	\$0.6	\$0.6	\$0.6	\$0.6
Total	\$909.9	\$18.7	\$1,316.1	\$1,022.7
Impacts on Net Present Value of Output Over 20 Years (millions of 2011 \$)¹				
Oil and Gas	\$8,477.5	\$98.2	\$12,059.8	\$9,436.6
Livestock Grazing Management	\$103.3	\$81.0	\$101.9	\$101.6
Recreation	\$6.7	\$6.7	\$6.7	\$6.7
Total	\$8,587.4	\$185.9	\$12,168.4	\$9,544.8
Source: Calculated using the IMPLAN model, as described in the text.				
¹ Net present value from 2009 to 2028, discounted at 7% (rate from Office of Management and Budget 2002).				
\$ U.S. dollar				
IMPLAN Impact Analysis for Planning model				

Table 4.66. Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area

Sector	Number of Jobs ¹			
	Alternative A	Alternative B	Alternative C	Alternative D
Oil and Gas	3,366	23	4,092	3,448
Livestock Grazing Management	110	79	108	107
Recreation	7	7	7	7
Total	3,482	109	4,206	3,562

Source: Calculated using the IMPLAN model, as described in the text.

¹Number of jobs is in annual job equivalents, where one annual job equivalent represents 12 months of employment. For example, one annual job equivalent could represent 1 job for 12 months, or 2 jobs for 6 months.

IMPLAN Impact Analysis for Planning model

Average annual earnings per job would differ for each of these sectors. Based on the IMPLAN model, earnings per job (expressed in year 2011 dollars) would average:

- Between \$52,000 and \$65,000 for jobs in oil and gas well drilling and completion
- Approximately \$67,000 for jobs in oil and gas production
- Approximately \$31,000 for jobs associated with cattle and sheep grazing
- Between \$23,000 and \$26,000 for recreation-related jobs

Effects on Tax Revenue

Projected tax revenues under Alternative A due to oil and gas production on federal mineral estate would average \$47.6 million per year for federal royalties, \$22.9 million per year for state severance taxes, and \$24.9 million per year for local ad valorem taxes. Because specific well locations are not known at this time, data are not sufficient to apportion the local tax receipts to individual counties; however, project-specific analyses will be able to provide this information. Table 4.67, “Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area (millions of 2011 \$)” (p. 1644) summarizes tax revenues from oil and gas production under the alternatives.

Table 4.67. Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area (millions of 2011 \$)

Tax Type	Alternative A	Alternative B	Alternative C	Alternative D
Federal mineral royalties	\$47.6	\$0.9	\$82.4	\$59.3
State severance taxes	\$22.9	\$0.4	\$39.6	\$28.5
Local ad valorem production taxes	\$24.9	\$0.5	\$43.2	\$31.1
Total	\$95.4	\$1.8	\$165.2	\$118.8

Source: Calculated based on the IMPLAN model and state, federal, and local tax rates, as described in the text.

\$ U.S. dollars

IMPLAN Impact Analysis for Planning model

Tax revenues due to recreation and livestock grazing activities would be nearly identical across the alternatives, as is the case for earnings and employment for those activities. In the context of overall tax collections, the differences in tax revenues from oil and gas development and production are relatively small, between alternatives A, C, and D. For instance, total state severance tax collections were \$877 billion in Fiscal Year 2012 (see Chapter 3). This is in part

because of the importance of tax revenues from other minerals, most notably coal, for which the alternatives would not result in a difference in production. The PRB Coal Review (ENSR 2005c) indicated that, from 2011 through 2015, severance tax revenues in Campbell, Johnson, Sheridan, and Converse Counties are expected to be over \$400 million annually, and ad valorem tax revenues about \$355 million annually, from coal mining, CBNG, and conventional oil and gas.

Effects on Non-Market Values

Alternative A would maintain BLM's current balance between multiple uses of BLM-administered lands. This means that current management affecting non-market values associated with recreation uses, environmental protection, or other benefits provided to local communities and occupational and interest groups would continue.

4.8.2.4. Alternative B

Effects on Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative B for the modeled sectors (oil and gas, grazing, and recreation) would average approximately \$3.9 million per year between 2009 and 2028, and regional output would average approximately \$18.7 million per year, due to activities on BLM surface and federal mineral estate. The net present value of the stream of regional output, discounted at a seven percent real discount rate (Office of Management and Budget 2002), would be approximately \$0.2 billion over 20 years.

Table 4.65, "Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area" (p. 1643) shows sector-level breakouts for earnings and output. These dramatic reductions compared to Alternative A primarily reflect the BLM's prediction of lower oil and gas development on BLM-administered lands. Based on the county distribution of oil and gas production and employment (described in the *Socioeconomic Resources* section of Chapter 3), the reduced direct employment supported by oil and gas activities on BLM-administered lands would be more likely felt in Johnson and Campbell counties, than in Sheridan County, although indirect employment impacts could be more broadly distributed. Alternative B would see a lower amount of earnings, output, and employment from livestock grazing.

Under Alternative B, the BLM would withdraw or apply restrictions on locatable and salable minerals development on more acres than Alternative A. However, locatable and salable minerals would continue to contribute to economic activity in the planning area. In general, the BLM would attempt to respond to plans of operation to develop locatable minerals and applications for disposals [contract sales and free use permits] for salable minerals in the planning area in a way that the operations would continue to meet market demand. However, given the planned restrictions on mineral entry in Alternative B, the BLM may not be able to meet this objective. If production of these minerals would be lower in Alternative B compared to Alternative A, then there could be some differences in employment and earnings associated with locatable and salable minerals. Even so, variations in employment and earnings would also be driven somewhat by market fluctuations, and the variation from those fluctuations could also be a substantial driver.

Under Alternative B, renewable-energy development projects would be excluded in areas closed to minerals leasing, closed to locatable and salable minerals, excluded from ROW development, and all other areas where surface disturbance would be prohibited. Alternative B would exclude more areas from renewable-energy development than Alternative A. However, given that renewable-energy development in the planning area is in its infancy, it is not possible to

estimate the level of economic activity, jobs, or labor earnings that could be associated with renewable-energy development in this alternative. The data are not sufficient to determine how the overall economic activity associated with renewable-energy development and production would compare to Alternative A.

Regarding coal, under Alternative B, the BLM would allow coal exploration only on federal coal lands in the two areas with high development potential, subject to license stipulations necessary to protect other resource values. The BLM predicts 60 new exploration licenses would be issued during the planning period, all in areas with high potential for coal development. Non-conventional technologies such as in situ gasification and CH₄ farming would not be permitted on federal coal lands. However, the BLM does not predict substantive production from these non-conventional production technologies over the life of the RMP. Thus, economic activity from coal exploration and development under Alternative B would likely be similar to that under Alternative A, based on the BLM forecast for leasing rate and production. According to this forecast, leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study through 2020; from 2020 to 2030, the rate of production increase is conservatively predicted to be one percent per year (see Leasable Minerals – Coal for more information).

Effects on Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Therefore, effects on employment are closely related to effects on economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative B for the modeled sectors would average approximately 109 jobs per year between 2009 and 2028 due to activities on BLM surface and federal mineral estate. Table 4.66, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1644) provides information on how these jobs break out by sector. Average annual earnings per job would be the same under Alternative B as under Alternative A, and are described above.

Effects on Tax Revenue

Projected tax revenues under Alternative B due to oil and gas production on federal mineral estate would average \$0.9 million per year for federal royalties, \$0.4 million per year for state severance taxes, and \$0.5 million per year for local ad valorem taxes. Because specific well locations are not known at this time, there are not sufficient data to apportion the local tax receipts to individual counties; however, project-specific analyses will be able to provide this information. Table 4.67, “Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area (millions of 2011 \$)” (p. 1644) summarizes tax revenues from oil and gas production under the alternatives.

Tax revenues due to recreation and livestock grazing activities would be nearly identical across the alternatives, as is the case for earnings and employment for those activities. For instance, total state severance tax collections were \$877 million in Fiscal Year 2012 (see Chapter 3). This is in part because of the importance of tax revenues from other minerals, most notably coal, for which the alternatives would not result in a difference in production. According to the PRB Coal Review (ENSR 2005c), from 2011 through 2015 severance tax revenues in Campbell, Johnson, Sheridan, and Converse Counties are expected to be over \$400 million annually, and ad valorem tax revenues about \$355 million annually, from coal mining, CBNG, and conventional oil and

gas. For Alternative B, the effect of reduced state, local and federal tax collections is more substantial in the context of overall revenue collections.

Effects on Non-Market Values

Alternative B would give lesser priority to oil and gas development on BLM-administered lands when compared to Alternative A. This would tend to protect non-market values associated with other uses or protection of natural resources. Non-market values associated with nonmotorized and non-consumptive activities would be enhanced relative to those associated with motorized and consumptive recreation.

4.8.2.5. Alternative C

Effects on Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative C for the modeled sectors (oil and gas, grazing, and recreation) would average approximately \$243.0 million per year between 2009 and 2028, and regional output would average approximately \$1,316.1 million per year, due to activities on BLM-administered lands and mineral estate. The net present value of the stream of regional output, discounted at a seven percent real discount rate (Office of Management and Budget 2002), would be approximately \$12.2 billion over 20 years. Table 4.65, “Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area” (p. 1643) shows sector-level breakouts for earnings and output.

Under Alternative C, the BLM would recommend no withdrawals from locatable mineral entry, and would apply slightly more restrictions on areas open to salable minerals development without restrictions. In both cases, the BLM expects to respond to plans of operation to develop locatable minerals and applications for disposals [contract sales and free use permits] for salable minerals in the planning area in a way that the operations would continue to meet market demand. Therefore, production of these minerals would not vary across the alternatives (with the possible exception of Alternative B as indicated in that section), and with this possible exception, the BLM does not expect differences in economic activity associated with each alternative. Variations in employment and earnings would be driven more by market fluctuations than BLM management decisions.

Under Alternative C, renewable-energy development projects would be allowed anywhere in the planning area as long as development would be consistent with other resource values. In addition, unlike alternatives A and B, Alternative C would not require transmission lines to be located within identified ROW corridor areas, which could result in decreased development times for projects and, ultimately, more development of renewable-energy resources. However, given that renewable-energy development in the planning area is in its infancy, it is not possible to estimate the level of economic activity, jobs, or labor earnings that could be associated with renewable energy development under this alternative. The data are not sufficient to determine how the overall economic activity associated with renewable-energy development and production would compare to Alternative A.

Alternative C could lead to greater disposition of federal lands and less acquisition of private and state lands by BLM. This would be expected to favor output and earnings generation, through greater utilization of lands with agricultural potential or water. With time, this could also have adverse effects on Payments in Lieu of Taxes made to counties, because Payments in Lieu of Taxes calculation considers the amount of federal lands within each county.

Regarding coal, exploration would be allowed on all federal coal lands under Alternative C, and the BLM predicts 65 new exploration licenses would be issued during the planning period. Sixty of these licenses would be issued for areas with high potential for coal development, and five would be for other areas. Under Alternative C, the BLM would allow new development technologies, such as in situ gasification and CH₄ farming, on federal coal lands. However, the BLM does not predict substantive production from these non-conventional production technologies over the life of the RMP. Thus, although this alternative would remove some restrictions included under Alternative A, the economic activity from coal exploration and development under Alternative C would likely be similar to that under Alternative A, based on the BLM forecast for leasing rate and production. According to the BLM forecast, leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study through 2020; from 2020 to 2030, the rate of production increase is conservatively predicted to be one percent per year (see Leasable Minerals – Coal for more information).

Effects on Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Therefore, effects on employment are closely related to effects on economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative C for the modeled sectors would average approximately 4,206 jobs per year between 2009 and 2028 due to activities on BLM surface and federal mineral estate. Table 4.66, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1644) provides information on how these jobs break out by sector. Average annual earnings per job under Alternative C are the same as under Alternative A.

Effects on Tax Revenue

Projected tax revenues under Alternative C due to oil and gas production on federal mineral estate would average \$82.4 million per year for federal royalties, \$39.6 million per year for state severance taxes, and \$43.2 million per year for local ad valorem taxes. Because specific well locations are not known at this time, data are not sufficient to apportion the local tax receipts to individual counties. Table 4.67, “Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area (millions of 2011 \$)” (p. 1644) summarizes tax revenues from oil and gas production under each alternatives.

Tax revenues due to recreation and livestock grazing activities would be nearly identical across the alternatives, as is the case for earnings and employment for those activities. In the context of overall tax collections, the differences in tax revenues from oil and gas development and production are relatively small, between alternatives A, C, and D. For instance, total state severance tax collections were \$877 million in Fiscal Year 2012 (see Chapter 3). This is in part because of the importance of tax revenues from other minerals, most notably coal, for which the alternatives would not result in a difference in production. According to the PRB Coal Review (ENSR 2005c), from 2011 through 2015 severance tax revenues in Campbell, Johnson, Sheridan, and Converse Counties are expected to be over \$400 million annually, and ad valorem tax revenues about \$355 million annually, from coal mining, CBNG, and conventional oil and gas.

Effects on Non-Market Values

Alternative C would give greater priority to oil and gas development on BLM-administered lands when compared to Alternative A. This would tend to reduce non-market values associated with other uses (e.g., recreation) or protection of natural resources. Recreational non-market values associated with nonmotorized and non-consumptive activities would be reduced relative to those associated with motorized and consumptive recreation.

4.8.2.6. Alternative D

Effects on Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative D for the modeled sectors (oil and gas, grazing, and recreation) would average approximately \$206.4 million per year between 2009 and 2028, and regional output would average approximately \$1,022.7 million per year, due to activities on BLM surface and federal mineral estate. The net present value of the stream of regional output, discounted at a 7 percent real discount rate (Office of Management and Budget 2002), would be approximately \$9.5 billion over 20 years. Table 4.65, “Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area” (p. 1643) shows sector-level breakouts for earnings and output.

Under Alternative D, the BLM would recommend or apply more withdrawals and restrictions on locatable and salable minerals development than under Alternative A. However, the BLM expects to respond to plans of operation to develop locatable minerals and applications for disposals [contract sales and free use permits] for salable minerals in the planning area in a way that the operations would continue to meet market demand. Therefore, production of these minerals would not vary across the alternatives (with the exception of Alternative B as indicated in that section), and with this possible exception, the BLM does not expect differences in the economic activity associated with each alternative. Variations in employment and earnings would be driven more by market fluctuations than by BLM management decisions.

Compared to the other alternatives, Alternative D would exclude renewable energy development across more area than Alternative A or C. However, given that renewable-energy development in the planning area is in its infancy, it is not possible to estimate the level of economic activity, jobs, or labor earnings that could be associated with renewable energy development under this alternative. The data are not sufficient to determine the overall economic activity associated with renewable-energy development and production compared to Alternative A.

Regarding coal, exploration would be allowed on all federal coal lands under Alternative D, subject to multiple use constraints, and the BLM predicts 65 new exploration licenses would be issued during the planning period. Sixty of these licenses would be issued for areas with high potential for coal development, and five would be for other areas. Under Alternative D, the BLM would implement existing coal leasing authority when federal coal lands are requested for in situ gasification. The BLM would develop an appropriate coal use authorization that provides public compensation for the reduction in coal value resulting from methanogenesis. However, the BLM does not predict substantive production from these non-conventional production technologies over the life of the RMP. Thus, although this alternative would increase some restrictions compared to Alternative A, the economic activity from coal exploration and development under Alternative D would likely be similar to that under Alternative A, based on the BLM forecast for leasing rate and production. According to the BLM forecast, leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study through 2020; from

2020 to 2030, the rate of production increase is conservatively predicted to be one percent per year (see Leasable Minerals – Coal for more information).

Effects on Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Therefore, effects on employment are closely related to effects on economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative D for the modeled sectors would average approximately 3,562 jobs per year between 2009 and 2028 due to activities on BLM surface and federal mineral estate. Table 4.66, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1644) provides information on how these jobs break out by sector. Average annual earnings per job would be the same under Alternative D as under Alternative A.

Effects on Tax Revenue

Projected tax revenues under Alternative D due to oil and gas production on federal mineral estate would average \$59.3 million per year for federal royalties, \$28.5 million per year for state severance taxes, and \$31.1 million per year for local ad valorem taxes. Because specific well locations are not known at this time, data are not sufficient to apportion the local tax receipts to individual counties. Table 4.67, “Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area (millions of 2011 \$)” (p. 1644) summarizes tax revenues from oil and gas production under the alternatives.

Tax revenues due to recreation and livestock grazing activities would be nearly identical across the alternatives, as is the case for earnings and employment for those activities. In the context of overall tax collections, the differences in tax revenues from oil and gas development and production are relatively small, between alternatives A, C, and D. For instance, total state severance tax collections were \$877 million in Fiscal Year 2012 (see Chapter 3). This is in part because of the importance of tax revenues from other minerals, most notably coal, for which the alternatives would not result in a difference in production. According to the PRB Coal Review (ENSR 2005c), from 2011 through 2015 severance tax revenues in Campbell, Johnson, Sheridan, and Converse Counties are expected to be over \$400 million annually, and ad valorem tax revenues about \$400 million annually, from coal mining, CBNG, and conventional oil and gas.

Effects on Non-Market Values

Alternative D would give greater priority to oil and gas development on BLM-administered lands when compared to Alternative A. This would tend to reduce non-market values associated with other uses (e.g., recreation) or protection of natural resources. Alternative D would however, provide some increased opportunities for recreation uses of BLM-administered lands, favoring non-market values associated both with nonmotorized and motorized and with non-consumptive and consumptive recreational activities.

4.8.2.7. Cumulative Impacts

This section discusses the cumulative impact of management actions and projected development on the economic and social conditions of local communities.

The assessment area for cumulative social and economic conditions consists of the three counties that overlap the planning area.

Analysis in this section primarily focuses on cumulative impacts related to oil and gas activity, ranching and livestock grazing, and quality of life, including non-market values.

Past, present, and reasonably foreseeable future actions in the planning area and surrounding geographic areas would affect both traditional economic measures (earnings, jobs, output) and non-market values in the planning area. For example, the BLM Bighorn Basin RMP, which is being updated concurrent with the present RMP, would update BLM's direction and management plans in the Cody and Worland Field Offices, which include land and resources in several counties that neighbor the BFO. Thus, the choice of alternatives in the Bighorn Basin RMP could directly affect social and economic conditions in the planning area for this RMP. However, the Preferred Alternative in the Bighorn Basin RMP revision, as identified in the Bighorn Basin Draft RMP and EIS, would continue the BLM's balanced management of land and resources, and if that is the selected alternative for the Cody and Worland planning areas, then the effects of BLM management actions in those areas would not be expected to have a significant effect on social or economic conditions in the Buffalo planning area.

Appendix G (p. 1937) lists RFAs within the planning area. BLM expects non-BLM actions in the planning area to include the development of coal, locatable and salable minerals, oil and gas, wind energy, powerlines, pipelines and communication sites, among other developments. These developments would likely constitute sources of employment and earnings, would contribute to the attraction or retention of population in the study area and would contribute to the change or maintenance of social characteristics of communities, in addition to the impacts of BLM actions under each alternative. Because of the relative importance of oil and gas in driving economic and social trends in the planning area, the remainder of this analysis adds the impacts of the development of oil and gas in private and state lands to those of actions on BLM-administered lands.

The impacts of oil and gas drilling and production described in the *Economic Conditions* section of this chapter relate to activities on BLM surface and federal mineral estate within the planning area. However, oil and gas activity on private and state land is estimated to constitute a substantial portion of projected oil and gas activity in all alternatives; Table 4.68, "Cumulative (including State and Private) Impacts of Oil and Gas Development over the Life of the Plan in the Planning Area" (p. 1652) displays the cumulative impacts of oil and gas development on federal as well as state and private land over the life of the plan. Specifically, in alternatives A, C, and D, oil and gas drilling and production on state and private land would comprise between 49 percent and 72 percent of total activity (about 49% in Alternative C, 60% in Alternative D, and 72% in Alternative A), while in Alternative B, about 98 percent of total drilling and production activity is expected to occur on private and state land. This also means that the additional activity on state and private land in Alternative B would partially mitigate the sharp reduction in oil and gas production on federal lands, and the overall reduction in earnings, employment, and output would be proportionally smaller than the reduction in activity on federal lands would suggest. To see this, note that the analysis earlier in Chapter 4 showed \$199 million in earnings and 3,366 jobs related to oil and gas drilling, completion, and production in Alternative A, and just \$1.3 million in earnings and 23 jobs for the same activities in Alternative B – a reduction of over 99 percent. The comparable figures incorporating state and private production are \$425 million and 7,222 jobs for Alternative A, and \$227 million and 3,880 jobs for Alternative B – about a 46 percent

reduction. While the reduction from Alternative A to Alternative B would still be substantial, the anticipated state and private production would moderate the change in BLM management actions.

Table 4.68. Cumulative (including State and Private) Impacts of Oil and Gas Development over the Life of the Plan in the Planning Area

Impact ¹	Alternative A	Alternative B	Alternative C	Alternative D
Annual Average Earnings	\$424.9	\$227.0	\$465.2	\$428.7
Annual Average Output	\$2,130.9	\$1,242.3	\$2,537.3	\$2,244.2
Net Present Value of Output	\$19,847.2	\$11,467.9	\$23,429.4	\$20,808.2
Annual Average Employment ²	7,222	3,880	7,948	7,305
Change from Alternative A – Earnings	N/A	-\$197.9	\$40.3	\$3.7
Change from Alternative A – Employment	N/A	-3,343	726	82
Percentage change from Alternative A (earnings, employment)	N/A	-47%	9%	1%
Percentage change from Alternative A (earnings, employment), for federal land only	N/A	-98%	20%	2%

Source: Calculated using the IMPLAN model, as described in the text. Includes oil and gas well drilling and completion, and production from new wells, as estimated in the BLM's Reasonably Foreseeable Development Scenario for federal, state, and private land.

¹All dollar values are in millions of year 2011 dollars. Net present value of output is discounted at a 7% real discount rate, as recommended in Office of Management and Budget 2002.

²Employment is in annual job equivalents.

\$ U.S. dollars

BLM Bureau of Land Management

IMPLAN Impact Analysis for Planning Model

N/A not applicable

OMB Office of Management and Budget

Under each alternative various management actions constrain mineral development on BLM-administered land for the protection of other resource values. These constraints can limit the mineral development activity on BLM surface and mineral estate, and constrict the minerals-based economy in the planning area. Table 4.69, "Reasonable Foreseeable Development Well Number Projections" (p. 1653) below summarizes the number of constrained federal wells and unconstrained non-federal wells for each alternative, including CBNG wells, over the life of the plan.

Table 4.69. Reasonable Foreseeable Development Well Number Projections

Well Type	Alternative A	Alternative B	Alternative C	Alternative D
Number of Projected New Federal Wells	2,731	108	7,270	4,494
Projected Number of Abandoned New Federal Wells	99	1	145	112
Projected Productive New Federal Wells	2,632	107	7,125	4,382
Number of Projected New Non-federal Wells	6,862	6,862	6,862	6,862
Projected Number of Abandoned New Non-federal Wells	137	137	137	136
Projected Productive New Non-federal Wells	6,725	6,725	6,725	6,726
Cumulative New Wells (Federal/Non-federal)	9,593	6,970	14,132	11,356
Cumulative Abandoned New Wells (Federal/Non-federal)	236	138	282	248
Cumulative Productive New Wells (Federal/Non-federal)	9,357	6,832	13,850	11,108

Source: Stilwell et al. 2012; Appendix G (p. 1937)

The projected number of cumulative productive new wells is greatest under Alternative C (14,132) and the least under Alternative B (6,970). The percent increase/decrease from the number of new wells under Alternative A follows.

- Alternative B – 27 percent decrease
- Alternative C – 48 percent increase
- Alternative D – 19 percent increase

Increasing energy development and mining for mineral resources is likely to have a substantial social and economic impact within the planning area. As noted in the *Economic Conditions* section of this chapter, Alternative C is anticipated to result in the most substantial increase of economic opportunities with the highest projected forecasted job growth for the planning area followed by alternatives D, A, and B, in that order. Regional employment under Alternative C is also anticipated to average the greatest number of full and part-time jobs per year related to the oil and gas, livestock grazing, and recreation industries, which may result in beneficial impacts on quality of life as measured by economic opportunity. However, Alternative C may also result in adverse impacts to air quality, wildlife, and other resources that improve quality of life related to natural characteristics, as priorities would be placed on the use of resources such as oil and gas over the conservation of resources such as air quality and wildlife.

Comparatively, Alternative B would provide the least economic and social benefits as measured by jobs and income; priorities under this alternative are centered on conservation of land and existing environmental conditions. There could be some benefits to livestock operations when compared to other alternatives, but these would likely be too minor to be perceptible.

Alternative A would result in more opportunities than Alternative B, but fewer economic and social opportunities than Alternative C and Alternative D; Alternative A essentially represents the continuation of current trends. Alternative D would continue BLM's current practice of allowing multiple uses, balancing the use of resources such as oil and gas reserves with the conservation of resources such as air quality, open space, and wildlife range areas while providing an increase in job opportunities dispersed geographically across the planning area.

4.8.2.8. Conclusion

Based on the data from the IMPLAN model and qualitative analysis of economic activity from other sectors, earnings, output, employment, and tax revenues due to activities on BLM surface and federal mineral estate would be highest under Alternative C and lowest under Alternative B. Under Alternative D, economic activity would be somewhat lower than under Alternative C, and under Alternative A, economic activity would be slightly lower than under Alternative D. The primary driver is projected oil and gas activity, which would be highest under Alternative C, followed by alternatives D, A, and B. Earnings, output, and employment from recreation would be identical across all the alternatives, and economic activity related to grazing would be highest under Alternative A and lowest under Alternative C. However, the lower amount of economic activity resulting from oil and gas drilling, completion, and production would counteract the larger amount from livestock grazing, resulting in a lower total economic output.

Economic activity related to other sectors not modeled using IMPLAN, including coal, renewable energy, locatable minerals, and salable minerals, would be similar across all the alternatives, at least in the first 5 to 10 years of the planning period. In the latter half of the planning period, economic activity from renewable energy could be somewhat higher under alternatives A, C, and D compared to Alternative B, but there are many uncertainties.

It is useful to compare the differences in earnings and employment across alternatives, not only in absolute terms, but also to the size of the regional economy. Table 4.70, "Comparison of Projected Earnings and Employment to 2011 Levels" (p. 1655) compares projected earnings and employment related to oil and gas, livestock grazing, and recreation activities on BLM-administered lands to the levels in 2011 for the three-county region. Under alternatives A and D, average earnings from activities on BLM-administered lands analyzed in IMPLAN amount to 5.0 percent and 5.1 percent of 2011 personal income; under Alternative C, average earnings would be slightly higher at 6.0 percent of 2011 personal income; and under Alternative B, the corresponding figure is somewhat lower, 0.1 percent. Therefore, Alternative B would represent a substantial reduction in economic activity on BLM-administered lands by more than half compared to alternatives A, C, and D. Alternatives A or D would also represent a reduction compared to Alternative C, although this latter difference, when compared to the size of the overall economy, would be relatively minor (about 1% of overall earnings).

The comparison of employment among alternatives, and to the regional economy, produces similar conclusions. Under alternatives A and D, average employment from activities on BLM-administered lands analyzed in IMPLAN would amount to approximately 6.0 to 6.1 percent of 2011 total employment for the three-county planning area; under Alternative C, the figure is somewhat higher at 7.2 percent. Under Alternative B, the corresponding figure is 0.2 percent. The reduction in economic activity represented in Alternative B would be substantial compared to alternatives A, C, and D. This difference would be comparable to an increase in the unemployment rate of about 6.0 percent, which would be substantial and could lead to migration out of the area as people search for jobs elsewhere.

The difference between Alternative A and Alternative D would be barely noticeable in regional statistics. The difference between either of these alternatives and Alternative C would be noticeable, but would not likely lead to wholesale changes in regional economic activity (as can be seen by comparing the earnings and employment figures across alternatives A, C, and D). Other national, state, and regional policies and trends, such as the value of the dollar compared to other world currencies, federal fiscal and monetary policy, and global oil and gas prices, may have as meaningful an effect on economic activity in the planning area.

While the economic differences between alternatives are a relatively small part of regional statistics (except in Alternative B), the impacts are likely to be highly important from the perspective of individual operators and companies, as well as the individuals directly affected by loss of employment. In addition, the activities of BLM may be important within portions of the study region, depending on where the restrictions occur and where BLM's activities take place. Thus, the above discussion is not intended to minimize the impacts, rather to provide a perspective from the regional context.

Table 4.70. Comparison of Projected Earnings and Employment to 2011 Levels

Measure	Alternative A	Alternative B	Alternative C	Alternative D
Forecasted annual earnings due to activities on BLM surface ¹	\$202.8	\$3.9	\$243.0	\$206.4
Total personal income in 2011	\$4,055	\$4,055	\$4,055	\$4,055
Forecasted annual earnings / 2011 income	5.0%	0.1%	6.0%	5.1%
Forecasted annual employment due to activities on BLM surface ¹	3,482	109	4,206	3,562
Total employment in 2011	58,241	58,241	58,241	58,241
Forecasted annual employment / 2011 employment	6.0%	0.2%	7.2%	6.1%
Source: Forecasted annual earnings and employment are calculated based on the IMPLAN model, as described in the text. Earnings and employment for 2011 are from BEA (Bureau of Economic Analysis 2012a; Bureau of Economic Analysis 2012b). Earnings are in millions of year 2011 dollars.				
¹ Estimate of annual earnings and employment includes direct, indirect, and induced economic activity (the multiplier effect) associated with those sectors for which sufficient quantifiable information was available: oil and gas, livestock grazing, and recreation.				
% percent				
IMPLAN Impact Analysis for Planning model				

4.8.3. Health and Safety

Health and safety, as discussed in this section, includes abandoned mine lands (AMLs), coal seam fires, physical hazards, hazardous substances, and hydrogen sulfide (H₂S) gas.

The generation, use, disposal, or accidental release of hazardous substances are subject to the federal and state laws and regulations identified in Chapter 1 and Appendix A (p. 1771). In addition, Onshore Order #6 addresses requirements for conducting operations in areas that are known to or could produce H₂S gas. These laws and regulations are designed to safeguard human health and safety and to protect the environment, and would minimize the short- and long-term risks associated with hazardous substances and H₂S gas.

4.8.3.1. Methods and Assumptions

- Most AML sites in the planning area are identified and characterized. The BLM will set as its highest AML physical safety action priority the cleaning up of those AML sites situated at locations: (a) where a death or injury has occurred and the site has not already been addressed; or (b) situated on or in location with high visitor use (BLM 2000c). AML sites adversely affecting watersheds are also a high priority. The BLM continues to support the Wyoming DEQ AML Division in reclaiming AML sites on public surface.
- No assumptions were identified for physical hazards.
- All new hazardous materials and waste sites are identified and characterized.
- Resource development activities identify any possible generation of hazardous waste.
- With the transition from CBNG development to more conventional natural gas development, more hazardous materials use and waste generation will occur.
- The BLM Hazard Management and Resource Restoration Program responds to all hazardous material releases on public surface. Emergency cleanup actions are implemented on sites posing a substantial threat to the public and/or the environment.

4.8.3.2. Impacts Common to All Alternatives

Abandoned Mine Lands and Coal Seam Fires

To reduce the threat of physical and environmental impacts from AML sites and coal seam fires, the BLM will remediate sites based on risk.

Coal seam fires can be difficult to control and extinguish. Not being in close proximity to coal seam fires is the best way to reduce any potential exposure to their safety hazards. The BLM will manage safety concerns through hazard monitoring and public education. Based on site-specific risks, fencing, warning signs, or other institutional controls may be required. All of these management actions would reduce the potential for human health and safety risks from coal seam fires.

Long-term beneficial impacts to health and safety would result from the Wyoming DEQ AML Division continuing to work with the BLM to mitigate hazards associated with AML sites and coal seam fires.

Implementation of the alternatives are not anticipated to result in additional AML sites or increase the risks at AML sites or coal seam fires that may adversely impact health and safety.

Physical Hazards

Physical hazards will be managed to reduce risks to the public by providing warnings and, where appropriate, developing mitigation measures to avoid and minimize effects associated with physical hazards.

Implementation of the alternatives would not result in an increase in the potential for physical hazards; however, management may decrease the risks and potential impacts on health and safety resulting from physical hazards.

Hazardous Substances

Increases in human presence and activity associated with recreation, minerals exploration and development activities, and ROW development increase risks associated with the generation, use, transportation, and disposal of hazardous substances. Minerals-related activities are the most likely activities to increase the risk of hazardous substances to health and safety.

Impacts to health and safety from the management of hazardous substances would be the same under all alternatives, as there are no separate management actions by alternative.

Implementing hazardous materials management activities will address human health and environmental risks from hazardous substances and H₂S gas. Due to the increase in activity in oil and gas extraction, H₂S poses an increasing threat to human health and safety. To reduce the risks to human health, all H₂S plans would comply with Onshore Order #6, which identifies “uniform national requirements and minimum standards of performance expected from operators when conducting operations involving oil or gas that is known or could reasonably be expected to contain hydrogen sulfide.” In addition, the BLM will mitigate safety concerns associated with H₂S through signs, warning sirens, and public education. All of these management actions would reduce the potential for human health and safety risks from H₂S. Any potential effects on health and safety from H₂S would increase in relation to the level of minerals-related activities that releases H₂S.

Hazardous materials are managed to reduce risks to visitors, employees, and the environment; to restore contaminated land; and to perform emergency-response actions, in accordance with appropriate laws, policies, and regulations. Management to reduce risk and contamination would result in reduced potential effects on health and safety from hazardous substances. There could be substantive indirect impacts related to risks from hazardous substances during remediation could exist.

Reporting spills and releases of chemicals, petroleum products, and produced water to the Wyoming DEQ would reduce the potential for both short- and long-term impacts, and increase the potential for beneficial impacts on health and safety by controlling spills and facilitating an appropriate response to hazardous substance spills.

4.8.3.3. Cumulative Impacts

As described in Chapter 3, the potential for more hazardous material spills will increase primarily from the increase in mineral development, particularly with conventional natural gas development. Cumulative impacts will be negligible due to immediate response and cleanup activities. Physical hazards, coal seam fires, and abandoned mines, will be mitigated directly or through other institutional controls, to protect human health and safety.

4.8.3.4. Conclusion

There would be beneficial impacts to health and safety from management of AML sites and coal seam fires under all alternatives. Under all alternatives, the BLM and Wyoming DEQ will identify and plan for remediation or mitigation of AML and coal seam fire sites, which would reduce adverse impacts to health and safety.

Primary impacts to health and safety from physical hazards would result from management that increases activities in areas with physical hazards and subsequently increases the risk and potential for accidents in those areas. Providing warning signs or other institutional controls would result in similar beneficial impacts under all alternatives.

The impacts from management of hazardous substances would be the same under all alternatives. The potential for impacts may vary by alternative based on the level of mineral-related activities. Alternative C, with the greatest amount of mineral-related activities, could increase the generation, use, transportation, and disposal of hazardous substances. To reduce adverse impacts to health and safety, authorized users would adhere to hazardous spill response plans, stipulations, and all applicable laws and regulations pertaining to hazardous substances. These requirements would provide detailed strategy and process for responding to releases of hazardous substances, therefore reducing short-term impacts from contamination.

4.8.4. Environmental Justice

This section addresses the potential for the alternatives to have disproportionate adverse effects on minority and low-income populations, including direct, indirect, short-term, and long-term effects. Appendix A (p. 1771) lists the laws, regulations, EOs, policies, and guidance considered in the analysis of disproportionate adverse effects.

Because the analysis of disproportionate adverse effects depends on effects identified for other resources, definitions of adverse effects as they apply to environmental justice issues are closely related to the definitions of adverse effects in other resource areas (e.g., social resources). For example, the displacement of a mobile home park that houses a low-income population to build a new road could be a direct disproportionate effect. An example of an indirect disproportionate effect would be a reduction in social services to low-income individuals that could result from decreased tax revenues as a result of decreased minerals production.

4.8.4.1. Methods and Assumptions

Because the analysis of disproportionate adverse effects is based on other effects identified for other resources, the assumptions for this analysis implicitly include the assumptions of other resource areas as they relate to the identification and analysis of effects. In addition, this analysis assumes that the latest available demographic data from the U.S. Census and other sources accurately represent the population in the study area.

In accordance with BLM and CEQ guidance for assessing environmental justice in the planning process, an area is considered to contain a minority population if either the minority population of the affected area exceeds 50 percent or the percentage of minority population in the affected area is meaningfully greater than the percentage in the general population. The “general population” is defined as a relevant comparison area, such as the state.

The minority population in the three planning area counties ranges from five percent (Johnson) to nine percent (Campbell), compared to a state average of 13 percent. Because none of the counties has a higher minority population than the state, they are not considered to contain a minority population concentration at the county level based on BLM and CEQ guidance. At the town level, two towns in the planning area (Arvada and Ranchester) had minority populations higher than the state average as of 2000 (more recent data are not available). These towns therefore have a relatively high concentration of minority population, as defined in BLM and CEQ guidance, compared to the state.

In terms of low-income populations, in 2007 all three counties had a poverty rate of less than 10 percent, which is the state level. Therefore, none of the counties has a minority population concentration at the county level. However, several towns had a higher poverty rate than the state in 2000 (the latest year for which town-level data are available): Arvada, Clearmont, Kaycee, Ranchester, and Story, and Sheridan's poverty rate is the same as the state. Therefore, there are concentrations of low-income populations in several regions of the planning area, as defined in BLM and CEQ guidance.

4.8.4.2. Impacts Common to All Alternatives

As noted above, demographic conditions in the planning area indicate concentrations of low-income populations in several towns, and concentrations of minority populations in the towns of Arvada and Ranchester. However, there are no direct or indirect effects under the alternatives that would affect these populations in a different way than the general population in the planning area. For example, the lower economic activity associated with Alternative B would cut across all sectors of the economy – from higher-skill managerial jobs to lower-skill service jobs. Therefore, there would be no identifiable environmental justice issues or direct or indirect effects associated with any of the alternatives that are specific to any minority or low-income community or population as defined in EO 12898 or BLM IM 2002-164 (BLM 2002).

As noted in Chapter 3, the Crow Indian Reservation and the Northern Cheyenne Indian Reservation are just north of the planning area, over the state border in Montana. Populations from both reservations use Sheridan, in particular, as a destination for shopping and services. However, no significant adverse effects were identified that would affect the quality of Sheridan as a destination for these services. Thus, there would be no significant adverse effects on residents of these reservations attributable to the actions in any alternative.

While there are minority and low-income populations in the planning area, no particular BLM actions proposed under any alternative have been identified as causing disproportionate adverse effects on these populations.

Environmental justice principles also require that the BLM provide opportunities for people of all backgrounds to have a meaningful voice in the planning process. The BLM has provided numerous opportunities in a variety of different formats, and has considered all input from persons regardless of their race, ethnicity, income status, or other social and economic characteristics.

4.8.4.3. Conclusion

The alternatives would be identical regarding potential effects on minority and low-income populations. No particular BLM actions proposed under any alternative would cause disproportionate adverse effects on minority or low-income populations. The BLM has

considered all input from persons regardless of their race, ethnicity, income status, or other social and economic characteristics.

4.8.5. Tribal Treaty Rights

Effects on tribal treaty rights can include limitations on access to tribal hunting, fishing, or resource collection areas that were reserved by certain treaty. Effects on such resources are usually identified on a project-specific basis in consultation with the appropriate tribes. The Crow, Northern Cheyenne, Northern Arapaho and potentially other tribes were granted hunting rights by treaty within the planning area which were never rescinded. However, hunting rights in Wyoming are managed by the WGFD and are not analyzed in this document.

Some tribes claim they retain treaty rights that the U.S. Government fails to recognize. For example, the Supreme Court determined in *United States v. Sioux Nation of Indians* that the U.S. Government violated the terms of the Fort Laramie Treaty of 1868 by taking lands that were entitled to the tribes by the treaty. The Sioux Nation declined to take compensation from the U.S. Government, because they did not want to give up their claim to the land. The entire planning area is within the original boundaries of the Sioux Nation as defined by the treaty, but is within what was defined as “unceded Indian Territory.”

4.9. Cumulative Impacts

This section analyses the combined cumulative impacts of all resource programs. Cumulative impacts of individual resource programs were analyzed within their individual sections.

CEQ defines cumulative effects as:

The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7).

For the Buffalo RMP revision, each of the three components of this definition of cumulative effects is addressed as follows:

- *Incremental impacts of the RMP revision.* The incremental impacts of the action (i.e., the revision of the existing plan), are described for each resource in the preceding sections.
- *Impacts from all past and present actions.* The impacts from all past and present actions are captured in the baseline conditions presented in Chapter 3, Affected Environment. As discussed in that chapter, the description of the current affected environment reflects past and present actions.
- *Reasonably foreseeable future actions.* Other reasonably foreseeable future actions are identified in Appendix G (p. 1937).

The analysis of cumulative impacts serves to place the projected incremental impacts from the management alternatives in the context of past, present, and future impacts. This combination necessarily involves projections and limited analyses. Public documents prepared by federal, state, and local agencies are the primary sources of information regarding past, present, and future actions. Speculative projects are not included in the projections, but areas of high potential for development or resource use that are unconstrained by management actions are identified and

potential impacts are assessed. Necessarily, some of these analyses results will be qualitative, while others can be quantified. Certain developments might be identified as too speculative for analysis, such as in-situ coal gasification.

Analyses are limited because there is incomplete documentation of all past and present impacts on private and public lands, and limited knowledge of future development because of changing economic and technical conditions. Illustrative of this process is the expansion of oil and gas activities associated with horizontal wells, or the impact to management considerations with the USFWS decision that listing the greater sage-grouse under the ESA is warranted but precluded.

Methods and Assumptions

It is neither practical nor required to exhaustively analyze all possible cumulative impacts to all resources and uses. Instead, the CEQ indicates the cumulative impact analysis should focus on meaningful impacts. Therefore, the analysis in this document focuses on past, present, and future actions anticipated to result in substantial impacts to historically important resources. This analysis is likely predictive of cumulative impacts to other resources not analyzed here. The resources to be analyzed were developed based on issues identified during public scoping and through the professional judgment of BLM specialists and Cooperating Agencies.

Public documents prepared by federal, state, and local government agencies are the primary sources of information regarding past, present, and future actions considered in the cumulative effects analysis. Actions undertaken by private persons and entities are assumed to be captured in the information made available by such agencies. Speculative or uncommitted projects are not included in the projections. These projections are not planning decisions. Using them in this analysis does not constitute approval by BLM or any authorizing agency. These projections do not set a limit or cap on future BLM actions. Unforeseen changes in such factors as economics; public demand; and federal, state, and local laws and policies could result in different outcomes than those projected for this analysis.

Assumptions used in the calculation of impacts from non-BLM actions in the planning area include:

- Oil and gas activities are based on the Wyoming Reservoir Management Group's Oil and Gas RFD for the Wyoming BLM field offices.
- For cumulative impacts associated with non-BLM activities other than oil and gas, there is no "standard" assumption that can be made by extrapolating impacts associated with BLM management. The land and mineral ownership patterns in the planning area do not support attributing the same trends observed or identified for federal lands on state and privately owned lands.
- Generally, the context and intensity of non-BLM activities are not anticipated to vary by alternative because these activities do not directly depend on BLM management actions and allowable uses set forth in the RMP alternatives. However, coal development will likely depend upon BLM management.
- Cumulative impacts such as soil erosion, invasive species spread, and habitat fragmentation are anticipated to be commensurate with the amount of surface disturbance projected in the planning area (Table 4.71, "Cumulative Surface Disturbance from BLM and Non-BLM Reasonable Foreseeable Actions" (p. 1662)).
- Actions by private persons and entities are captured in public documents prepared by federal, state, and local agencies.

- The assumptions for reclamation are that short-term disturbance will be reclaimed within 2 years. This level of reclamation is based on soil stability and does not suggest a return to predisturbance conditions. Habitat fragmentation will not be restored in this timeframe; indeed predisturbance vegetation and habitat condition might not return for decades past the end of the planning period.
- Additional assumptions are identified under each issue.

Table 4.71. Cumulative Surface Disturbance from BLM and Non-BLM Reasonable Foreseeable Actions

Action	Alternative A	Alternative B	Alternative C	Alternative D
Total Acres Disturbed from BLM Actions	322,026	422,903	422,544	486,957
Total Acres Reclaimed from BLM Actions	221,888	344,752	291,923	358,871
Total Acres Long-Term Disturbance from BLM Actions	100,138	78,152	130,621	128,086
Total Acres Disturbed from Non-BLM Actions	2,123,460	1,890,239	2,531,611	2,168,799
Total Acres Reclaimed from Non-BLM Actions	1,943,463	1,766,623	2,174,564	1,965,851
Total Acres Long-Term Disturbance from Non-BLM Actions	179,998	123,617	357,048	202,949
Cumulative Long-Term Acres of Disturbance	280,135	201,768	487,669	331,035
Source: Appendix G (p. 1937)				
BLM Bureau of Land Management				

Site-specific actions that have already occurred (past) or are ongoing (present) are not considered in this cumulative impacts analysis because they are already captured in Chapter 3, Affected Environment. Only those reasonably foreseeable future actions are considered in this cumulative impacts analysis.

Quantifiable aspects of the analysis, including surface disturbance have been identified. It is important to note however, that the specificity of the numbers in the table suggests a degree of accuracy that the data do not support, particularly because historical trends are used to predict future activity. With the immediate impacts of fluctuation of commodity prices on development, historical trends might not be representative of the future. For example, historical trends in locatable mineral development include a 15-year period in which 8 years had prices of uranium averaging under \$15.00 per pound and 1 year with prices close to \$100 per pound. In addition, much of the BLM data were created before modern equipment made exact measurement possible. Historic surface disturbance is based on permitted activities rather than the as-built environment. Acknowledging the limitations of the data is not to undermine its utility for comparative analysis of alternatives, either for assessing cumulative impacts or for direct and indirect impacts. This is especially true for the RMP, which includes site-specific analysis.

Table 4.72, “Summary of Reasonably Foreseeable Future Actions” (p. 1664) identifies reasonably foreseeable future projects that are considered in this cumulative impacts analysis. The majority of the projects identified are programmatic and/or strategic in nature; therefore, the exact intensity or location of anticipated impacts cannot be quantified. Most projects identified in Table 4.72, “Summary of Reasonably Foreseeable Future Actions” (p. 1664) are ongoing and provide a management framework for site-specific actions implemented during the life of the various projects. Though they are considered in this cumulative impacts analysis, refer to Chapter 3 for a detailed description of site-specific past and present (i.e., ongoing) actions. Additional management plans that were reviewed to identify RFAs are listed in Table 1.3, “Related Plans” (p. 16).

Table 4.72. Summary of Reasonably Foreseeable Future Actions

Resource Plans	Physical Resources	Mineral Resources				Fire & Fuels	Biological Resources	Heritage & Visual Resources	Land Resources								Special Designations				Socioeconomic Resources
		Coal	Fluids	Locatable	Salable				Forest Products	Lands & Realty	Renewable Energy	Rights of Way & Corridors	Travel & Transportation	Recreation	Wilderness Characteristics	Livestock Grazing	ACECs	National Byways	Wild & Scenic Rivers	WSAs	
BLM RESOURCE MANAGEMENT PLANS																					
Bighorn Basin Draft RMP & EIS (2011)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Billings & Pompey’s Pillar National Monument Draft RMP & EIS (2013)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Casper Field Office Approved RMP/EIS (2007)	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X
Miles City Draft RMP & EIS (2013)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Newcastle Field Office Approved RMP/EIS (2000)	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X		X		X
Programmatic EIS on Wind Energy Development on BLM-Administered Lands in the Western United States (2005)	X										X	X									X
Programmatic EIS for Geothermal Leasing in the Western United States (2008)	X		X							X	X										X
OTHER FEDERAL AGENCY PLANS																					
Bighorn National Forest Approved Land & RMP (2005)	X		X	X	X	X	X	X	X	X		X	X	X	X	X				X	X
Generic Final EIS for In Situ Leach Uranium Milling Facilities (2009)	X			X			X	X					X								X
Programmatic EIS, Designation of Energy Corridors on Federal Land in 11 Western States (DOE/EIS-0386) (2008)	X									X	X	X									X
Thunder Basin National Grassland Approved Land & RMP (2002)	X	X	X		X	X	X	X	X	X		X	X	X	X	X			X		X
STATE AGENCY PLANS																					
WGFD Strategic Habitat Plan (2001)							X									X					
Wyoming Greater Sage-Grouse Conservation Plan (2003)	X		X				X									X					

	Physical Resources	Mineral Resources				Fire & Fuels	Biological Resources	Heritage & Visual Resources	Land Resources								Special Designations				Socioeconomic Resources
		Coal	Fluids	Locatable	Salable				Forest Products	Lands & Realty	Renewable Energy	Rights of Way & Corridors	Travel & Transportation	Recreation	Wilderness Characteristics	Livestock Grazing	ACECs	National Byways	Wild & Scenic Rivers	WSAs	
Resource Plans																					
Wyoming Statewide Comprehensive Outdoor Recreation Plan (2009)														X			X				
Wyoming Statewide Trails Plan 2004 (2004)														X			X		X		
Wyoming SHPO Comprehensive Statewide Historic Preservation Plan (2007)								X													
COUNTY PLANS																					
Campbell County Comprehensive Plan (2007)	X	X	X				X	X		X			X			X					X
Johnson County Comprehensive Land Use Plan (2005)	X		X				X	X		X		X	X			X					X
Sheridan County Comprehensive Plan (2008)	X						X	X		X		X	X			X					X
CONSERVATION DISTRICT PLANS																					
Campbell County Conservation District Long Range & Natural RMP 2010-2015 (2009)	X						X		X	X	X				X	X					X
Lake DeSmet Conservation District Long Range Plan 2007-2012 (2006)	X						X									X					X
Powder River Conservation District Long Range Natural RMP 2010-2015 (2010)	X						X									X					X
Sheridan County Conservation District Long Range Plan 2010-2014 (2009)	X						X									X					X

4.10. Irreversible and Irretrievable Commitment of Resources

Section 102(2)(C) of NEPA and Section 1502.16 of the CEQ regulations for implementing NEPA require that the discussion of environmental consequences include a description of “...any irreversible or irretrievable commitment of resources which would be involved in the proposal should it be implemented.” An irreversible commitment of a resource is one that cannot be reversed or cannot be renewed within a reasonable timeframe. Extinction of a species or disturbance to cultural resources would constitute irreversible impacts, as would extraction of sand, gravel, or oil or gas since these minerals resources cannot be renewed in the ground within a reasonable timeframe. An irretrievable commitment of a resource occurs when the resource or its use is lost for a period of time. For example, a decision not to treat juniper encroachment into adjacent sagebrush habitat results in the irretrievable loss of forage production from the grassland community. This action is not irreversible, because a treatment applied to the encroaching juniper could restore the forage production of the sagebrush habitat.

The decision to select one of the four alternatives described in this Proposed RMP and Final EIS does not constitute an irreversible or irretrievable commitment of resources because the decision does not authorize implementation level activities. Instead, decisions made in the selected plan serve to guide future actions and subsequent site-specific decisions. Following the signing of the ROD for the RMP revision, subsequent implementation plans (activity- or project-specific) will be developed and implemented by the BLM. Implementation decisions require appropriate project-specific planning and NEPA analysis, and constitute the BLM’s final approval authorizing on-the-ground activities to proceed.

Assuming the BLM selects one of the action alternatives, and that subsequent implementation decisions authorize activity- or project-specific plans, some irreversible and irretrievable commitment of resources would occur. However, the specific nature and extent of the impacts cannot be clearly defined since the location, scale, timing, rate of implementation, and relationship to other actions is currently unknown. Such impacts can be better assessed after site-specific implementation, including implementation of mitigation measures and assessment of the efficacy of the mitigation measures.

Even without the specifics of implementation plans, the likelihood of irreversible and irretrievable effects on some resources can be estimated. Effects from some actions may be both irreversible and irretrievable for some resources. Resources most likely to be affected include minerals and energy development; vegetation including forests, forest products, and noxious weeds; fish and wildlife and their habitat; soils; water; visual resources; wilderness characteristics; and cultural and paleontological resources. The management actions most likely to result in irreversible and/or irretrievable effects include those related to development and surface disturbance such as mineral extraction, energy development, timber harvesting/silvicultural treatments, livestock grazing, and transportation and access.

Additionally, the effects of management actions are interrelated and generally affect multiple resources concurrently. For example, mineral extraction would result in an irreversible and irretrievable loss of those minerals. The effects of extraction on vegetation, associated wildlife habitat, and livestock grazing would be irretrievable and potentially irreversible if reclamation efforts prove unsuccessful. Irreversible effects on soils and water quality could occur, depending on the implementation of mitigation measures and their efficacy. Visual resources would be irretrievably affected during extraction activities, but the effects would not necessarily be irreversible. If the extraction activities occurred near a WSA or lands with wilderness

characteristics, those qualities could be irretrievably lost during extraction and such effects could be irreversible. Any cultural or paleontological resources affected by extraction would be irretrievably and irreversibly lost. However, all of these effects would be localized and have the potential to be minimized through effective mitigation.

4.11. Unavoidable Adverse Impacts

Section 102(C) of NEPA also mandates disclosure of “any adverse environmental effects which cannot be avoided should the proposal be implemented.” These are impacts for which there are no mitigation measures or for impacts that remain even after the implementation of mitigation measures. Implementation of the RMP and subsequent activity- or project-specific plan implementation would result in unavoidable adverse impacts to some resources. The impacts resulting from implementation of the RMP are described in detail in Chapter 4, Environmental Consequences, and summarized herein. As discussed under the preceding section on irreversible and irretrievable impacts, the specific nature and extent of the implementation-level impacts cannot be clearly defined due to unknowns regarding site-specific implementation and associated mitigation measures.

In general, development and surface-disturbing activities including those from mineral extraction, energy development, vegetation treatments or timber harvesting, livestock grazing, and transportation and access would result in unavoidable adverse impacts including soil compaction and erosion, loss of vegetative cover, spread of noxious weeds, disturbance to and displacement of wildlife, visual intrusions on the landscape, and potential loss of cultural or paleontological resources. Conversely, proposed restrictions on some activities such as energy development or livestock grazing intended to protect sensitive resources and resource values would have unavoidable adverse impacts on some users, operators, and permittees by limiting their ability to use public lands and potentially increasing their operating costs.

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Chapter 5. References

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Chapter 6. List of Preparers

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Table 6.1. List of Preparers

Name	Project Role
Bureau of Land Management	
Thomas Bills	Project Manager/Inspector and Team Leader
Buck Damone	Technical Coordinator; Cultural Resources; Areas of Critical Environmental Concern
Christopher Carlton	State Office Planning Lead
Duane Spencer	Buffalo Field Manager
Stephanie Connelly	High Plains District Manager
Pamela Murdock	State Office Planner
Diane Adams	GIS Coordinator
Kerry Aggen	Geological Resources; Mineral Resources – Locatable, Salable, Other Leasable Minerals, Geothermal; Carbon Capture and Sequestration
Cindy Allen	Forests and Woodlands, Forest Products
Roy Allen	Social Conditions/ Economic Conditions/ Environmental Justice
Allison Barnes	Visual Resources; Travel and Transportation Management; Recreation; Lands with Wilderness Characteristics; Areas of Critical Environmental Concern; Back Country Byways; Wild and Scenic Rivers; Wilderness Study Areas
Brent Breithaupt	Paleontological Resources; Areas of Critical Environmental Concern
Kristi Bulock	Fire and Fuels Management – Planned Fire (Prescribed Fire)
Jude Carino	Lands with Wilderness Characteristics; Wild and Scenic Rivers; Wilderness Study Areas
Lesley Collins	Public Affairs
Ronald Cross	ePlanning
Al Elser	Mineral Resources – Oil and Gas, Coal
Jay Esperance	Fire and Fuels Management – Unplanned/Wildland Fire
Janelle Gonzales	Stabilization and Rehabilitation; Grassland and Shrubland Communities; Riparian and Wetland Resources, Invasive Species; Livestock Grazing
Kay Medders	Grassland and Shrubland Communities; Riparian and Wetland Resources, Livestock Grazing
Dale Hanson	Paleontological Resources; Areas of Critical Environmental Concern
Amber Haverlock	Lands and Realty, Rights-of-Way and ROW Corridor
Ken Henke	Health and Safety
Melissa Hovey	Air Quality
Melanie Hunter	Mineral Resources – Oil and Gas
Arnie Irwin	Soil
Mike Karbs	Mineral Resources – Coal
Theresa Johnson	Mineral Resources – Coal
Meleah Corey	Invasive Species and Pest Management
Travis Kern	Mineral Resources – Oil and Gas Surface Resources
Seth Lambert	Cave and Karst Resources
Brent Lignell	Air Resources
Jenny Morton	Fish and Wildlife; Special Status Species
Bill Ostheimer	Fish; Special Status Fish
Jerry Queen	Geologic Resources; Mineral Resources – Other Solid Leasables, Locatable, Salable
Christine Sadler	Lands and Realty; Renewable Energy; Rights-of-Way and Corridors
Lesly Smith	Travel and Transportation Management; Recreation; Areas of Critical Environmental Concern; Back Country Byways
Brent Sobotka	Water
Jennifer Spegon	Reclamation
Dean Stilwell	Mineral Resources – Oil and Gas
Charis Tuers	Air Quality

Name	Project Role
Jennifer Walker	Fire and Fuels Management – Unplanned Fire (Wildfire), Planned Fire (Prescribed), Emergency Stabilization and Rehabilitation
Matthew Warren	Mineral Resources – Oil and Gas
Chris Williams	Water
Mike Worden	Mineral Resources – Oil and Gas
Victor Xuan	Mineral Resources – Oil and Gas
John Zachariassen	Air Quality
Ryan McCammon	Air Quality
Consultant	
ICF International	Interdisciplinary Team
Madeline Terry	Project Manager
Randall Coleman	Deputy Project Manager
Jay Haney	Air Quality
Rob Fetter	Social Conditions/Economic Conditions/Environmental Justice
Alex Uriarte	Social Conditions/Economic Conditions/Environmental Justice
Joe Walsh	GIS
Science Applications International Corporation (SAIC)	Interdisciplinary Team

Glossary

Access:

The opportunity to approach, enter, or cross public lands.

Accessible:

A term used to describe a site, building, facility, or trail that complies with the Architectural Barriers Act Accessibility Standards and can be approached, entered, and used by people with disabilities.

Active Mining Claim:

See Mining Claim.

Active Nest:

A nest that could reasonably be expected to be occupied in the future; the period of time that a nest can be unoccupied but still classified as active varies and is dependent on the characteristics of the species most likely to use the nest in the future.

ADA Compliant:

The subject (facility, website, trail, etc.) meets the standards of the Americans with Disabilities Act of 1990 (ADA). For example; new facility construction or alterations that meet the ADA standards published in the Title II (28 Code of Federal Regulations [CFR] part 35) and Title III regulations (28 CFR Part 36) issued by the Department of Justice (Revised September 15, 2010).

Administrative Access:

A term used to describe access for resource management and administrative purposes such as fire suppression, law enforcement and military in the performance of their official duty, or other access needed to manage Bureau of Land Management (BLM)-administered lands.

Allotment:

An area of land where one or more livestock operators graze their livestock. Allotments are BLM lands, but may also include other federally managed, state-owned, and private lands. An allotment may include one or more separate pastures. Livestock numbers and periods of use are specified for each allotment.

Allotment Categorization:

All allotments in the Buffalo Field Office have been categorized as Improve (I), Maintain (M), or Custodial (C), based on resource values and opportunities for improvement. Allotment category refers to BLM's level of management for a given grazing allotment and is used to establish priorities for distributing available funds and personnel during plan implementation to achieve cost-effective improvement of rangeland resources. Categorization is also used to organize allotments into similar groups for purposes of developing multiple use prescriptions, analyzing site-specific and cumulative impacts, and determining trade-offs. Allotments in Category I are managed more intensively and are monitored more frequently. Allotments in Category M are usually at a desired condition and are managed to maintain or improve that condition. Allotments in Category C are usually isolated parcels with few resource concerns that are fenced in with larger parcels of deeded land, are managed in conjunction with the permittee/lessee's normal livestock operation, and are monitored less frequently. Additional information on the categories follows:

- **I (Improve):** The category for allotments where (1) present range condition is unsatisfactory and where range condition is expected to decline further; (2) present grazing management is not adequate; (3) the allotment has potential for medium to high vegetative production but production is low to moderate; (4) resource conflicts/controversy with livestock grazing are evident; (5) there is potential for positive economic return on public investment.
- **M (Maintain):** The category for allotments where (1) the present range condition and management are satisfactory with good to excellent condition and will be maintained under present management, or fair condition and improving with improvement expected to continue under present management or opportunities for BLM management are limited because percentage of public land is low or acreage of public lands is small; (2) the allotment has a potential for moderate or high vegetative production is producing at or near this potential; (3) there are no significant land-use resource conflicts with livestock grazing; (4) land ownership status may or may not limit management opportunities; (5) opportunities for positive economic return from public investment may exist.
- **C (Custodial):** The category for allotments where (1) present range condition is not in a downward trend; (2) the allotment has a low vegetative production potential and is producing near this level; (3) there may or may not be limited conflicts between livestock grazing and other resources; (4) present management is satisfactory or is the only logical management under existing conditions; and (5) opportunities for a positive economic return on public investments do not exist.

Allotment Management Plan:

A written program of livestock grazing management, including supportive measures if required, designed to attain specific management goals in a grazing allotment.

Analysis Area:

Any lands, regardless of jurisdiction, for which the BLM synthesizes, analyzes, and interprets data for information that relates to planning for BLM-administered lands.

Animal Unit Month (AUM):

A standardized measurement of the amount of forage necessary for the sustenance of one cow unit or its equivalent for one month (approximately 800 pounds of forage).

Annual Brome:

A term which commonly refers to non-native annual brome grasses invading western rangelands. Annual brome species include, among others, cheatgrass (*Bromus tectorum*) and Japanese brome (*B. japonicas*).

Archeological Monitor:

A professional archeologist contracted to observe firsthand surface-disturbing activity occurring in areas of known or predicted cultural sensitivity and to make recommendations to protect cultural resources that may be impacted. A Monitor must meet the Secretary of the Interior's Professional Qualifications Standards (36 CFR Part 61) for an archeologist.

Archeological site:

A place which holds evidence of past human activity.

Archeology:

A method of the discovery, study and reconstruction of past human cultures from material remains such as artifacts and sites.

Area of Critical Environmental Concern (ACEC):

An area within the public lands designated for special management attention to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and safety from natural hazards. According to 43 CFR 1601.0-5a, "The identification of...[an] ACEC shall not, of itself, change or prevent change of the management or use of public lands."

Artifact:

Any object made, modified or used by humans, usually but not necessarily portable.

Avoid:

A term used to address mitigation of some activity (i.e., resource use). Paraphrasing the Council on Environmental Quality (CEQ) Regulations (40 CFR 1508.20), avoidance means to circumvent, or bypass, an impact altogether by not taking a certain action, or parts of an action. Therefore, the term "avoid" does not necessarily prohibit a proposed activity, but it may require the relocation of an action, or the total redesign of an action to eliminate any potential impacts resulting from it.

Avoidance Areas:

Areas with sensitive resource values where rights-of-way (ROWs) and Section 302 permits, leases, and easements would be strongly discouraged. Authorizations made in avoidance areas would have to be compatible with the purpose for which the area was designated and not be otherwise feasible on lands outside the avoidance area.

Back Country Byway:

- **Back Country Byway Type I:** Byways that are either paved or have an all-weather surface. Normal passenger cars can easily negotiate the roads. They are usually narrow, slow-speed, secondary roads. None of the byways follow the main highways.
- **Back Country Byway Type II:** Roads that require high-clearance trucks or four-wheel-drive vehicles, although passenger cars may be able to negotiate them under good conditions. These roads are not paved but often have an improved gravel surface. They often cross dry, rocky arroyos, have rough rutted sections, and have occasional steep grades and sharp curves.
- **Back Country Byway Type III:** Byways requiring four-wheel-drive vehicles and others such as dirt bikes and all-terrain vehicles (ATVs). These roads are often unimproved dirt tracks. Expect steep grades, rocky and muddy sections, and possible route-finding. Do not attempt these byways in a two-wheel-drive vehicle, the consequences could be serious for operator/passenger and car.
- **Back Country Byway Type IV:** Trails that are managed for snowmobile, dirt bike, mountain bike, or ATV use.

Badland :

Badland is moderately steep to very steep barren land dissected by many intermittent drainage channels. Ordinarily, the areas are not stony. Badland is most common in semiarid and arid regions where streams cut into soft geologic material. Local relief generally ranges between 10 and 200 meters. Potential runoff is very high, and erosion is active. *Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.*

Baseline:

The pre-existing condition of a defined area and/or resource that can be quantified by an appropriate metric(s). During environmental reviews, the baseline is considered the affected environment that exists at the time of the review's initiation, and is used to compare predictions of the effects of the proposed action or a reasonable range of alternatives.

Basin:

hydrologic basin: An extent of land where water from rain or snow melt drains downhill into a body of water, such as a river, lake, reservoir, estuary, wetland, sea or ocean. The basin includes both the streams and rivers that convey the water as well as the land surfaces from which water drains into those channels, and is separated from adjacent basins by a drainage divide.

geologic basin: A geographic depression in the earth's surface in which sediments accumulate over time.

Big Game Crucial Winter Range:

Winter habitat on which a wildlife species depends for survival. Because of severe weather conditions or other limiting factors, no alternative habitat would be available.

Biological Buffer Zone:

A combination of distance and screening (visual and/or audio) that reduces adverse impacts to a biological resource to an acceptable level.

BLM-administered land:

Land or interest in land owned by the United States and administered by the Secretary of the Interior through the BLM, except lands located on the Outer Continental Shelf, and land held for the benefit of Indians, Aleuts, and Eskimos. Synonym for public lands administered by BLM; includes surface and/or mineral estate.

BLM jurisdiction:

Synonym for public lands, includes surface and/or mineral estate.

BLM-managed land:

Synonym for public lands, includes surface and/or mineral estate.

BLM surface land:

Those public lands where the surface estate is owned by the United States and administered by the Secretary of the Interior through the BLM.

Borrow Material:

A term typically used in conjunction with construction. The term refers to excavated material transported for use as fill at another location.

Camping:

Erecting a tent or shelter or arranging bedding, or both, or parking a vehicle for the purpose of remaining overnight on land.

Carbon Dioxide (CO₂):

A colorless, odorless, nontoxic gas that is a normal component of earth's atmosphere. One of a number of "greenhouse gases."

Carbon Dioxide (CO₂) Flood:

A CO₂ flood is an enhanced oil recovery technique that injects fluid into the reservoir. When CO₂ is injected, it mixes with the oil and the two compounds dissolve into one another. The injected CO₂ acts as a solvent to overcome forces that trap oil in tiny rock pores and helps sweep the immobile oil left behind after the effectiveness of water injection decreases, resulting in increased oil production.

Carbon Dioxide (CO₂) Sequestration, also called Carbon Capture and Storage (CCS):

A number of technologies used or proposed for capturing CO₂ and sequestering (isolating) it, to keep it from entering the atmosphere. These technologies include scrubbing (removing) the CO₂ gas from the stream of exhaust gases emitted from various industrial operations (including coal burning at electrical generation plants), as well as liquefying the CO₂ gas and injecting it into underground reservoirs.

Casual Use:

Activities ordinarily resulting in no or negligible disturbance of the public lands, resources, or improvements (43 CFR 2801.5, 2881.5, 3150.0-5, 3200.1, 3400.0-5, 3482.1, and 3809.5).

Cave:

Any naturally occurring void, cavity, recess, or system of interconnected passages beneath the surface of the earth or within a cliff or ledge, including any cave resource therein, and which is large enough to permit a person to enter, whether the entrance is excavated or naturally formed. Such term shall include any natural pit, sinkhole, or other feature that is an extension of a cave entrance or which is an integral part of the cave.

Cave Significance Criteria:

Under the Federal Cave Resources Protection Act, a cave is considered significant if it meets one or more of the following criteria (per 43 CFR 37.11(c)).

- **Biota:** The cave provides seasonal or yearlong habitat for organisms or animals, or contains species or subspecies of flora or fauna that are native to caves, or are sensitive to disturbance, or are found on state or federal sensitive, Threatened, or Endangered species lists.
- **Cultural:** The cave contains historic properties or archeological resources or other features that are included in or eligible for inclusion in the National Register of Historic Places because of their research importance for history or prehistory, historical associations, or other historical or traditional significance.
- **Geologic/Mineralogic/Paleontologic:** The cave possesses one or more of the following features: (i) Geologic or mineralogic features that are fragile, or that exhibit interesting formation processes, or that are otherwise useful for study. (ii) Deposits of sediments or features useful for evaluating past events. (iii) Paleontologic resources with potential to contribute useful educational and scientific information.
- **Hydrologic:** The cave is a part of a hydrologic system or contains water that is important to humans, biota, or development of cave resources.
- **Recreational:** The cave provides or could provide recreational opportunities or scenic values.
- **Educational or Scientific:** The cave offers opportunities for educational or scientific use; or, the cave is virtually in a pristine state, lacking evidence of contemporary human disturbance or impact; or, the length, volume, total depth, pit depth, height, or similar measurements are notable (43 CFR 37.11(c)).

Cheatgrass:

Cheatgrass is an annual grass that forms tufts up to 2 feet tall. The leaves and sheaths are covered in short, soft hairs. The flowers occur as drooping, open, terminal clusters that can have a greenish, red, or purple hue. Flowering occurs in the early summer. These annual plants will germinate in fall or spring (fall is more common), and senescence usually occurs in summer. Cheatgrass invades rangelands, pastures, prairies, and other open areas. Cheatgrass has the potential to completely alter the ecosystems it invades. It can completely replace native vegetation and change fire regimes and is most problematic in areas of the western United States with lower precipitation levels.

Class II Wells:

Injection wells

1. That are brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production, and may be commingled with wastewaters from gas plants, which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.
2. For enhanced recovery of oil or natural gas.
3. For storage of hydrocarbons that are liquid at standard temperature and pressure.

Class I Wells:

Injection wells that are

1. Wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to inject hazardous waste beneath the lowermost formation containing, within 0.25 mile of the wellbore, an underground source of drinking water.
2. Other industrial and municipal disposal wells that inject fluid beneath the lowermost formation containing, within 0.25 mile of the wellbore, an underground source of drinking water.
3. Radioactive waste disposal wells that inject fluid below the lowermost formation containing an underground source of drinking water within 0.25 mile of the wellbore.

Climate Change:

A change of climate, which may be attributed to a variety of factors, including, directly or indirectly, human activity that may alter the composition of the global atmosphere and natural climate variability observed over comparable time periods.

Climax Forest:

A relatively stable forest community that represents the final stage of ecological succession for its locality; the natural potential of a forest community. The climax community perpetuates itself indefinitely unless disturbed by outside forces.

Clinker:

A reddish, brownish, to black rock common in certain areas of the Powder River Basin, often near or above coal outcrops. Formed when the heat produced from a coal seam fire baked and/or melted the rocks, sediments, and/or soils on top of the coal seam. Ranges from friable (easily broken) to very durable and hard to break. Can have a bubbly-looking appearance, which gave rise to its local name of “scoria” (a bubbly-looking volcanic rock).

Closed:

Generally denotes that an area is not available for a particular use or uses; refers to specific definitions found in law, regulations, or policy guidance for application to individual programs.

Commercial use:

Commercial use is defined as recreational use of public lands and related waters for business or financial gain. Financial gain includes gratuities, donations, gifts, bartering, etc.

Commodity:

An economic good, such as a product of agriculture or mining.

Communication Site Management Plan:

A plan that provides for effective administration of a communications site. The site plan defines the principles and technical standards adopted in the site designation. The site plan provides direction for the day-to-day operations of the site in connection with the lease. The site plan shall delineate the types of uses that are appropriate at this site and the technical and administrative requirements for management of the site. The site plan should reflect the complexity of the current situation and the anticipated demand for the site.

Community Wildfire Protection Plan (CWPP):

A plan for at risk communities that identifies and prioritizes areas for hazardous fuel reduction treatments, recommends the types and methods of treatment on federal and non-federal land that will protect one or more at-risk communities and essential infrastructure, and recommends measures to reduce structural ignitability throughout the at-risk community. A CWPP is a collaborative product involving interested parties, local government, local firefighting agencies, the state agency which oversees forest management, and federal land management agencies.

Comprehensive Weed Management Plan:

A plan for controlling invasive plant species that incorporates integrated weed management techniques and accounts for pertinent considerations, such as management actions and allocations affecting weeds.

Consumptive Use:

The use of a resource that reduces the supply. For example, removing water from a source like a river, lake or aquifer without returning an equal amount of water, reduces the supply.

Contrast:

Opposition or unlikeness of different forms, lines, colors, or texture in a landscape.

Controlled Surface Use (CSU):

Surface occupancy or use will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts. Identified resource values require special operational constraints that may modify the lease rights. CSU is used for operating guidance, not as a substitute for the no surface occupancy or timing limitation stipulations.

Cultivate:

To raise crops; to water, loosen the soil, and weed around growing plants.

Cultivation:

The process of preparing the land and caring for growing crops.

Cultural Resource Inventory Levels:

A three-tiered process for discovering, recording, and evaluating cultural resources.

- **Class I** - A review of existing literature and oral informant data combined with an analysis of a specific geographic region (e.g., an area of potential effect, drainage basin, resource area, etc.).
- **Class II** - A sampling survey usually aimed at developing and testing a predictive model of cultural resource distribution.
- **Class III** - An on-the-ground survey to discover, record, and evaluate cultural resources within a specific geographic area (e.g., usually an area of potential effect for a proposed undertaking).

Culture:

The customs, beliefs, and ways of life of a group of people.

Day-use:

Visitor use during the period of one-half hour before sunrise until one-half hour after sunset. Alternatively, a day use site may post hours for a defined time (i.e., 6 a.m. until 10 p.m.).

dB (decibel):

A unit of measurement of the loudness or strength of a signal. One decibel is considered the smallest difference in sound level that the human ear can discern. Decibels are a relative measurement derived from two signal levels: a reference input level and an observed output level. A decibel is the logarithm of the ratio of the two levels. One Bel is when the output signal is 10 times that of the input and one decibel is 1/10th of a Bel.

Defer:

Postpone for the life of the plan.

Defer (Minerals):

To set-aside, or postpone, a particular resource use(s) or activity(ies) on the public lands to a later time. Generally when this term is used the period of the deferral is specified. Deferments sometimes follow the sequence timeframe of associated serial actions (e.g., action B will be deferred until action A is completed, etc.).

Deferment (Livestock Grazing):

Delay of livestock grazing on an area for an adequate period of time to provide for plant reproduction, establishment of new plants, or restoration of vigor of existing plants.

Designated Roads and Trails:

Specific roads and trails on which some type of motorized vehicle use is allowed either seasonally or year-long. Use can be defined as open to the general public or for administrative use only.

Desired Future Condition (DFC):

Landscape conditions and management scenarios that should exist for a specific land area and for a specific resource (e.g., livestock grazing or wildlife) that meet the managing agency's vision statement and objectives for ecological, economic and social considerations.

Desired Future Condition (DFC) for Riparian and Wetlands (after 20-40 years of management):

- Manage for proper functioning conditions (PFCs) on all riparian and wetland habitats.
- Riparian and wetland vegetation supports PFC of biologic, hydrologic, and physical components of streams and wetlands.

- Systems are vertically stable (no downcutting).
- Floodplain connectivity.
- Herbaceous plant communities are composed of functional and structural plant groups that are dominated by deep-rooted native species that support stream bank and shoreline stability, floodplain development, water quality, and nutrient cycling. Also includes woody species and cottonwoods within the site's potential.
- Management of invasive, noxious, and undesirable species.
- Provide 'Yellow, Red and Blue Ribbon' streams on those systems with fish habitat potential.

Desired Plant Community (DPC):

Of the several plant communities that may occupy a site, the DPC is the community that has been identified through a management plan to best meet the plan's objectives for the site. At a minimum, it must protect the site.

Developed Recreation Site:

Any designated site or location built or improved for recreation and visitor services on BLM-administered land such as a trailhead, scenic vista, interpretive site, parking area, boat launch, picnic area, potable water source, restroom or campground.

Diet:

What people and living organisms eat is their diet. A diet is a combination of foods and liquids that provide the necessary nutrients for the body.

Dispersed Recreation:

Recreation that occurs on BLM-administered lands outside of a developed recreation site or designated trail.

Disposal:

Federally owned **Salable Minerals (mineral materials)** are disposed of through federally-approved actions, including sales and free use. Sales generate a set royalty to the federal government, by the ton or cubic yard, while royalty-free use is granted to municipal governments for uses in public works projects and to qualified non-profit organizations.

Disruptive Activity:

Those Public Land resource uses/activities that are likely to alter the behavior, displace, or cause excessive stress to existing animal or human populations occurring at a specific location and/or time. In this context, disruptive activity(ies) refers to those actions that alter behavior or cause the displacement of individuals such that reproductive success is adversely affected, or an individual's physiological ability to cope with environmental stress is compromised. This term does not apply to the physical disturbance of the land surface, vegetation, or features. Examples of disruptive activities may include noise, human foot or vehicle traffic, domestic livestock roundups, or other human presence regardless of the activity. When administered as a land use restriction (e.g., No Disruptive Activities), this term may prohibit or limit the physical presence of sound above ambient levels, light beyond background levels, and/or the nearness of people and their activities. The term is commonly used in conjunction with protecting wildlife during crucial life stages (e.g., breeding, nesting, birthing, etc.), although it could apply to any resource value on the Public Lands. The use of this land use restriction is not intended to prohibit all activity or authorized uses. (IB WY-2007-029)

Disturbance Free Buffer Zone:

An area from which surface-disturbing and disruptive activities are prohibited for the protection of a resource. This is synonymous with ‘minimal human activity levels’ as described in the Greater Yellowstone Bald Eagle Management Plan (Greater Yellowstone Bald Eagle Working Group 1996). Essentially no disruptive activity with the following exceptions: (1) existing patterns of land use activities, (2) monitoring or research activities by experienced personnel, and (3) traffic that maintains a constant velocity (no stopping) and at an acceptable frequency.

Domestication:

The process of taming or making usable for humans.

Ecological Site:

A kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in that the site has the ability to produce distinctive kinds and amounts of vegetation and to respond to management. Ecological sites are defined and described with information about soil, species composition, and annual production.

Endangered Species:

Any species that is in danger of extinction throughout all or a significant portion of its range.

Enhancement:

A management action designed to improve visual quality.

Environment:

The conditions around an area that affect it. These include geography, soil, climate, plants, and animals.

Ephemeral Stream:

A stream that flows only in direct response to precipitation, and whose channel is at all times above the water table. Confusion over the distinction between intermittent and ephemeral streams may be minimized by applying Meinzer’s suggestion that the term “ephemeral” be arbitrarily restricted to streams that do not flow continuously for at least 30 days (Prichard et al. 1998). Ephemeral streams support riparian areas when streamside vegetation reflects the presence of permanent subsurface water.

Epidemic:

An outbreak of a pest or disease in a high proportion of the individuals of a population in a geographic area. For example, outbreaks of bark beetles causing mortality in a large portion of pine trees in a forest.

Erosion:

The general term used for any of a group of processes whereby earth materials (rocks, soil, and sediments) are worn away, removed, and/or moved to another site. Erosion includes mechanical processes (such as physical wearing away by water and wind, and movement due to gravity), chemical processes (such as dissolution by water and the constituents in water), biological processes (such as breaking down by plants into soil, and consumption of rocks by lichen).

Evidence:

Data which are used to prove a point, or which clearly indicate a situation.

Excavation (cultural resources):

Carefully removing layers of dirt or sediment to find objects or features made by people from long ago.

Exceedance:

An event in which measurements of ambient air quality are above the national ambient air quality standard (NAAQS) or the Wyoming Department of Environmental Quality (DEQ) standard set for a particular pollutant. For example, an annual average nitrogen dioxide value of 110 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) is an exceedance of both the NAAQS and Wyoming DEQ annual average standard for nitrogen dioxide of 100 $\mu\text{g}/\text{m}^3$.

Exclusion Areas:

Areas with sensitive resource values where ROWs and 302 permits, leases, and easements would not be authorized.

Extensive Recreation Management Areas (ERMA):

See *Recreation Management Areas*.

Extinct:

No longer existing or active; died out.

Extinction:

Bring to an end, wiping out, or destruction.

Federal Mineral Estate:

Lands where all or some minerals (such as coal or oil and gas) underlying the surface are owned by the federal government.

Federal Undertaking:

A project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including:

- a. those carried out by or on behalf of the agency;
- b. those carried out with federal financial assistance;
- c. those requiring a federal permit license, or approval; and
- d. those subject to State or local regulation administered pursuant to a delegation or approval by a federal agency (16 United States Code [U.S.C.] 470w).

Fire-adapted:

Fire adapted are those organisms or plant communities where fire is essential and the species have evolved adaptations to respond positively to fire and to facilitate fire's spread, i.e. the vegetation is fire-prone and flammable.

Firearm:

A loaded or unloaded pistol, rifle, shotgun or other barreled weapon that is designed to, or may be readily converted to, expel a projectile by the action of an explosive.

Fire Management Plan:

A strategic plan that identifies appropriate strategies to achieve resource objectives based on an approved Resource Management Plan. Identifies fire policy, objectives, and prescribed actions; may include maps, charts, tables, and statistical data.

Fire Regime Condition Class:

A classification of the amount of departure from the natural fire regime. The departure results in changes to one or more of the following ecological components: vegetation characteristics (e.g., species composition, structural stages, stand age, canopy closure, and mosaic pattern), fuel composition, fire frequency, severity, and pattern, and other associated disturbance (e.g., insect and disease mortality, grazing, and drought). The three condition classes are listed below:

Condition Class 1

- The historic disturbance regime is largely intact and functioning (e.g., has not missed a fire return interval)
- Potential intensity and severity of fire within historic range
- Effects of disease and insects within historic range
- Hydrologic functions within normal historic range
- Vegetation composition and structure resilient to disturbances
- Non-native species currently not present or to a limited extent
- Low risk of loss for key ecosystem components

Condition Class 2

- Moderate alterations to historic disturbance regime evident (e.g., missed one or more fire return intervals)
- Effects of disease and insects pose an increased risk of loss of key community components
- Riparian areas and associated hydrologic function show measurable signs of adverse departure from historic conditions
- Vegetation composition and structure shifted toward conditions less resilient to disturbances
- Populations of non-native species may have increased, increasing the risk of further increases following disturbance

Condition Class 3

- Historic disturbance regime significantly altered; historic disturbance processes and impacts may be precluded (e.g., missed several fire return intervals)
- Effects of disturbance (fire, insects, and disease) may cause significantly or complete loss of key community components
- Hydrologic functions may be adversely altered; high potential for increased sedimentation and reduced streamflows
- Invasive species may be common and in some cases the dominant species on the landscape; disturbance will likely increase both the dominance and geographic extent of these invasive species
- Highly altered vegetation composition and structure predisposes community to disturbance events outside the range of historic availability; disturbance may have effects not observed or measured before

Fire Return Interval:

The number of years between two successive fire events at a specific site or area.

Flaring/Venting:

The controlled burning (flare) or release (vent) of natural gas that cannot be processed for sale or use because of technical or economic reasons.

Floodplain Connectivity:

Maintenance of lateral, longitudinal, and vertical pathways for biological and hydrological processes in the floodplain. Examples of failures to maintain connectivity could include culverts or levees that restrict flow in the floodplain and that focus overbank flow into the channel.

Flushing Livestock:

Flushing livestock is the holding of livestock in an invasive plant species seed-free area where they are fed an invasive species seed-free ration for 72 hours, thus flushing invasive species seed from the animals' digestive systems.

Foothill:

A low hill near the base of a mountain or range of mountains.

Foreground-Middle Ground Zone:

An area that can be seen from a travel route for a distance of 3 miles (foreground) to 5 miles (middle ground) where management activities might be viewed. A distance from 5 to 15 miles is called the Background Zone and the area beyond 15 miles is called the Seldom-Seen Zone.

Fossil:

The remains or traces of an organism preserved by natural processes in the earth's crust. This would include plants and animals, their tracks, burrows, and other imprints. Fossils are considered a nonrenewable resource. The definition does not include minerals derived from fossils such as coal or oil and gas.

Fresh Water:

Water containing total dissolved solids concentrations of less than 10,000 milligrams per liter.

Geologic Resources:

Resources associated with the earth, including its composition, structure, and physical properties. Geologic resources commonly include the structure of the earth, rocks and minerals; landforms; and the processes that produce them.

Geothermal Energy:

Heat energy that occurs naturally in the earth, and that can be extracted and used. Can be either moist (containing water as steam) or dry.

Glacier:

A large mass of ice that moves slowly down a slope or valley.

Goal:

A broad statement of a desired outcome. Goals are usually not quantifiable and may not have established timeframes for achievement.

Greenhouse Gas:

A gas that absorbs and retains heat radiation. These gases include CO₂, water vapor, and methane (CH₄).

Gullied land:

Gullied land consists of areas where erosion has cut a network of V-shaped or U-shaped channels. The areas resemble miniature badlands. Generally, gullies are so deep that extensive reshaping is necessary for most uses. Small areas can be shown by spot symbols. Phases indicating the kind of material remaining may be useful in some places. *Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.*

Guzzler:

A water development for wildlife.

Hazardous Fuel:

Excessive live or dead wildland fuel accumulations that increase the potential for uncharacteristically intense wildland fire and decrease the capability to protect life, property, and natural resources.

Hazardous Substance:

As defined by Comprehensive Environmental Response, Compensation, and Liability Act 42 U.S.C. 9601(14), the term “hazardous substance” means (A) any substance designated pursuant to section 311(b)(2)(A) of the Federal Water Pollution Control Act [33 U.S.C. 1321(b)(2)(A)], (B) any element, compound, mixture, solution, or substance designated pursuant to section 9602 of this title, (C) any hazardous waste having the characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act [42 U.S.C. 6921] (but not including any waste the regulation of which under the Solid Waste Disposal Act [42 U.S.C. 6901 et seq.] has been suspended by Act of Congress), (D) any toxic pollutant listed under section 307(a) of the Federal Water Pollution Control Act [33 U.S.C. 1317(a)], (E) any hazardous air pollutant listed under section 112 of the Clean Air Act [42 U.S.C. 7412], and (F) any imminently hazardous chemical substance or mixture with respect to which the Administrator has taken action pursuant to section 7 of the Toxic Substances Control Act [15 U.S.C. 2606]. The term does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of this paragraph, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

Heavy Equipment :

As applicable for wildfire management actions which restrict “Heavy Equipment” this would include: Dozers, Skidders, & Graders. It would not include Fire Engines or Water Tenders.

Held by Production:

Leases that become productive and do not terminate until all wells on the lease have ceased production.

Highly Erosive Soil:

There are two primary erosion mechanisms, water and wind. Highly erosive soils have severe potential for erosion from one or both of these mechanisms.

Water Erosion – Water erosion is a function of soil erodibility and percent slope. Soil erodibility factor (Kw) quantifies soil detachment by runoff and raindrop impact. Factor Kw applies to the whole soil, which includes rock fragments. Kw is based primarily on percentage of silt, sand, and organic matter, soil structure, saturated hydraulic conductivity,

and rock fragments. Values of Kw range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water (NRCS 2010b).

Slope gradient is the difference in elevation between two points, expressed as a percentage of the difference between those points. Representative Value Slope indicates the expected slope value for a given SMU (NRCS 2010b).

Water Erosion Hazard = Kw factor x Representative Value Slope. A water erosion hazard greater than 7 is rated severe.

Wind Erosion – The soil wind erosion hazard is estimated by the using the soil Wind Erosion Index. The Wind Erosion Index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion (NRCS 2010b). A wind erosion index of (134, 160, 180, 220, 250, 310) is rated severe.

Historic:

Referring to the time after written records or after the Europeans first came and wrote about the people and events in America.

Historic American Buildings Survey/Historic American Engineering Record:

The Historic American Buildings Survey/Historic American Engineering Record is an integral component of the federal government's commitment to historic preservation. The program documents important architectural, engineering and industrial sites throughout the United States and its territories. A complete set of Historic American Buildings Survey/Historic American Engineering Record documentation, consisting of measured drawings, large-format photographs, and written history plays a key role in accomplishing the mission of creating an archive of American architecture and engineering and in better understanding what historic resources tell us about America's diverse ethnic and cultural heritage. To insure that such evidence is not lost to future generations, the Historic American Buildings Survey/Historic American Engineering Record Collections are archived at the Library of Congress, where they are made available to the public.

Historic property:

Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the National Register of Historic Places maintained by the Secretary of the Interior. They include artifacts, records, and material remains related to such a property or resource (16 U.S.C. 470w).

History:

The study of past events and times through use of written and recorded sources. In some cases, oral sources may also be available.

House Pit:

A small dwelling that had a shallow excavated floor and a roof of poles covered with branches or hides.

Hunter-gatherers:

People who depend on wild animals and plants for food to survive.

Hydrogen Sulfide (H₂S):

The chemical formula for H₂S. This colorless, toxic and flammable gas often results from the break down of sulfites within nonorganic matter in the absence of oxygen. H₂S can occur in natural gas, swamps, volcanic gases, and well water.

Impact Analysis for Planning (IMPLAN 2000) Model:

IMPLAN is a regional economic model that provides a mathematical accounting of the flow of money, goods, and services through a region's economy. The model provides estimates of how a specific economic activity translates into jobs and income for the region. It includes the "ripple effect" (also called the "multiplier effect") of changes in economic sectors that may not be directly impacted by management actions, but are linked to industries that are directly impacted. In IMPLAN, these ripple effects are termed indirect impacts (for changes in industries that sell inputs to the industries that are directly affected) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

Indicator:

An indicator is a component of a system whose characteristics (for example, presence, absence, quantity, and distribution) can be observed, measured, or monitored based on sound scientific principles. An indicator can be evaluated at a site- or species-specific level. Monitoring of an indicator must be able to show change within timeframes acceptable to management and be capable of showing how the health of the ecosystem is changing in response to specific management actions. Selection of the appropriate indicators to be observed, measured, or monitored in a particular allotment is a critical aspect of early communication among the interests involved on-the-ground. The most useful indicators are those for which a change or trend can be easily quantified and for which agreement as to the significance of the indicator is broad based.

Infestation:

The inhabitation of a host by large numbers of pests, such as bark beetles on pine trees.

***In Situ* Leaching or *In Situ* Recovery (ISR):**

A mining method whereby the valuable mineral(s) of a mineral deposit are removed without requiring physical extraction of the rock(s) containing the mineral(s). Also called "solution mining." Using *In Situ* Leaching or ISR methods eliminates much of the tailings and waste that would be created during traditional mining methods (underground or surface mining).

Integrated Pest Management (IPM):

A pest control strategy that uses a variety of complementary strategies including: mechanical devices, physical devices, genetic, biological, cultural management, and chemical management. These methods are done in three stages: prevention, observation, and intervention. It is an ecological approach with a main goal of significantly reducing or eliminating the use of pesticides while at the same time managing pest populations at an acceptable level.

Intermittent Stream:

A stream that flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow in mountainous areas. Confusion over

the distinction between intermittent and ephemeral streams may be minimized by applying Meinzer's suggestion that the term "intermittent" be arbitrarily restricted to streams that flow continuously for periods of at least 30 days (Prichard et al. 1998).

Invasive Species:

A non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health (Executive Order [EO] 13112).

Karst Region:

Karst topography is a landscape shaped by the dissolution of a layer or layers of soluble or semi-soluble bedrock, usually carbonate rock such as limestone or dolomite. Due to subterranean drainage, there may be very limited surface water, even to the absence of all rivers and lakes. Many karst regions display distinctive surface features, with sinkholes or dolines being the most common. However, distinctive karst surface features may be completely absent where the soluble rock is mantled, such as by glacial debris, or confined by a superimposed non-soluble rock strata. Some karst regions include thousands of caves, even though evidence of caves that are big enough for human exploration is not a required characteristic of karst.

Key Features:

Areas or types of resource features that should guide land use allocation decisions.

Landscape character:

The arrangement of a particular landscape as formed by the variety and intensity of the landscape features and the four basic elements of form, line, color, and texture. These factors give the area a distinctive quality which distinguishes it from its immediate surroundings.

Land Tenure:

To improve the manageability of BLM-administered lands and improve their usefulness to the public, the BLM has numerous authorities for "repositioning" lands into a more consolidated pattern, disposing of lands, and entering into cooperative management agreements. These land-pattern improvements are completed primarily through the use of land exchanges, but also through land sales, jurisdictional transfers to other agencies, and through the use of cooperative management agreements and leases. These ownership or jurisdictional changes are referred to as "Land Tenure Adjustments."

Leasable Minerals:

Those minerals or materials subject to lease by the federal government under the Mineral Leasing Act of 1920, the Mineral Leasing Act for Acquired Lands of 1947, and their amendments. They include, but are not limited to coal, phosphate, asphalt, sulphur, potassium, and sodium minerals, oil and gas, as well as geothermal resources; and are administered pursuant to 43 CFR Parts 3100, 3200, 3400, 3500 and 3900.

Lease:

Any contract, profit-share arrangement, joint venture, or other agreement issued or approved by the United States under a mineral leasing law that authorizes exploration for, extraction of, or removal of minerals. Federally owned leasable minerals, such as coal, oil and gas, are obtained through a lease, in which the federal government receives a set royalty for each mineral being extracted.

Lease By Application (LBA):

An application for a for a federal coal lease under a competitive, sealed-bid process (see regulations under 43 CFR 3425). Not part of regional coal leasing (described under 43 CFR 3420), the LBA process pertains to leasing individual coal tracts which will continue or extend the life of an existing mine. If an LBA meets regulatory requirements, BLM application-processing steps include: notification of the Governor of LBA receipt, ensuring the LBA conforms with the applicable Resource Management Plan, preparing site-specific environmental analysis, holding a public hearing, consulting with surface-management agencies, the Governor, Attorney General and Indian Tribes, and holding a lease sale or rejecting the application. If a sale is held, bidding is open to any qualified bidder and is not limited to the applicant. A coal lease is issued to the highest bidder, if the BLM determines that the high bid meets or exceeds the fair market value of the coal as determined by BLM's economic evaluation, and if the U.S. Department of Justice determines that no antitrust violations would result from assigning the lease to the high bidder.

Lease Notice:

A provision on a mineral lease that provides more detailed information concerning limitations that already exist in law, lease terms, regulations, or operational orders. A Lease Notice also addresses special items the lessee should consider when planning operations, but does not impose new or additional restrictions (Uniform Format for Oil and Gas Lease Stipulations, March 1989. Rocky Mountain Regional Coordinating Committee). An information [lease] notice has no legal consequences, except to give notice of existing requirements, and may be attached to a lease by the authorized officer at the time of lease issuance to convey certain operational, procedural or administrative requirements relative to lease management within the terms and conditions of the standard lease form. Information [lease] notices shall not be a basis for denial of lease operations (43 CFR 3101.1-3).

Lease Stipulation:

A provision that modifies standard lease rights and is attached to and made a part of the lease. (Uniform Format for Oil and Gas Lease Stipulations, March 1989. Rocky Mountain Regional Coordinating Committee). The authorized officer may require stipulations as conditions of lease issuance. Stipulations shall become part of the lease and shall supersede inconsistent provisions of the standard lease form. Any party submitting a bid shall be deemed to have agreed to stipulations applicable to the specific parcel (43 CFR 3101.1-3).

Lek:

A traditional courtship display area attended by male Greater Sage-Grouse in or adjacent to sagebrush dominated habitat. A lek is designated based on observations of two or more male Greater Sage-Grouse engaged in courtship displays. Before adding the suspected lek to the database, it must be confirmed by an additional observation made during the appropriate time of day, during the strutting season. Sign of strutting activity (tracks, droppings, feathers) can also be used to confirm a suspected lek. Sub-dominant males may display on itinerant (temporary) strutting areas during population peaks. Such areas usually fail to become established leks. Therefore, a site where small numbers of males (less than 5) are observed strutting should be confirmed active for two years before adding the site to the lek database.

Lentic:

Standing water riparian-wetland areas such as lakes, ponds, seeps, bogs, and meadows.

Limited Activity Zone:

An area from which surface-disturbing activities are prohibited, temporally or permanently, for the protection of a resource. Disruptive activities are permissible synonymous with ‘light human activity levels’ as described in the Greater Yellowstone Bald Eagle Management Plan (Greater Yellowstone Bald Eagle Working Group 1996). Day use and low impact activities are allowed at low densities and frequencies. Extended use activities such as oil and gas development, heavy construction, timber harvest, and concentrated use are excluded.

Limited Area:

Means an area restricted, at certain times, in certain areas, and/or to certain vehicle use. These restrictions may be of any type, but can generally be accommodated within the following type of categories: Number of vehicles, type of vehicles, time of season of vehicle use, permitted or licensed use only, use on existing roads and trails, use on designated roads and trails, and other restrictions.

Limited Reclamation Potential:

Areas possessing unique landscape characteristics (e.g., sensitive geologic formations, extremely limiting soil conditions, biological soil crusts, badlands, rock-outcrops, etc.) often make meeting reclamation requirements impractical and/or unrealistic due to physical, biological, and/or chemical challenges. When disturbed, these areas may require extraordinary and/or unconventional reclamation strategies to attain reclamation success.

Locatable Minerals:

Minerals subject to exploration and development via staking (locating) lode or placer mining claims as provided for by the Mining Law of 1872, as amended, and regulated pursuant to 43 CFR Part 3800 regulations. This includes deposits of metallic minerals containing gold, silver and uranium; nonmetallic minerals such as bentonite and gypsum; and uncommon variety minerals not subject to disposal under 43 CFR Part 3600 regulations. There is no royalty to the federal government associated with the extraction of locatable minerals from public lands.

Lotic:

Running water riparian-wetland areas such as rivers, streams and springs.

Major Right-of-Way:

Pipelines 16 inches or greater or surface-disturbing activities greater than 50 feet.

Medicinal/Ceremonial Plants:

Plants in Native American culture that serve an important function in spiritual or social ritual or that are believed to provide therapeutic benefit.

Methanogenesis:

The production of CH₄ under anaerobic conditions by biological processes that are carried out by single celled microorganisms (methanogens).

Mineral Entry:

Areas “open to mineral entry” are areas that are open to the operation of the mining laws; mining claims may be located, and locatable minerals may be explored and/or developed in these areas. Areas “closed to mineral entry” are those areas which are closed to the operation of the mining laws; this includes locating of mining claims, and exploration/development of locatable minerals in these areas.

Mineral Leasing Deferral:

The postponement of the offering of a parcel in a mineral lease sale. Reasons for postponement may involve concerns about the impacts of mineral development on other resources and/or involve parcels on federal lands with land use plans that are currently being revised or amended.

Mineral Materials:

See Salable Minerals.

Mineral Withdrawal:

A formal order that withholds federal lands and minerals from entry under the Mining Law of 1872, as amended, and closes the area to mineral location (i.e., staking of mining claims and sites) and exploration and development pursuant to the 43 CFR Subparts 3802 and 3809.

Mining Claims, and Location of Mining Claims:

A mining claim or site is a selected parcel of Federal land, valuable for a specific mineral deposit or deposits (or to be used to process or remove the minerals), for which you have asserted a right of possession under the General Mining Law (of 1872, as amended). A mining claim/site can be located in any parcel for which all minerals are reserved to the federal government, and which are not closed to mineral entry; this includes split estate lands. The claimant(s)'s right is restricted to the development and extraction of a mineral deposit. The rights granted by a mining claim protect against a challenge by the United States and other claimants only after the discovery of a valuable mineral deposit. A mining claim/site gives the claimant the royalty-free right to explore for and develop the locatable minerals occurring in the claim, given the claimant follows all applicable state and federal laws and regulations (including those under 43 CFR 3800). This also includes BLM's annual timely receipt of the claim's Maintenance Fee, Maintenance Fee Waiver (for "small" miners, those who hold 10 or fewer claims), or Affidavit of Work, and that the claim/site has been located correctly and accurately. Mining claims or sites may be located and held by U.S. citizens (born or naturalized), or corporations (these are held to the same standard); non-citizens are not permitted to own or have an interest in mining claims or sites. There is no limit to the number of claims/sites that may be held by a qualified claimant, as long as the requirements of the General Mining Law have been met. There are four types of mining claims/sites: two are mineral in nature — lode claims (for vein-type mineralizations, which generally tend to be higher in grade and more limited in size and extent), and placer claims (for mineralizations that tend to form in lower grades and larger in size and extent); one is strictly for milling (processing) of minerals — mill site claims; and one is strictly for constructing tunnels (to reach or remove minerals) — tunnel site claims. There are 5 types of mining claim/site status:

- **Active:** A mining claim/site for which BLM has timely received the Maintenance Fee, or Affidavit of Work, or received and approved the Maintenance Fee Waiver (for "small" miners, those who hold 10 or fewer claims).
- **Closed:** A mining claim/site that the claimant(s) no longer wish to hold, and has provided notification of abandonment or relinquishment to BLM.
- **Pending:** A mining claim/site for which BLM has received the location notification, but has not yet fully recorded all the claims' pertinent information; there may be a number of reasons for this status.

- **Void:** A mining claim/site for which BLM has not received the timely receipt of the annual Maintenance Fee; the claim essentially no longer exists.
- **Valid, or Validity:** A claimant(s) who holds a BLM-recorded mining claim/site is not required to prove the “discovery” of a valuable mineral(s) in that claim, or on land near the claim site (mill or tunnel). However, there may be a number of circumstances in which this assumption of “discovery” may be challenged; these include an impending withdrawal of public lands that includes the claim/site’s parcel. Federal statute does not describe what constitutes a “valuable mineral deposit, therefore the federal government adopted the “prudent man rule.” This rule was first stated by the Department of the Interior (DOI) in the adjudication of *Castle v. Womble* (19 L.D. 455) in 1894; this holding states “..where minerals have been found and the evidence is of such a character that a person of ordinary prudence would be justified in the further expenditure of his labor and means, with a reasonable prospect of success in developing a valuable mine, the requirements of the statute have been met.” The U.S. Supreme Court approved this definition in *Chrisman v. Miller* (197 U.S. 313, 1905). The DOI’s Solicitor issued an opinion in 1933 that noted a need for a distinct showing that the mineral could be mined, removed, and marketed at a profit. The marketability test is supplemental to the prudent man rule and considers the economics and market entry of the minerals in the deposit. The claimant(s) is required to show a reasonable prospect of making a profit from the sale of minerals from a claim or group of contiguous claims. DOI decisions require a discovery on each claim based on an actual exposure of the mineral deposit within the claim(s) boundaries. If a federal agency administers the parcel(s) that the claim(s)/site(s) are located in, they administer an examination of the claim(s)/sites(s) economics, using these same parameters. If the claimant(s) can prove they can mine and market the minerals at a profit, the claim(s)/site(s) are said to be “valid.” If they cannot prove this, and the federal agency’s examination proves they cannot, the location of the claim(s)/site(s) is said to be “invalid,” and the determined to be void.

Miscellaneous Areas :

Miscellaneous areas have essentially no soil and support little or no vegetation. This can be a result of active erosion, washing by water, unfavorable soil conditions, or human activities. Some miscellaneous areas can be made productive but only after major reclamation efforts. Map units are designed to accommodate miscellaneous areas, and most map units named for miscellaneous areas have inclusions of soil. If the amount of soil exceeds the standards for inclusions defined in this chapter, the map unit is named as a complex or association of miscellaneous area and soil. *Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.*

Mitigation:

Includes:

- a. Avoiding the impact altogether by not taking a certain action or parts of an action.
- b. Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- c. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- d. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- e. Compensating for the impact by replacing or providing substitute resources or environments.

Mitigation Measures:

Methods or procedures designed to reduce or lessen the adverse impacts caused by management activities.

Motor Vehicle or Motorized Vehicle:

Any device that is moved or propelled by an internal combustion engine or electrically powered motor. It shall include, but not be limited to automobiles, trucks, motorcycles, ATVs, motor bikes, motor-scooters and off-road vehicles, whether or not they can be licensed to operate on public roads. The term does not include vessels or personal mobility assistive devices, such as wheelchairs.

Multiple Use Reservoir:

A human-created lake or pond with a combination of balanced uses, including, but not limited to, recreation, livestock watering, watershed health, and wildlife and fish.

Native American:

The first people living in North and South America. Many groups of people today are Native Americans and have ancestors who lived on these continents for thousands of years before Columbus came. They are also called American Indians, First Americans, Alaska Native and Native People.

Native American Monitor:

An official representative of a Native American tribe who monitors projects that may impact cultural resources significant to their tribe. The Monitor participates and obtains firsthand knowledge of archeological excavations and surface-disturbing activities in areas that are known to have cultural sensitivity or have the potential for cultural sensitivity. The Native American Monitor should be knowledgeable about his or her culture and its traditions, and be familiar with archeological practices, as well as federal and state laws and regulations regarding Native American cultural concerns.

Native Species Status (NSS):

NSS refers to the population status of species native to the area in which their habitats occur. The NSSs are divided into the following categories:

NSS1 Native Species Status 1

- Populations are greatly restricted or declining, extirpation appears possible; or ongoing significant loss of habitat.

NSS2 Native Species Status 2

- Populations are declining, extirpation appears possible; habitat is restricted or vulnerable, but no recent or ongoing significant loss; species may be sensitive to human disturbance
OR
- Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; ongoing significant loss of habitat.

NSS3 Native Species Status 3

- Populations are greatly restricted or declining, extirpation appears possible; habitat is not restricted or vulnerable, but has no loss; species is not sensitive to human disturbance
OR
- Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is restricted or vulnerable, but no recent

or ongoing significant loss species may be sensitive to human disturbance
OR

- Species is widely distributed; population status or trends are unknown, but are suspected to be stable; ongoing significant loss of habitat.

NSS4 Native Species Status 4

- Populations are greatly restricted or declining, extirpation appears possible; habitat is stable and not restricted
OR
- Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is not restricted, vulnerable, but has no loss; species is not sensitive to human disturbance
OR
- Species is widely distributed, population status or trends are unknown, but are suspected to be stable; habitat is restricted or vulnerable, but no recent or ongoing significant loss; species may be sensitive to human disturbance
OR
- Populations that are stable or increasing and not restricted in numbers and/or distribution; ongoing significant loss of habitat.

Natural Fire Regime:

The general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning (Agee 1993; Brown 1995).

Necessary Tasks (Clause):

Work requiring the use of motor vehicles. Examples include using motor vehicles to repair range improvements, manage livestock, perform geophysical exploration activities and other types of leasable mineral exploration activity (other than casual use), and performing mining claim functions resulting in less than five acres of surface disturbance as described in 43 CFR 3809.

Net Conservation Gain:

The actual benefit of gain above baseline conditions.

Nonconsumptive Use:

The use of a resource that does not reduce the supply. For example, wildlife viewing does not reduce the supply of wildlife as opposed to big game hunting, which reduces the supply of big game.

No-net Gain:

The result of land tenure adjustments that result in no overall acreage gain in public land.

No Surface Occupancy:

A mineral lease stipulation where use or occupancy of the land surface for mineral exploration or development is prohibited to protect identified resource values.

Noxious Weed:

In Wyoming, a noxious weed is a legal designation of plants under the Wyoming Weed and Pest Control Act.

Objective:

A description of a desired condition for a resource. Objectives can be quantified and measured and, where possible, have established timeframes for achievement.

Occupied Lek:

A lek that has been active during at least one strutting season within the last 10 years.

Off-Highway Vehicle (OHV):

Any motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain, excluding (1) any nonamphibious registered motorboat; (2) any military, fire, emergency, or law enforcement vehicle being used for emergency purposes; (3) any vehicle whose use is expressly authorized by the authorized officer, or otherwise officially approved; (4) vehicles in official use; and (5) any combat or combat support vehicle when used in times of national defense emergencies.

Off-Highway Vehicle (OHV) Management Designations:

Used by federal agencies in the management of OHVs on public lands. Refers to the land use planning decisions that permit, establish conditions, or prohibit OHV activities on specific areas of public lands. All public lands are required to have OHV designations (43 CFR 8342.1). The CFR requires all BLM-administered public lands to be designated as “open”, “limited”, or “closed” to off-road vehicles, and provides guidelines for designation. The definitions of open, limited, and closed are provided in 43 CFR 8340.0-5 (f), (g), and (h), respectively.

Closed: Motorized vehicle travel is prohibited in the area. Access by means other than motorized vehicle, such as mechanized or nonmotorized use, is permitted. Areas are designated closed if closure to all vehicular use is necessary to protect resources, promote visitor safety, or reduce use conflicts (see 43 CFR 8340.0-5).

Open: Motorized vehicle travel is permitted year-long anywhere within an area designated as “open” to OHV use. Open designations are used for intensive OHV use areas where there are no special restrictions or where there are no compelling resource protection needs, user conflicts, or public safety issues to warrant limiting cross-country travel (See 43 CFR 8340.0-5).

Limited:

- a. Motorized vehicle travel within specified areas and/or on designated routes, roads, vehicle ways, or trails is subject to restrictions. The “limited” designation is used where OHV use must be restricted to meet specific resource management objectives. Examples of limitations include number or type of vehicles; time or season of use; permitted or licensed use only; use limited to designated roads and trails; or other limitations if restrictions are necessary to meet resource management objectives, including certain competitive or intensive use areas that have special limitations (see 43 CFR 8340.0-5).
- b. Vehicle travel may be permitted only on roads and vehicle routes designated by the BLM. In areas where final designation has not been completed, vehicle travel is limited to existing roads and vehicle routes as described above. Designations would be posted as appropriate stating:
 1. Vehicle route is open to vehicular travel.
 2. Vehicle route is closed to vehicular travel.

- c. Vehicle travel may be limited by number or type of vehicle. Designations would be posted as appropriate stating:
 - 1. Vehicle route limited to four-wheel drive vehicles only.
 - 2. Vehicle route limited to motorbikes only.
 - 3. Area is closed to over-snow vehicles.
 - 4. Vehicle travel is limited to licensed or permitted use.
 - 5. Vehicle travel is limited to time or season of use.
 - 6. Where specialized restrictions are necessary to meet resource management objectives, other limitations also may be developed.

The BLM may place other limitations, as necessary, to protect other resources, particularly in areas with intensive OHV use. Where off-road vehicles are causing or will cause considerable adverse effects upon soil, vegetation, wildlife, wildlife habitat, cultural resources, historical resources, threatened or endangered species, wilderness suitability, other authorized uses, or other resources, the affected areas shall be immediately closed to the type(s) of vehicle causing the adverse effect until the adverse effects are eliminated and measures implemented to prevent recurrence.

Old Growth Forest:

Ecosystem distinguished by old trees and related structural features. Old growth encompasses the later stages of stand development that typically differs from earlier stages in several ways, including tree size; accumulation of large, dead woody material; number of canopy layers; species composition; and ecosystem function.

Open:

Generally denotes that an area is available for a particular use or uses. Refer to specific program definitions found in law, regulations, or policy guidance for application to individual programs.

Organized Event:

A structured, ordered, consolidated, or scheduled event or occupation of public lands or related waters for recreation use that is not commercial or competitive, and that the BLM has determined needs a SRP based on planning decisions, resource concerns, potential user conflicts, and/or public health and safety. The threshold for requiring a permit is determined for relevant management areas (for example, 10 people in a sensitive riparian area may constitute an organized group, but a less sensitive upland area may be able to handle 200 people without the need for special management).

Outbreak:

The infestation of a relatively small and contained grouping of trees by bark beetles.

Overgrazing:

Continued heavy grazing that exceeds the recovery capacity of the forage plants and creates deterioration of the grazing lands (Valentine 1990).

Paleontological Locality:

A geographic point or area where a fossil or associated fossils are found in a related geological context. A paleontological locality is confined to a discrete stratigraphic layer, structural feature, or physiographic area.

Paleontology:

The study of ancient plants and animals now known only from fossil remains.

Perennial Stream:

A stream that flows continuously. Perennial streams generally are associated with a water table in the localities through which they flow (Prichard et al. 1998).

Permitted Use:

The forage allocation by, or under guidance of, an applicable land use plan for livestock grazing in an allotment under a permit or lease and is expressed in AUMs.

Pest:

With the exception of vascular plants classified as invasive plant species, a pest can be any biological life form that poses a threat to human or ecological health and welfare. For the purposes of this planning effort, an “animal pest” is any vertebrate or invertebrate animal subject to control by Animal and Plant Health Inspection Service (APHIS). APHIS is currently BLM’s authorized agent for controlling “animal pests.” For this reason, “animal pests” will be considered a subset of Pest.

Petroglyph:

Pictures created on rock faces by removing a portion of the rock by pecking, abrading, incising, or scratching.

Pictograph:

Picture created on a rock face by applying pigment or charcoal.

Planning Area:

A geographic area for which land use and resource management plans are developed and maintained.

Potential Fossil Yield Classification:

Geologic units are classified according to the Potential Fossil Yield Classification system, usually at the formation or member level, based on the relative abundance of significant fossils and their sensitivity to adverse impacts. The classification uses a ranking of 1 through 5, with Class 5 assigned to units with a very high potential for fossils. The classifications are described below.

Class 1 – Very Low: Igneous or metamorphic geologic units, or other units not likely to contain recognizable fossil remains. Management concern is negligible for Class 1 units and mitigation requirements are rarely necessary.

Class 2 – Low: Sedimentary geologic units that are not likely to contain vertebrate fossils or significant nonvertebrate fossils. Management concern is low for Class 2 units and mitigation requirements are not likely.

Class 3 – Moderate or Unknown: Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential. Management concern may extend across the entire range of management. Ground-disturbing activities require sufficient assessment to determine whether significant resources occur in the area of the proposed action, and whether the action could affect the paleontological resources. Predisturbance surveys, monitoring, or avoidance procedures may be necessary.

Class 4 – High: Geologic units containing known occurrences of significant fossils, but these occurrences may vary in local abundance and predictability. Management concern is moderate to high, depending on the potential impacts of the proposed action and local geologic conditions. Predisturbance field surveys are often needed, and avoidance or onsite monitoring may often be necessary during project activities.

Class 5 – Very High: Highly fossiliferous geologic units that consistently and predictably produce significant fossils, and that are at risk of human-caused adverse impacts or natural degradation. Class 5 areas merit a high level of management focus. Mitigation of ground-disturbing activities, including Predisturbance surveys, onsite monitoring, or avoidance procedures, are nearly always necessary. These units are often the focus of illegal collecting activities. Special management designations may be appropriate for protection or interpretation.

Potential Natural Community:

The biotic community that would become established if all successional sequences were completed without interference by humans under the present environmental conditions. Natural disturbances are inherent in development.

Prairie Dog “Complex”:

Defined as a cluster of two or more prairie dog towns within 3 kilometers of each other (Clark and Stromberg 1987), and bounded by either natural or artificial barriers (Whicker and Detling 1988), which effectively isolate one cluster of colonies from interacting/interchanging with another. Prairie dogs may commonly move among colonies of a cluster, and thereby foster reproductive/genetic viability, but exhibit little emigration/immigration between clusters. A cluster may include some currently unoccupied, through physically suitable (i.e., vegetation, soils, topography, etc.), land immediately adjacent to occupied colonies that support other prairie dog-associated (ecosystem function), obligate or facultative species (e.g., swift fox, mountain plover, burrowing owl).

Prehistory/Prehistoric:

Information about past events prior to the recording of events in writing. The period of prehistory differs around the world depending upon when written records became common in a region.

Prescribed Burning:

Application of fire to wildland fuels in either their natural or modified state under specified environmental conditions that allow the fire to be confined to a predetermined area and at the same time to produce the fire intensity and rate of spread required to attain planned resource management objectives.

Prescribed Fire:

A wildland fire originating from a planned ignition to meet specific objectives identified in a written, approved, prescribed fire plan for which the National Environmental Policy Act requirements (where applicable) have been met prior to ignition.

Primitive and Unconfined Recreation:

Nonmotorized, nonmechanized (except as provided by law), and undeveloped types of recreational activities. Bicycles are considered to constitute mechanized transport.

Priority Fish Species:

Priority fish species are species considered to be sport fish and native species.

Produced Water:

Groundwater removed to facilitate the extraction of minerals, such as coal, oil, or gas.

Proper Functioning Condition:

See *Riparian/Wetland Functionality Classification*.

Proper Grazing:

Proper grazing is the practice of managing forage use by grazing animals at a sustainable level that maintains rangeland health. Proper grazing will maintain or increase plant cover, including residue, which acts to slow down or reduce runoff, increase water infiltration, and keep erosion and sedimentation at or above acceptable levels within the potential of ecological sites within a given geographic area (e.g., watershed, grazing allotment).

Public Land:

Any land and interest in land (surface and mineral) owned by the United States within the several states and administered by the Secretary of the Interior through the BLM, without regard to how the United States acquired ownership, except—

1. lands located on the Outer Continental Shelf; and
2. lands held for the benefit of Indians, Aleuts, and Eskimos.

Range Improvement Project:

A structural improvement requiring placement or construction to facilitate management or control distribution and movement of grazing or browsing animals. Such improvements may include, but are not limited to, fences, wells, troughs, reservoirs, water catchments, pipelines, and cattleguards. The project also may include a practice or treatment which improves rangeland condition and or resource production for multiple use. Nonstructural types of projects may include, but are not limited to, seeding and plant control through chemical, mechanical, and biological means or prescribed burning.

Rangeland:

Land on which the native vegetation is predominantly grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing. This includes lands revegetated naturally or artificially when routine management of that vegetation is accomplished mainly through manipulation of grazing. Rangelands include natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows.

Rangeland Health:

The degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained. This is generally synonymous with Land Health.

Raptor:

Bird of prey with sharp talons and a strongly curved beak, such as hawks, falcons, owls, vultures, and eagles.

Raptor Species of High Federal Interest or Conservation Concern:

Bird of prey species that the U.S. Fish and Wildlife Service (USFWS) and the BLM have identified as high interest species. Species selection is based on national importance or public

value, the potential for regional decline, regional jeopardy, or long-term impact, and status as an indicator species.

Reclamation:

Taking measures following disturbance of public lands caused by operations to meet applicable performance standards and achieve conditions required by the BLM at the conclusion of operations. Components of reclamation include, where applicable: (1) Isolation, control, or removal, of acid-forming, toxic, or deleterious substances; (2) Regrading and reshaping to conform with adjacent landforms, facilitate revegetation, control damage, and minimize erosion; (3) Rehabilitation of fisheries or wildlife habitat; (4) Placement of growth medium and establishment of self-sustaining revegetation; (5) Removal or stabilization of buildings, structures, or other support facilities; (6) Plugging of drill holes and closure of underground workings; and (7) Providing for post-mining monitoring, maintenance, or treatment. (43 CFR 3809.5)

Initial Reclamation: Occurs as soon as possible after the surface is disturbed.

Interim Reclamation: Occurs on all disturbed areas not needed for active support of to minimize the environmental impacts of development on other resources and uses.

Final Reclamation: Occurs at the end of the project and the character and productivity of the land and water are restored.

Reclamation Suitability:

The inherent ability of the soil to recover from impacts; often referred to as soil resilience.

Reclamation Suitability (Source of Reclamation Material):

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings do not apply to quarries or other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reclaimed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Recreation Management Areas:

Recreation management areas are units within a planning area guiding recreation management on public lands having similar recreation related issues and concerns. There are two types of recreation management areas: extensive and special.

Extensive Recreation Management Areas (ERMA): an administrative unit that requires specific management consideration in order to address recreation use, demand, or recreation and visitor services program investments. ERMA's are managed within the recreation program to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA, commensurate with the management of other resources and resource uses. Management actions within ERMA's focus on access to the public lands, conflict resolution, resource protection and visitor health and safety.

Special Recreation Management Areas (SRMA): an administrative unit where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance and/or distinctiveness, especially as compared to other areas used for recreation. SRMAs are areas where recreation is recognized as the predominant LUP focus, where specific recreation opportunities and recreation setting characteristics are managed and protected on a long-term basis.

Rehabilitation:

Altering or reclaiming a degraded habitat in order to improve ecological function.

Required Design Features (RDF):

RDFs are required for certain activities in Greater Sage-Grouse habitat. RDFs establish the minimum specifications for certain activities to help mitigate adverse impacts. However, the applicability and overall effectiveness of each RDF cannot be fully assessed until the project level when the project location and design are known. Because of site-specific circumstances, some RDFs may not apply to some projects (e.g., a resource is not present on a given site) and/or may require slight variations (e.g., a larger or smaller protective area). All variations in RDFs would require that at least one of the following be demonstrated in the NEPA analysis associated with the project/activity:

- A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g., due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable;
- An alternative RDF is determined to provide equal or better protection for Greater Sage-Grouse or its habitat;
- A specific RDF will provide no additional protection to Greater Sage-Grouse or its habitat.

Reserve Common Allotment:

A unit of public land that will not have term grazing permits issued. Such an allotment would only be grazed on a temporary, nonrenewable basis to provide temporary grazing to rest other areas following wildfire, habitat treatments, or to allow for more rapid attainment of rangeland health. The allotment must be of sufficient size to be managed as a discrete unit. Reserve common allotments should be distributed throughout the planning area.

Rest (livestock grazing):

Leaving an area ungrazed, thereby foregoing grazing of one forage crop. Normally rest implies absence of grazing for a full growing season or during a critical portion of plant development; i.e., seed production.

Restricted Disposal:

Parcels identified for restricted disposal may be disposed of under the Recreation and Public Purposes Act, by exchange, may limit the disposal to a particular type of entity capable of preserving the resource values, or may include the use of covenants in the deed or land sale patent to ensure the resource values are protected.

Right-of-Way (ROW):

A ROW grant is an authorization to use a specific piece of public land for a specific project, such as roads, pipelines, transmission lines, and communication sites. The grant authorizes rights and privileges for a specific use of the land for a specific period of time.

Riparian:

A form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels are typical riparian areas. Included are ephemeral streams that have vegetation dependent upon free water in the soil. All other ephemeral streams are excluded.

Riparian/Wetland Functionality Classification:

Functional-at-Risk: Riparian/wetland areas that are in functional condition, but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

Proper Functioning Condition (PFC): A riparian or wetland area is considered to be in PFC when adequate vegetation, landform, or large woody debris is present to do the following:

- Dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality
- Filter sediment, capture bedload, and aid floodplain development
- Improve floodwater retention and groundwater recharge
- Develop root masses that stabilize stream banks against cutting action
- Develop diverse ponding and channel characteristics to provide the habitats and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses
- Support greater biodiversity

Nonfunctional: Riparian or wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and thus are not reducing erosion, improving water quality, and so on, as listed above. The absence of certain physical attributes, such as a floodplain where one should be, are indicators of nonfunctioning conditions.

Unknown: Riparian or wetland areas that the BLM lacks sufficient information on to make any form of determination.

Rock outcrop:

As used in Geology: That part of an in-situ geological formation or structure that appears at the surface of the earth. In-situ rock (often called “bedrock”) that is exposed and visible at earth’s surface. Taken from various Geological Dictionaries.

As used in Soil Science: Exposures of bare bedrock other than lava flows and rock-lined pits. If needed, map units can be named according to the kind of rock: Rock outcrop, chalk; Rock outcrop, limestone; Rock outcrop, gypsum. Many rock outcrops are too small to be delineated as areas on soil maps but can be shown by spot symbols. Some areas are large, broken by only small areas of soil. Most rock outcrops are hard rock, but some are soft. *Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.*

Rock Shelter:

A shallow, cave-like opening at the base of a bluff or cliff.

ROW Avoidance Areas:

Areas where adverse routing factors exist. ROWs either will not be granted in these areas, or – if granted – will be subject to stringent terms and conditions. In other words, ROWs would be restricted (but not necessarily prohibited) in these avoidance areas.

Salable Minerals:

Also called Mineral Materials. Common variety minerals, such as sand, gravel, common decorative or building stone, pumice, pumicite, and common clay, that are not obtainable under the mining or leasing laws, but can be acquired under the Mineral Materials Act of 1947, as amended. These minerals are used mainly for construction purposes, like buildings, roads, etc. Salable minerals are disposed of by sales to the public for a set royalty by the ton or cubic yard, or through free-use permits (FUPs) to government agencies or qualified nonprofit organizations.

Saturated Soil:

A condition in which all voids between soil particles are temporarily or permanently filled with water.

Scenic Area:

An area whose landscape character exhibits a high degree of variety and harmony among the basic elements which results in a pleasant landscape to view.

Scenic Quality:

The relative worth of a landscape from a visual perception point of view. Scenic quality is rated as Class A (high), Class B (medium), or Class C (low).

Scoria:

See Clinker. Local term often used in the Powder River Basin area for “clinker.” Very different rock type from true scoria, which is volcanic in origin, although some clinker can appear very similar to true scoria which is how the term came to be used for clinker in the PRB area.

Seasonal Ranges:

The Wyoming Game and Fish Department has identified various ranges for big game species. These ranges are defined as follows:

Summer or Spring-Summer-Fall: A population or portion of a population of animals uses the documented habitats within this range annually from the end of previous winter to the onset of persistent winter conditions.

Severe Winter Relief: A documented survival range, which may or may not be considered a crucial range area as defined above. It is used to a great extent, but only in extremely severe winters. It may lack habitat characteristics that would make it attractive or capable of supporting major portions of the population during normal years, but is used by and allows at least a significant portion of the population to survive the occasional extremely severe winter.

Winter: A population or portion of a population of animals annually uses the documented suitable habitat sites within this range in substantial numbers during the winter period only.

Winter/Year-long: A population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months, there is a significant influx of additional animals into the area from other seasonal ranges.

Year-long: A population or substantial portion of a population of animals makes general use of the suitable documented habitat sites within the range on a year-round basis. On occasion, animals may leave the area under severe conditions.

Calving Areas (Parturition): Documented birthing areas commonly used by females. They include calving areas, fawning areas, and lambing grounds. These areas may be used as nurseries by some big game species.

Section 106 of National Historic Preservation Act:

“The head of any federal agency having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking in any state and the head of any federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. The head of any such federal agency shall afford the Advisory Council on Historic Preservation established under Title II of this Act a reasonable opportunity to comment with regard to such undertaking” (16 U.S.C. 47 df).

Security Habitat:

The area to which wildlife retreat when disturbance in their usual range is intensified. Each species tends to be most comfortable or secure within habitat blocks larger than a minimum area. The Fortification Creek Resource Management Plan amendment defined elk security habitat as contiguous habitat of 250 acres or greater that is more than 0.5 mile or not visible from an open road.

Sensitive Sites or Resources:

Sensitive sites or resources refer to significant cultural resources that are or may be eligible for nomination to the National Register of Historic Places.

Sensitive Species:

Species designated as sensitive by the BLM State Director include species that are under status review, have small or declining populations, live in unique habitats, or require special management. BLM Manual 6840 provides policy and guidance for special status species management. The BLM Wyoming Sensitive Species Policy and List are provided in a memorandum updated annually. The primary goals of the BLM Wyoming policy include maintaining vulnerable species and habitat components in functional BLM ecosystems and preventing a need for species listing under the Endangered Species Act.

Seral Stage:

One of a series of plant communities that follows another in time on a specific ecological site.

Setting:

Setting is the physical environment of a historic property and how the property evokes a sense of feeling and association with past events. Accordingly, setting referees to the character of the place in which the property played its historic role. It involves how, not just where, the

property is situated and its relationship to surrounding features and open space. These features and their relationships should be considered not only within the exact boundaries of the property, but also between the property and its surroundings.

Significant Paleontological Resource (also Significant Fossil Resource):

Any paleontological resource that is considered to be of scientific interest, including most vertebrate fossil remains and traces, and certain rare or unusual invertebrate and plant fossils. A significant paleontological resource is considered to be scientifically important because it is a rare or previously unknown species, it is of high quality and well-preserved, it preserves a previously unknown anatomical or other characteristic, provides new information about the history of life on earth, or has identified educational or recreational value.

Silviculture:

The art of producing and tending a forest; the application of knowledge of silvics in the treatment of a forest; the theory and practice of controlling forest establishment, composition, structure, and growth.

Site:

A location, place. Is a term used by archeologists for places that prehistoric and historic people lived in or used. Sites are places where humans left things behind.

Soil Interpretations:

Soil survey interpretations predict soil behavior for specified soil uses and under specified soil management practices. (<http://www.nedc.nrcs.usda.gov/catalog/NASISoilInterpretations.html>)

Soil Mapping Unit-Map Units:

A map unit is a collection of areas defined and named the same in terms of their soil components or miscellaneous areas or both. Each map unit differs in some respect from all others in a survey area and is uniquely identified on a soil map. Each individual area on the map is a *delineation*. Map units consist of one or more components. An individual component of a map unit represents the collection of polypedons or parts of polypedons that are members of the taxon or a kind of miscellaneous area. (<http://soils.usda.gov/technical/manual/contents/chapter2.html#3>)

Special Recreation Management Areas (SRMA):

See *Recreation Management Areas*.

Special Recreation Permit (SRP):

An authorization that allows specified recreational uses of the public lands and related waters as required by 43 CFR 2932.11a(1). SRPs are issued as a means to manage visitor use and to protect natural and cultural resources and as a mechanism to authorize commercial, competitive, and vending use; organized group activities and events; and individual or group use of special areas. Commercial SRPs are also issued as a means to provide a fair return for the commercial recreational use of public lands.

Special Status Species:

Special status species are species proposed for listing, officially listed as Threatened, Endangered, proposed, or are candidates for listing as Threatened or Endangered under the provisions of the Endangered Species Act; those listed by a state in a category implying

potential endangerment or extinction; and those designated by the State Director as sensitive (BLM 2008d).

Species of Greatest Conservation Need (SGCN):

Low and declining populations that are indicative of the diversity and health of Wyoming's wildlife.

Split Estate:

Surface land and mineral estate of a given area under different ownerships. Frequently, the surface will be privately owned and the minerals federally owned.

Stabilization:

Minimize sheet and rill erosion on/or adjacent to the reclaimed area. There shall be no evidence of mass wasting, head cutting, large rills or gullies, down cutting in drainages, or overall slope instability on/or adjacent to the reclaimed area. Instruction Memorandum No. WY-2012-032.

Stakeholder:

Entities whose interests may be affected as a result of project execution or project completion.

State-listed Species:

Species proposed for listing or listed by a state in a category implying, but not limited to, potential endangerment or extinction. Listing is either by legislation or regulation.

Stratigraphy:

The science of studying layers of materials, as in rock layers in the Earth or deposits in archeological sites. Usually, the layer on the bottom is the oldest, and the layer on the top is the youngest. Cultural remains and soils/sediments become buried over time. Rocks, and soil or sediments comprising different layers are often different from one another, such as different colors, or containing different clasts (pieces of rock) and/or different fossils; however, different layers can also be very similar.

Subsoil:

Technically, the subsoil includes the B horizon. This is roughly the part of the solum below the organic topsoil and above the rocky parent material of the C horizon. When suitable, the subsoil may be salvaged to supplement the topsoil for plant establishment.

Surface-disturbing Activities (or Surface Disturbance):

An action that alters the vegetation, surface/near surface soil resources, and/or surface geologic features, beyond natural site conditions and on a scale that affects other Public Land values. Examples of surface-disturbing activities may include: operation of heavy equipment to construct well pads, roads, pits and reservoirs; installation of pipelines and powerlines; and the conduct of several types of vegetation treatments (e.g., prescribed fire, etc.). Surface-disturbing activities may be either authorized or prohibited.

Surface Water Classes and Uses:

The following water classes are a hierarchical categorization of waters according to existing and designated uses. Except for Class 1 waters, each classification is protected for its specified uses plus all the uses contained in each lower classification. Class 1 designations are based on value determinations rather than use support and are protected for all uses in existence at the time of or after designation. There are four major classes of surface water in Wyoming

with various subcategories within each class (see “Wyoming Surface Water Classification List” for current listing).

Class 1, Outstanding Waters: Class 1 waters are those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate best management practices. Pursuant to Section 7 of these regulations, the water quality and physical and biological integrity that existed on the water at the time of designation will be maintained and protected. In designating Class 1 waters, the Environmental Quality Council shall consider water quality, aesthetic, scenic, recreational, ecological, agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, archeological, fish and wildlife, the presence of substantial quantities of developable water, and other values of present and future benefit to the people.

Class 2, Fisheries and Drinking Water: Class 2 waters are waters, other than those designated as Class 1 that are known to support fish or drinking water supplies or where those uses are attainable. Class 2 waters may be perennial, intermittent, or ephemeral and are protected for the uses indicated in each subcategory listed below. Five subcategories of Class 2 waters exist.

Class 3, Aquatic Life Other than Fish: Class 3 waters are waters other than those designated as Class 1 that are intermittent, ephemeral, or isolated waters, and because of natural habitat conditions, do not support nor have the potential to support fish populations or spawning or certain perennial waters that lack the natural water quality to support fish (e.g., geothermal areas). Class 3 waters provide support for invertebrates, amphibians, or other flora and fauna that inhabit waters of the state at some stage of their life-cycles. Uses designated on Class 3 waters include aquatic life other than fish, recreation, wildlife, industry, agriculture, and scenic value. Generally, waters suitable for this classification have wetland characteristics; and such characteristics will be a primary indicator used in identifying Class 3 waters. There are four subcategories of Class 3 waters.

Class 4, Agriculture, Industry, Recreation, and Wildlife: Class 4 waters are waters other than those designated as Class 1 where it has been determined that aquatic life uses are not attainable pursuant to the provisions of Section 33 of these regulations. Uses designated on Class 4 waters include recreation, wildlife, industry, agriculture and scenic value (Wyoming DEQ 2002).

Threatened Species:

Any species that is likely to become Endangered within the foreseeable future throughout all or a significant portion of its range.

Topsoil:

The biologically active, upper part of the soil profile, being the most favorable material for plant growth. The topsoil includes the O and A horizons.

Traditional Cultural Property:

A cultural property eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community. "Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or

through practice. The traditional cultural significance of a historic property is derived from the role the property plays in a community's historically rooted beliefs, customs, and practices.

Undetermined Lek:

Any lek that has not been documented as being active in the last 10 years, but does not have sufficient documentation to be designated unoccupied. Management protection will be afforded to undetermined leks until their status has been documented as unoccupied.

Unoccupied Lek:

There are two types of unoccupied leks, "destroyed" and "abandoned." Unoccupied leks are not protected during surface-disturbing activities.

- Destroyed lek – A formerly active lek site and surrounding sagebrush habitat that has been destroyed and is no longer suitable for Greater Sage-Grouse breeding. A lek site that has been strip-mined, paved, converted to cropland or undergone other long-term habitat type conversion is considered destroyed. Destroyed leks are not monitored unless the site has been reclaimed to suitable Greater Sage-Grouse habitat.
- Abandoned lek – A lek in otherwise suitable habitat that has not been active during a period of 10 consecutive years. To be designated abandoned, a lek must be "inactive" (see above criteria) in at least four non-consecutive strutting seasons spanning the ten years. The site of an "abandoned" lek should be surveyed at least once every ten years to determine whether it has been re-occupied by Greater Sage-Grouse.

Uranium:

Pure uranium (elemental form) is a silvery white metal, and is weakly radioactive. It is malleable and ductile (can be bent and shaped), slightly paramagnetic (slightly attracted to a strong magnetic field), and is a poor electrical conductor. It is harder than most elements, but a little softer than steel. It has a very high density — about 70% denser than lead, and slightly less dense than gold. Uranium is the heaviest naturally-occurring element available in large quantities; it is more common in nature than was originally thought. Uranium metal oxidizes in air, becoming coated with a dark layer of uranium oxide. Uranium's reactivity increases with increasing temperature. Its numerous oxidation states allow for formation of a variety of compounds, including oxides, fluorides, chlorides, bromides, iodides, hydrides, carbonates, carbides, nitrides and phosphates. Uranium can exist in aqueous solutions as various ions, with oxidation state +6 (as the UO_2^{2+} ion, yellow in color) the most stable. Uranium and its' compounds are highly toxic, both from chemical and radiological standpoints.

Usable Water:

Water containing less than 10,000 parts per million total dissolved solids.

Valid Mining Claims, or Validity of Mining Claims:

See Mining Claims.

Vegetative Diversity:

The variety of vegetative types in an area, including species, the genetic differences among species and populations, the communities and ecosystems in which vegetation types occur, and the structure and seral stage of these communities. Vegetative diversity includes rare as well as common vegetative types, and typically supports a diverse array of animal species and communities.

Viewshed:

Viewshed is used in Visual Resource Management to describe "...landscape that can be seen under favorable atmospheric conditions from a viewpoint (key observation point) or along a transportation corridor" (BLM 1984).

Visual Resource Management (VRM) Classes:

The objectives of each VRM Class are as follows:

- **Class I:** To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention. It is applied to wilderness and wilderness study areas, some natural areas, wild portions of Wild and Scenic Rivers, and other similar situations in which management activities are to be restricted.
- **Class II:** To retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Proposed alterations should be designed so as to retain the existing character of the landscape. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- **Class III:** To partially retain the existing character of the landscape. Contrasts to the basic elements (form, line, color, and texture) caused by a management activity may be evident and begin to attract attention in the characteristic landscape; however, the changes should remain subordinate to the existing characteristic landscape. The level of change to the characteristic landscape should not exceed the moderate threshold.
- **Class IV:** To provide for management activities which require major modification of the existing character of the landscape. Contrasts may attract attention and be a dominant feature of the landscape in terms of scale; however, changes should repeat the basic elements (form, line, color, and texture) inherent in the characteristic landscape. The level of change to the characteristic landscape can be high.

Visual Resources:

The visible physical features of a landscape (topography, water, vegetation, animals, structures, and other features) that constitute the scenery of an area.

Watershed:

See *Basin*.

Wetlands:

Areas that are inundated or saturated by surface or groundwater often and long enough to support and under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. BLM Manual 1737, Riparian-Wetland Area Management (BLM 1992a), includes marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands.

Wild and Scenic River:

A river or portion of a river that is part of a national system of congressionally designated rivers and their immediate environments that have outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural and other similar values and are preserved in a free-flowing condition. The system consists of three types of streams:

1. Recreation – rivers or sections of rivers that are readily accessible by road or railroad and that may have some development along their shorelines and may have undergone some impoundments or diversions in the past;
2. Scenic – rivers or sections of rivers free of impoundments with shorelines or watersheds still largely undeveloped but accessible in places by roads; and
3. Wild – rivers or sections of rivers free of impoundments and generally inaccessible except by trails, with watersheds or shorelines essentially primitive and waters unpolluted.

Wilderness (area):

A unit designated by Congress for inclusion in the National Wilderness Preservation System.

Wilderness characteristics:

Wilderness characteristics are discussed in Section 2(c) of the Wilderness Act of 1964, and incorporated in Federal Land Policy Management Act, which states: “A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected by the forces of nature, with the imprint of man’s work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.”

Wilderness Study Area:

An area inventoried, found to have wilderness characteristics, and managed to preserve those characteristics under authority of the review of public lands required by Section 603 of the Federal Land Policy and Management Act of 1976. During the period of review or “study,” Wilderness Study Areas are managed so as not to impair the suitability of such areas for preservation as wilderness.

Wildfire:

Unplanned ignition of a wildland fire, (such as a fire caused by lightning, volcano, unauthorized and accidental human caused fires), and escaped prescribed fires.

Wildland Fire:

A general term describing any non-structure fire that occurs in the wildland.

Wildland Industrial Interface:

The area where industrial development meets or intermingles with undeveloped wildland.

Wildland Urban Interface:

Healthy Forest Restoration Act 2003: defines wildland urban interface (section 101) as an area within or adjacent to an at risk community that has been identified by a community in its wildfire protection plan or, for areas that do not have such a plan, an area extending (1) 0.5 mile from the boundary of an at risk community; (2) 1.5 miles when other criteria are met

(e.g., a sustained steep slope or a geographic feature aiding in creating an effective fire break or is condition class III land; or (3) is adjacent to an evacuation route.

Wildlife-Disturbing Activity:

BLM-authorized activities other than routine maintenance that may cause displacement of or excessive stress to wildlife during critical life stages. Wildlife-disturbing activities include human presence, noise, and activities using motorized vehicles or equipment.

Wildlife Habitat Management Area:

Special management areas that are designed to protect or preserve habitat for wildlife. The environment in these areas is unique in some respects, and it is therefore desirable to apply different management prescriptions to these areas from those of the surrounding public lands. The integration of different land management goals, objectives, and actions will be implemented to ensure that the integrity of these areas will be maintained. (Record of Decision and Approved Rawlins Resource Management Plan, G-21, BLM)

Wildlife Monitoring and Protection Plan:

A plan that is developed with a goal of avoiding or minimizing impacts to wildlife by monitoring wildlife population trends and by developing appropriate mitigation actions. A Wildlife Monitoring and Protection Plan is often produced in conjunction with an Environmental Impact Statement. These plans are intended to help the BLM identify problems, design project plans, monitor decisions and make recommendations to adjust management actions as they relate to wildlife protection.

Withdrawal:

Removal or withholding of public lands, by statute or Secretarial order, from operation of some or all of the public land laws. A mineral withdrawal is the closing of an area to locatable mineral location and development activities.

Woodland:

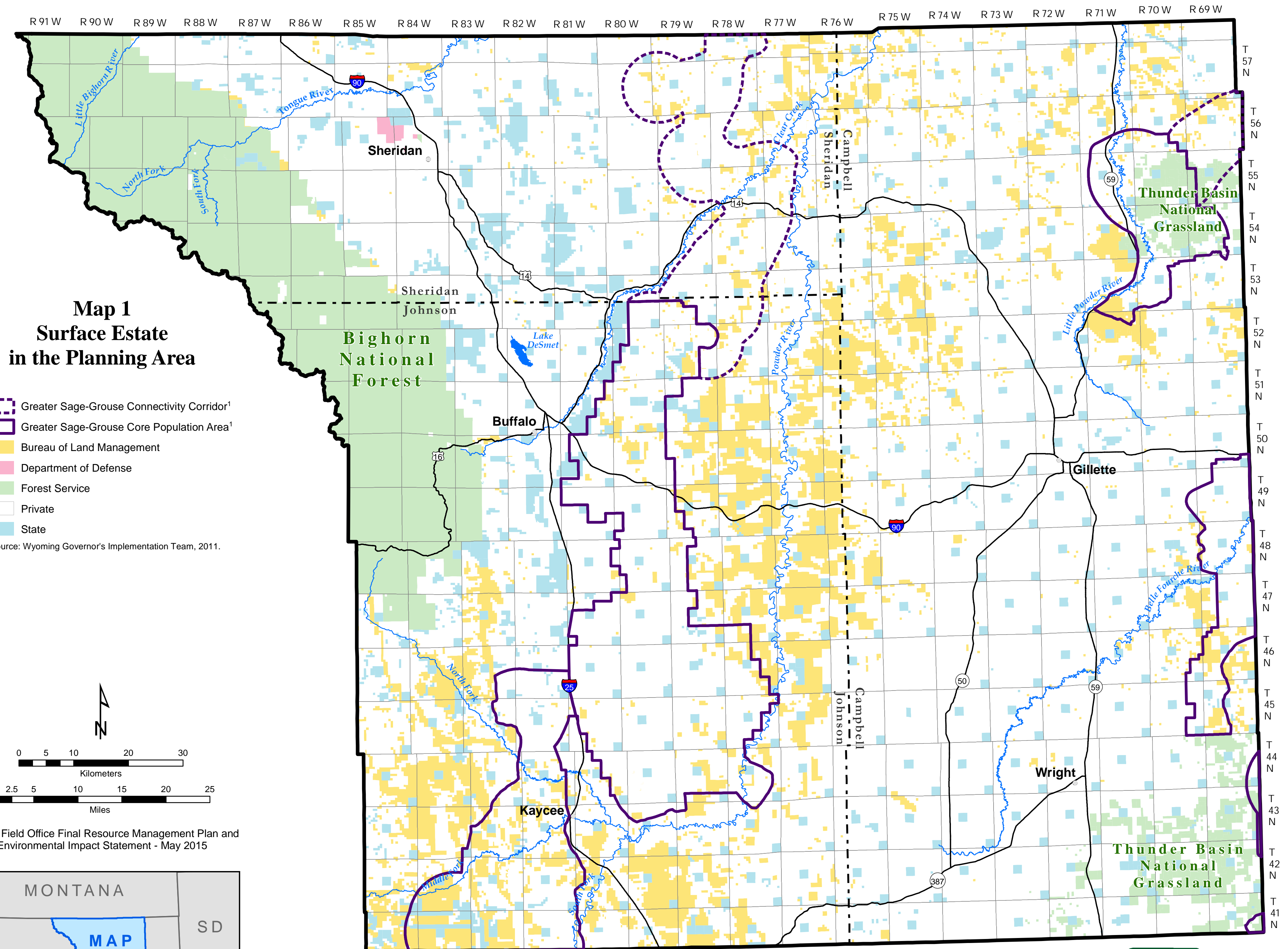
Forest lands which are not included in the commercial forest land allowable cut base. These lands include both commercial and noncommercial forest lands. Also included are those lands formerly defined as noncommercial forest lands and those that cannot be reforested within 15 years (now Category I and II lands).

Yellowcake:

The solid form of mixed uranium oxides, produced from the milling (refining) of uranium ore. The proportion of the various uranium oxides, and impurities, present leads to color variations from bright yellow to orange to dark green or black. The higher the temperature at which the material is dried (lower level of hydration), and the greater the impurities, the darker the dried product. Higher drying temperatures also produce a less soluble material. Yellowcake produced by many modern mills is often brown or black, rather than yellow; the name is still used, and came from the color and texture of the material produced in early mills. Yellowcake is commonly referred to as U_3O_8 and is assayed as pounds U_3O_8 equivalent; often, it's comprised of approximately 85% U_3O_8 . This fine powder is packaged in drums at the mill, and then transported to a uranium conversion facility(ies). These facilities transform it into uranium hexafluoride, in preparation for fabricating nuclear reactor fuel. There are other uses for uranium, such as in medicine, science, biology, etc., and these may require a different conversion process, or another conversion process after the uranium hexafluoride is prepared.

MAPS

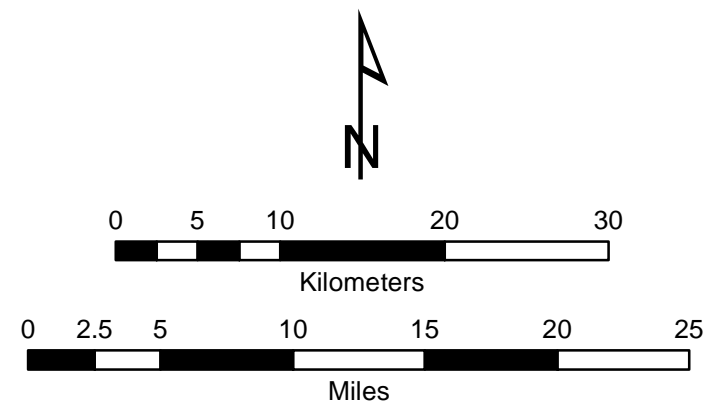
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Map 1
Surface Estate
in the Planning Area

- Greater Sage-Grouse Connectivity Corridor¹
- Greater Sage-Grouse Core Population Area¹
- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State

¹Source: Wyoming Governor's Implementation Team, 2011.



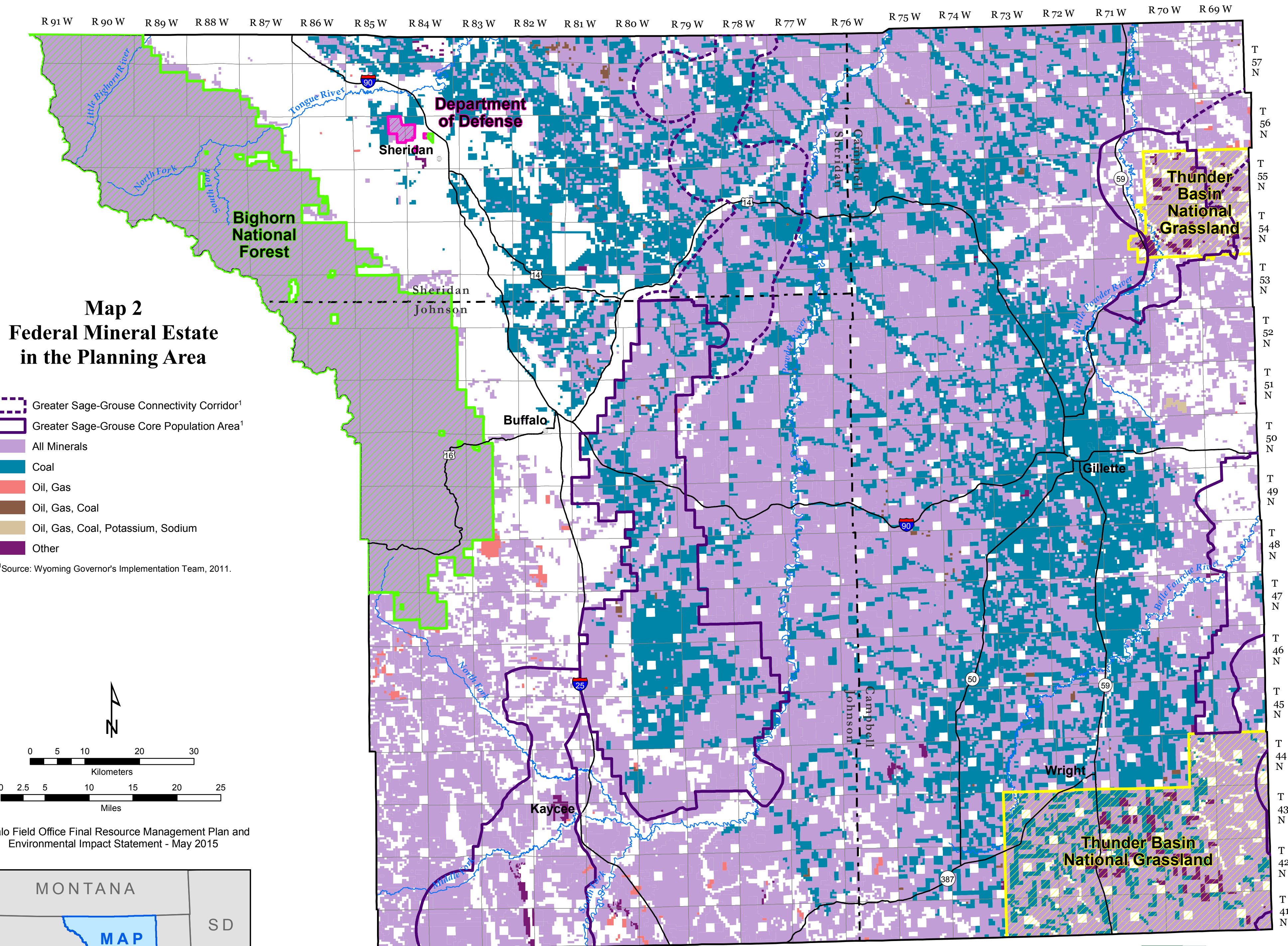
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Map 2
Federal Mineral Estate
in the Planning Area

- Greater Sage-Grouse Connectivity Corridor¹
- Greater Sage-Grouse Core Population Area¹
- All Minerals
- Coal
- Oil, Gas
- Oil, Gas, Coal
- Oil, Gas, Coal, Potassium, Sodium
- Other

¹Source: Wyoming Governor's Implementation Team, 2011.

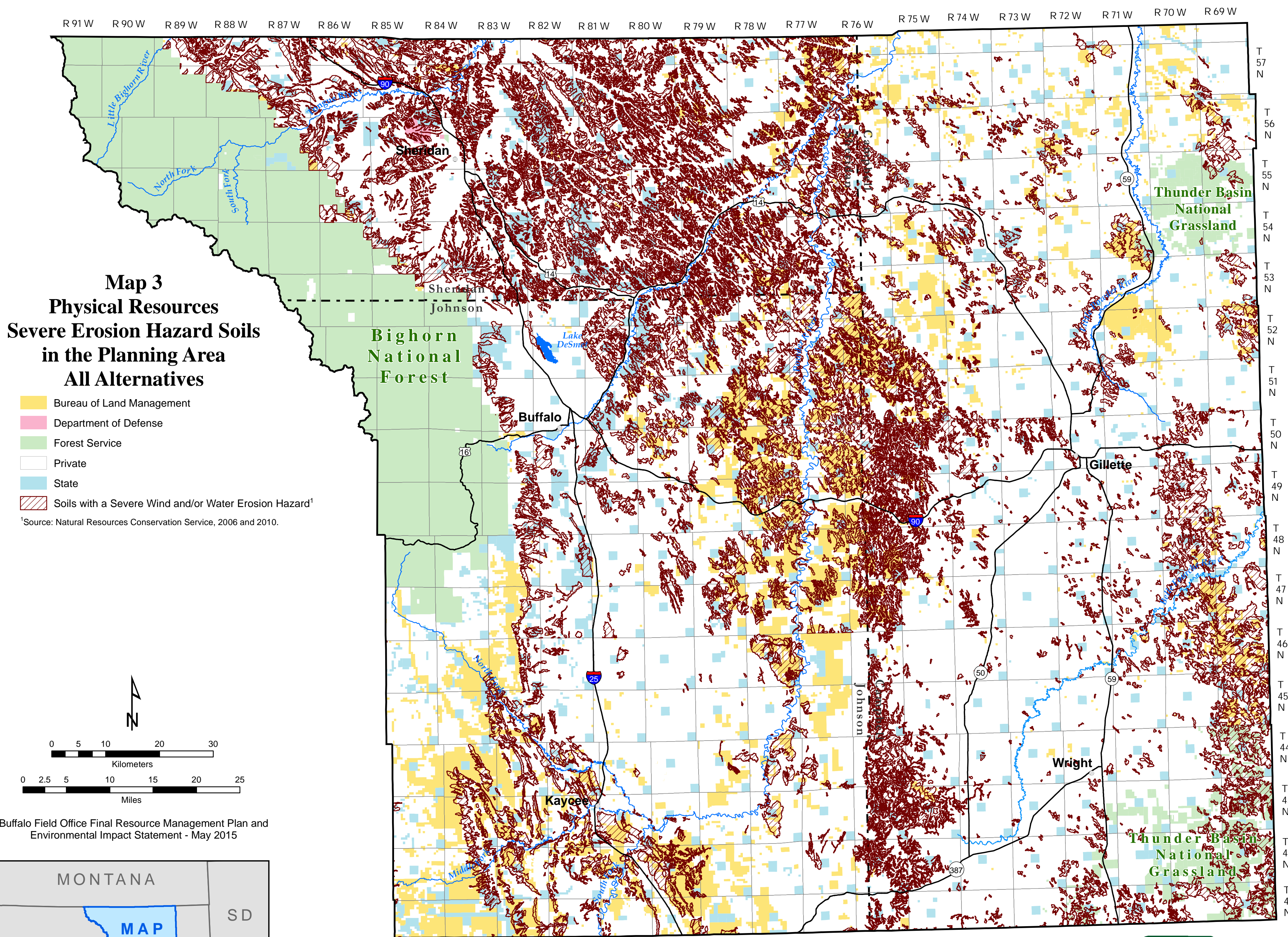
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Map 3
Physical Resources
Severe Erosion Hazard Soils
in the Planning Area
All Alternatives

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Soils with a Severe Wind and/or Water Erosion Hazard¹

¹Source: Natural Resources Conservation Service, 2006 and 2010.

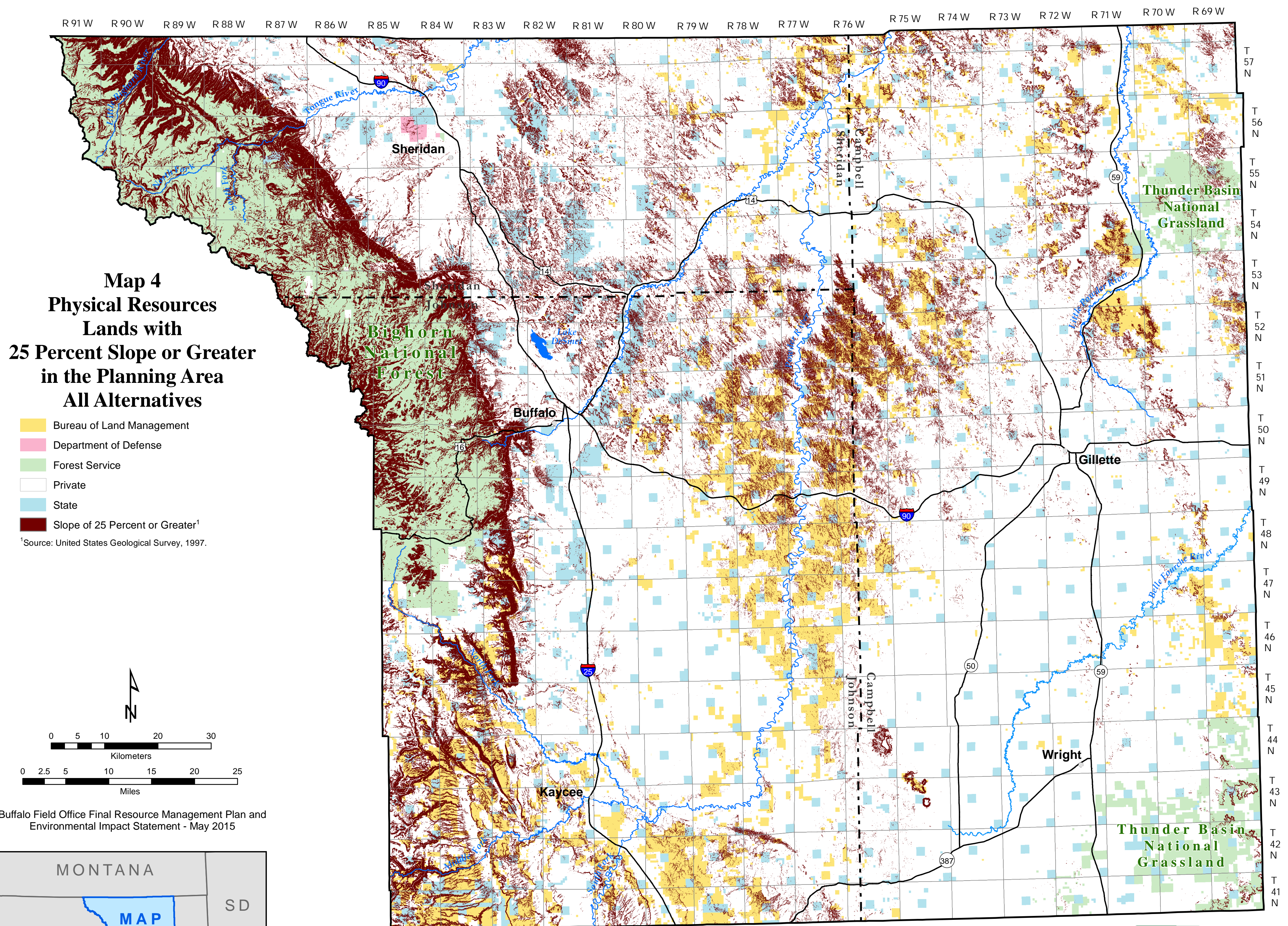
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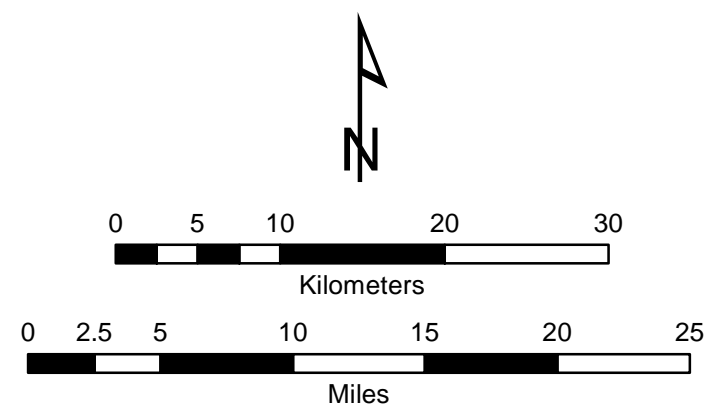
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Map 4
Physical Resources
Lands with
25 Percent Slope or Greater
in the Planning Area
All Alternatives

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Slope of 25 Percent or Greater¹

¹Source: United States Geological Survey, 1997.



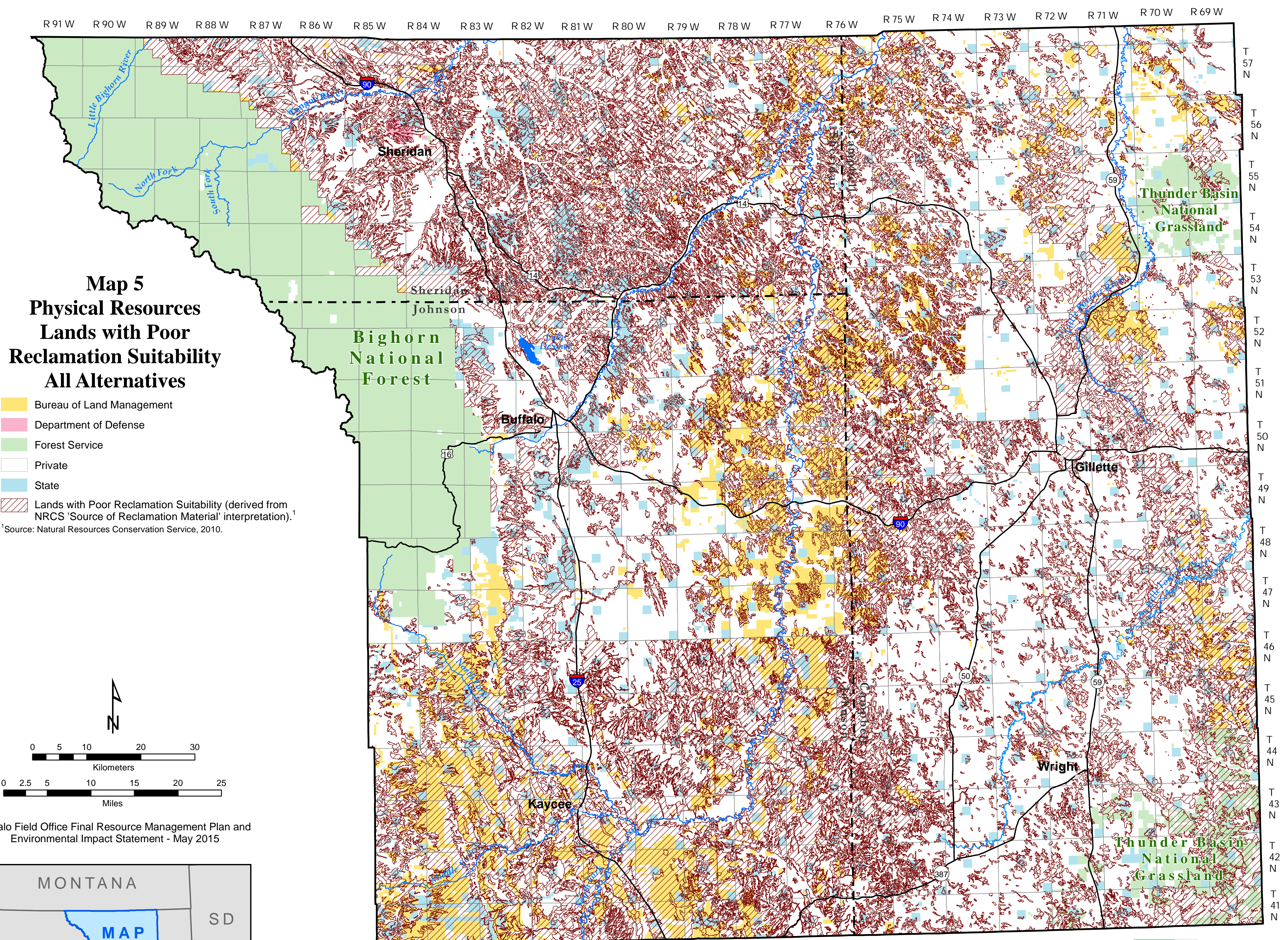
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Map 5
Physical Resources
Lands with Poor
Reclamation Suitability
All Alternatives

- Bureau of Land Management
 - Department of Defense
 - Forest Service
 - Private
 - State
 - Lands with Poor Reclamation Suitability (derived from NRCS 'Source of Reclamation Material' interpretation).¹
- ¹Source: Natural Resources Conservation Service, 2010.

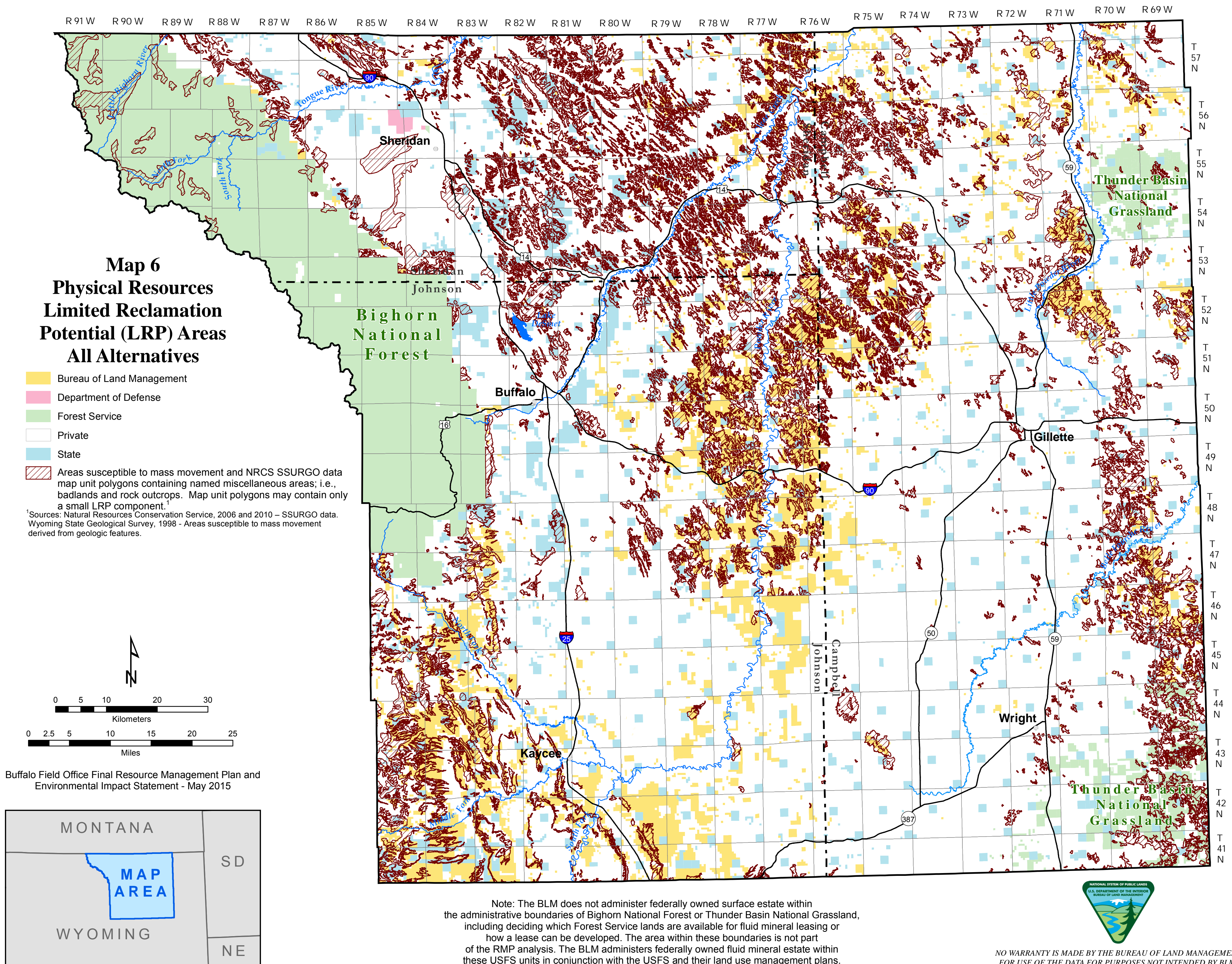
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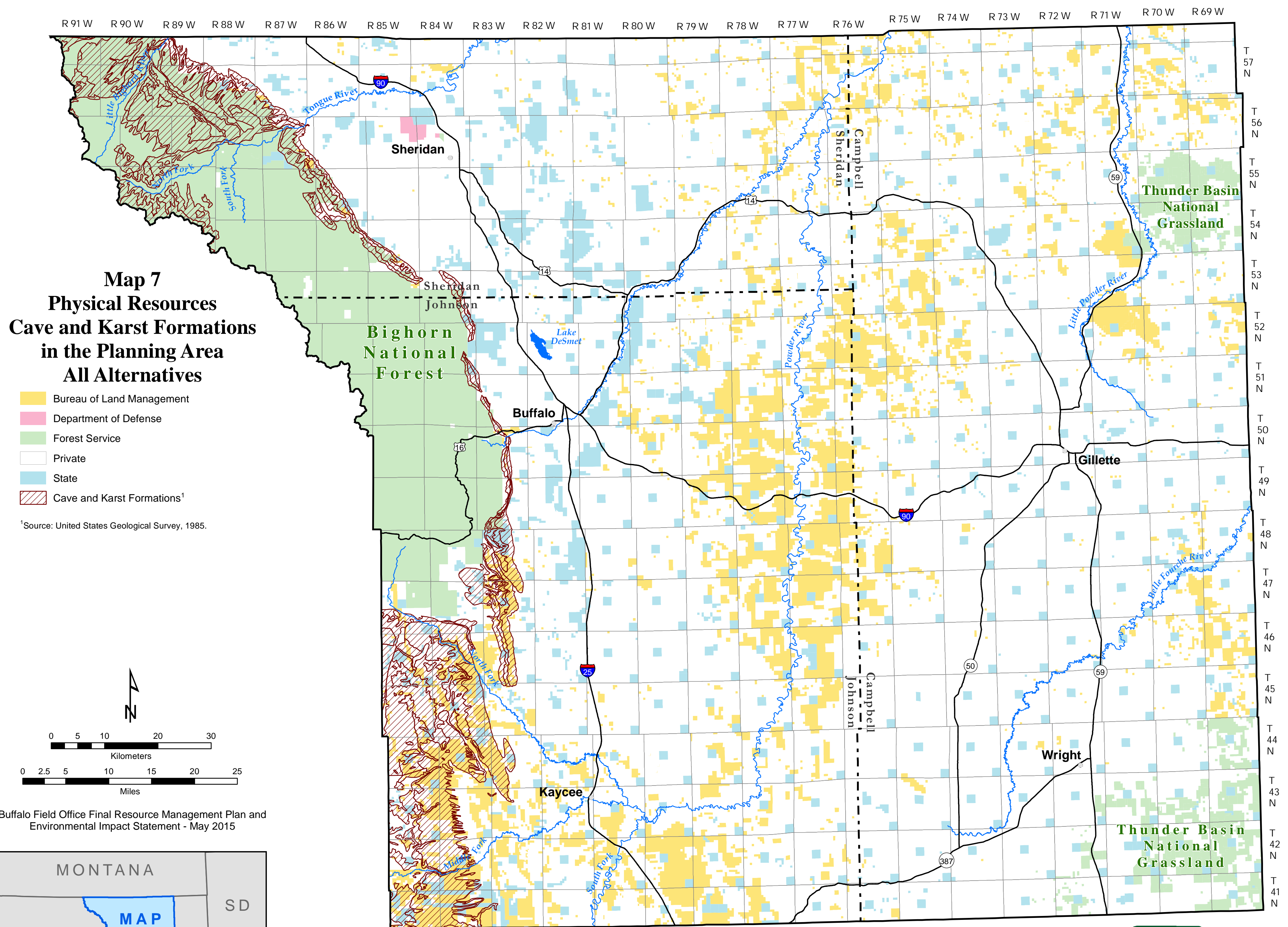


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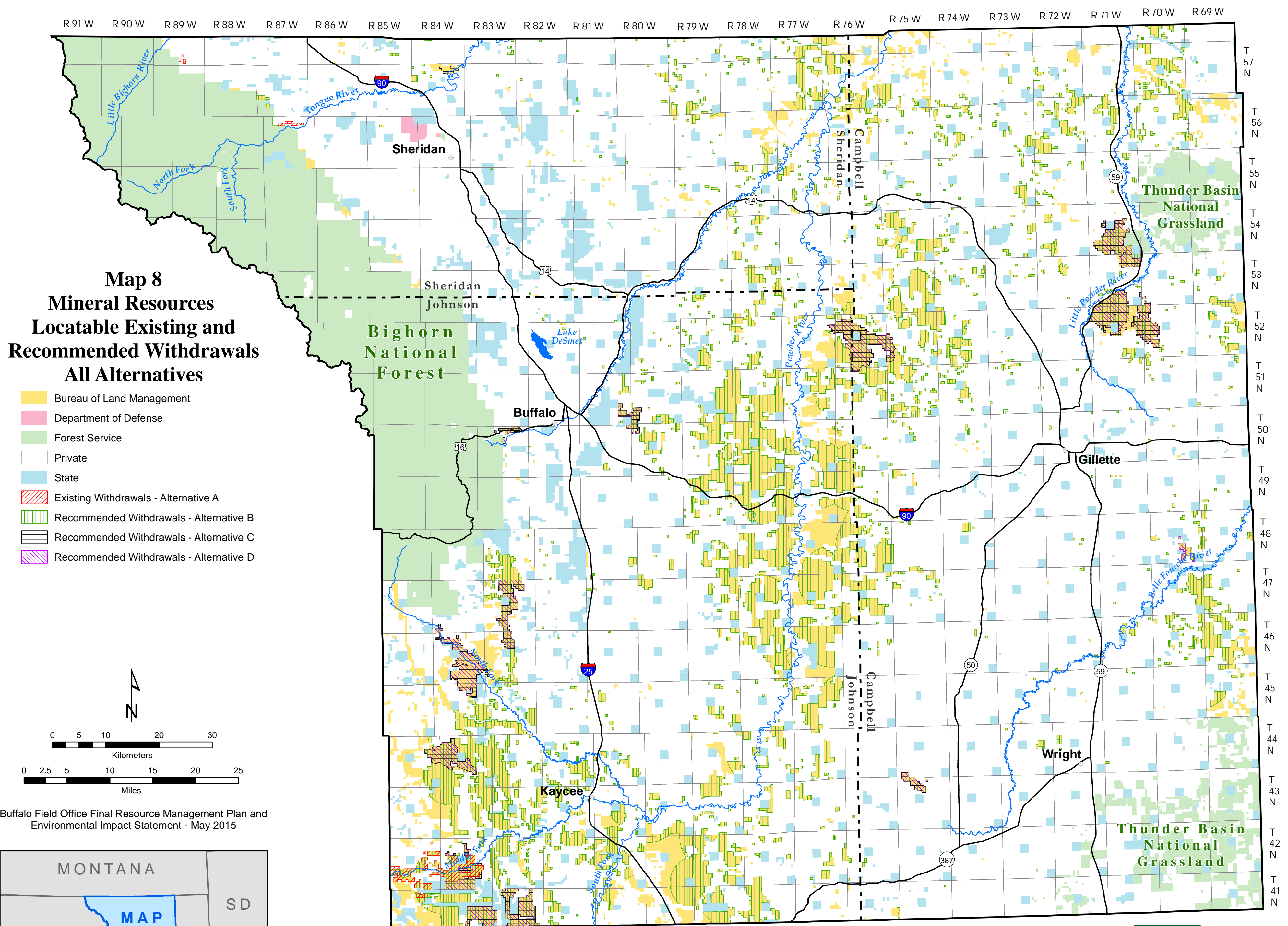




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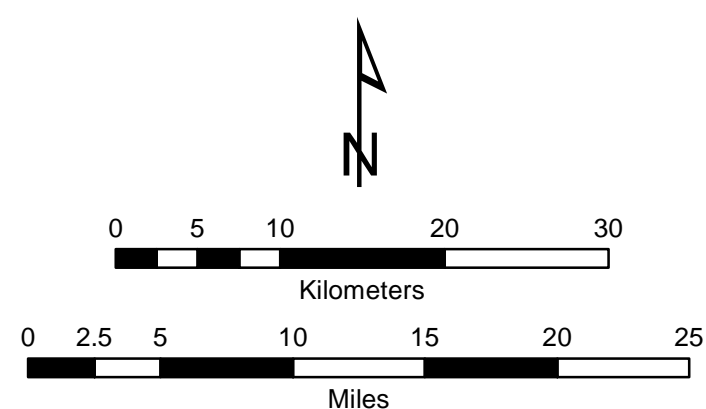


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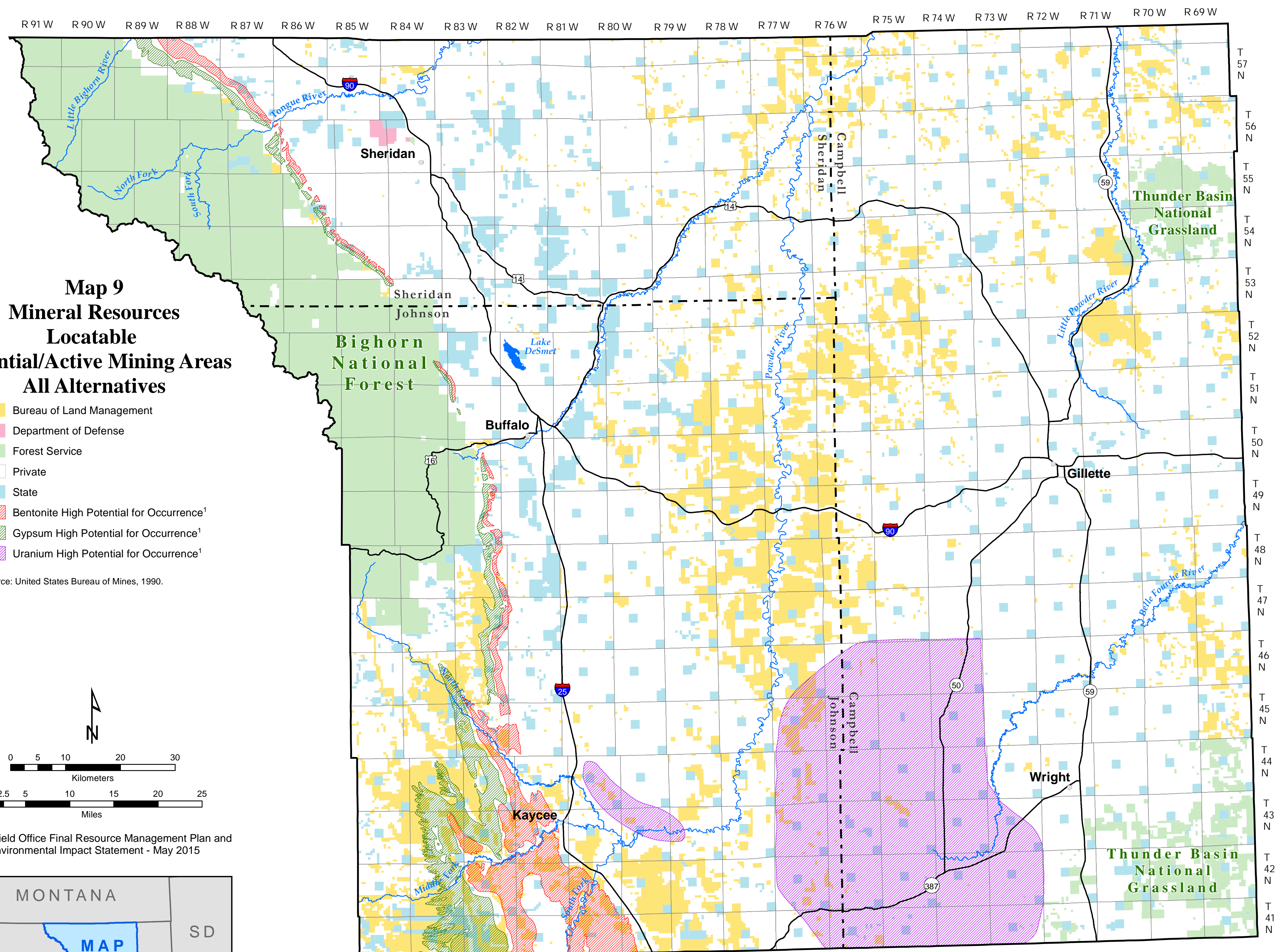
Map 9 **Mineral Resources** **Locatable** **Potential/Active Mining Areas** **All Alternatives**

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Bentonite High Potential for Occurrence¹
- Gypsum High Potential for Occurrence¹
- Uranium High Potential for Occurrence¹

¹Source: United States Bureau of Mines, 1990.



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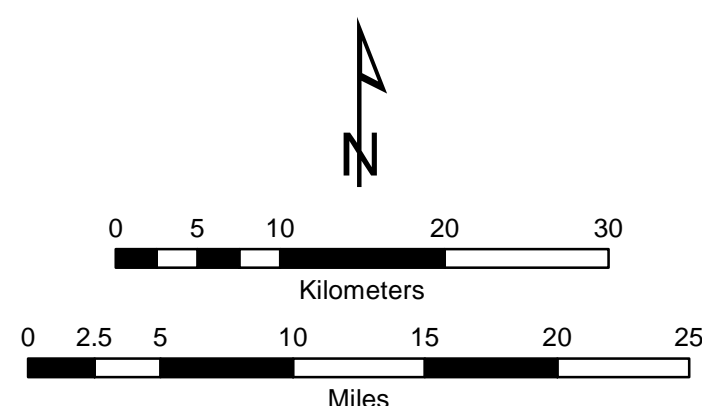


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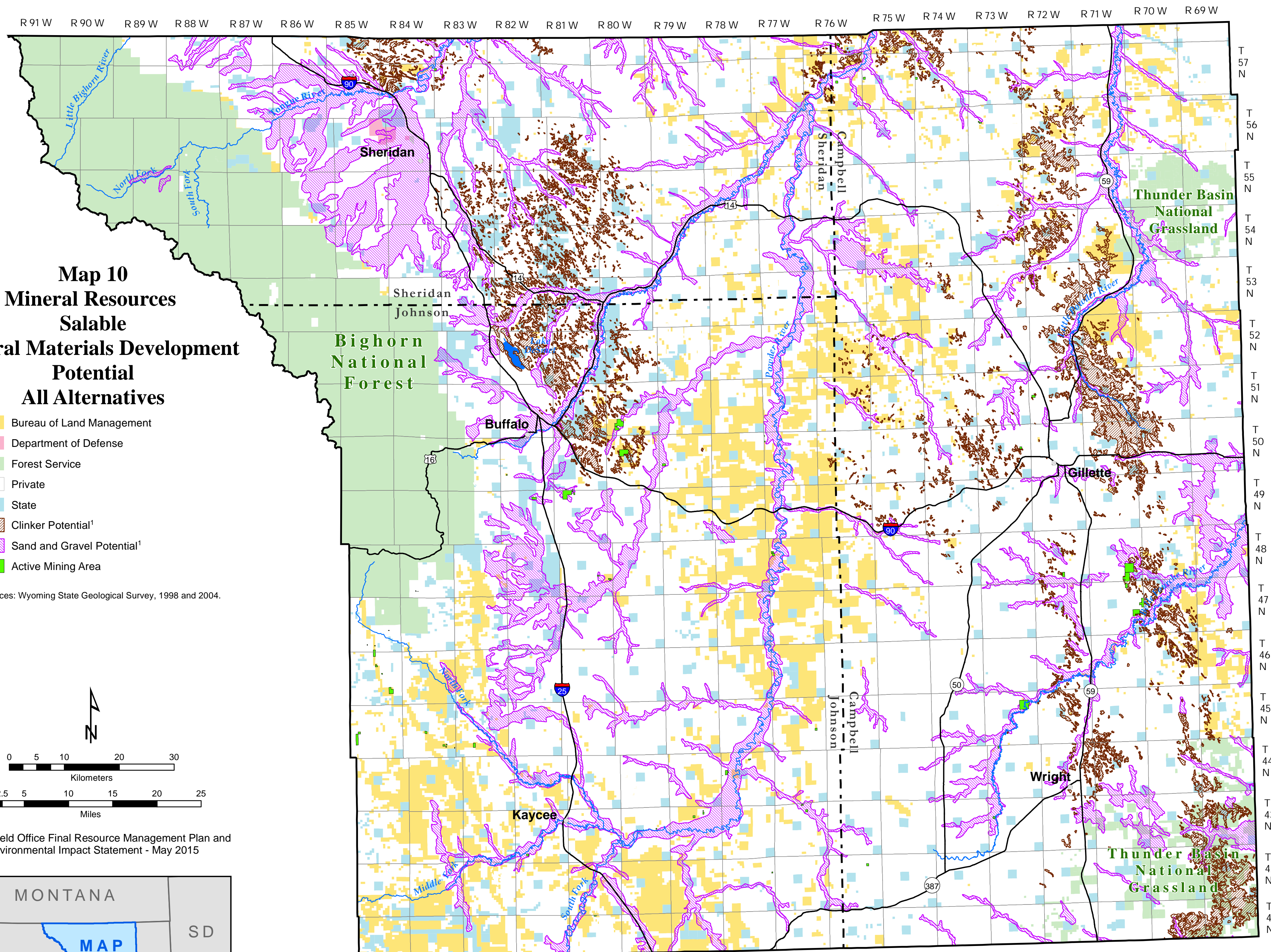
Map 10 Mineral Resources Salable Mineral Materials Development Potential All Alternatives

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Clinker Potential¹
- Sand and Gravel Potential¹
- Active Mining Area

¹Sources: Wyoming State Geological Survey, 1998 and 2004.



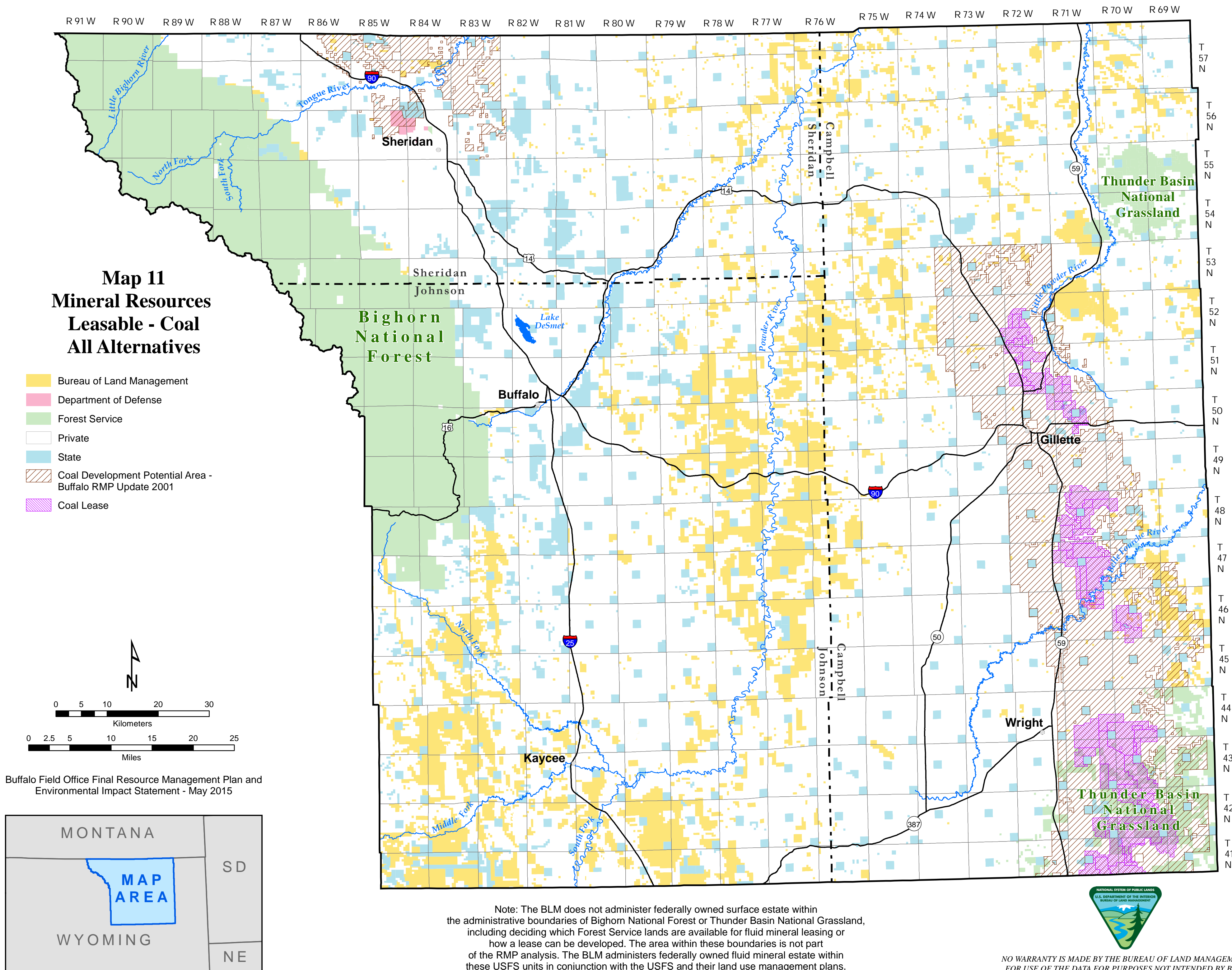
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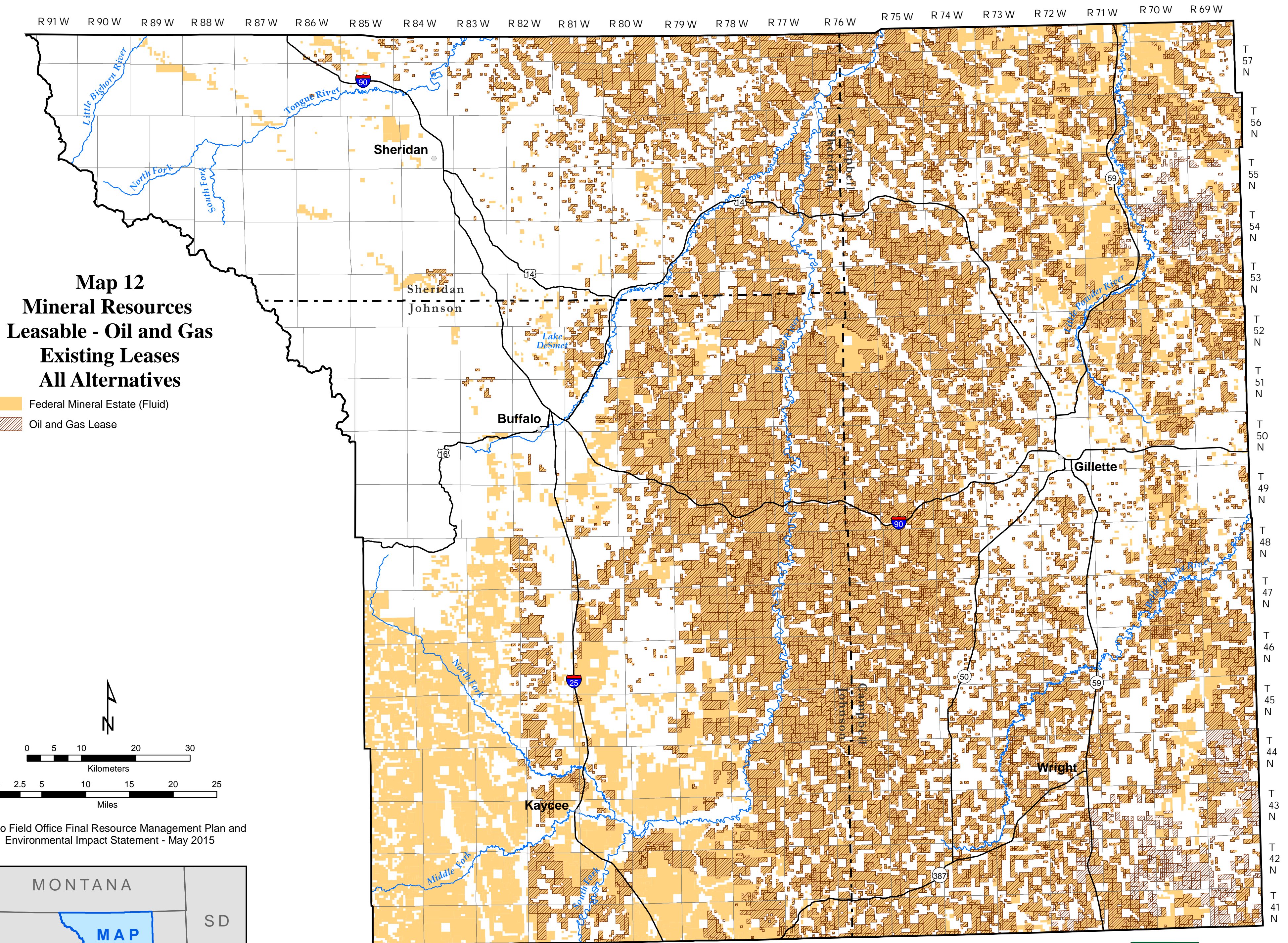


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Map 12
Mineral Resources
Leasable - Oil and Gas
Existing Leases
All Alternatives

- Federal Mineral Estate (Fluid)
- Oil and Gas Lease

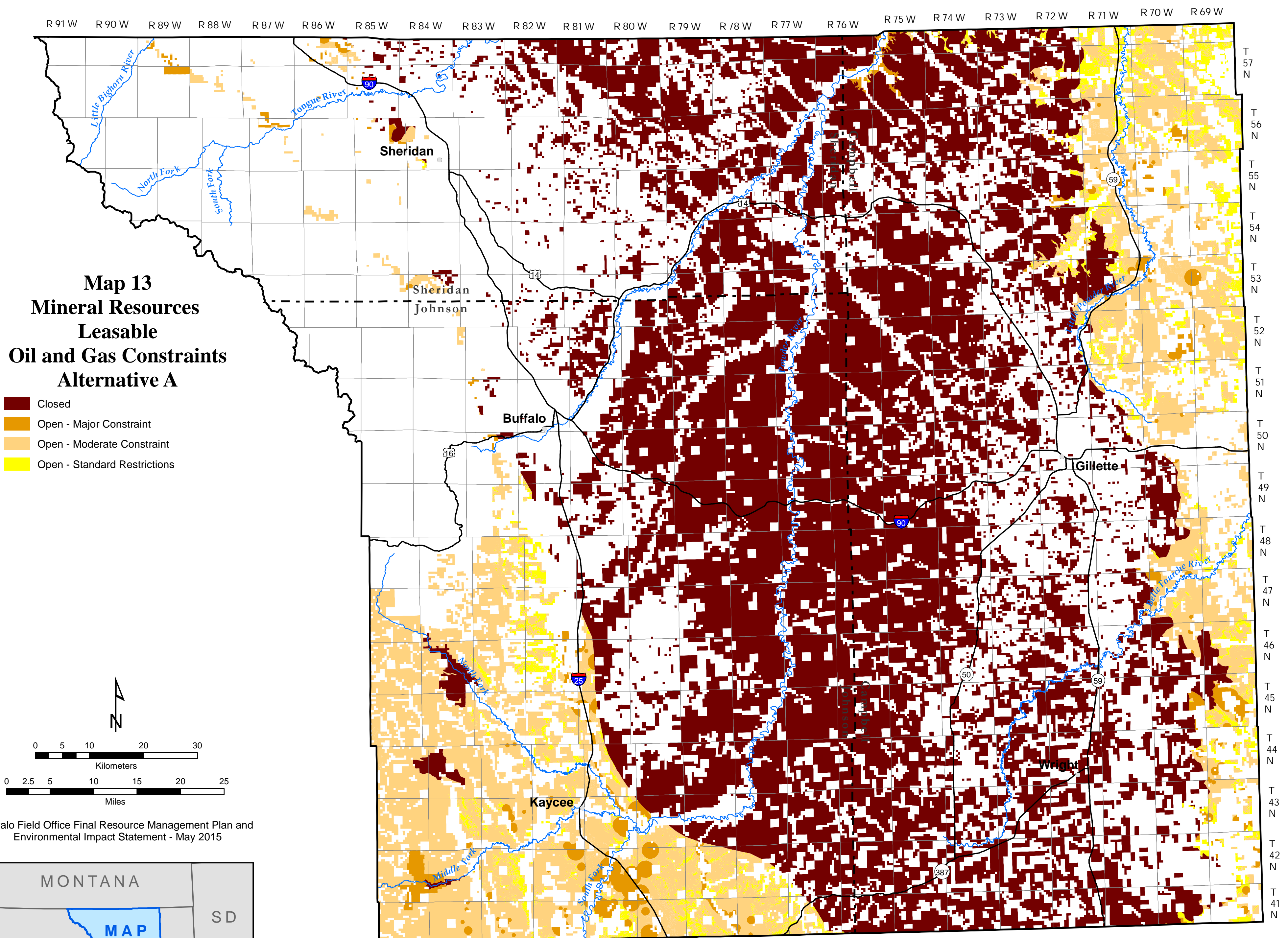
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Map 13
Mineral Resources
Leasable
Oil and Gas Constraints
Alternative A

- Closed
- Open - Major Constraint
- Open - Moderate Constraint
- Open - Standard Restrictions



0 5 10 20 30
 Kilometers

0 2.5 5 10 15 20 25
 Miles

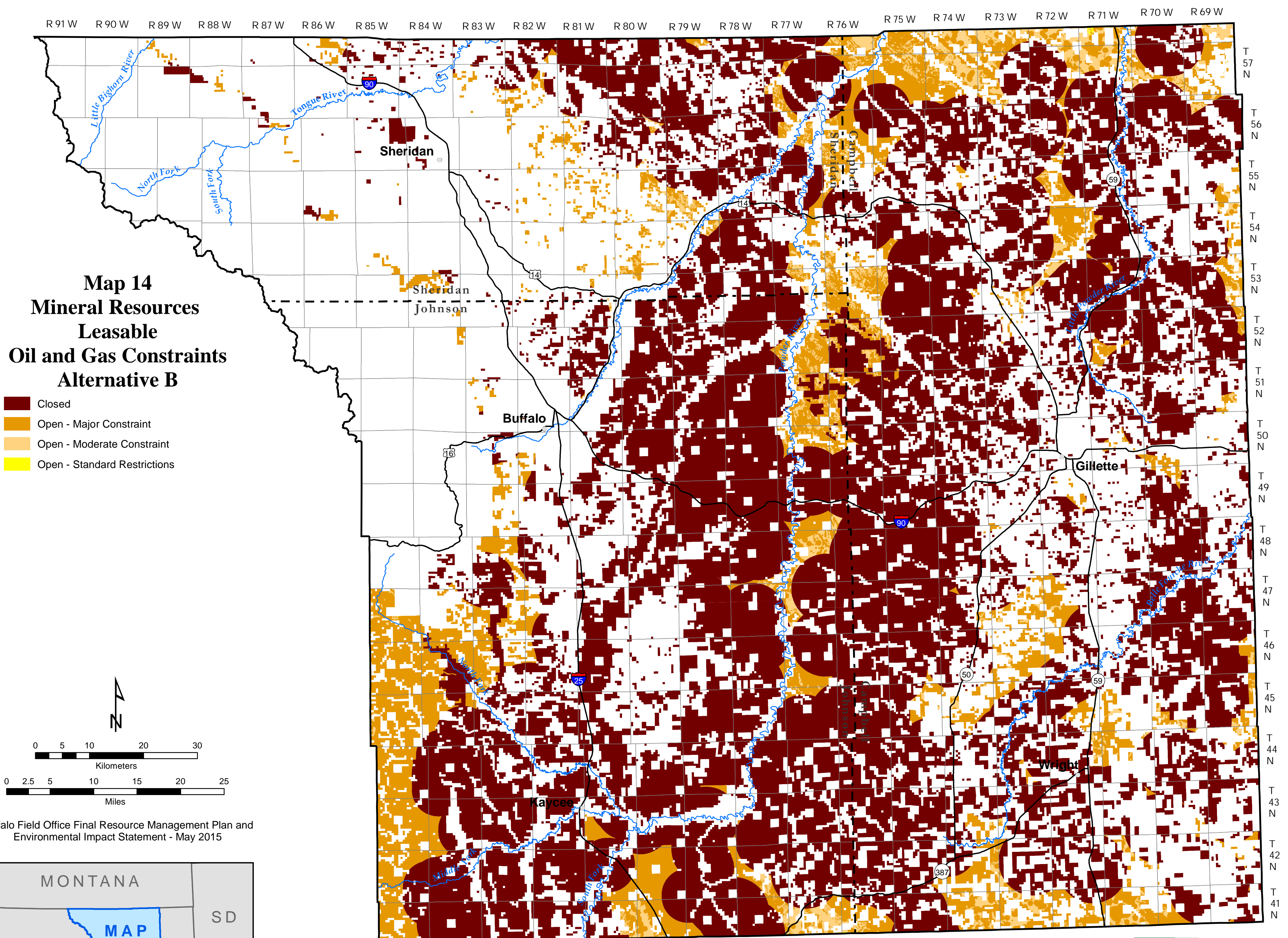
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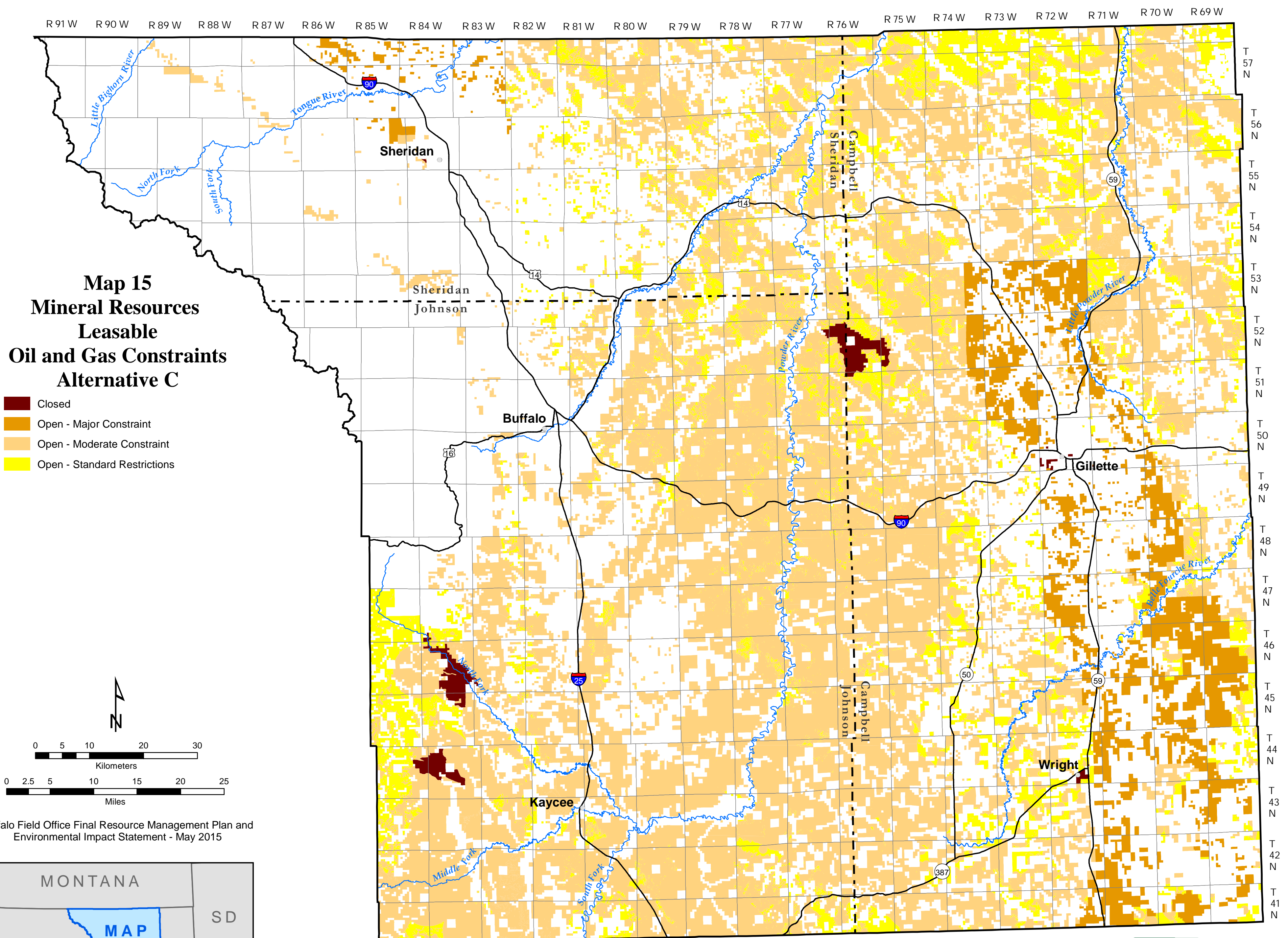
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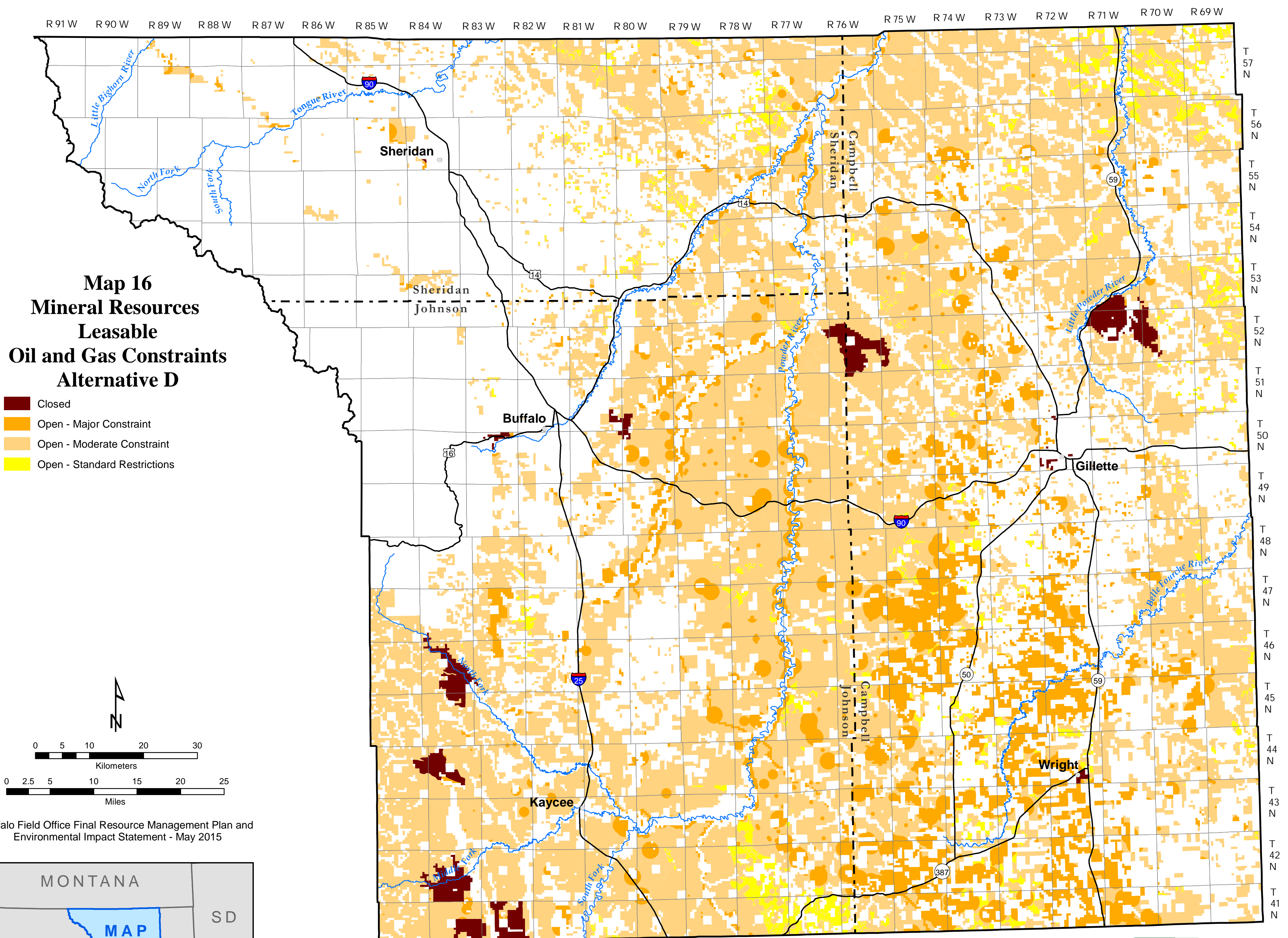
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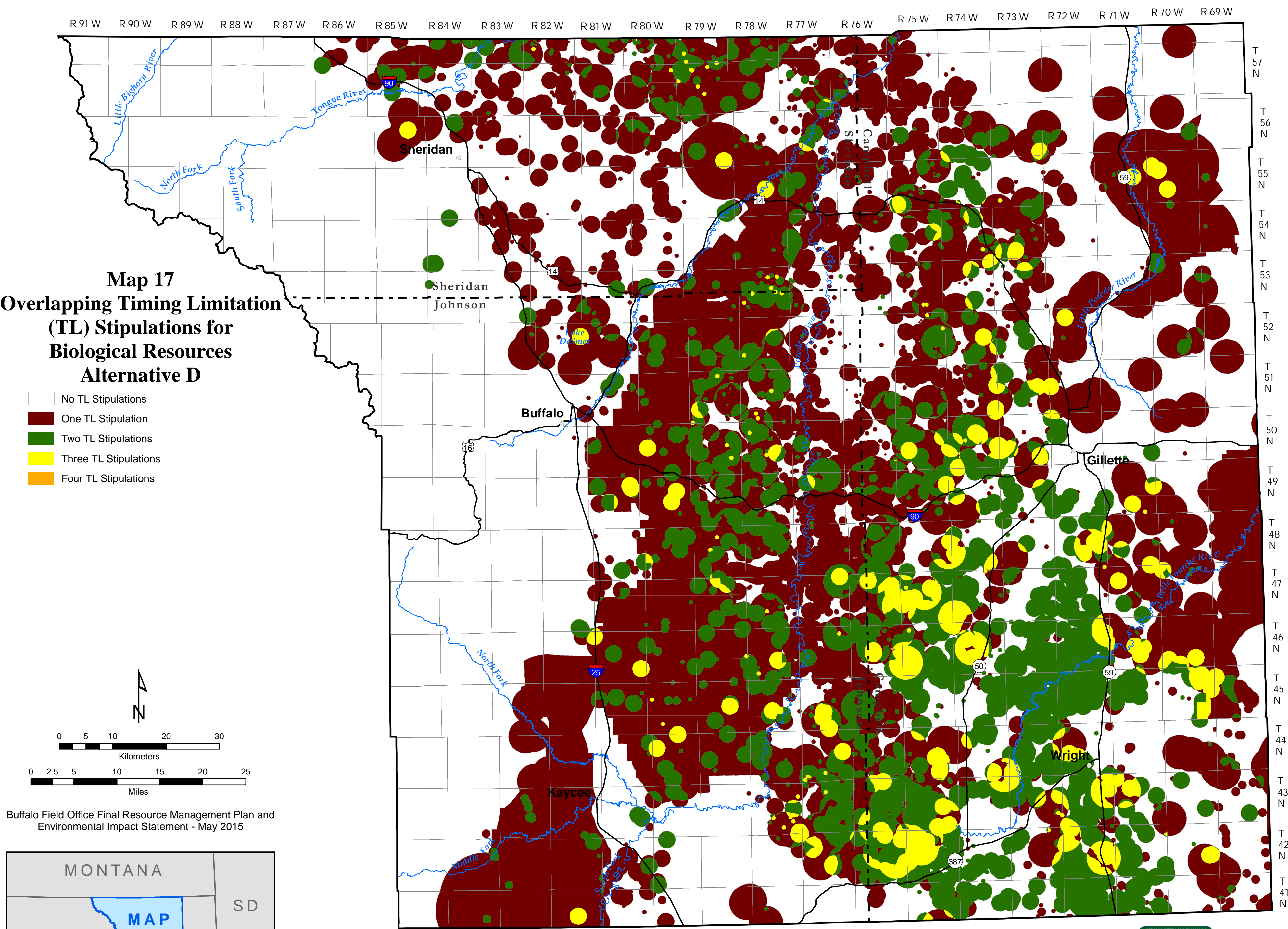
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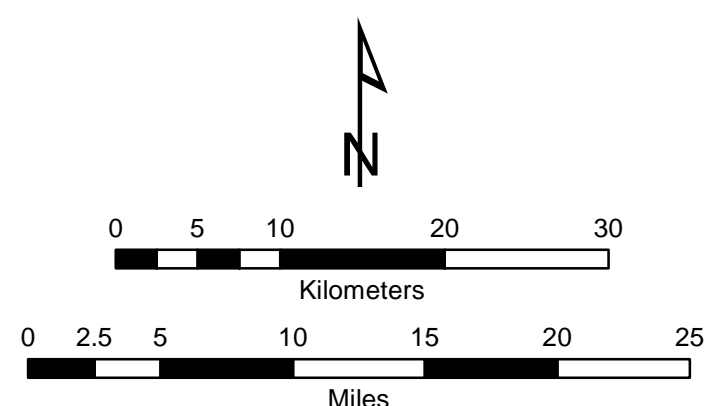
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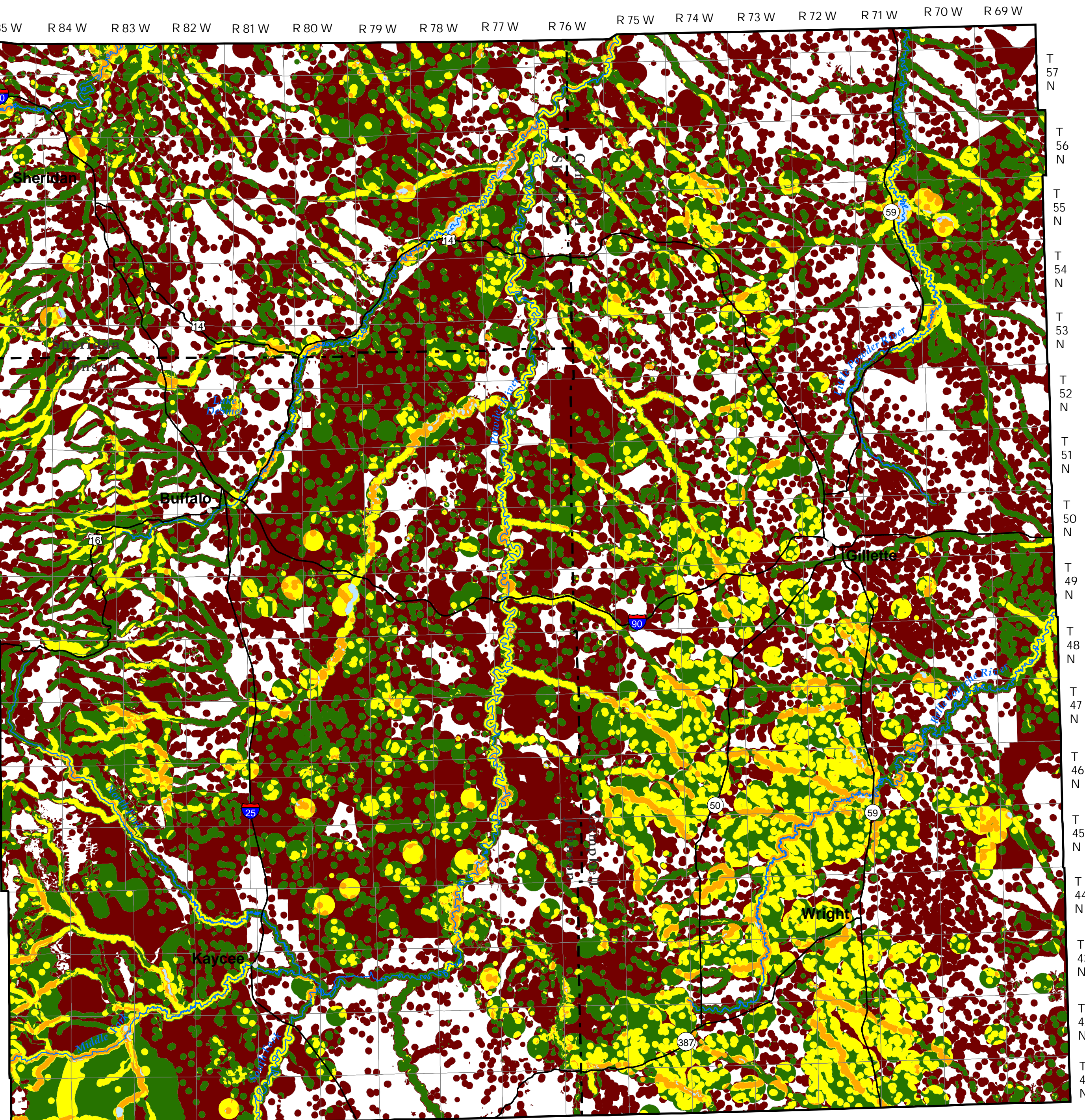
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Map 18 **Overlapping Controlled Surface** **Use (CSU) Stipulations for** **Biological Resources** **Alternative D**

- No CSU Stipulations
- One CSU Stipulation
- Two CSU Stipulations
- Three CSU Stipulations
- Four CSU Stipulations
- Five CSU Stipulations
- Six CSU Stipulations



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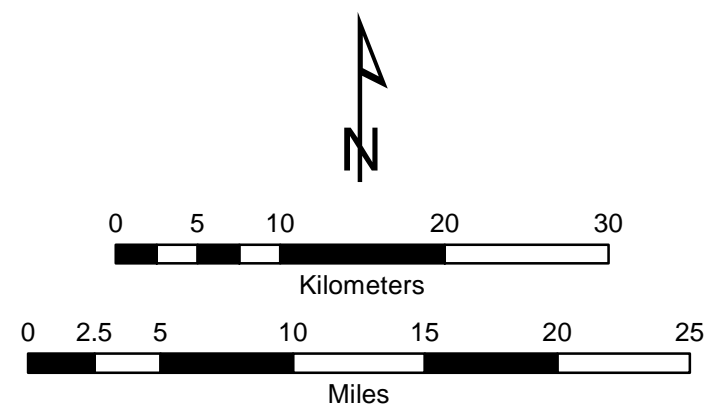


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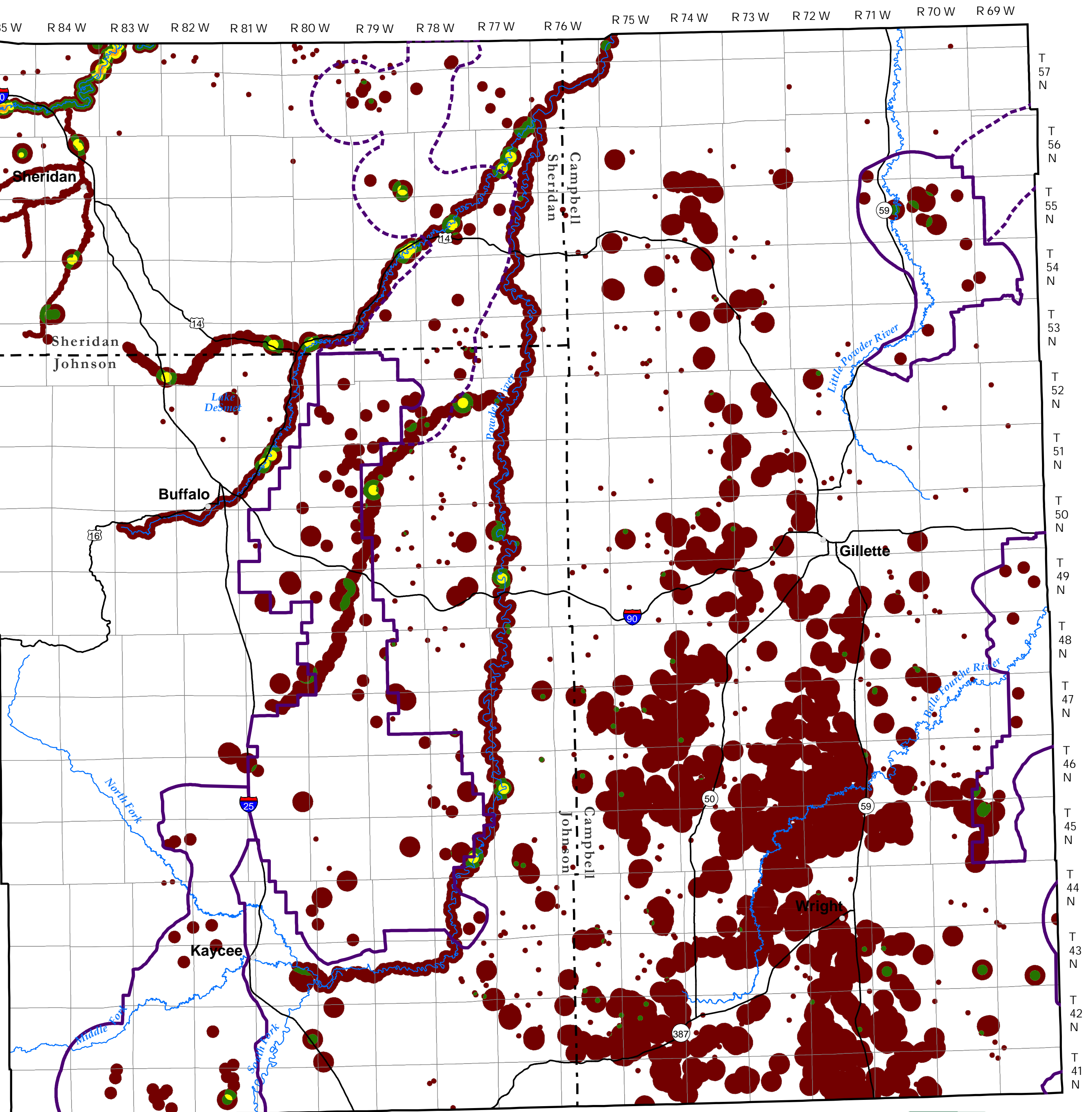
Map 19 **Overlapping No Surface** **Occupancy (NSO) Stipulations** **for Biological Resources** **Alternative D**

-  Greater Sage-Grouse Connectivity Corridor¹
-  Greater Sage-Grouse Core Population Area¹
-  No NSO Stipulations
-  One NSO Stipulation
-  Two NSO Stipulations
-  Three NSO Stipulations
-  Four NSO Stipulations

¹Source: Wyoming Governor's Implementation Team, 2011.



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Map 20 **Overlapping Controlled Surface** **Use (CSU) Stipulations for** **Cultural Resources** **Alternative D**

- No CSU Stipulations
- One CSU Stipulation



0 5 10 20 30
Kilometers

0 2.5 5 10 15 20 25
Miles

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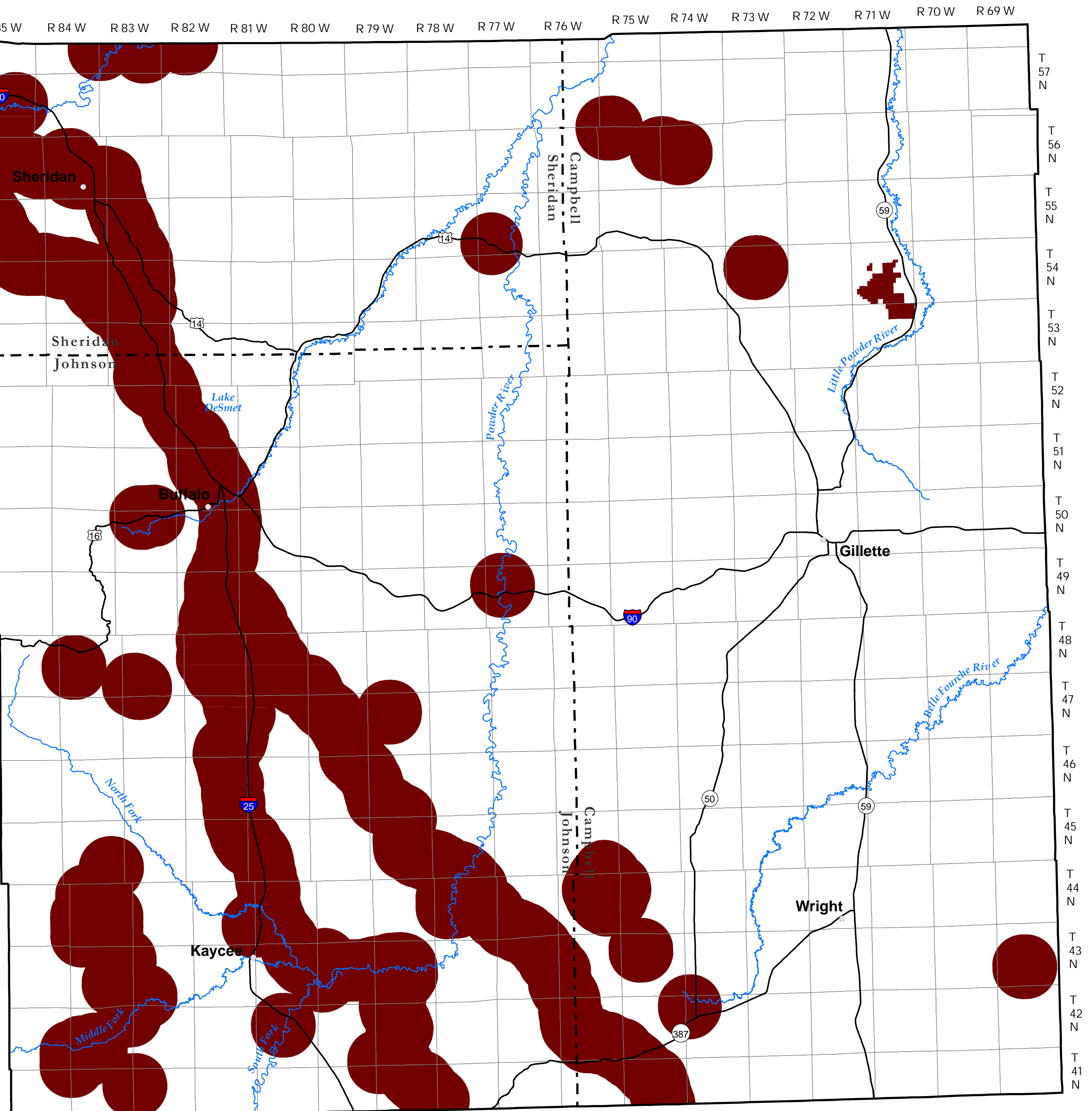
MONTANA

SD

WYOMING

NE

MAP
AREA



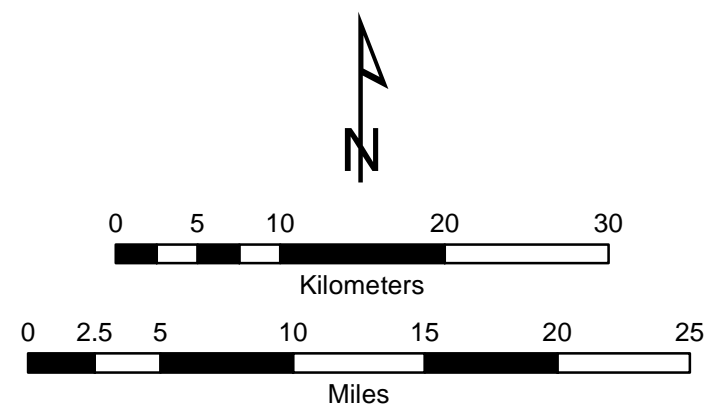
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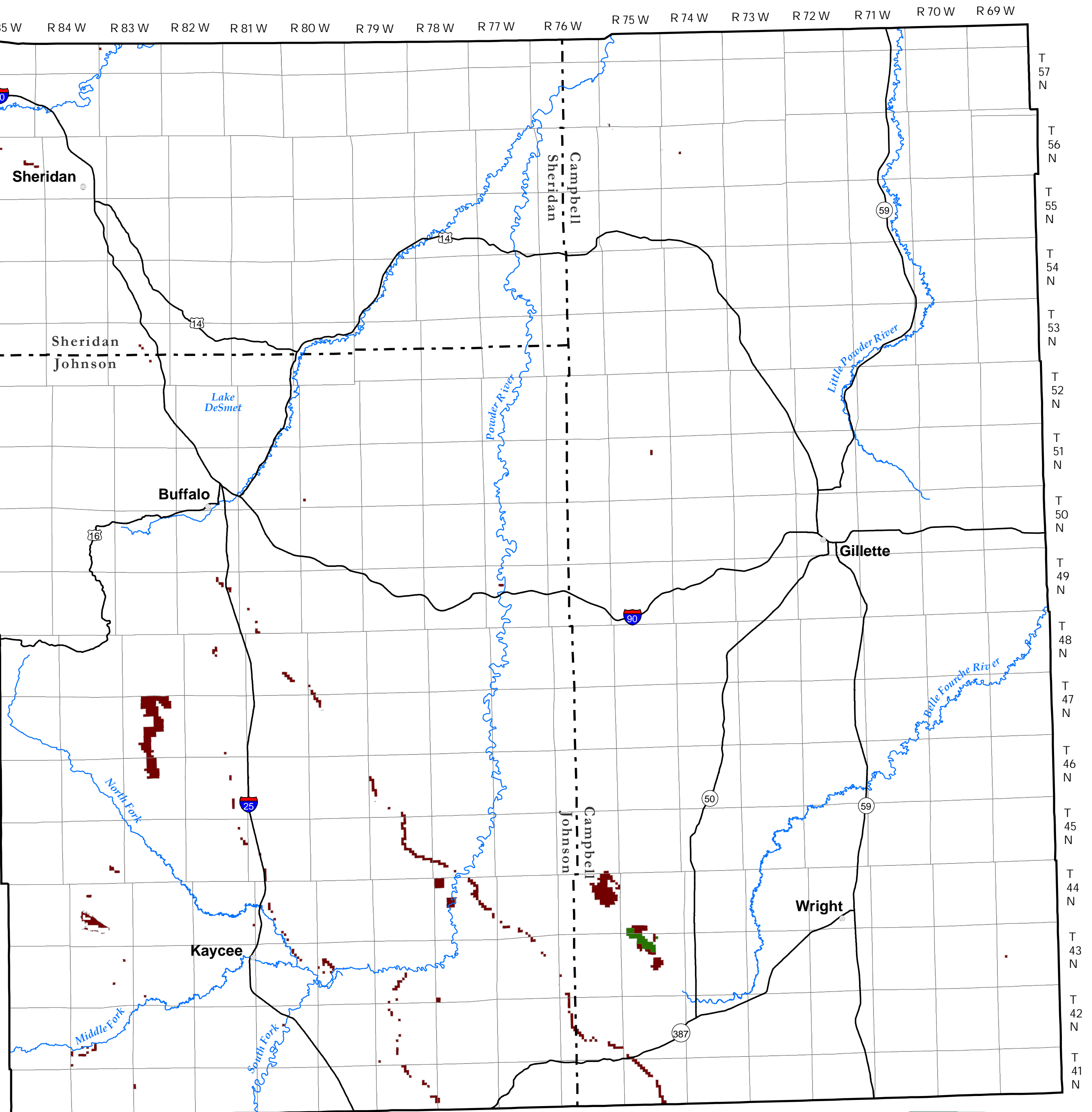
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Map 21 Overlapping No Surface Occupancy (NSO) Stipulations for Cultural Resources Alternative D

- No NSO Stipulations
- One NSO Stipulation
- Two NSO Stipulations



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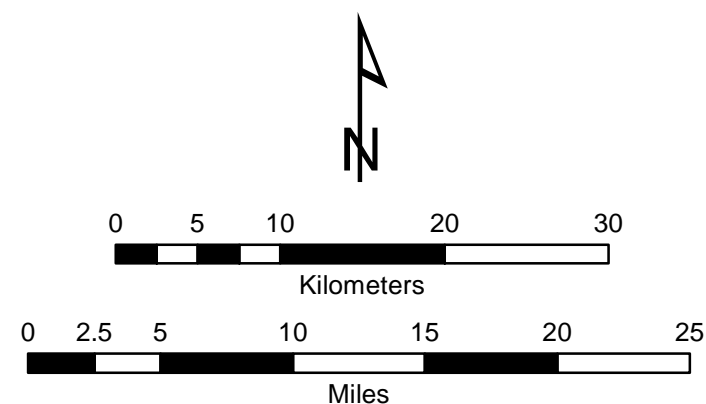
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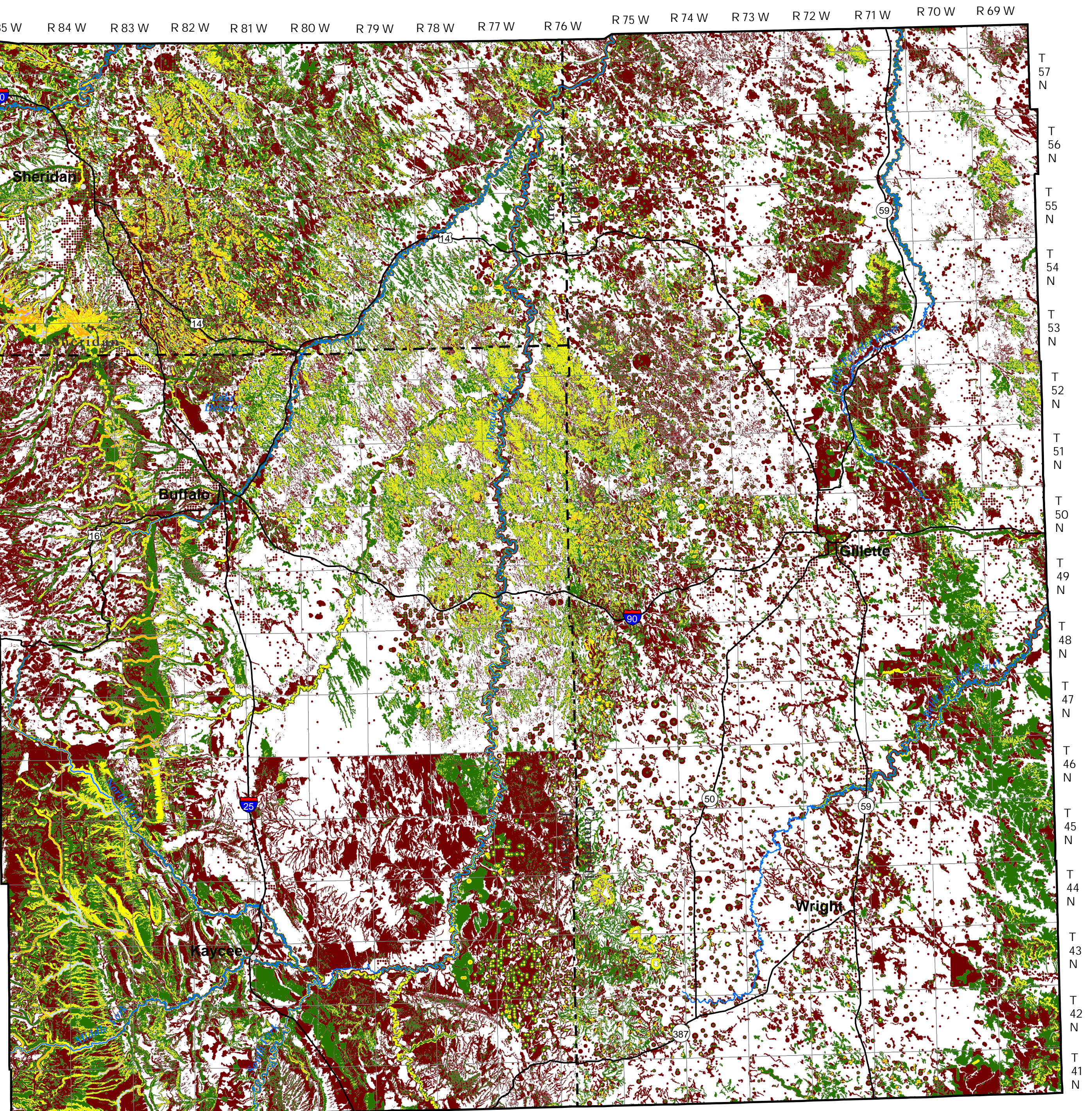
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Map 22 **Overlapping Controlled Surface** **Use (CSU) Stipulations for** **Physical Resources** **Alternative D**

- No CSU Stipulations
- One CSU Stipulation
- Two CSU Stipulations
- Three CSU Stipulations
- Four CSU Stipulations
- Five CSU Stipulations
- Six CSU Stipulations



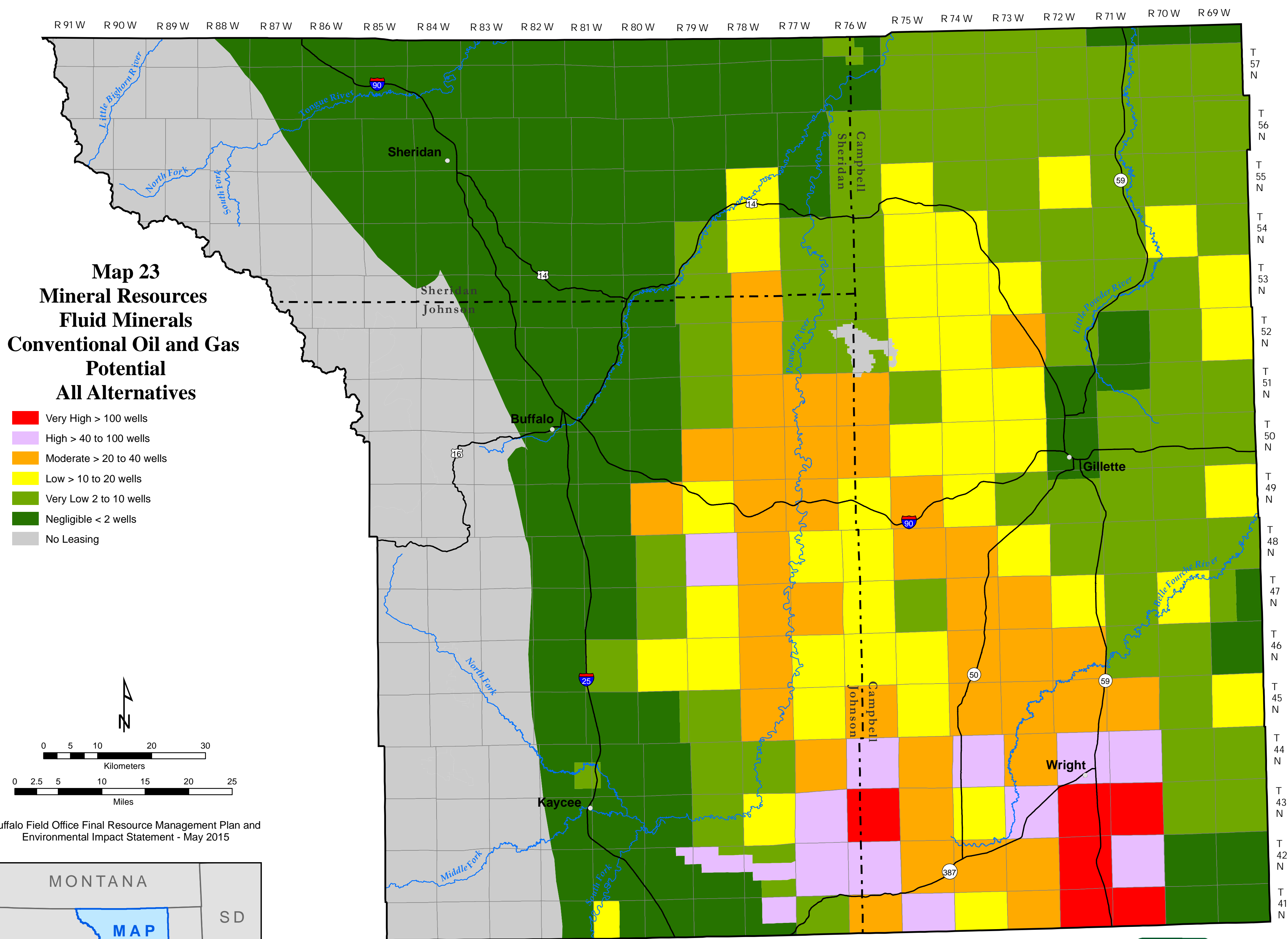
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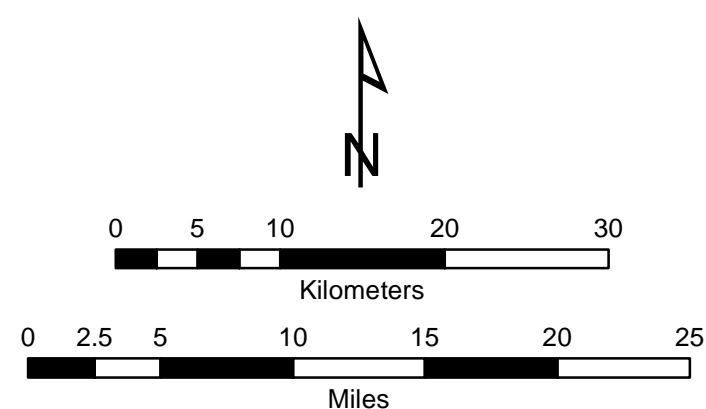
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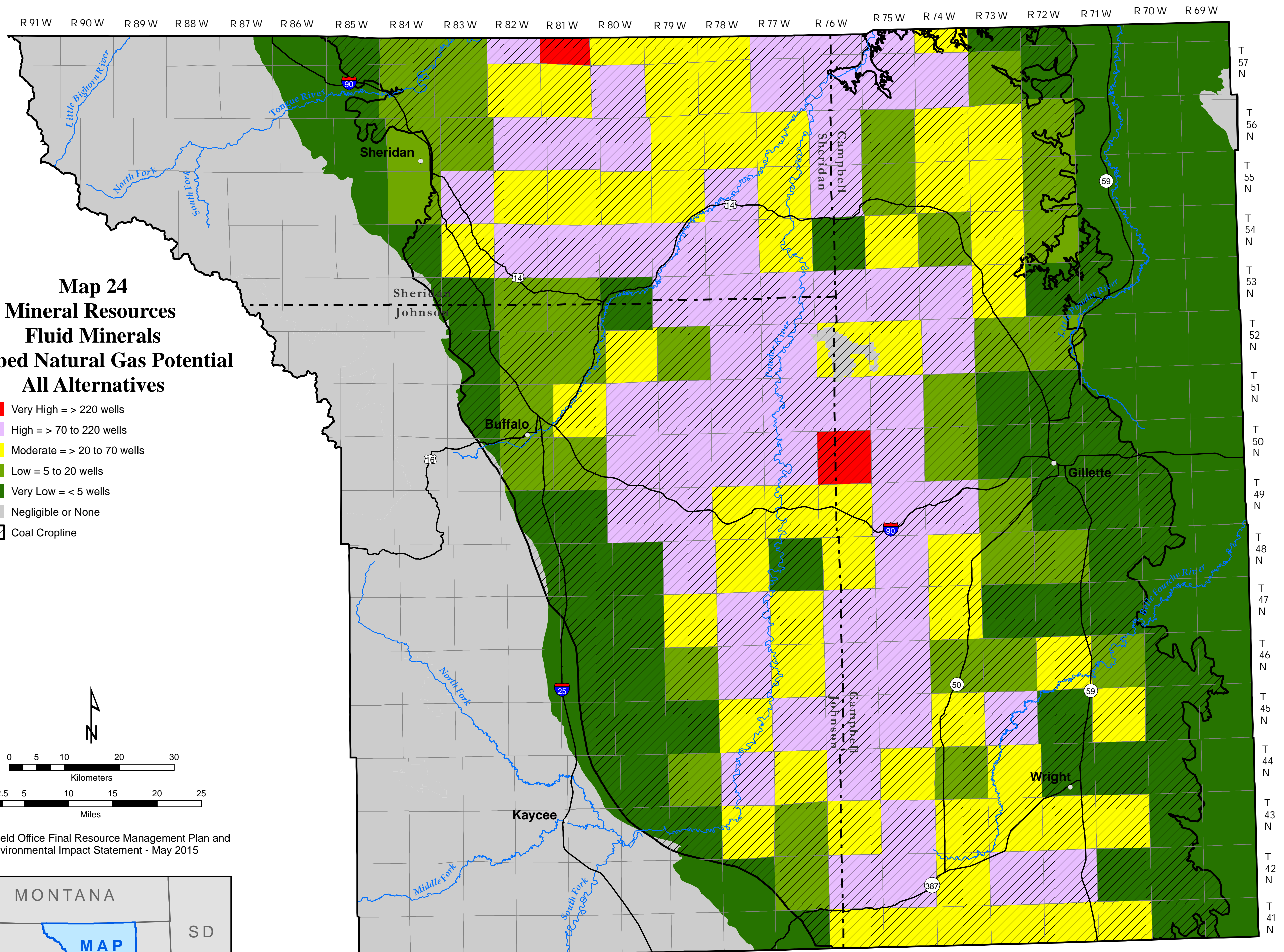
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Map 24 **Mineral Resources** **Fluid Minerals** **Coalbed Natural Gas Potential** **All Alternatives**

- Very High = > 220 wells
- High = > 70 to 220 wells
- Moderate = > 20 to 70 wells
- Low = 5 to 20 wells
- Very Low = < 5 wells
- Negligible or None
- Coal Cropline



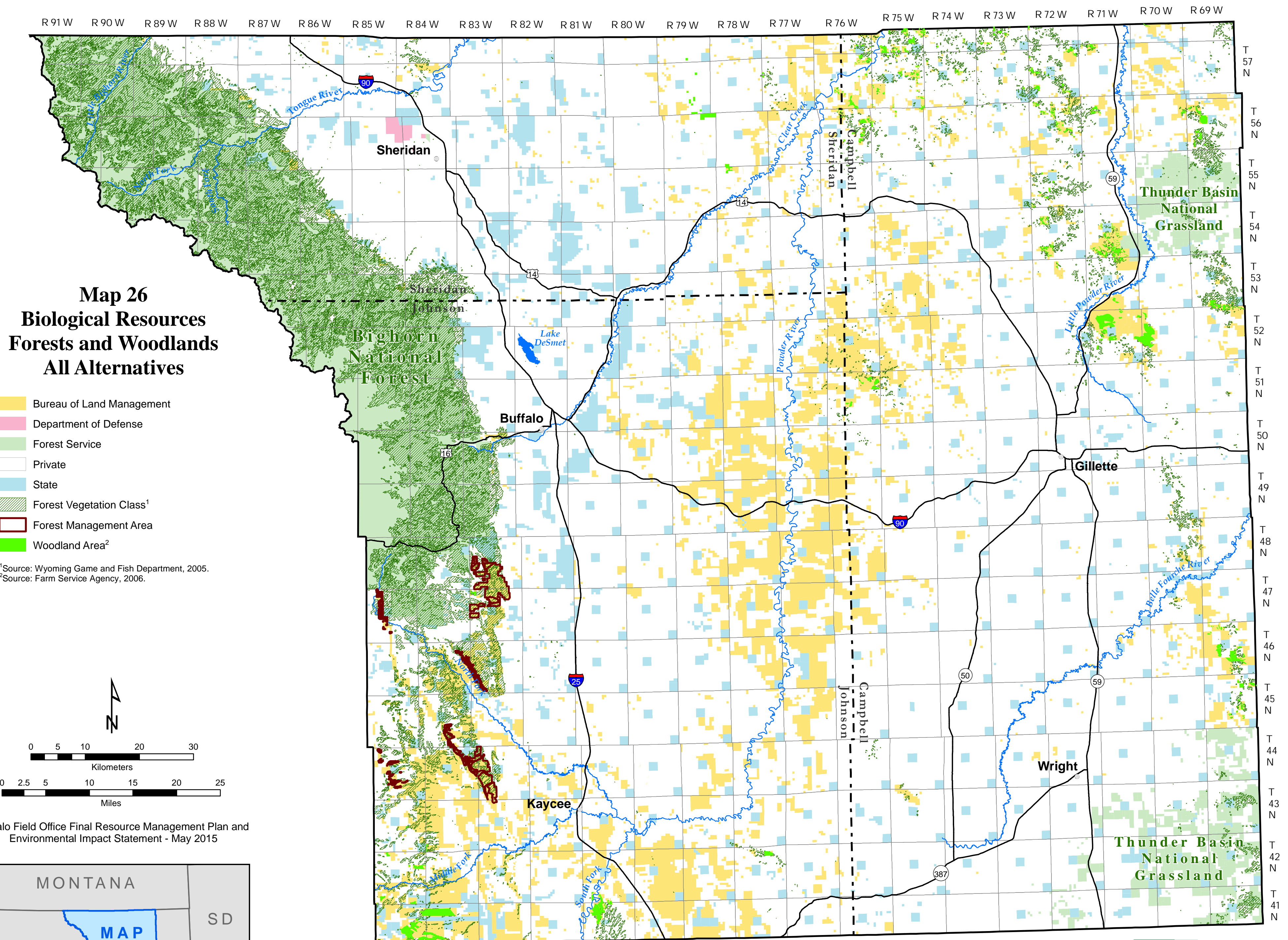
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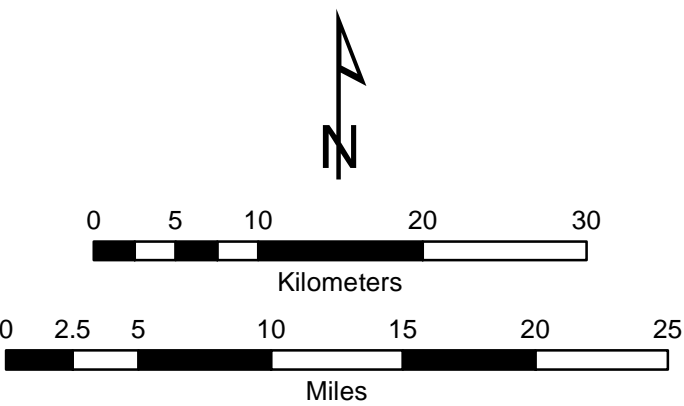
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Map 26 **Biological Resources** **Forests and Woodlands** **All Alternatives**

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Forest Vegetation Class¹
- Forest Management Area
- Woodland Area²

¹Source: Wyoming Game and Fish Department, 2005.
²Source: Farm Service Agency, 2006.



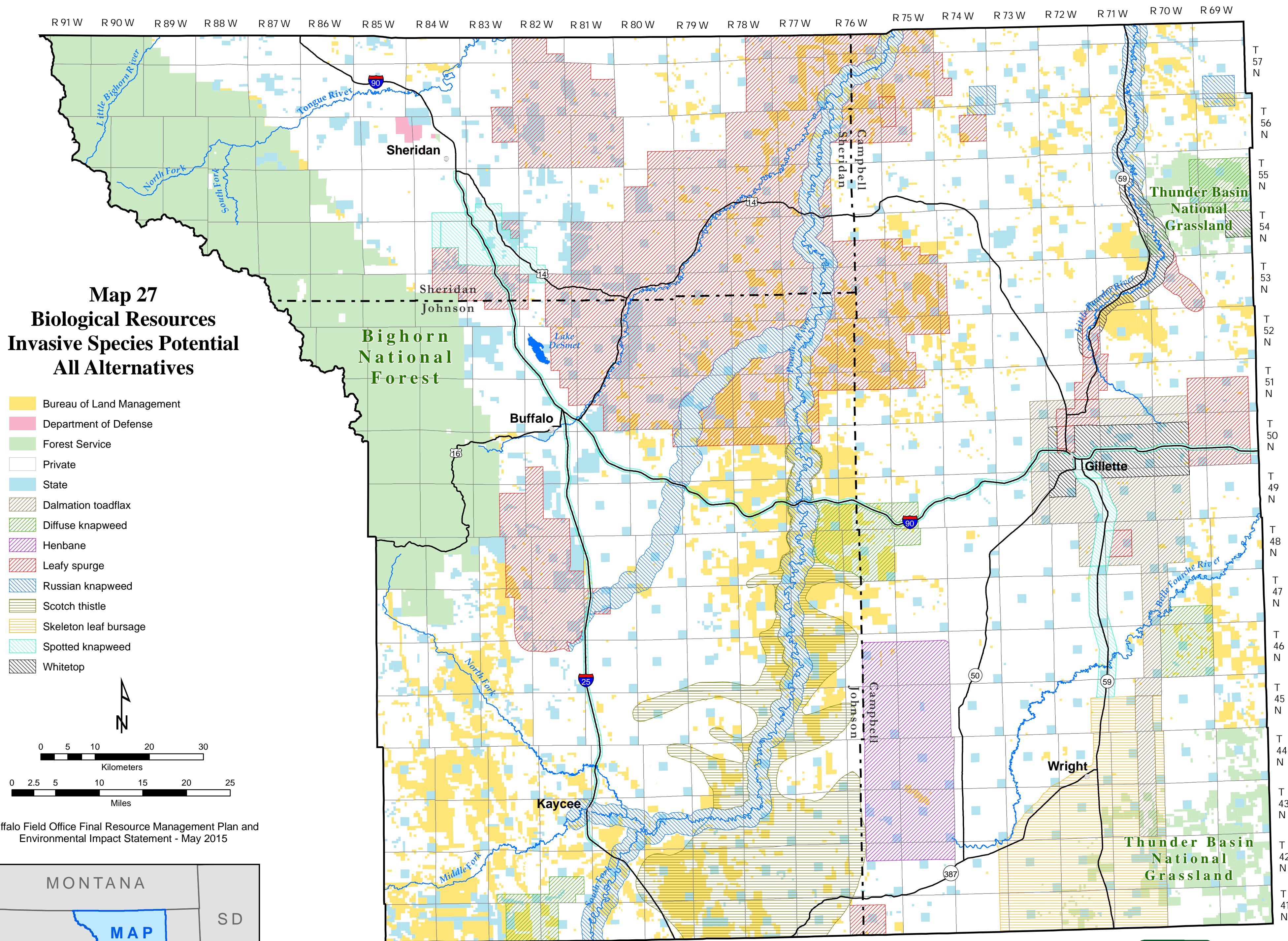
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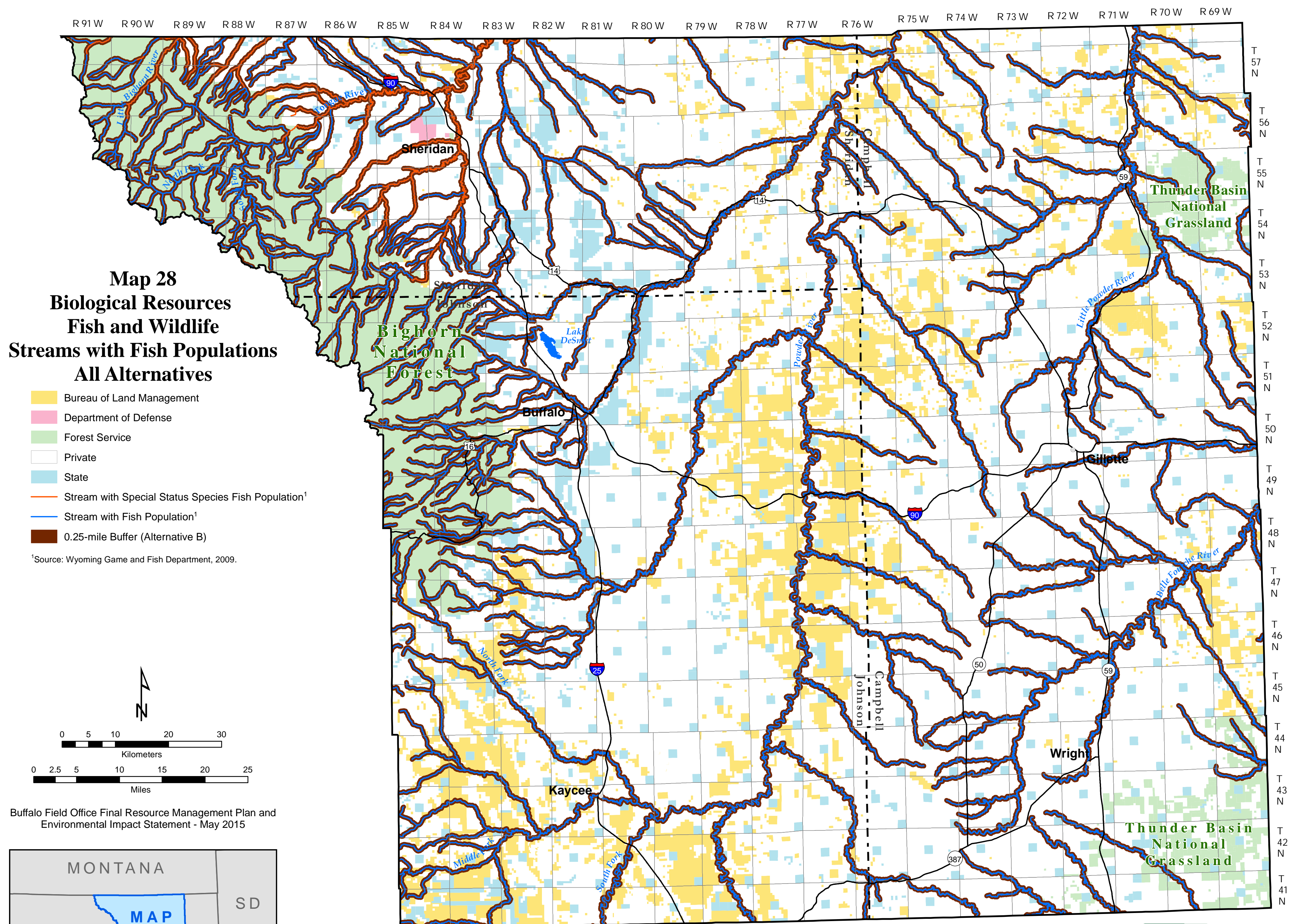
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Map 29

Biological Resources

Fish and Wildlife

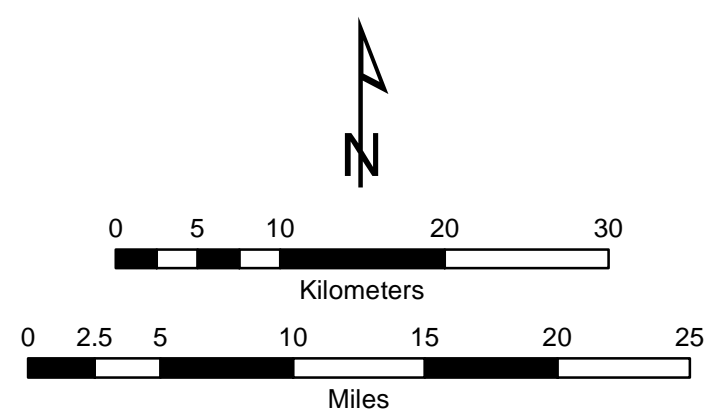
Elk Seasonal Ranges and

Big Game Migration Corridors

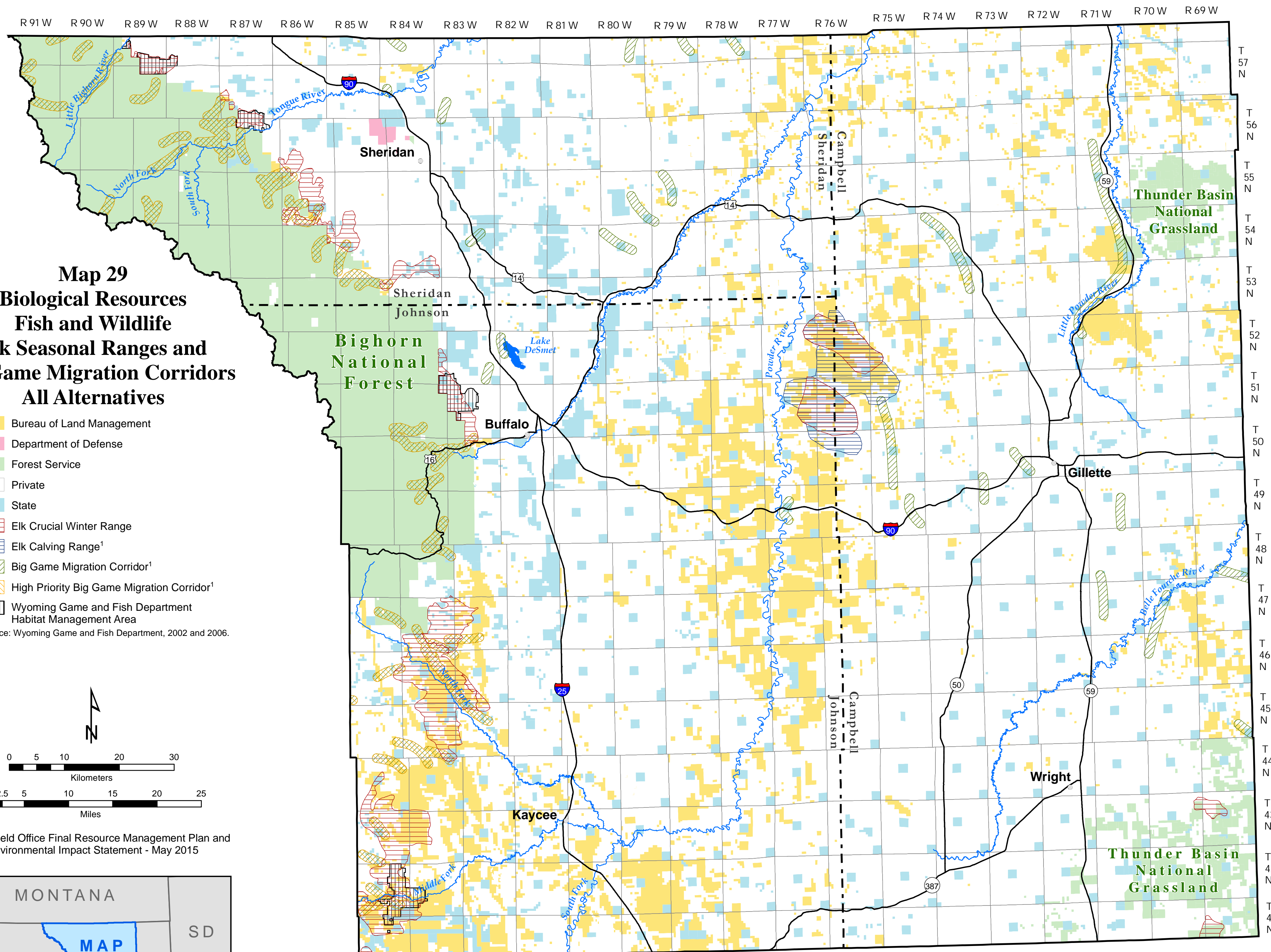
All Alternatives

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Elk Crucial Winter Range
- Elk Calving Range¹
- Big Game Migration Corridor¹
- High Priority Big Game Migration Corridor¹
- Wyoming Game and Fish Department
Habitat Management Area

¹Source: Wyoming Game and Fish Department, 2002 and 2006.



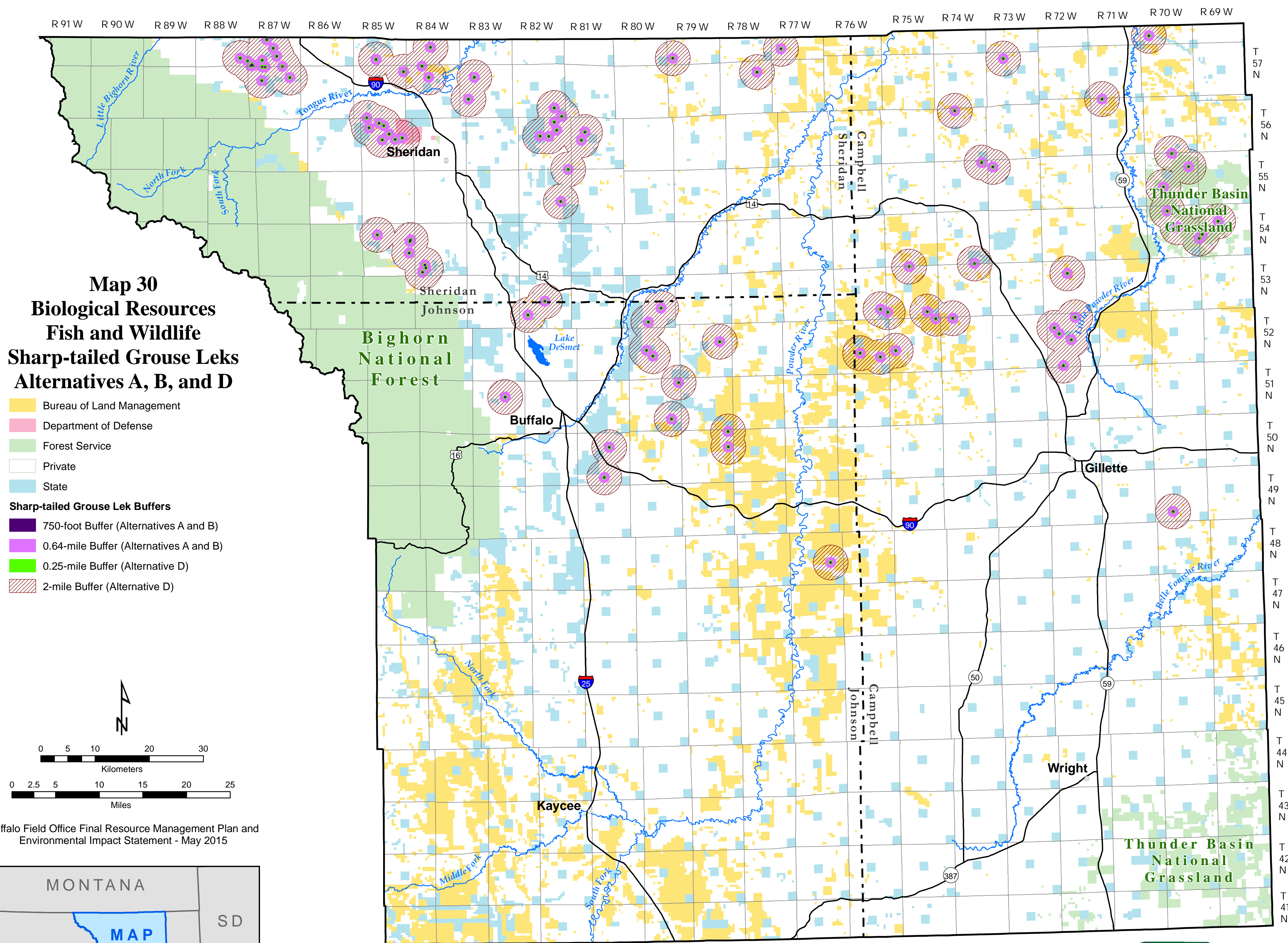
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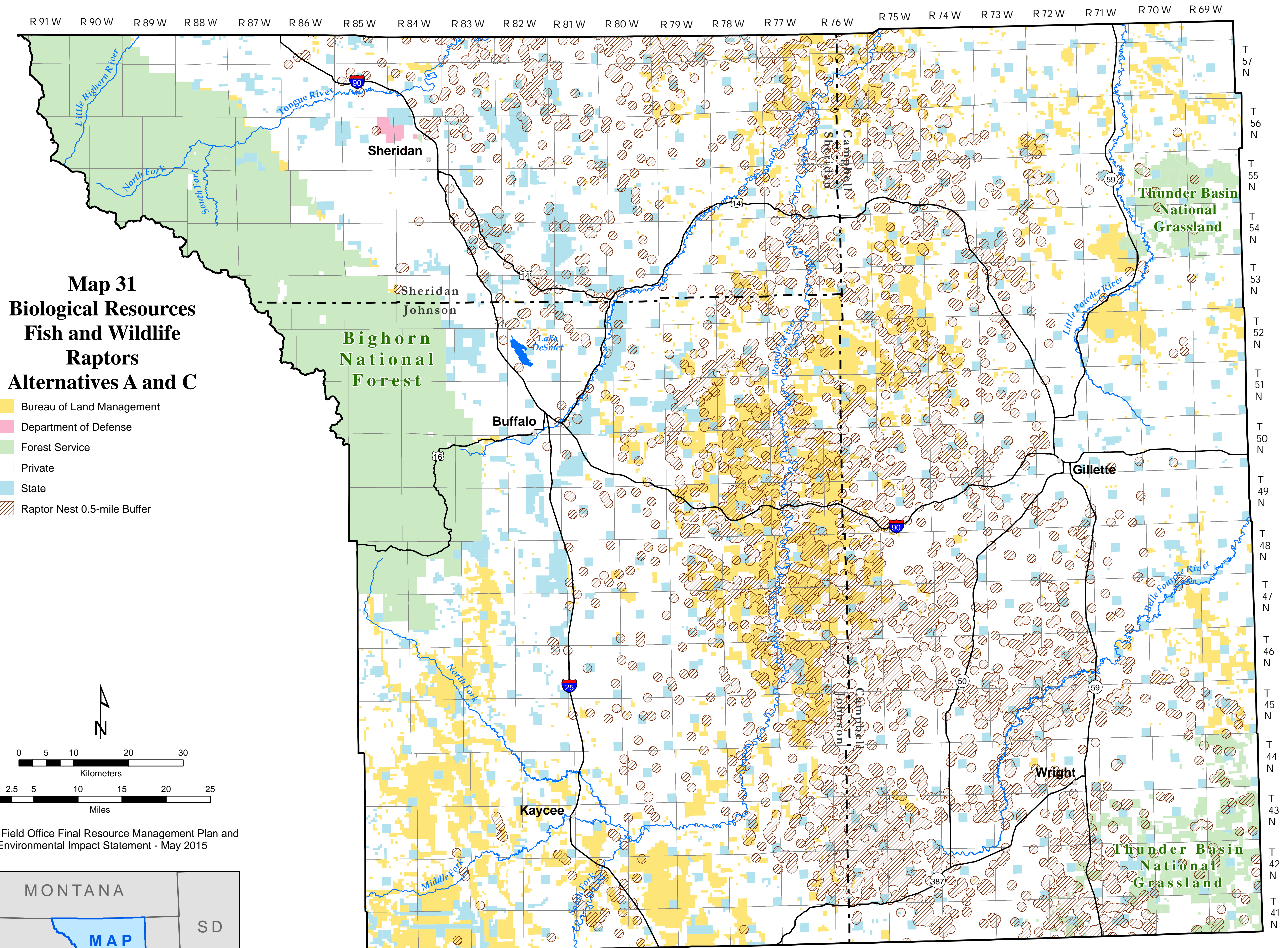
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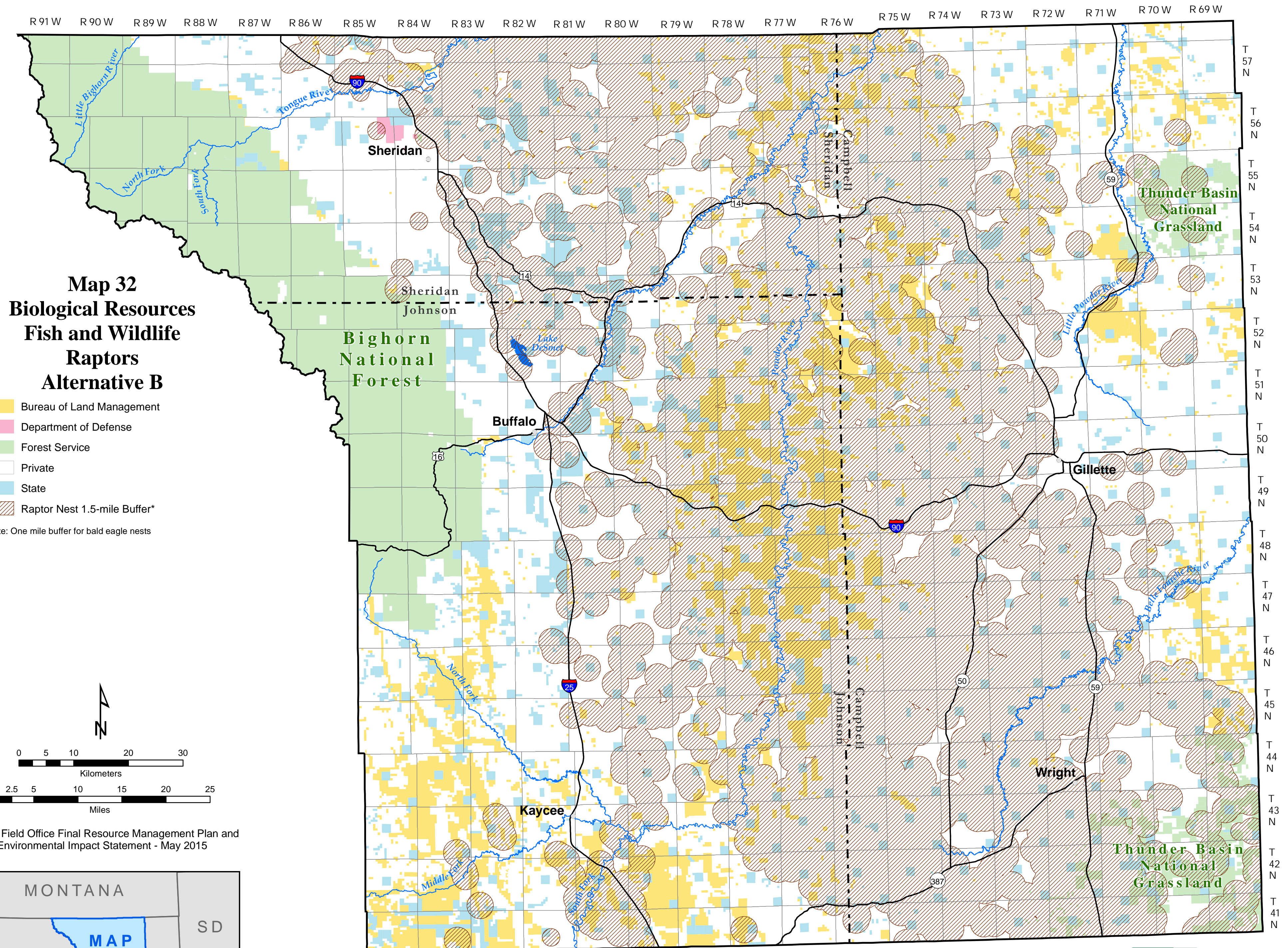
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Map 32
Biological Resources
Fish and Wildlife
Raptors
Alternative B

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Raptor Nest 1.5-mile Buffer*

Note: One mile buffer for bald eagle nests

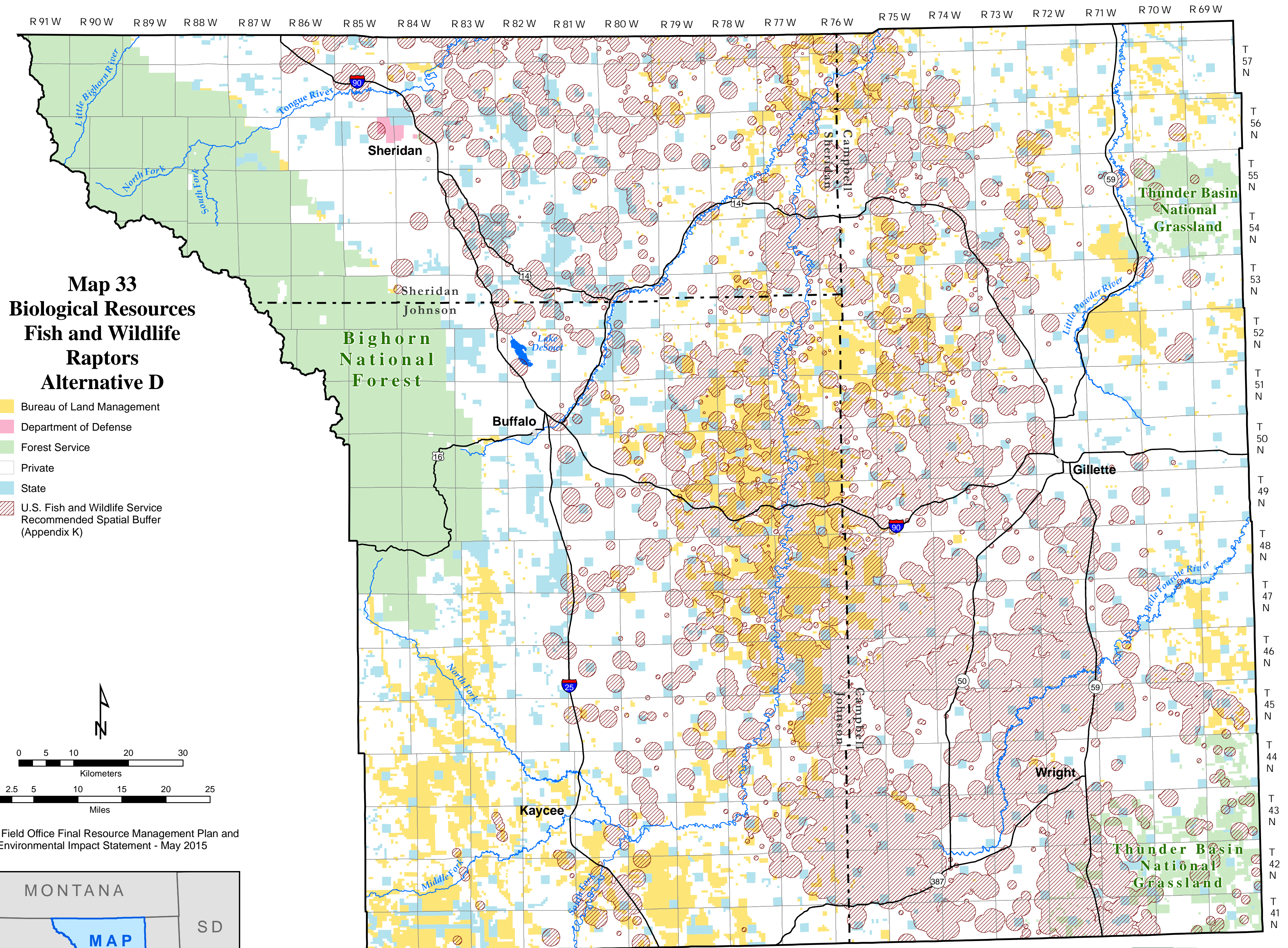
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Map 33
Biological Resources
Fish and Wildlife
Raptors
Alternative D

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- U.S. Fish and Wildlife Service Recommended Spatial Buffer (Appendix K)



0 5 10 20 30
 Kilometers

0 2.5 5 10 15 20 25
 Miles

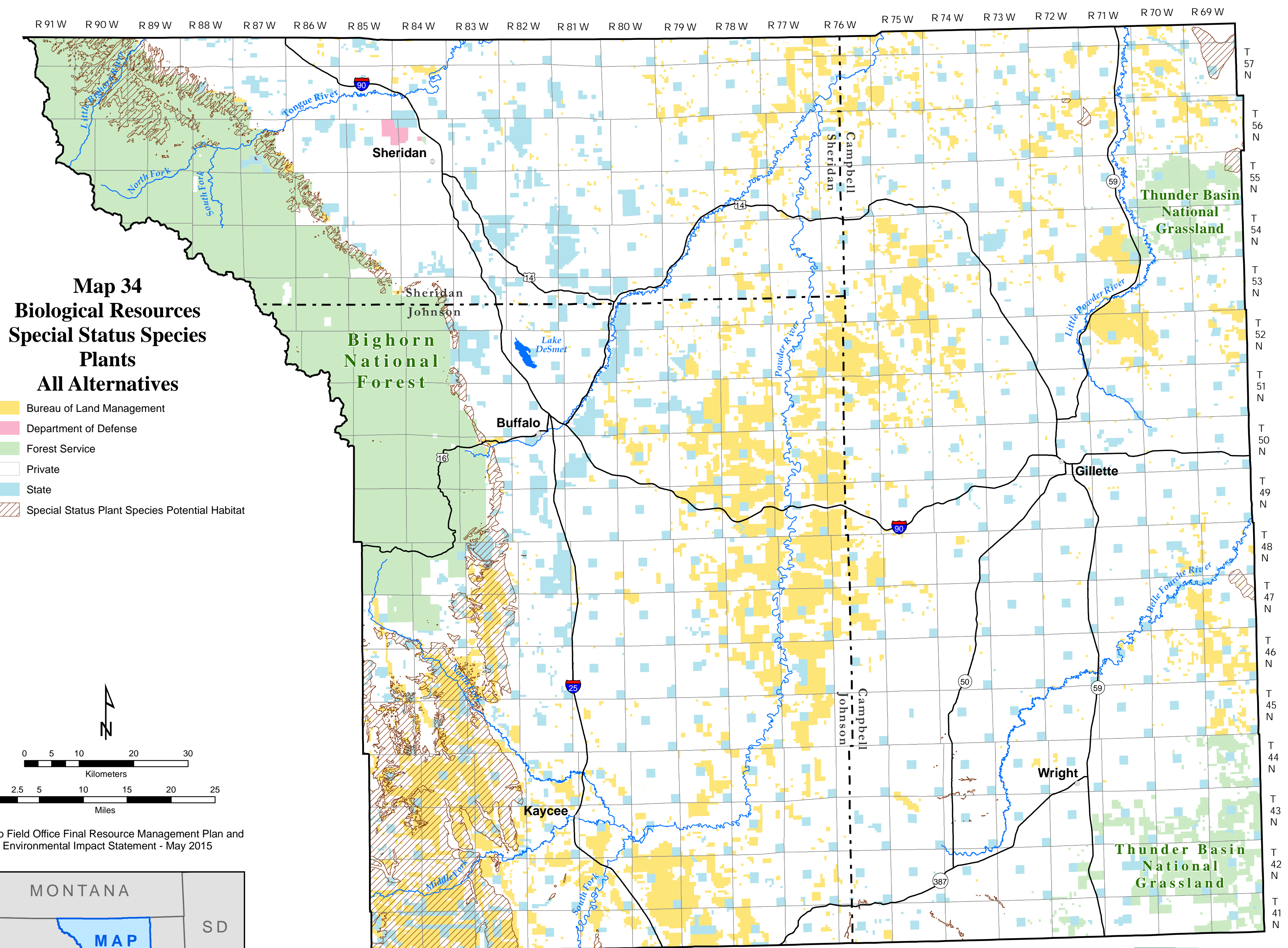
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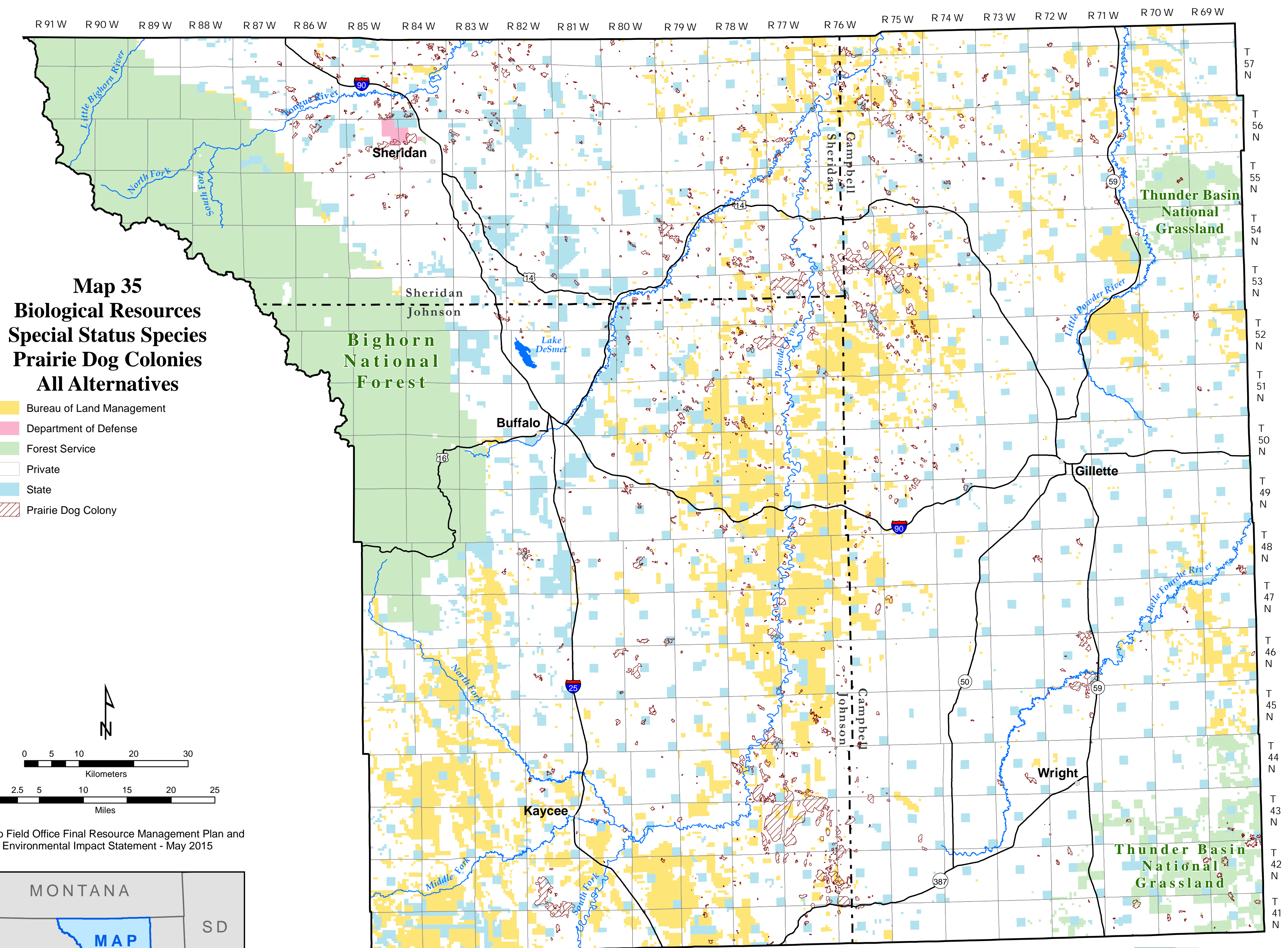
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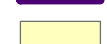






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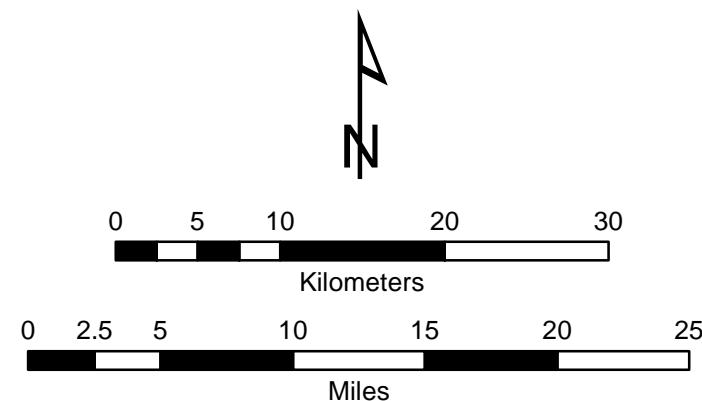


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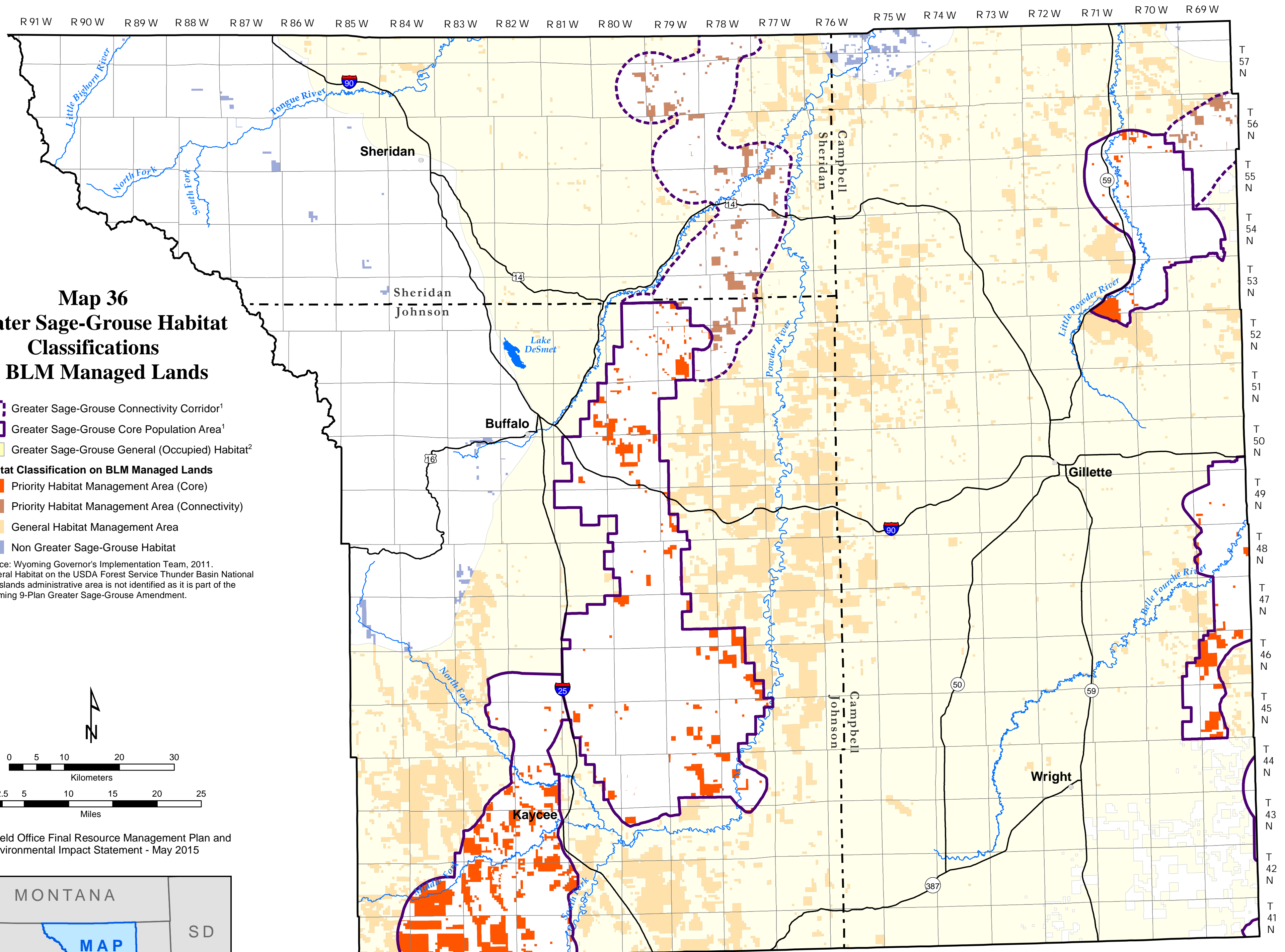
Map 36 Greater Sage-Grouse Habitat Classifications on BLM Managed Lands

-  Greater Sage-Grouse Connectivity Corridor¹
-  Greater Sage-Grouse Core Population Area¹
-  Greater Sage-Grouse General (Occupied) Habitat²
- Habitat Classification on BLM Managed Lands**
-  Priority Habitat Management Area (Core)
-  Priority Habitat Management Area (Connectivity)
-  General Habitat Management Area
-  Non Greater Sage-Grouse Habitat

¹Source: Wyoming Governor's Implementation Team, 2011.
²General Habitat on the USDA Forest Service Thunder Basin National Grasslands administrative area is not identified as it is part of the Wyoming 9-Plan Greater Sage-Grouse Amendment.



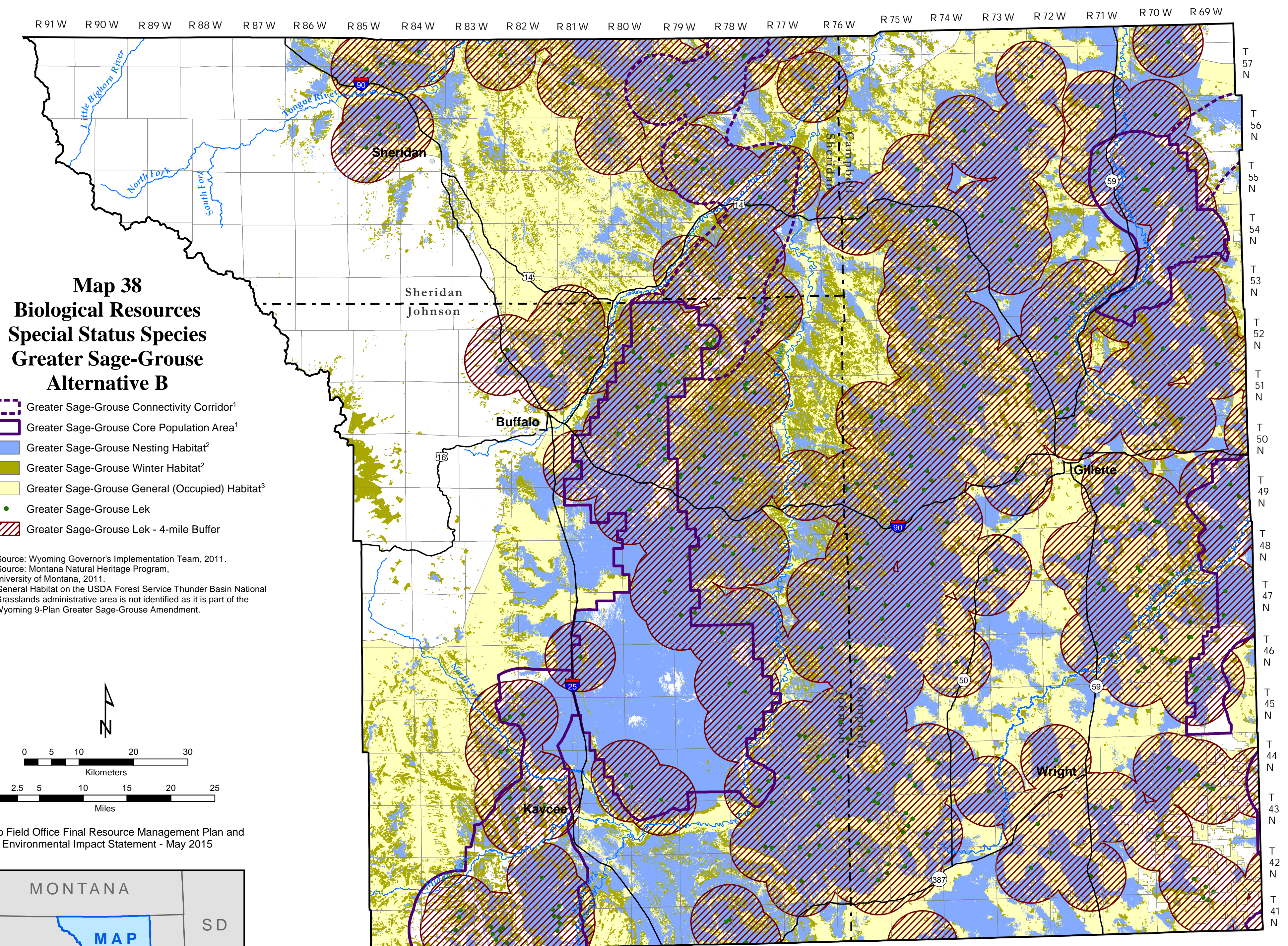
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Map 38
Biological Resources
Special Status Species
Greater Sage-Grouse
Alternative B

Greater Sage-Grouse Connectivity Corridor¹
Greater Sage-Grouse Core Population Area¹
Greater Sage-Grouse Nesting Habitat²
Greater Sage-Grouse Winter Habitat²
Greater Sage-Grouse General (Occupied) Habitat³
Greater Sage-Grouse Lek
Greater Sage-Grouse Lek - 4-mile Buffer

¹Source: Wyoming Governor's Implementation Team, 2011.
²Source: Montana Natural Heritage Program, University of Montana, 2011.
³General Habitat on the USDA Forest Service Thunder Basin National Grasslands administrative area is not identified as it is part of the Wyoming 9-Plan Greater Sage-Grouse Amendment.

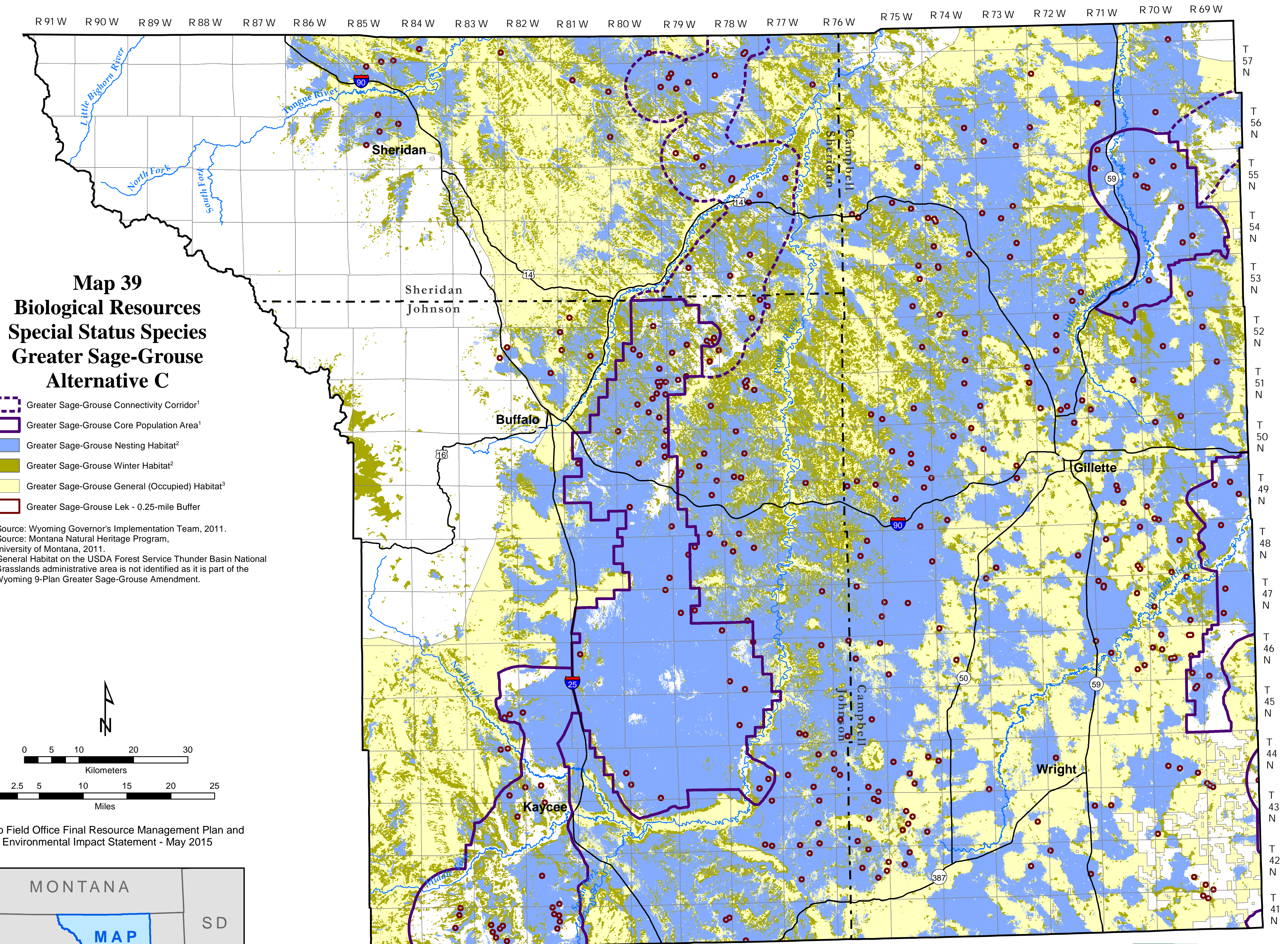
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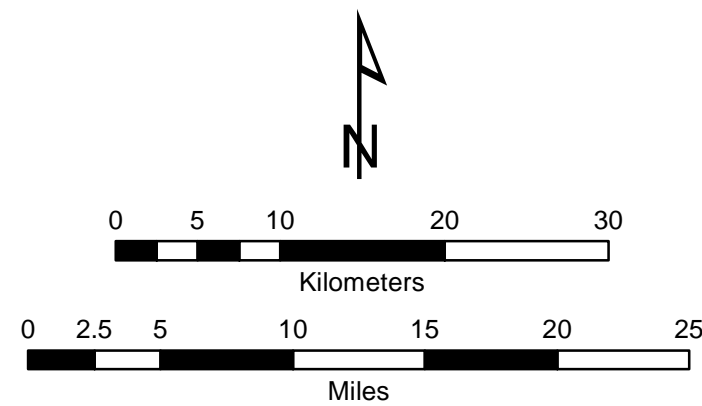
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Map 39 **Biological Resources** **Special Status Species** **Greater Sage-Grouse** **Alternative C**

- Greater Sage-Grouse Connectivity Corridor¹
- Greater Sage-Grouse Core Population Area¹
- Greater Sage-Grouse Nesting Habitat²
- Greater Sage-Grouse Winter Habitat²
- Greater Sage-Grouse General (Occupied) Habitat³
- Greater Sage-Grouse Lek - 0.25-mile Buffer

¹Source: Wyoming Governor's Implementation Team, 2011.
²Source: Montana Natural Heritage Program, University of Montana, 2011.
³General Habitat on the USDA Forest Service Thunder Basin National Grasslands administrative area is not identified as it is part of the Wyoming 9-Plan Greater Sage-Grouse Amendment.



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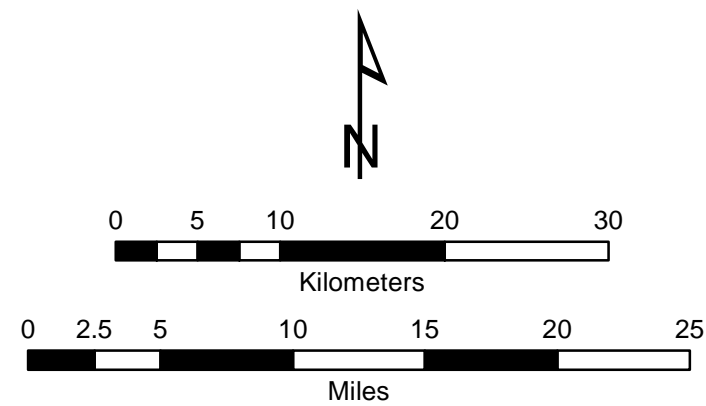


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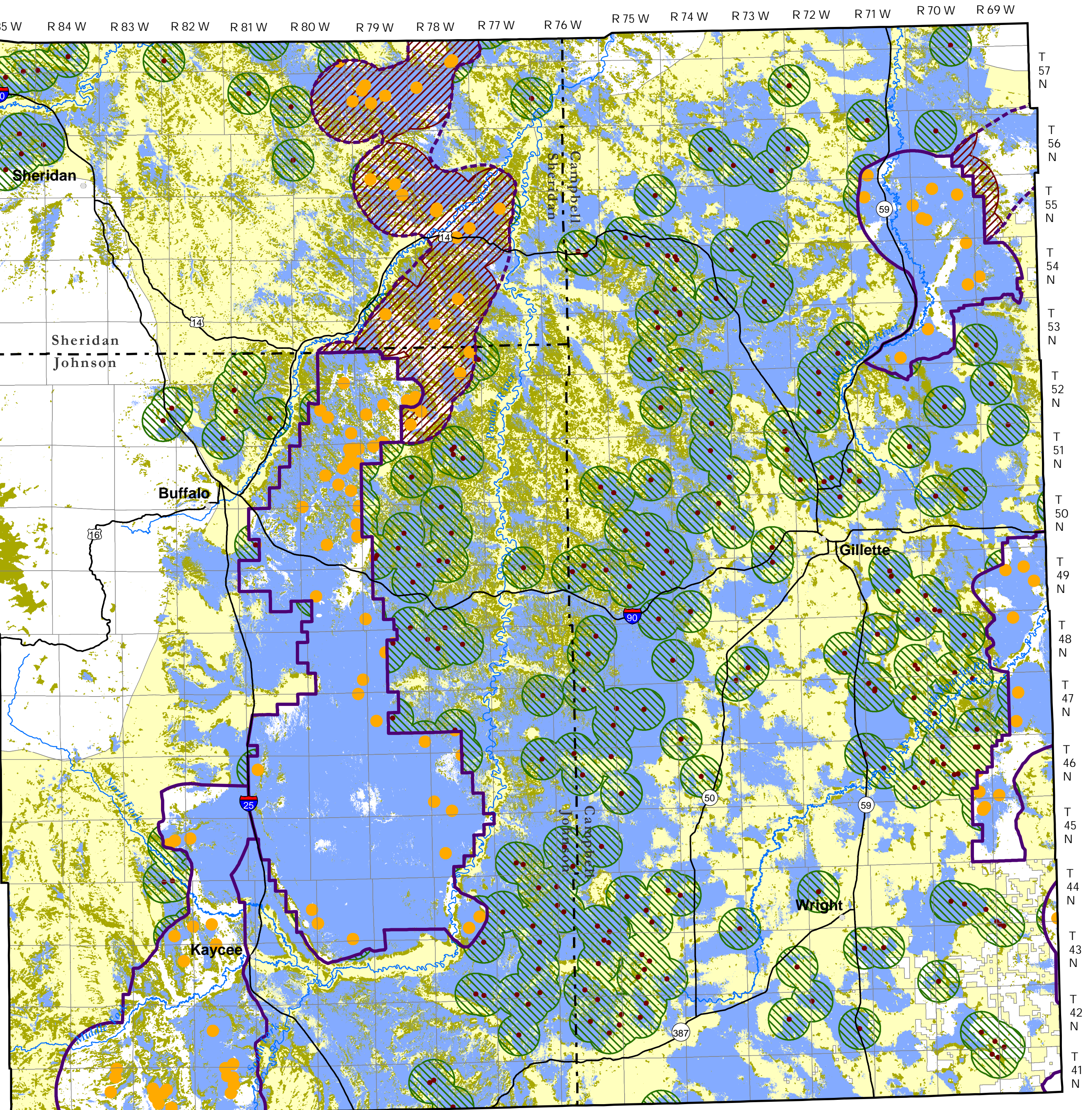
Map 40 **Biological Resources** **Special Status Species** **Greater Sage-Grouse** **Alternative D**

-  Greater Sage-Grouse Connectivity Corridor¹
-  Greater Sage-Grouse Core Population Area¹
-  Greater Sage-Grouse Nesting Habitat²
-  Greater Sage-Grouse Winter Habitat²
-  Greater Sage-Grouse General (Occupied) Habitat³
- Greater Sage-Grouse Lek Buffers Inside Core Population Area and Connectivity Corridor**
-  Greater Sage-Grouse Lek - 0.6-mile Buffer
- Greater Sage-Grouse Lek Buffers Inside Connectivity Corridor**
-  Greater Sage-Grouse Lek - 4-mile Buffer
- Greater Sage-Grouse Lek Buffers Outside Core Population Area and Connectivity Corridor**
-  Greater Sage-Grouse Lek - 0.25-mile Buffer
-  Greater Sage-Grouse Lek - 2-mile Buffer

¹Source: Wyoming Governor's Implementation Team, 2011.
²Source: Montana Natural Heritage Program, University of Montana, 2011.
³General Habitat on the USDA Forest Service Thunder Basin National Grasslands administrative area is not identified as it is part of the Wyoming 9-Plan Greater Sage-Grouse Amendment.



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Map 41

Biological Resources

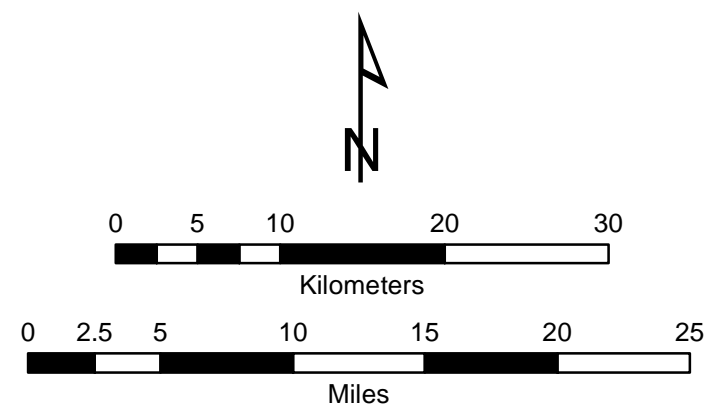
Special Status Species

Bald Eagle Roosts and Nests

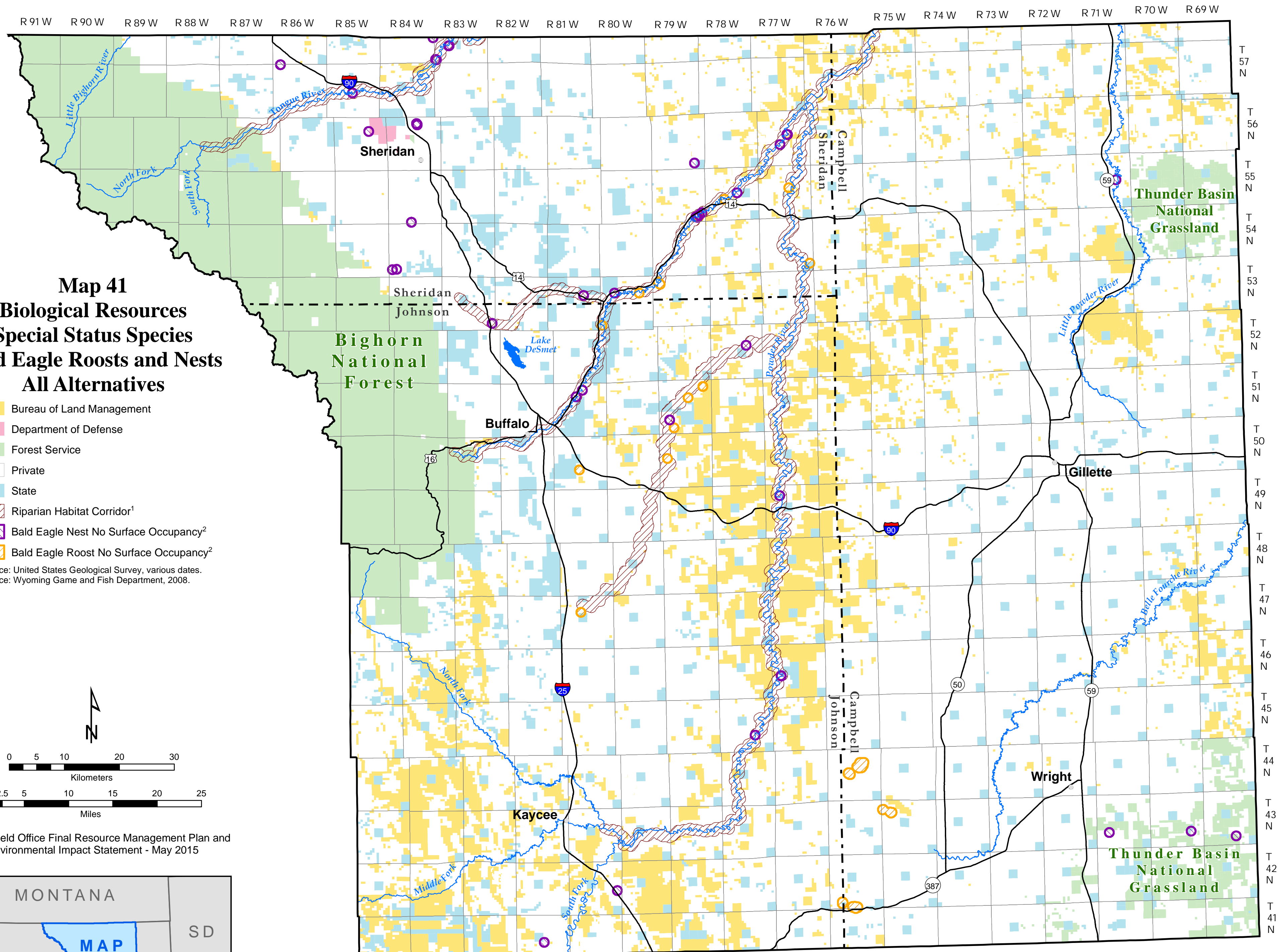
All Alternatives

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Riparian Habitat Corridor¹
- Bald Eagle Nest No Surface Occupancy²
- Bald Eagle Roost No Surface Occupancy²

¹Source: United States Geological Survey, various dates.
²Source: Wyoming Game and Fish Department, 2008.



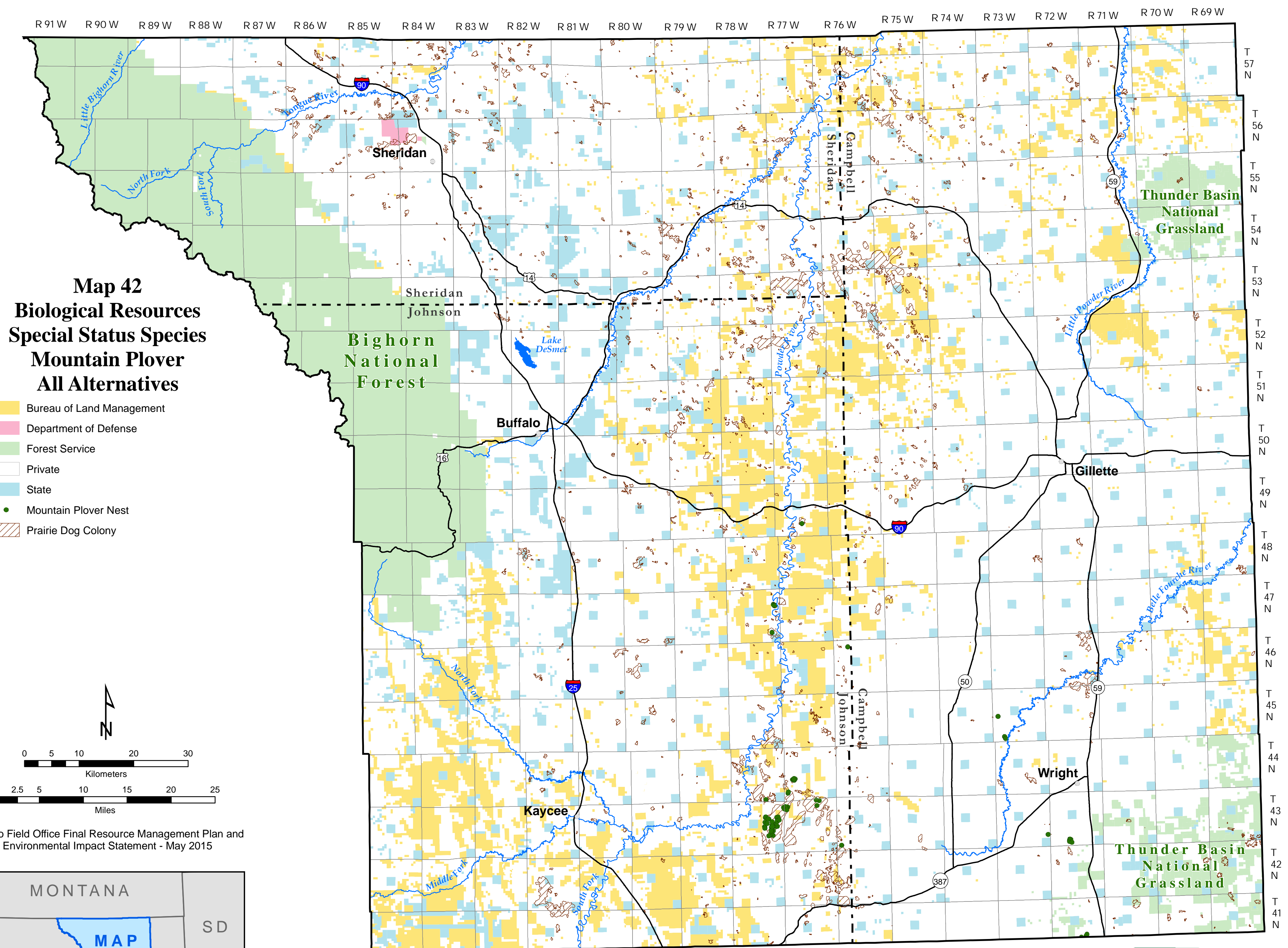
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Map 43

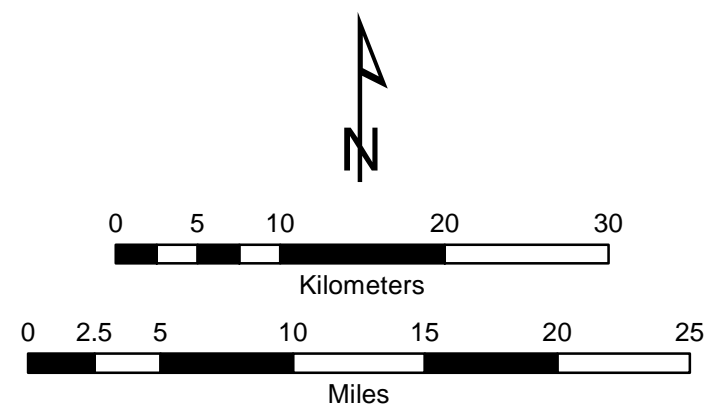
Heritage and Visual Resources

Cultural Resources

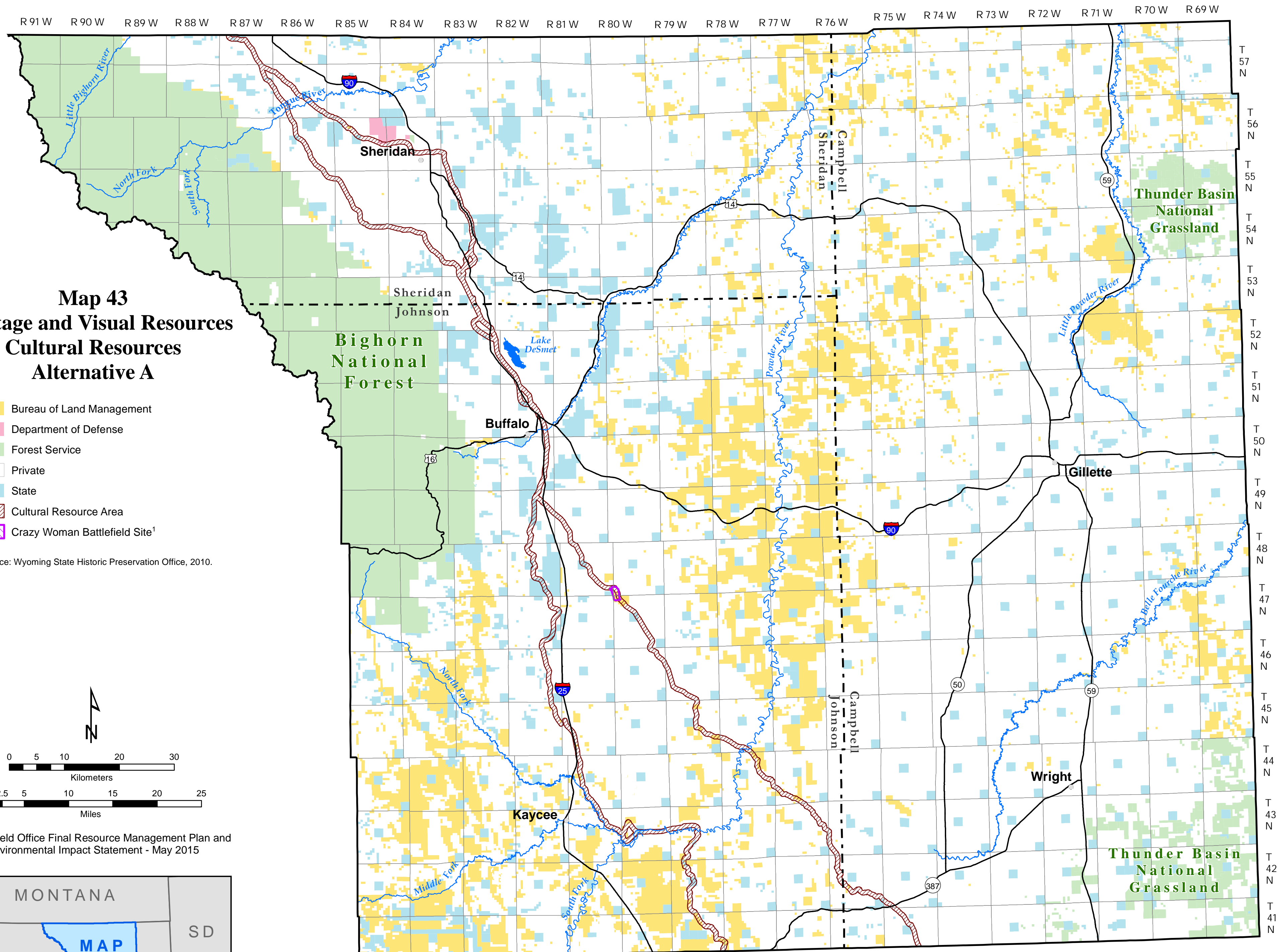
Alternative A

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Cultural Resource Area
- Crazy Woman Battlefield Site¹

¹Source: Wyoming State Historic Preservation Office, 2010.



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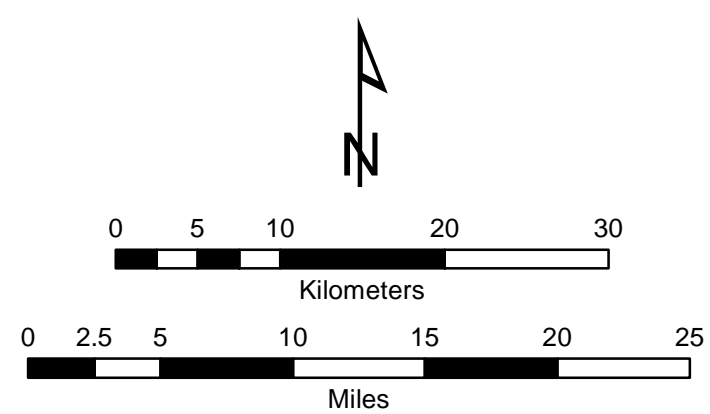
Map 44

Heritage and Visual Resources

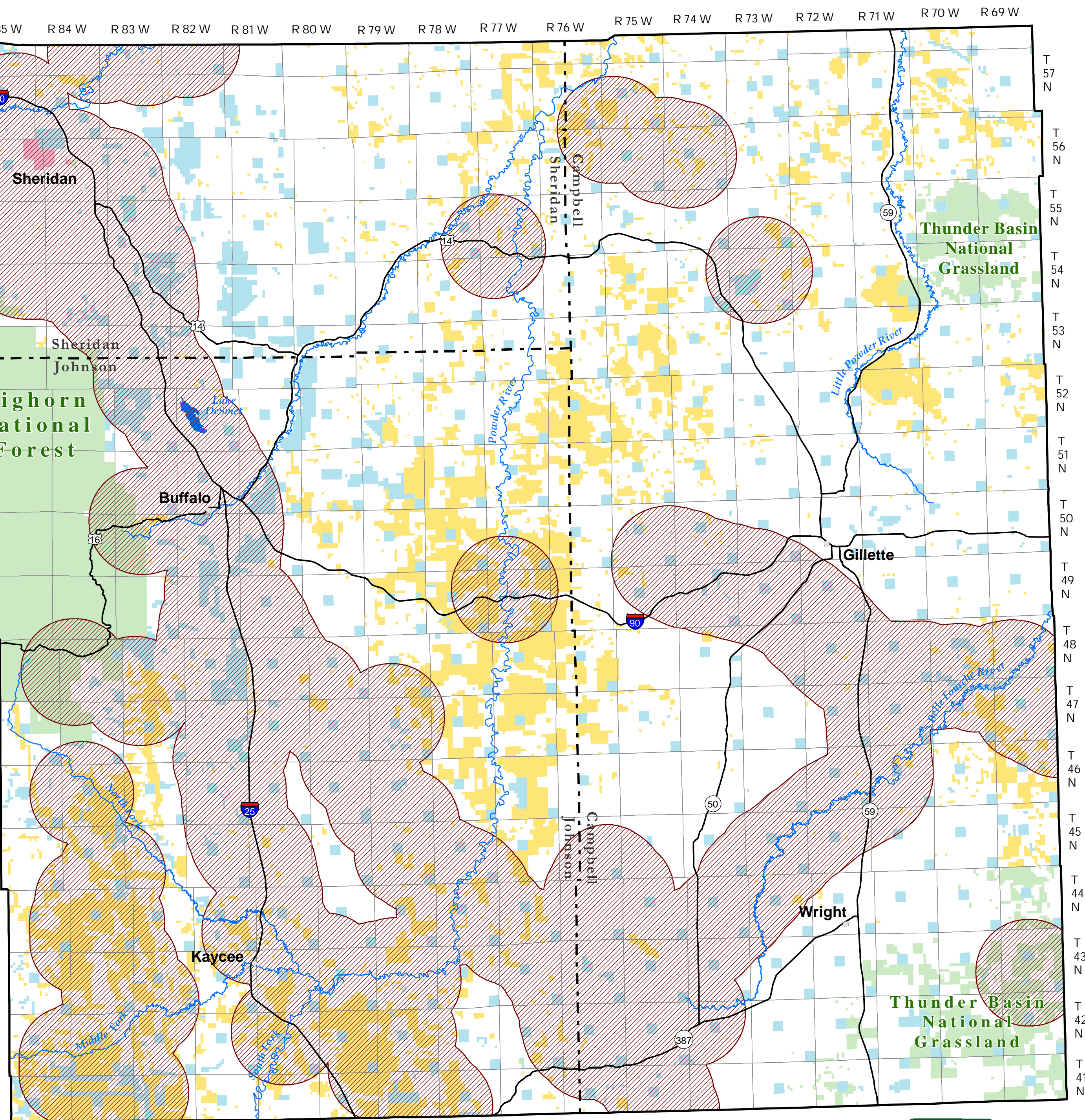
Cultural Resources

Alternative B

-  Bureau of Land Management
-  Department of Defense
-  Forest Service
-  Private
-  State
-  Cultural Resource Area



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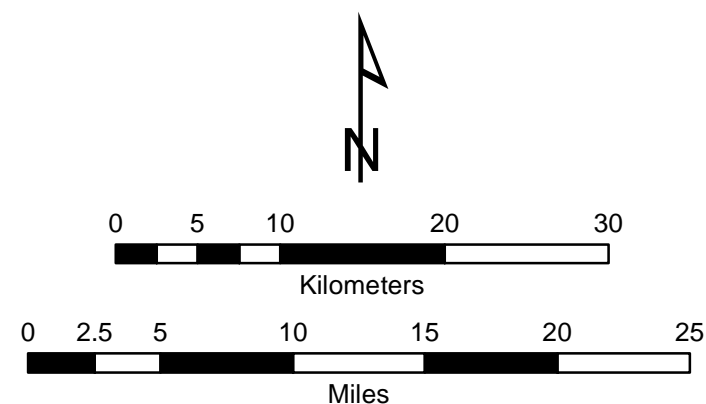
Map 45

Heritage and Visual Resources

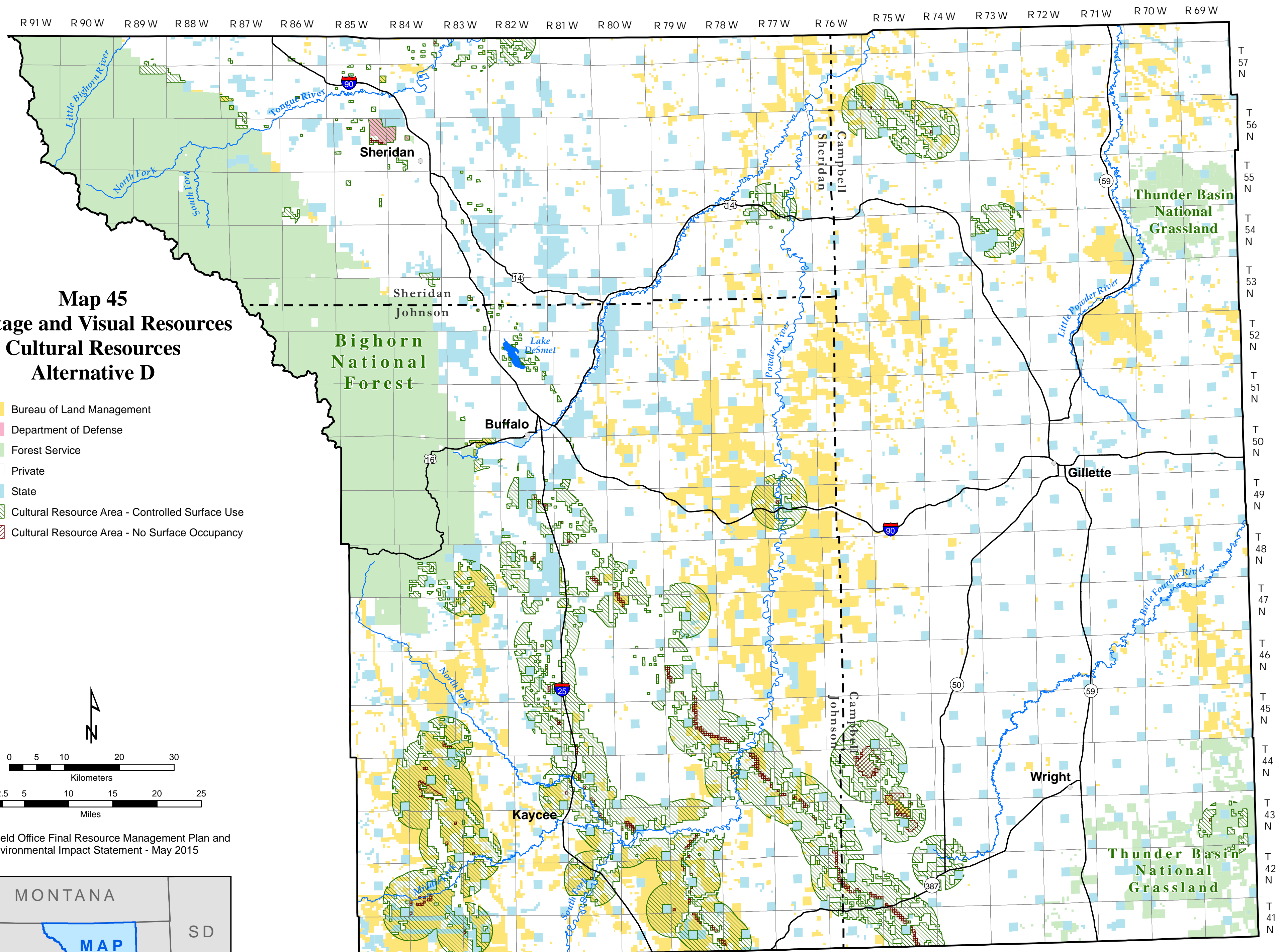
Cultural Resources

Alternative D

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Cultural Resource Area - Controlled Surface Use
- Cultural Resource Area - No Surface Occupancy



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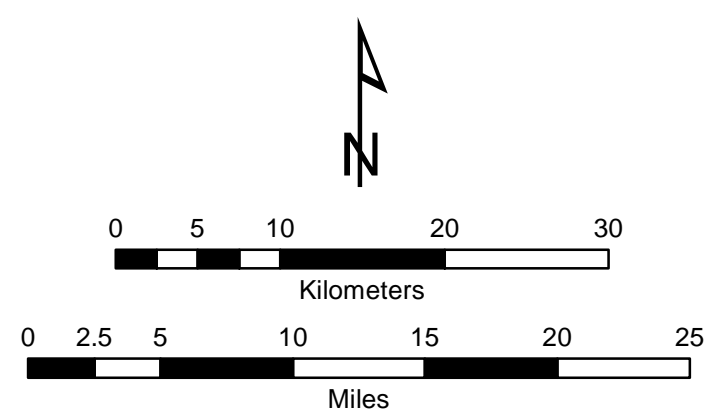
Map 46

Heritage and Visual Resources

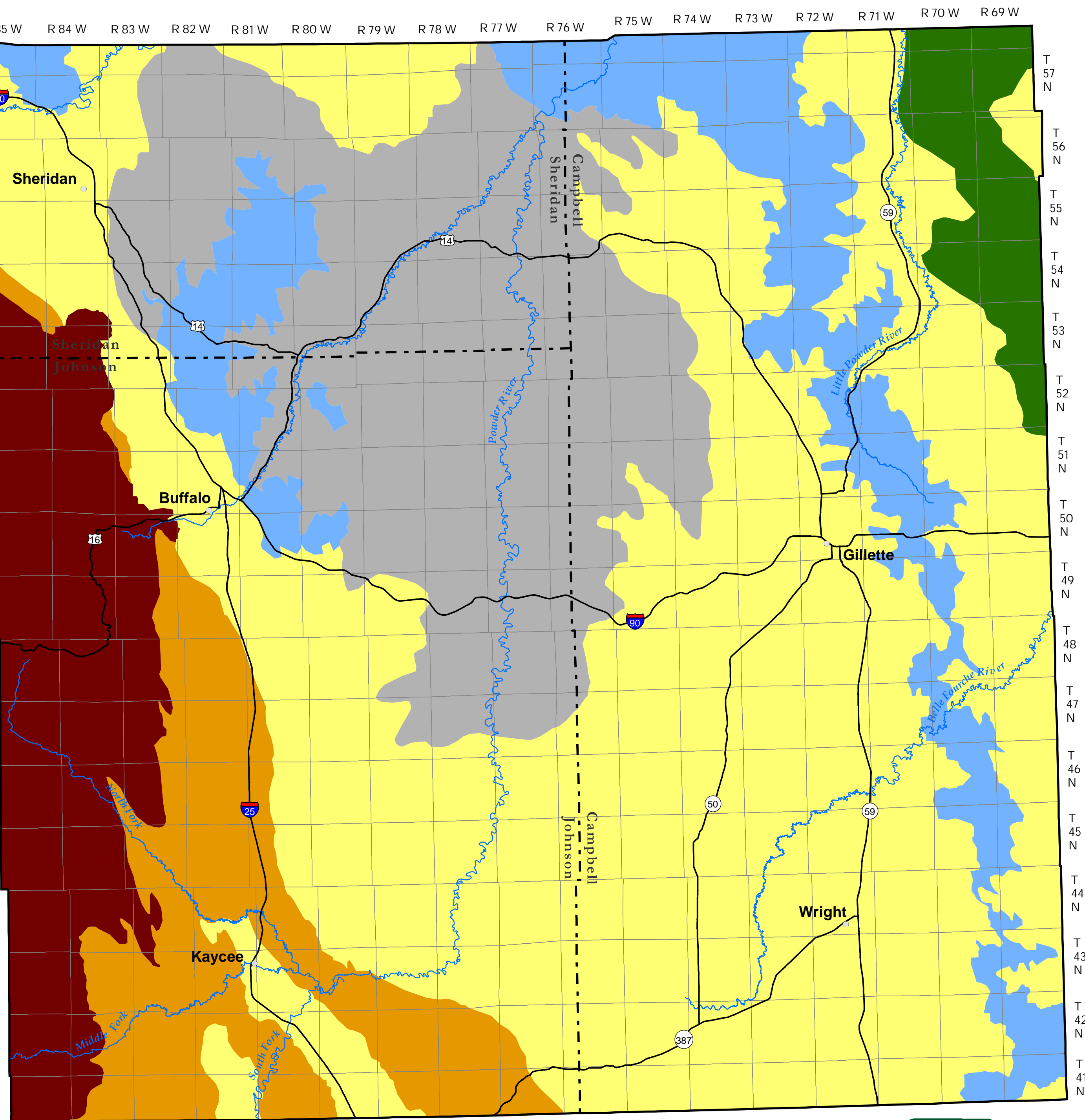
Cultural Sub-Regions

All Alternatives

- Breaks
- Foothills/Escarpments
- Mountains
- Plains
- Recessional Escarpment
- Scoria Hills



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Map 47

Heritage and Visual Resources

Potential Fossil Yield Classification

All Alternatives

Potential Fossil Yield Classification

- 0 = Water
- 1 = Very Low
- 2 = Low
- 3 = Moderate or Unknown
- 3a = Moderate
- 5 = Very High



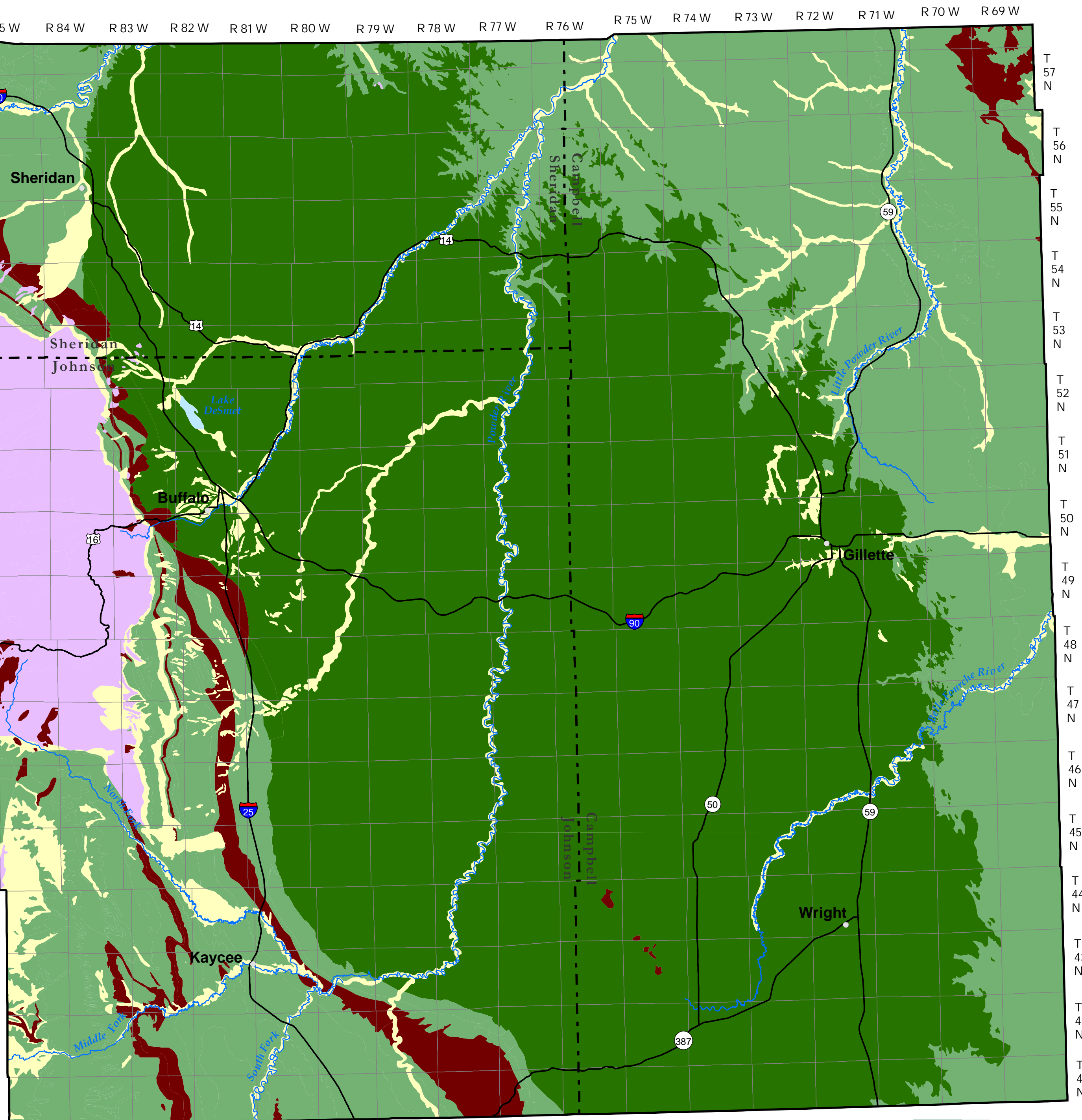
0 5 10 20 30

Kilometers

0 2.5 5 10 15 20 25

Miles

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Map 48

Heritage and Visual Resources

Visual Resource Management

Alternative A

Visual Resource Management Class

- Class II
- Class III
- Class IV
- Class V



0 5 10 20 30

Kilometers

0 2.5 5 10 15 20 25

Miles

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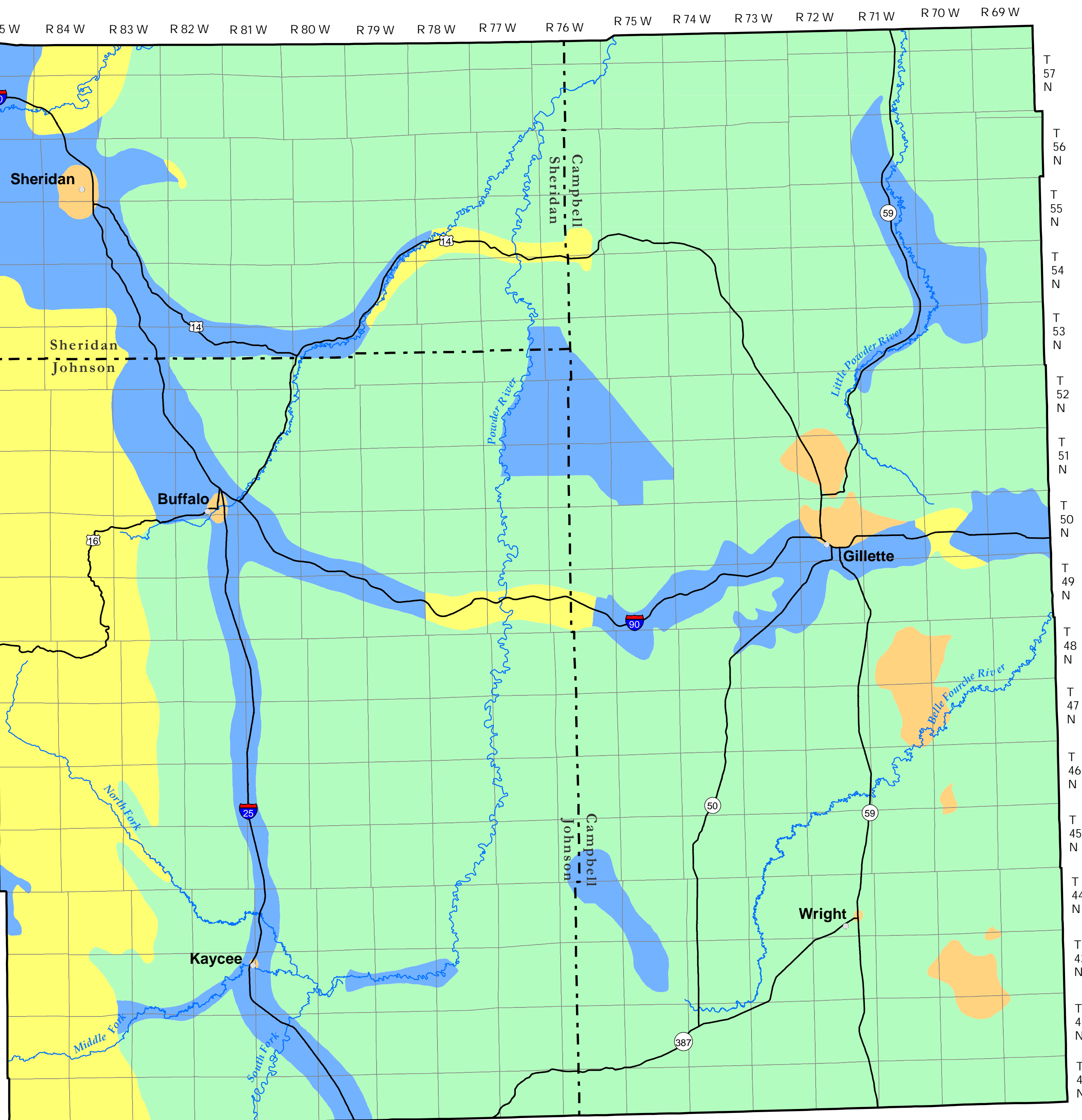


MONTANA

SD

WYOMING

NE



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Map 49

Heritage and Visual Resources

Visual Resource Management

Alternative B

Visual Resource Management Class

- Class I
- Class II
- Class III
- Class IV
- Not Rated



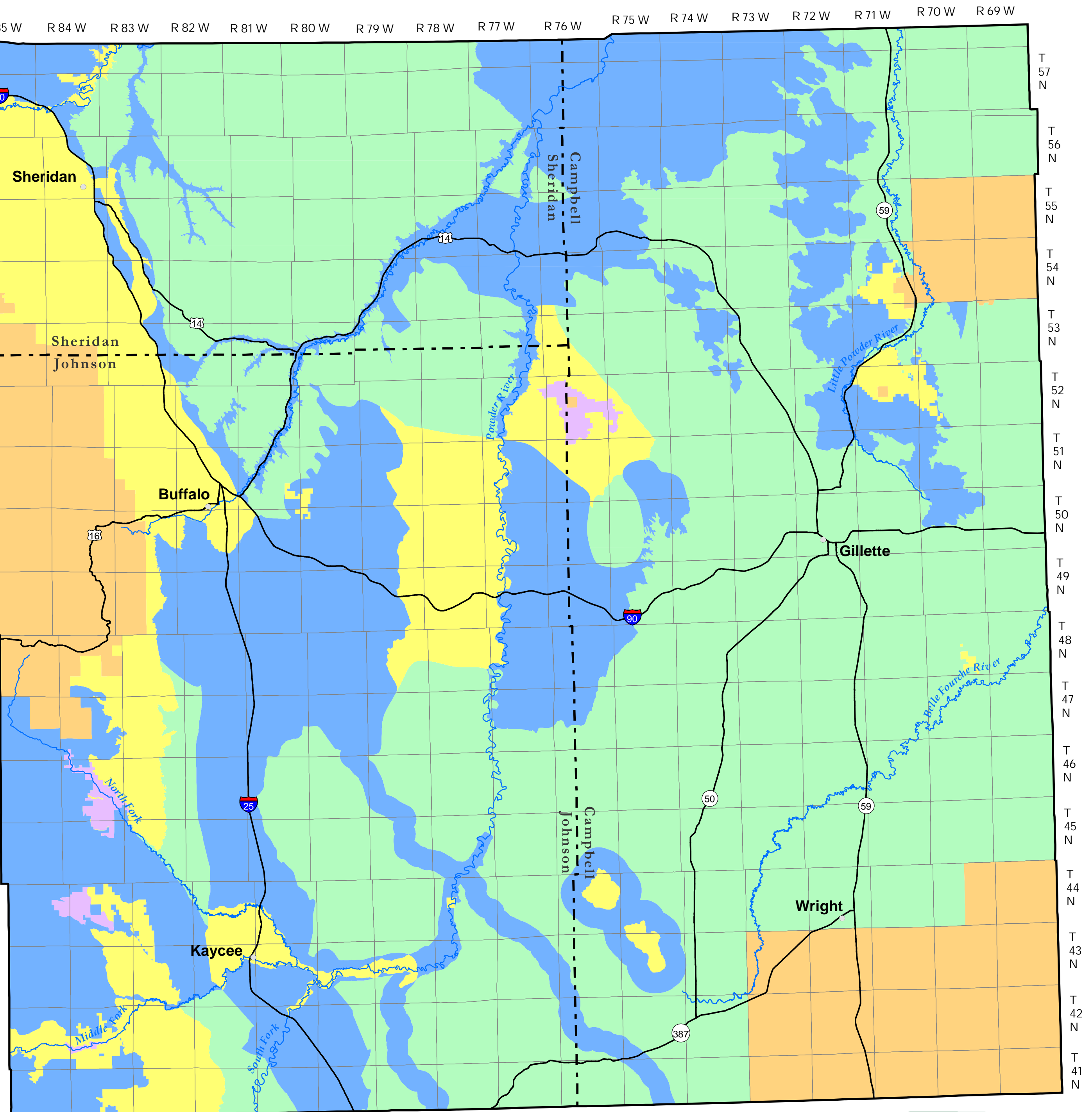
0 5 10 20 30

Kilometers

0 2.5 5 10 15 20 25

Miles

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Map 50

Heritage and Visual Resources

Visual Resource Management

Alternative C

Visual Resource Management Class

- Class I
- Class III
- Class IV
- Not Rated



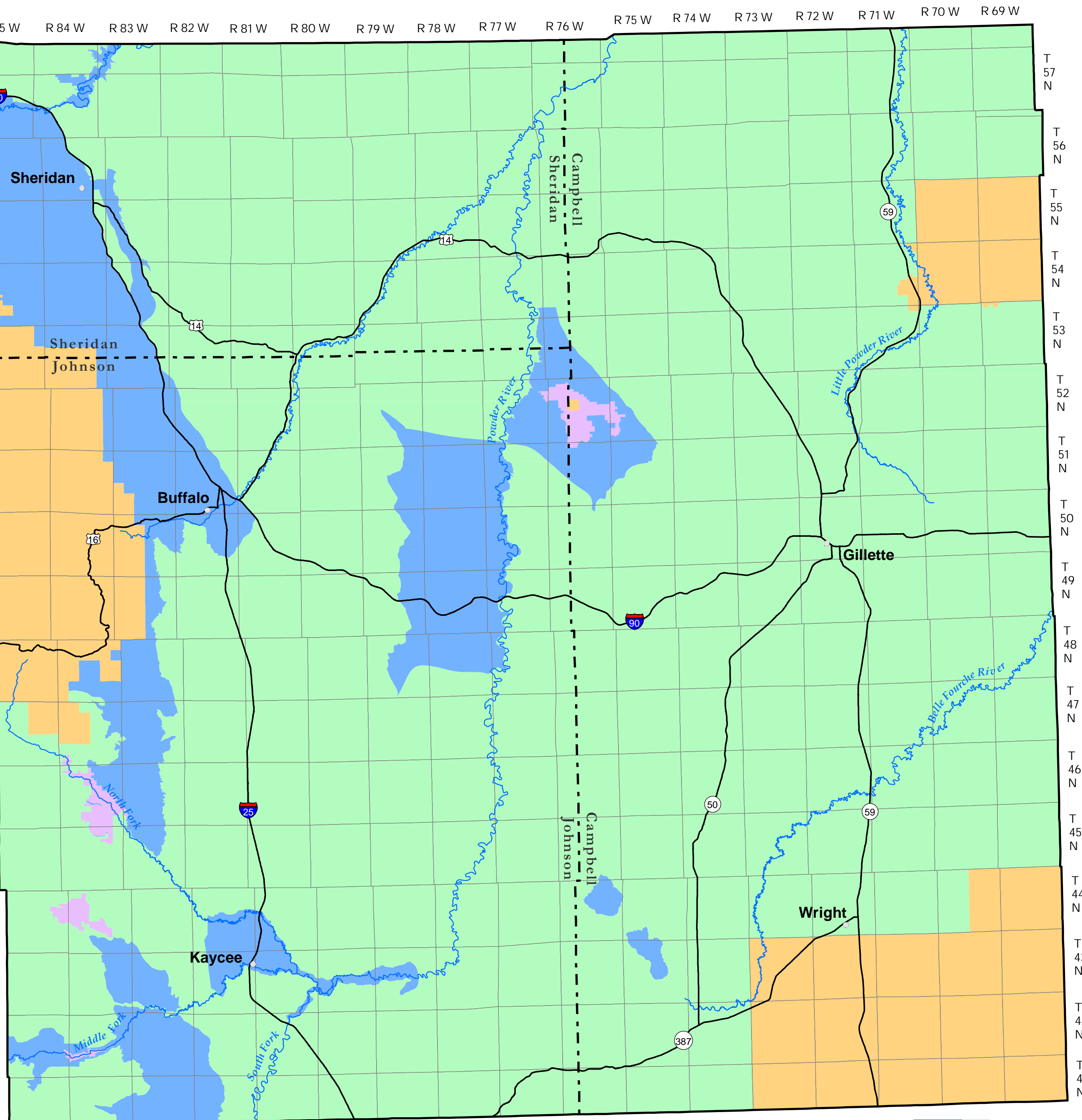
0 5 10 20 30

Kilometers

0 2.5 5 10 15 20 25

Miles

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Map 51

Heritage and Visual Resources

Visual Resource Management

Alternative D

Visual Resource Management Class

- Class I
- Class II
- Class III
- Class IV
- Not Rated



0 5 10 20 30

Kilometers

0 2.5 5 10 15 20 25

Miles

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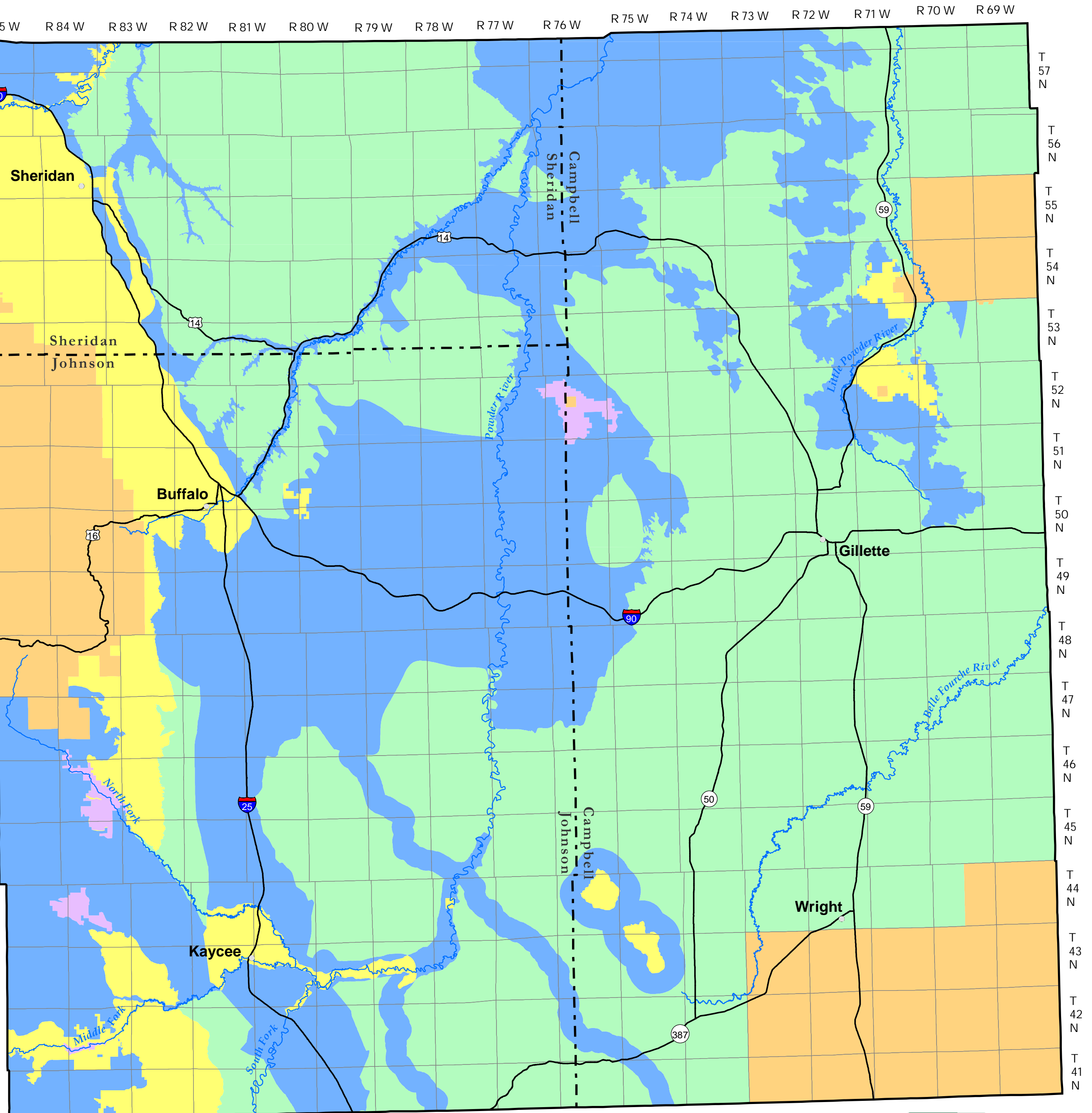


MONTANA

SD

WYOMING

NE



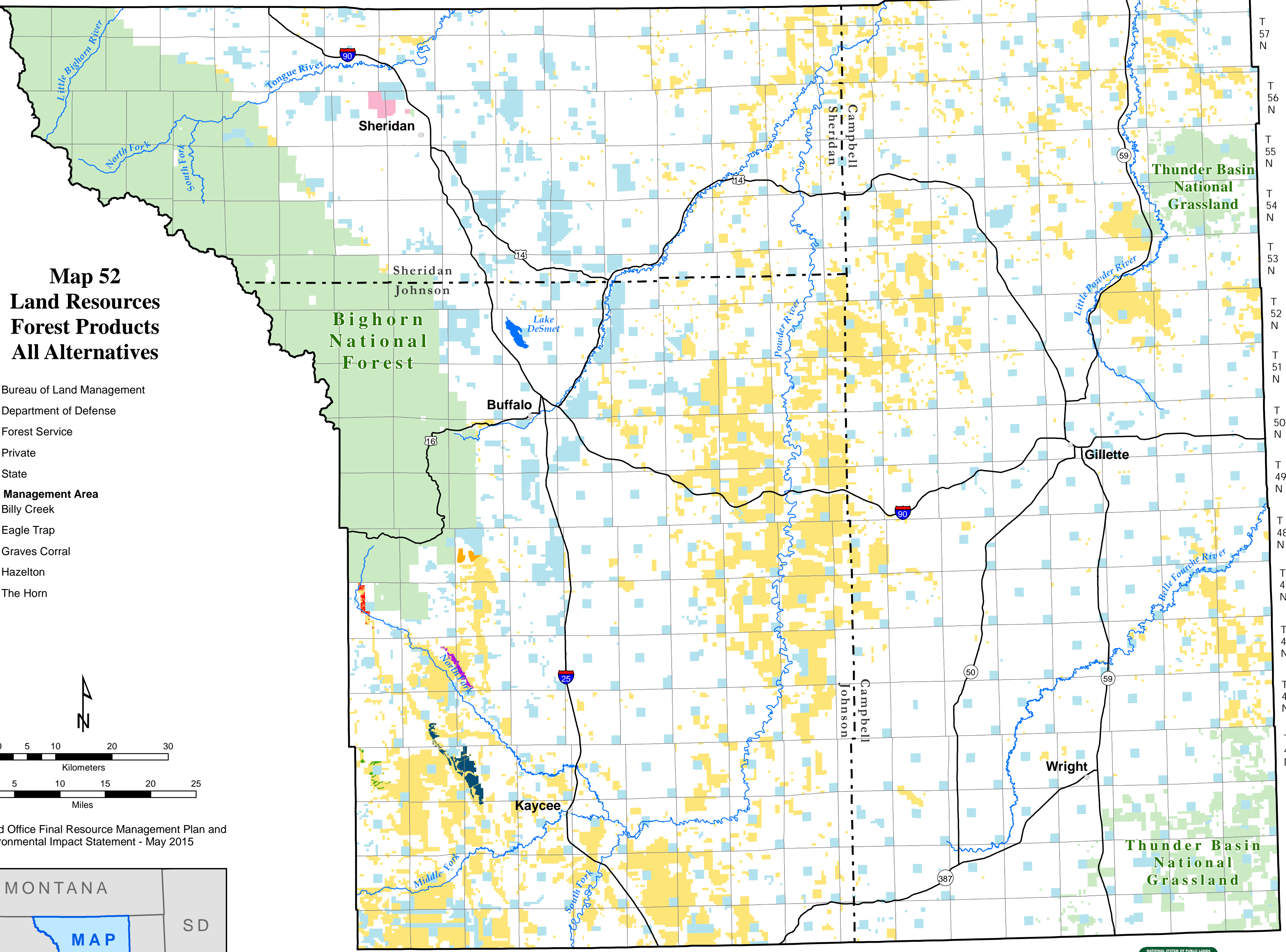
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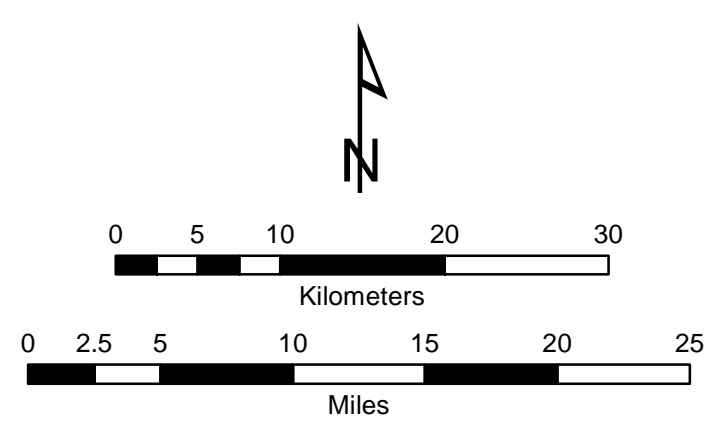
R 91 W R 90 W R 89 W R 88 W R 87 W R 86 W R 85 W R 84 W R 83 W R 82 W R 81 W R 80 W R 79 W R 78 W R 77 W R 76 W R 75 W R 74 W R 73 W R 72 W R 71 W R 70 W R 69 W

T 57 N
T 56 N
T 55 N
T 54 N
T 53 N
T 52 N
T 51 N
T 50 N
T 49 N
T 48 N
T 47 N
T 46 N
T 45 N
T 44 N
T 43 N
T 42 N
T 41 N



Map 52
Land Resources
Forest Products
All Alternatives

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Forest Management Area**
 - Billy Creek
 - Eagle Trap
 - Graves Corral
 - Hazelton
 - The Horn



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R 91 W R 90 W R 89 W R 88 W R 87 W R 86 W R 85 W R 84 W R 83 W R 82 W R 81 W R 80 W R 79 W R 78 W R 77 W R 76 W R 75 W R 74 W R 73 W R 72 W R 71 W R 70 W R 69 W

T 57 N
T 56 N
T 55 N
T 54 N
T 53 N
T 52 N
T 51 N
T 50 N
T 49 N
T 48 N
T 47 N
T 46 N
T 45 N
T 44 N
T 43 N
T 42 N
T 41 N

Map 53 Land Resources Disposal Lands Alternative A

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Land Available for Disposal

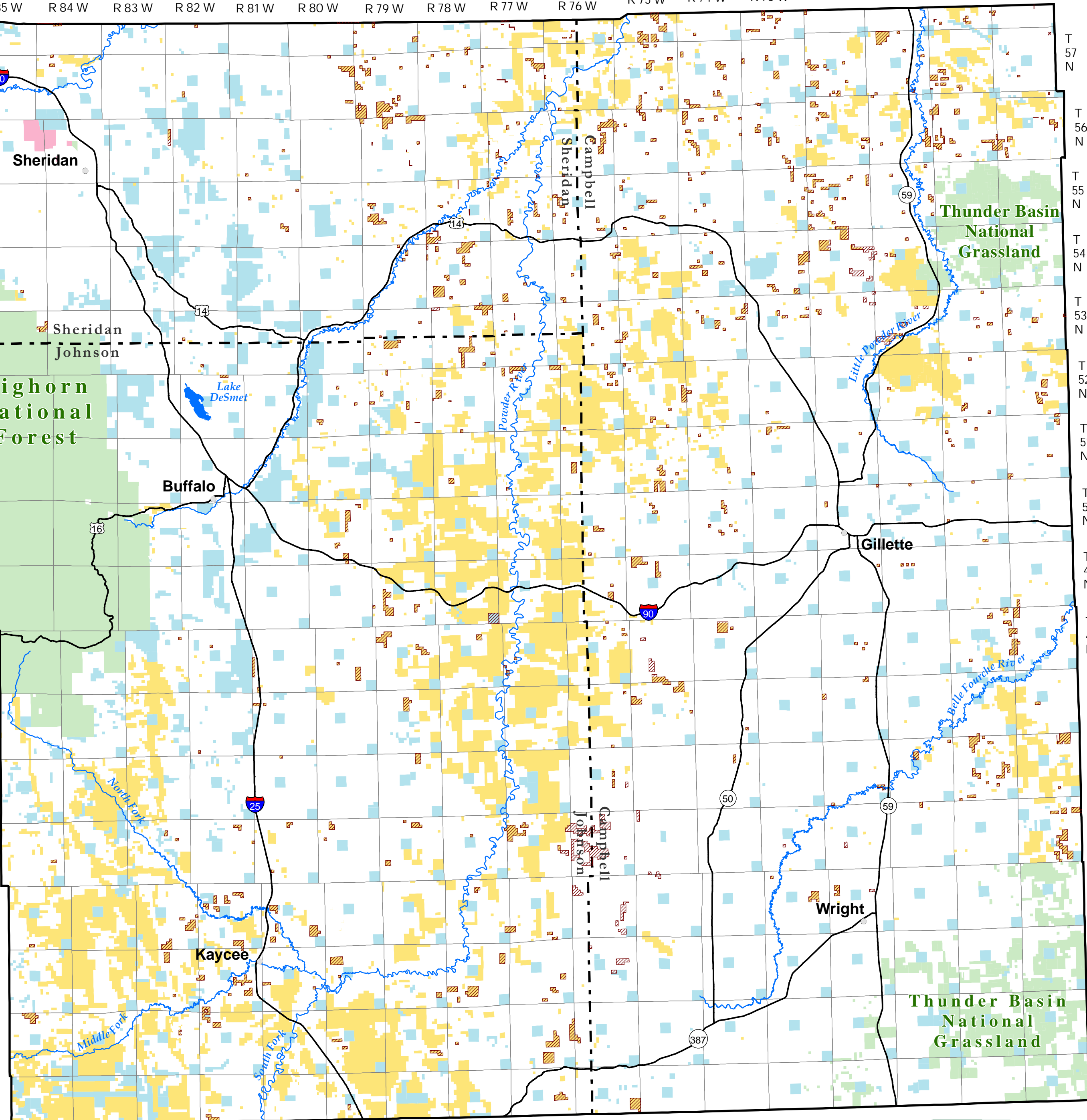
Note: The lands identified for disposal on this map are those originally identified in the 1985 RMP, and some of which may have been disposed of since 1985.



0 5 10 20 30
Kilometers

0 2.5 5 10 15 20 25
Miles

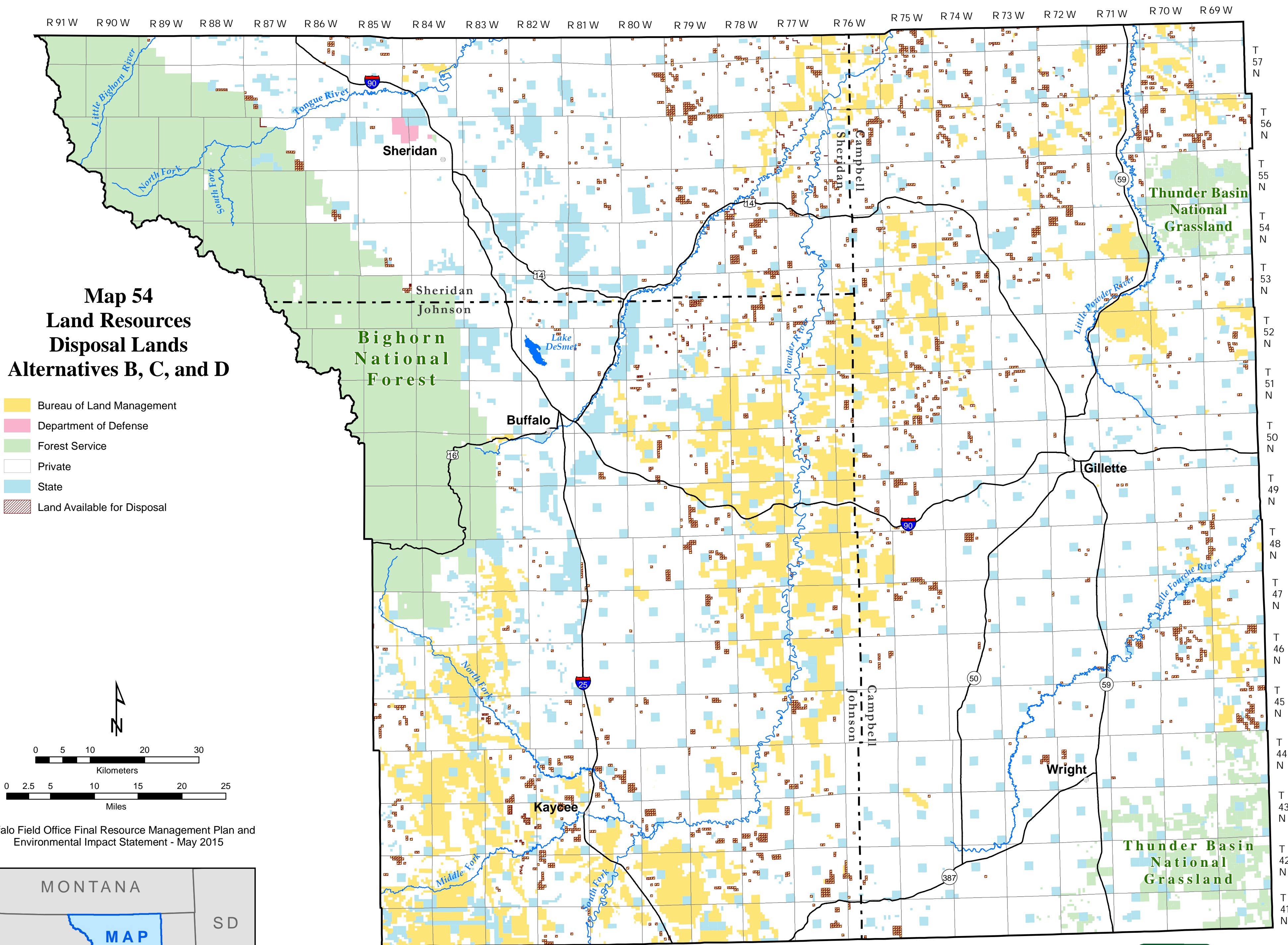
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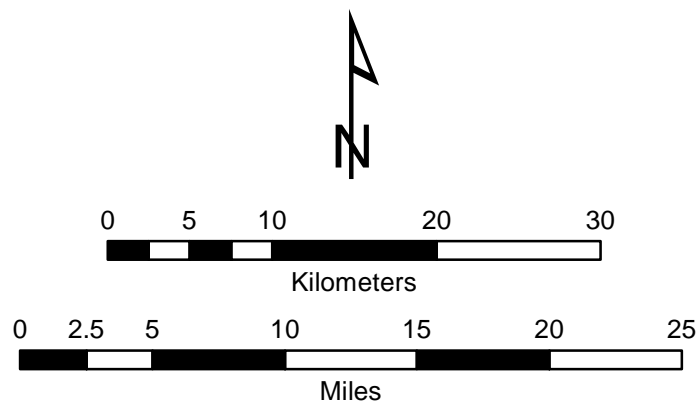


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Map 54 **Land Resources** **Disposal Lands** **Alternatives B, C, and D**

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Land Available for Disposal



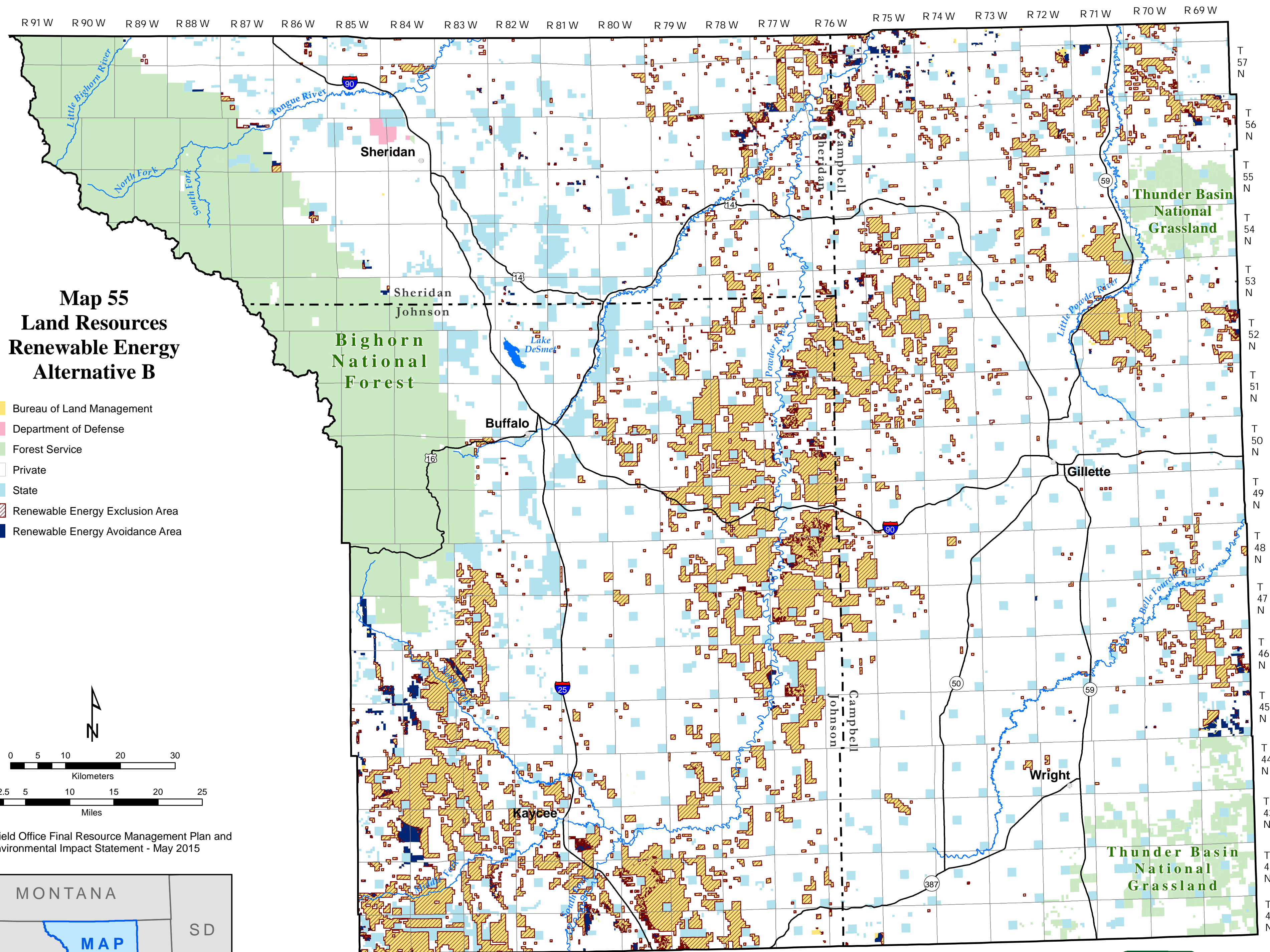
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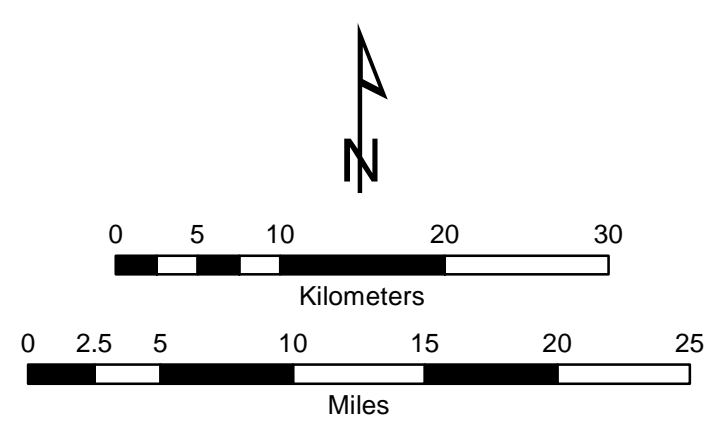


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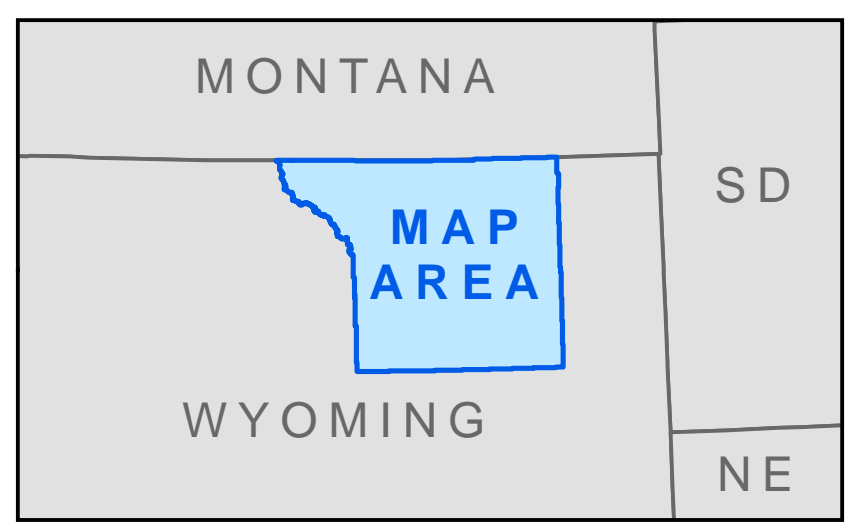


Map 55
Land Resources
Renewable Energy
Alternative B

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Renewable Energy Exclusion Area
- Renewable Energy Avoidance Area



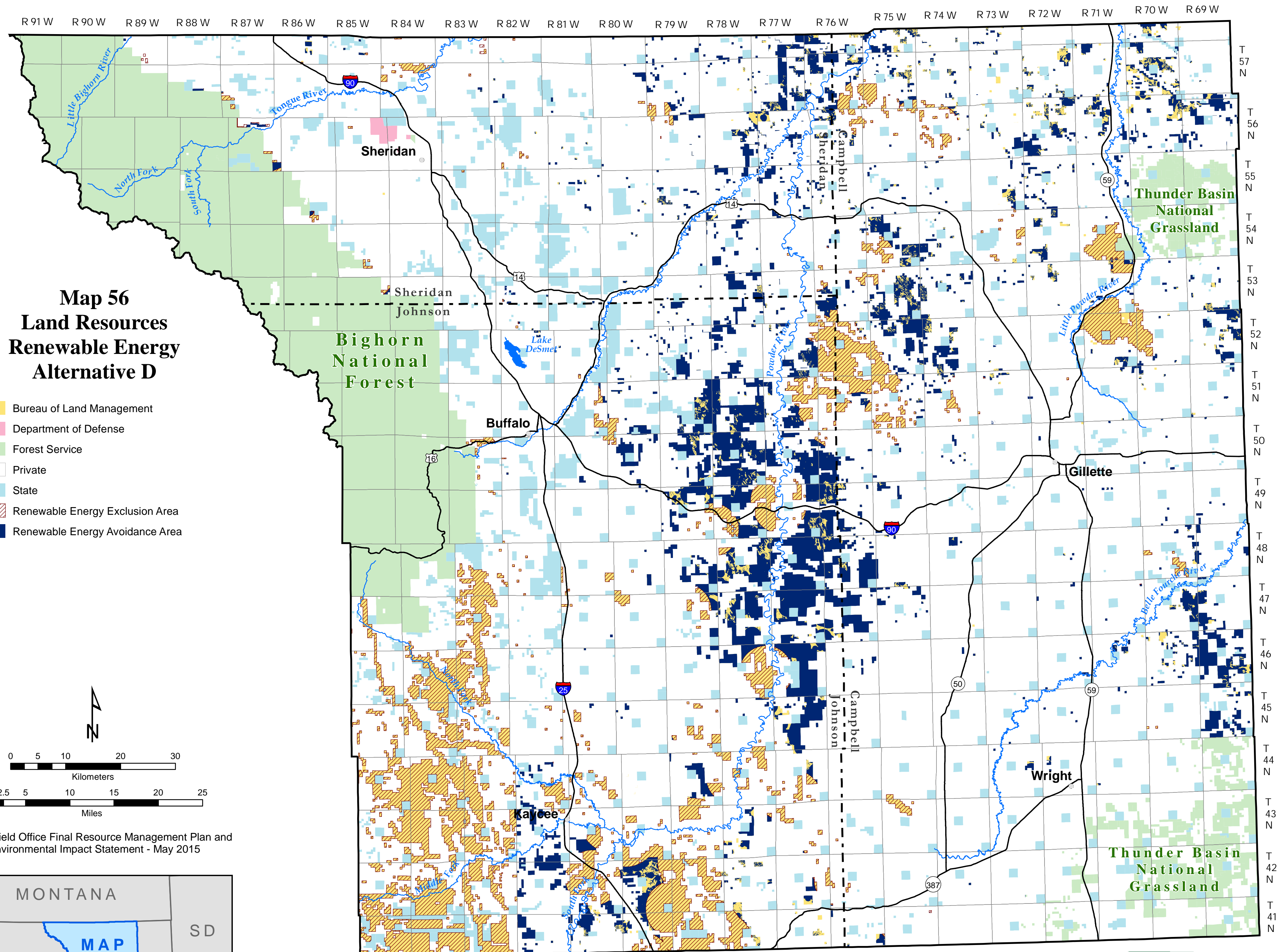
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Map 56
Land Resources
Renewable Energy
Alternative D

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Renewable Energy Exclusion Area
- Renewable Energy Avoidance Area



0 5 10 20 30
 Kilometers

0 2.5 5 10 15 20 25
 Miles

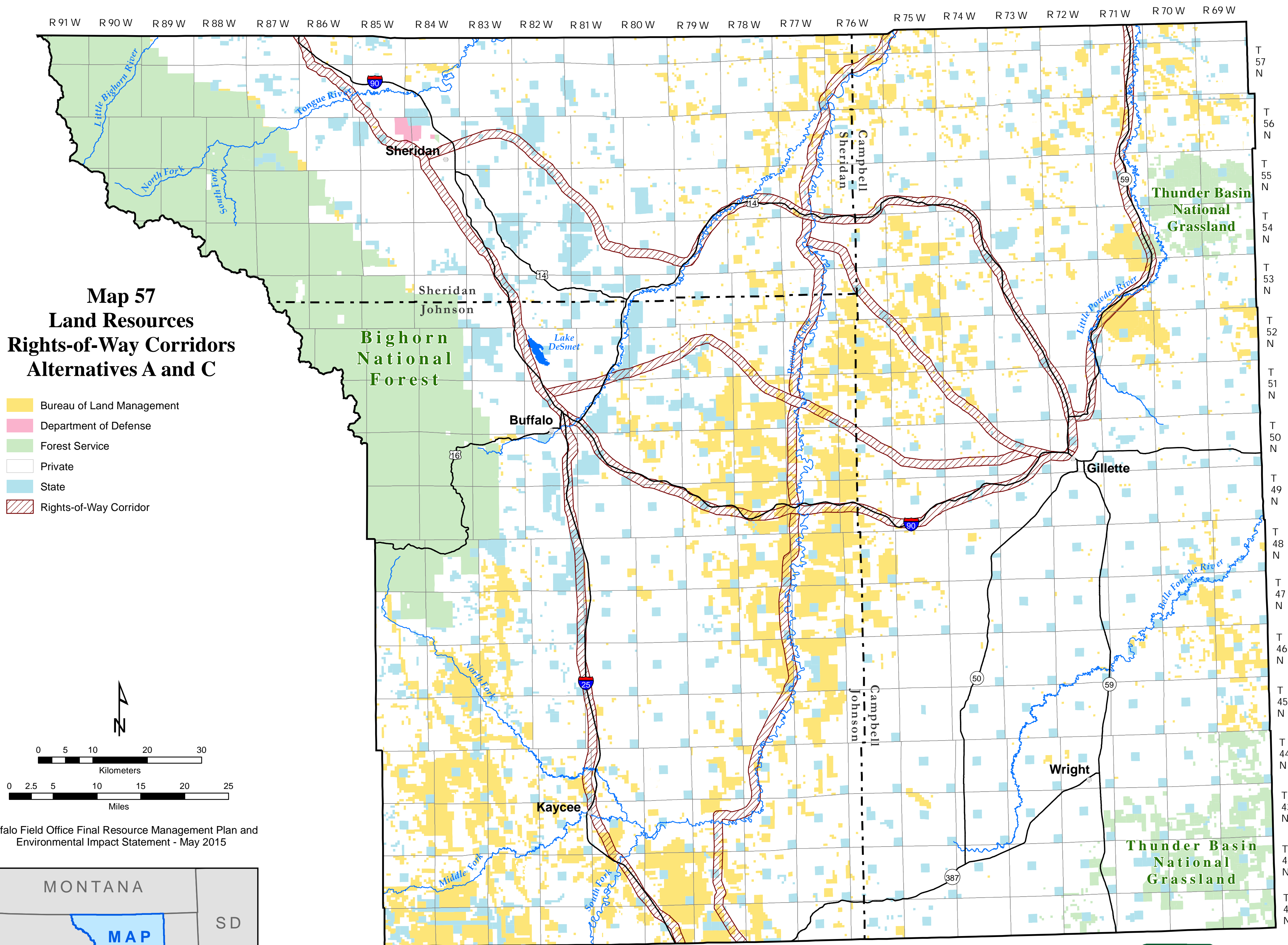
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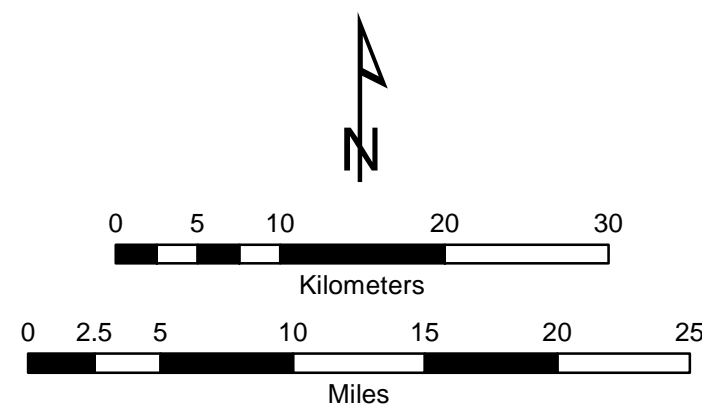


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Map 57
Land Resources
Rights-of-Way Corridors
Alternatives A and C

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Rights-of-Way Corridor



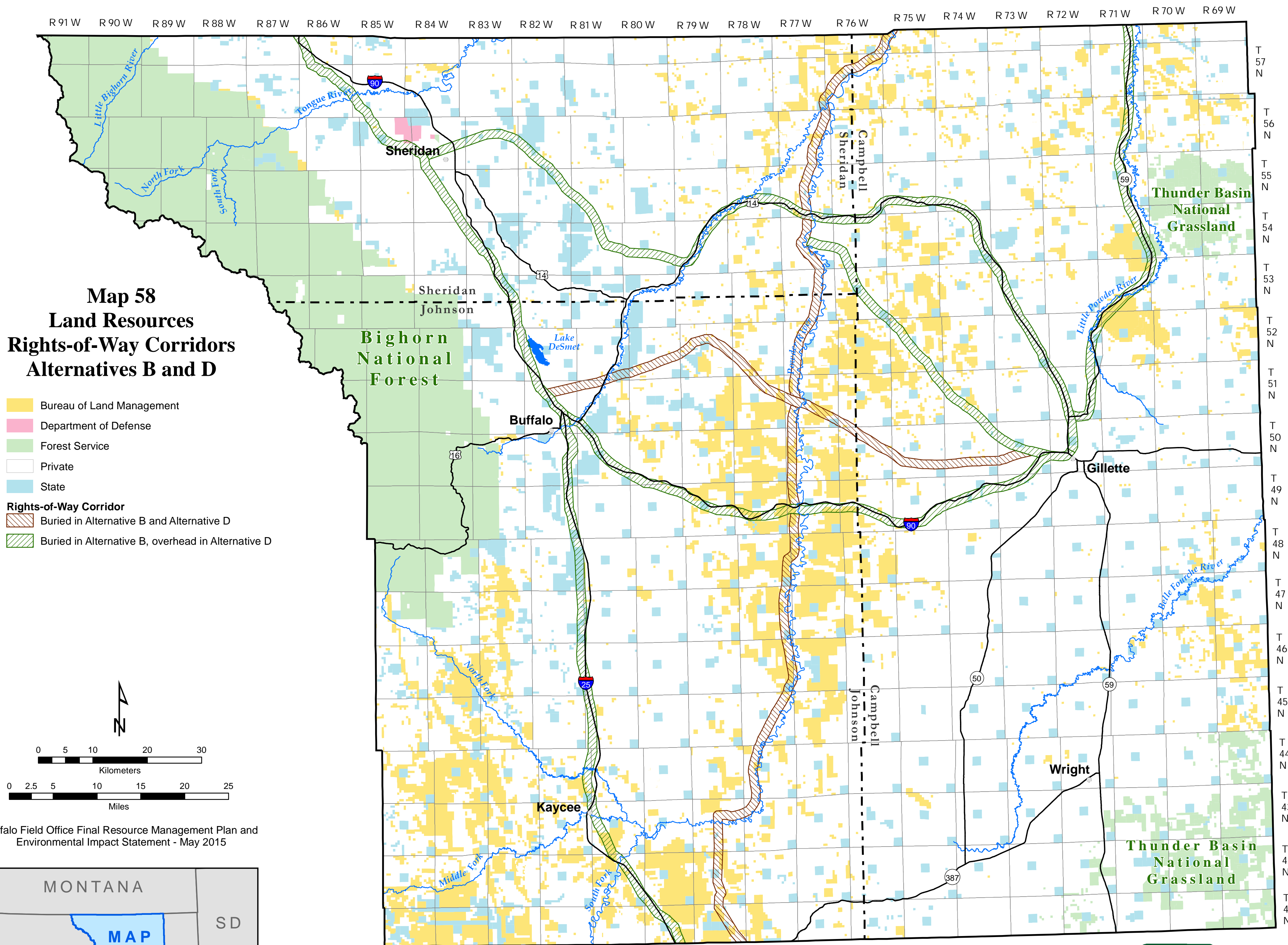
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Map 58
Land Resources
Rights-of-Way Corridors
Alternatives B and D

- Bureau of Land Management
 - Department of Defense
 - Forest Service
 - Private
 - State
- Rights-of-Way Corridor**
- Buried in Alternative B and Alternative D
 - Buried in Alternative B, overhead in Alternative D

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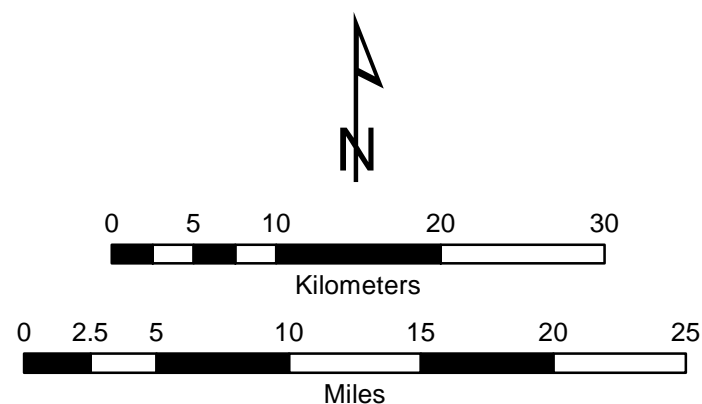
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Map 59 Land Resources Rights-of-Way Avoidance and Exclusion Alternative D

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Rights-of-Way Exclusion Area
- Rights-of-Way Avoidance Area



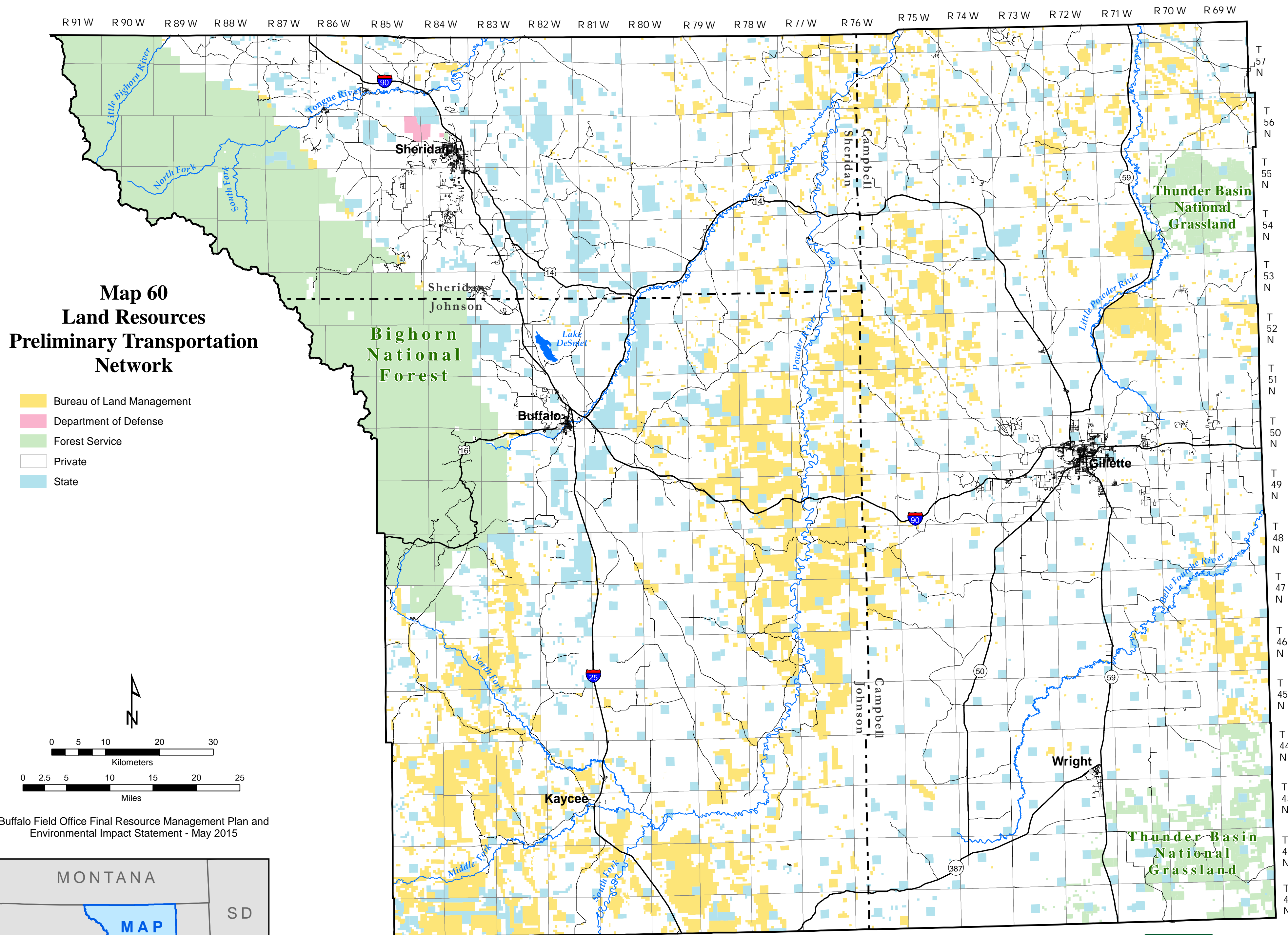
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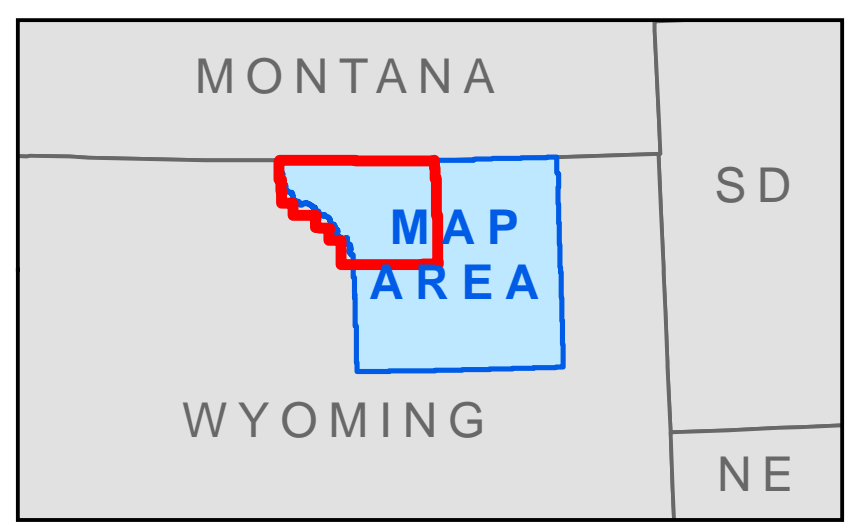
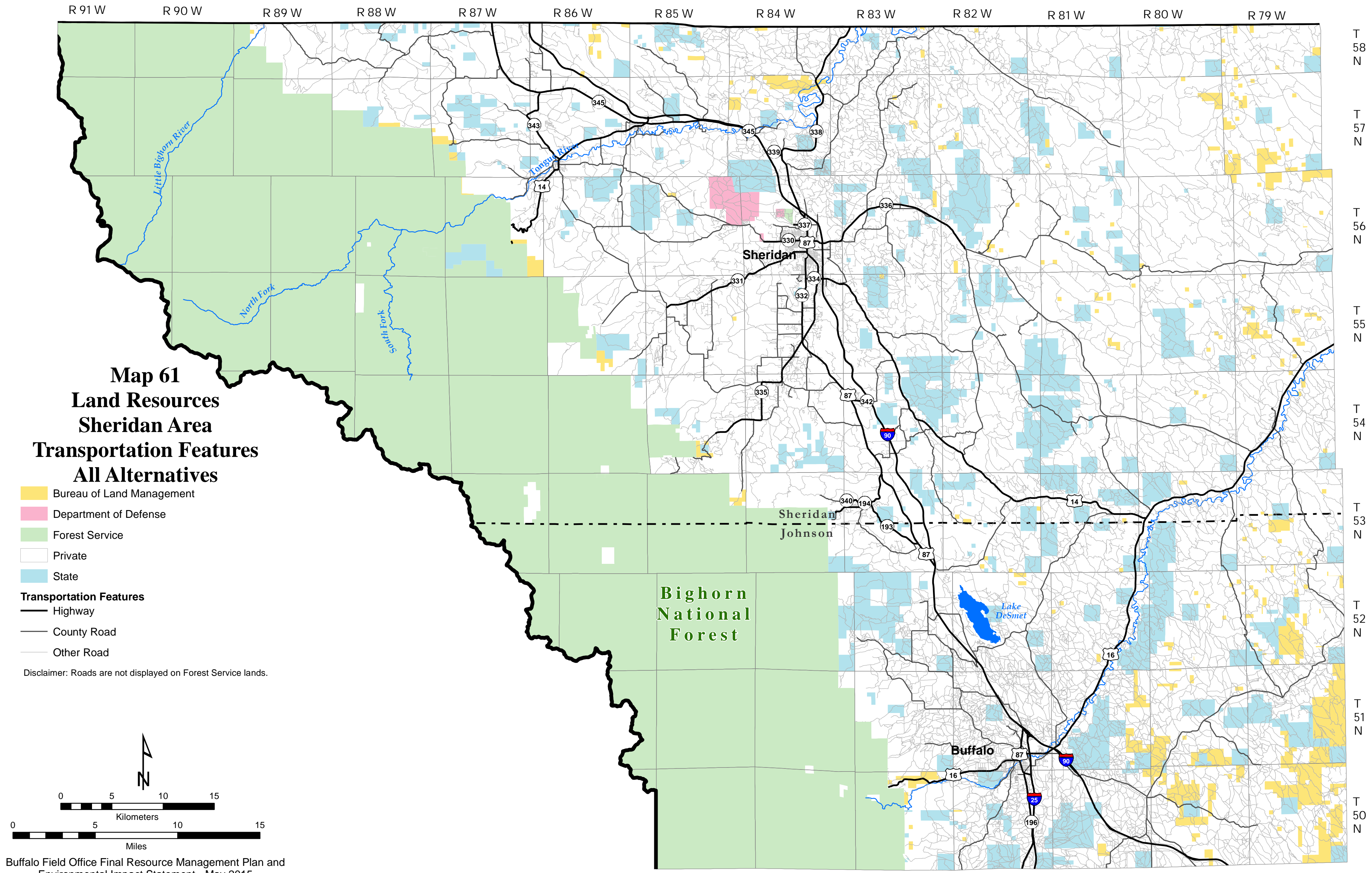
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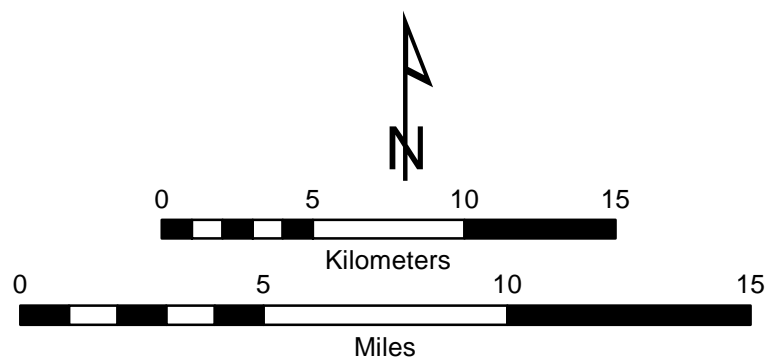
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Map 62 Land Resources Gillette Area Transportation Features All Alternatives

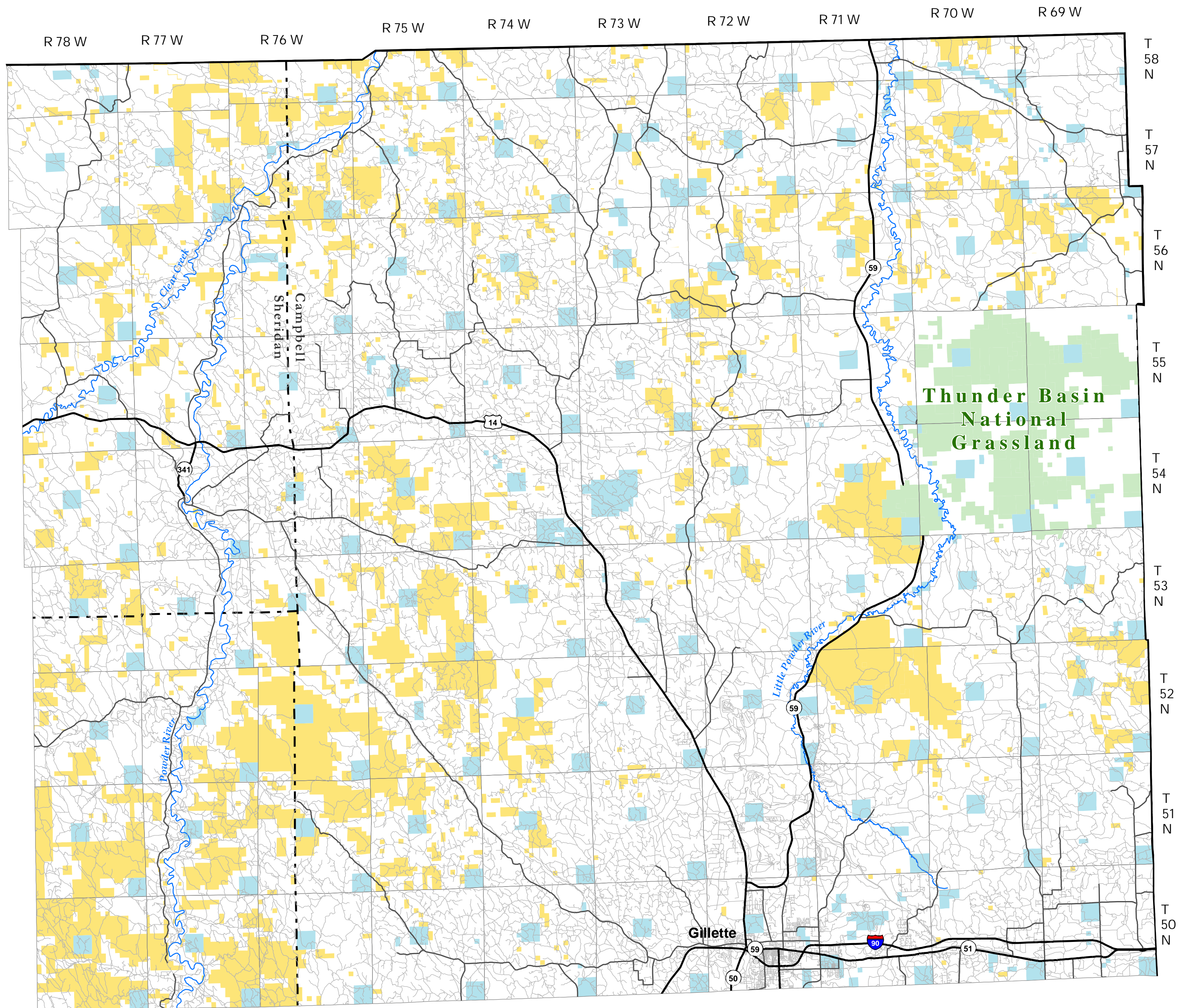
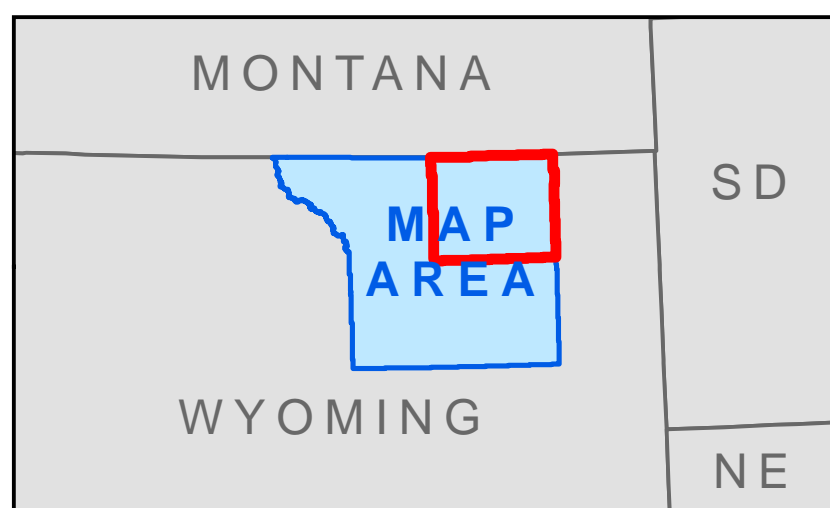
- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State

- Transportation Features**
- Highway
 - County Road
 - Other Road

Disclaimer: Roads are not displayed on Forest Service lands.



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Map 63

Land Resources

Wright Area

Transportation Features

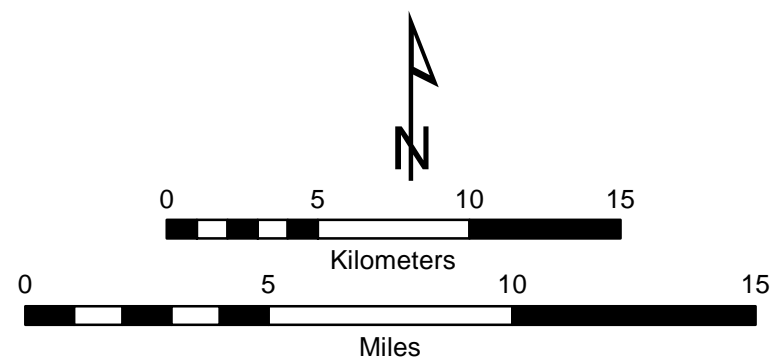
All Alternatives

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State

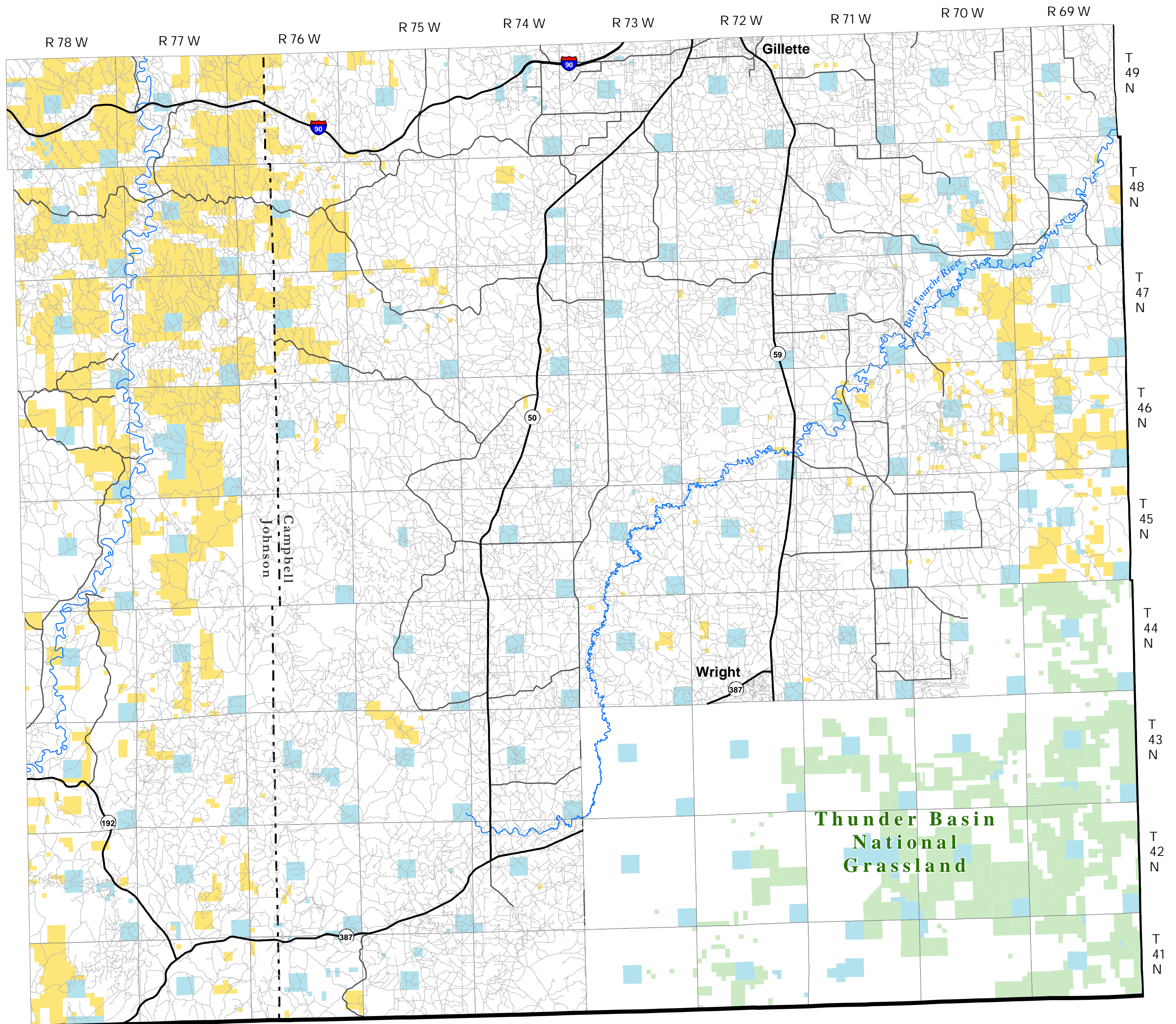
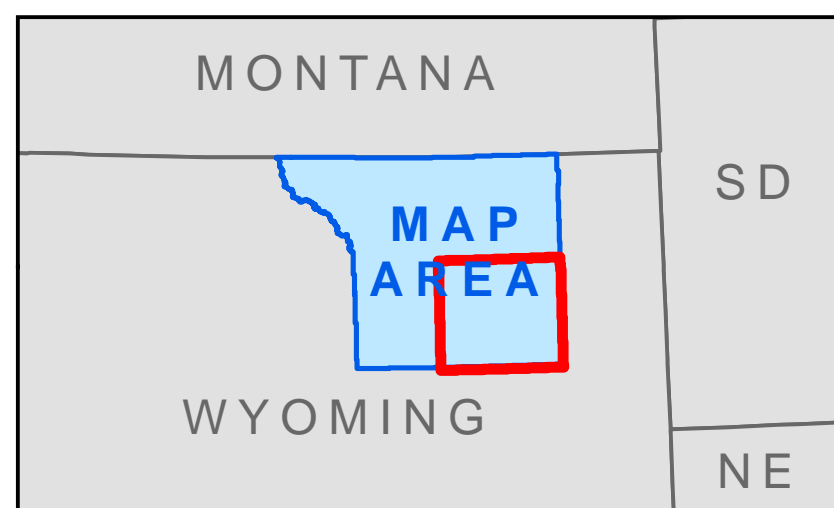
Transportation Features

- Highway
- County Road
- Other Road

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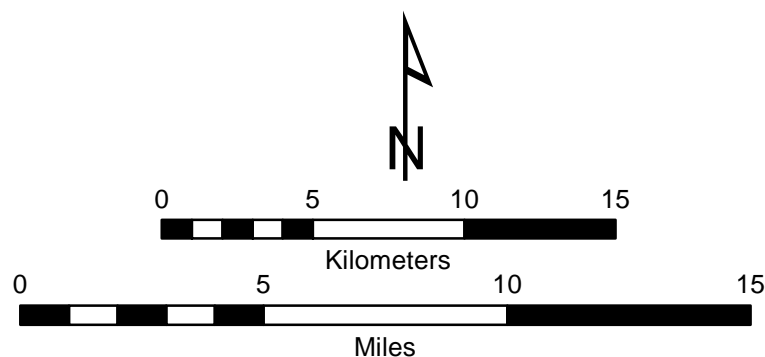
Map 64 Land Resources Kaycee Area Transportation Features All Alternatives

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Transportation Features

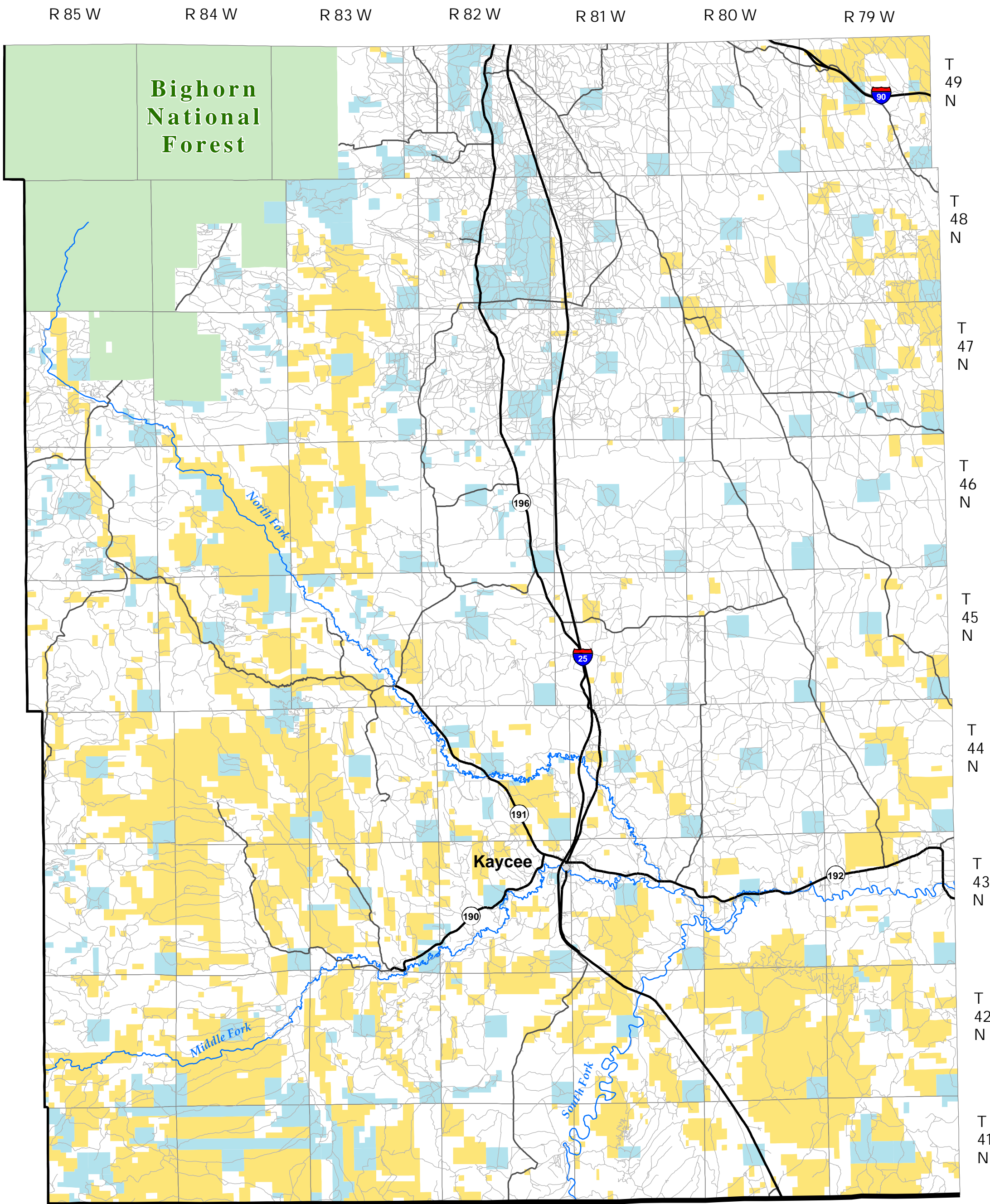
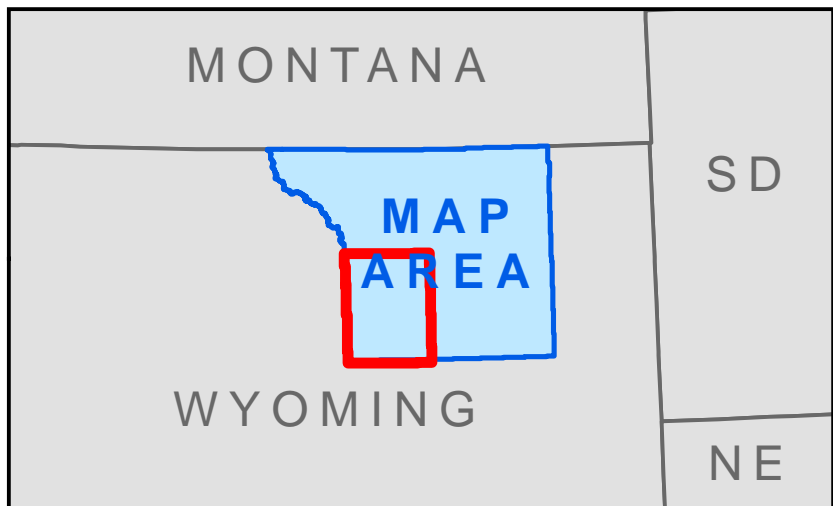
Highway

County Road

Other Road
- Disclaimer: Roads are not displayed on Forest Service lands.



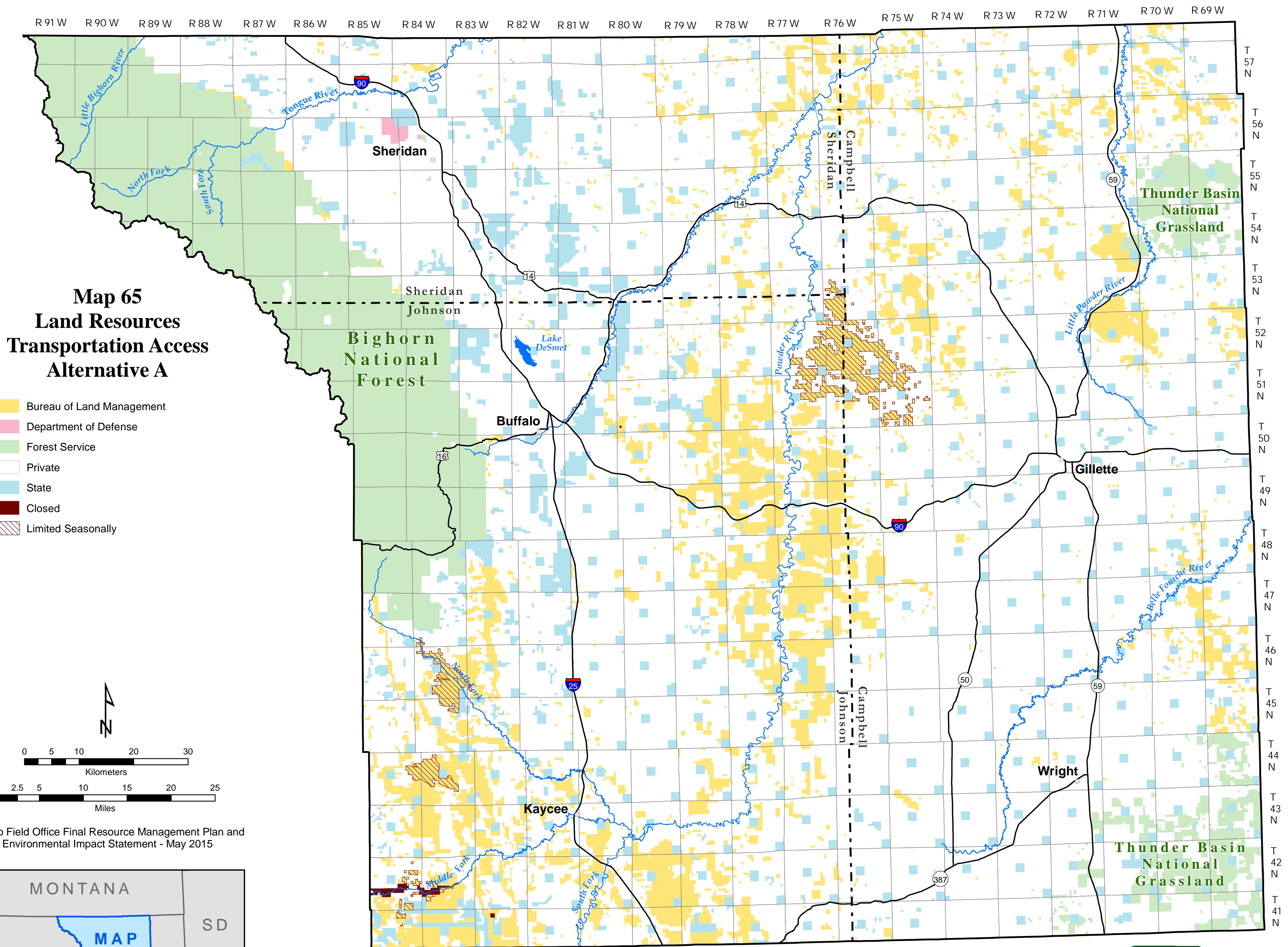
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Map 65 **Land Resources** **Transportation Access** **Alternative A**

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Closed
- Limited Seasonally

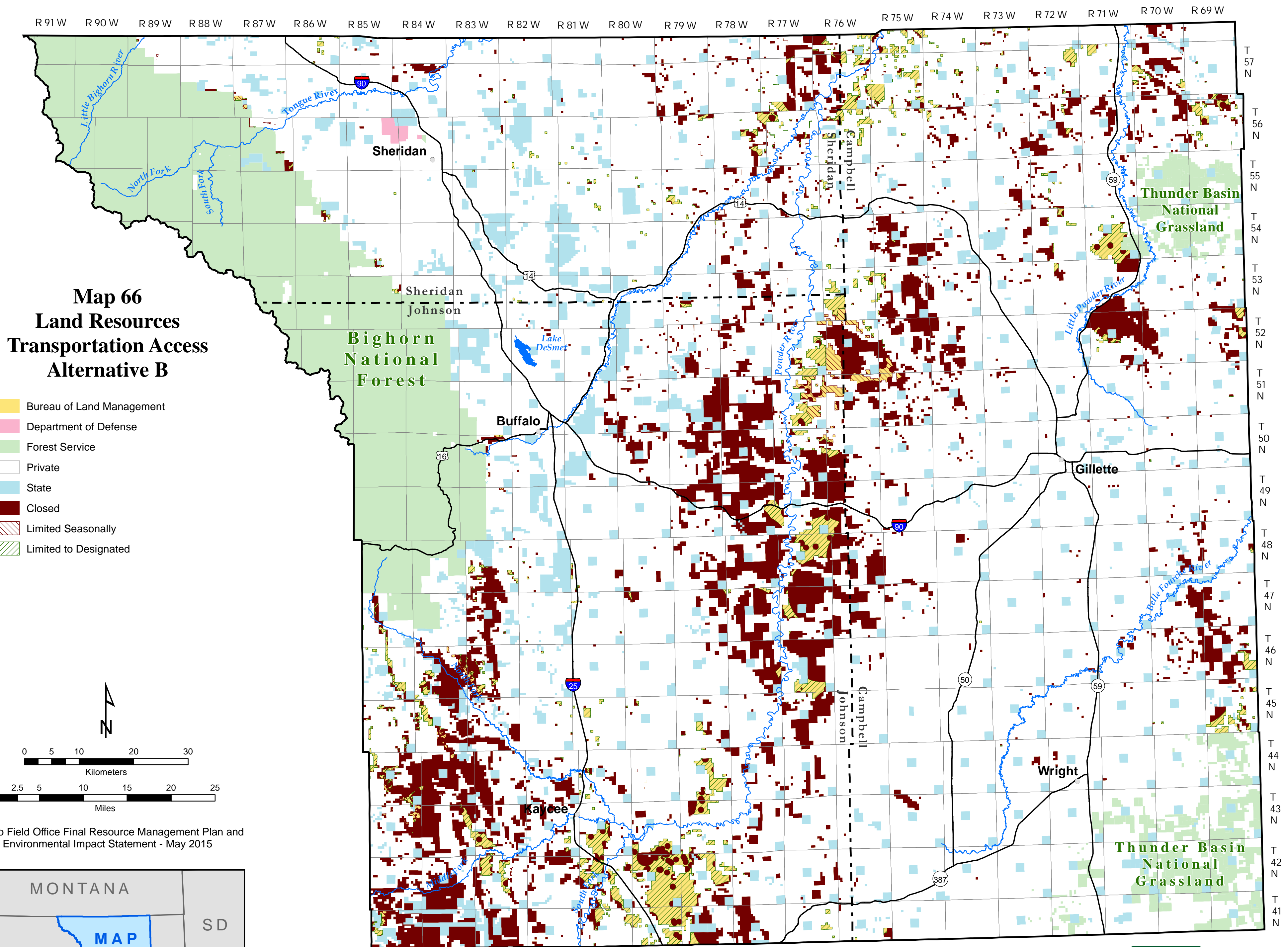
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Map 66
Land Resources
Transportation Access
Alternative B

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Closed
- Limited Seasonally
- Limited to Designated



0 5 10 20 30
 Kilometers

0 2.5 5 10 15 20 25
 Miles

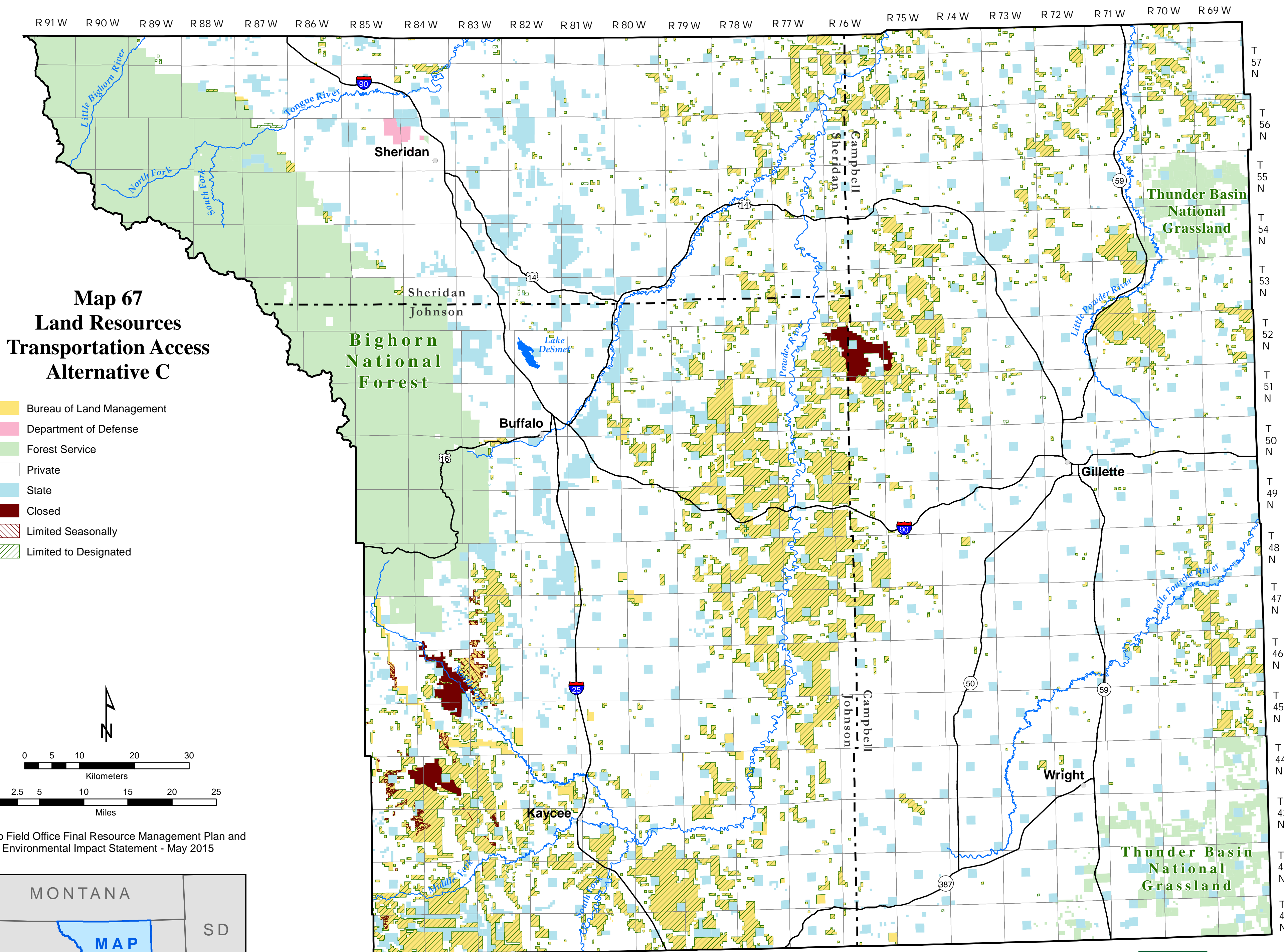
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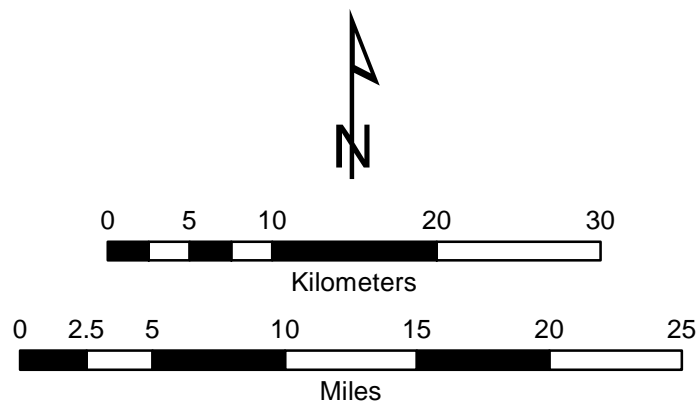


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Map 67 **Land Resources** **Transportation Access** **Alternative C**

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Closed
- Limited Seasonally
- Limited to Designated



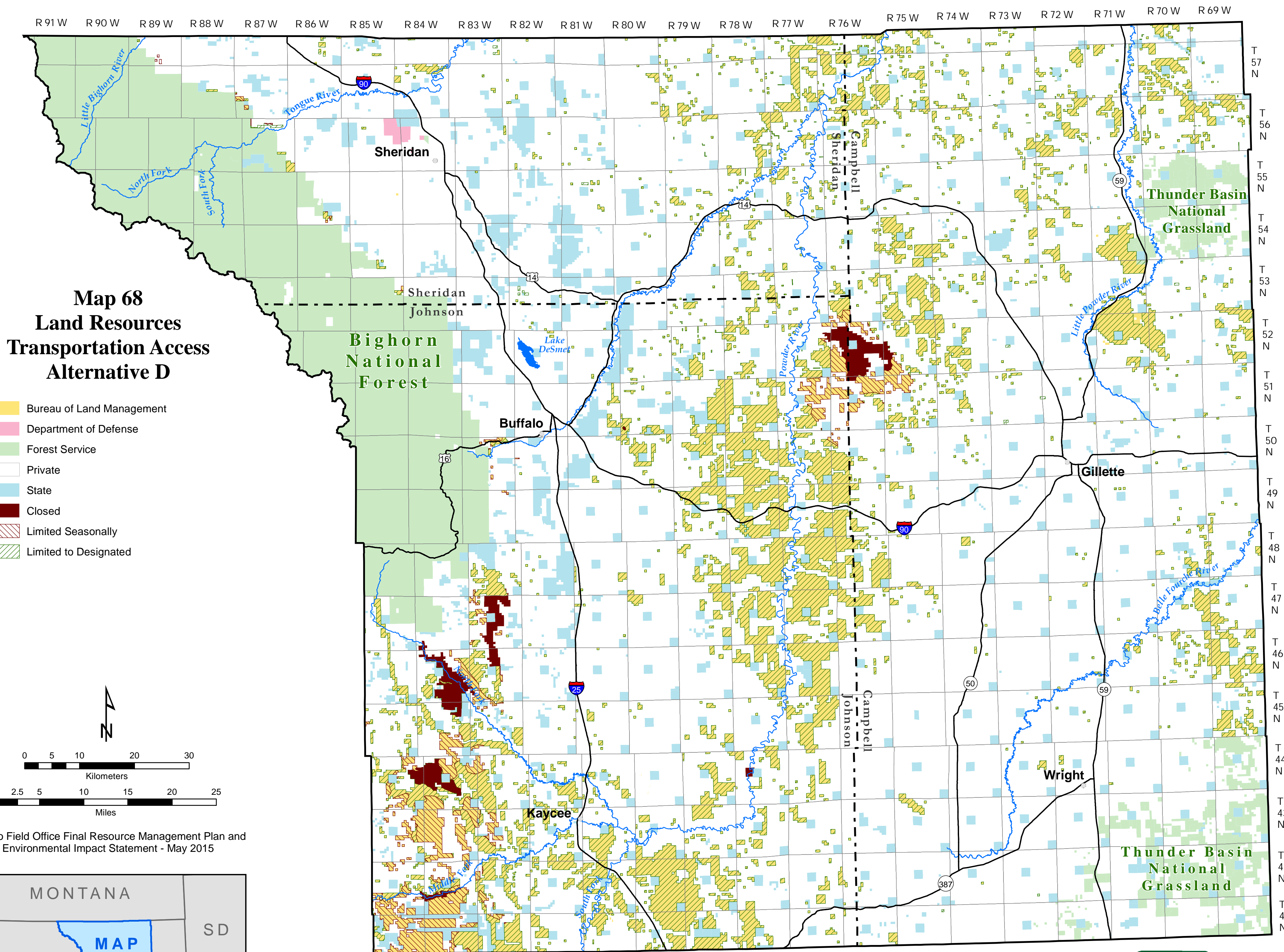
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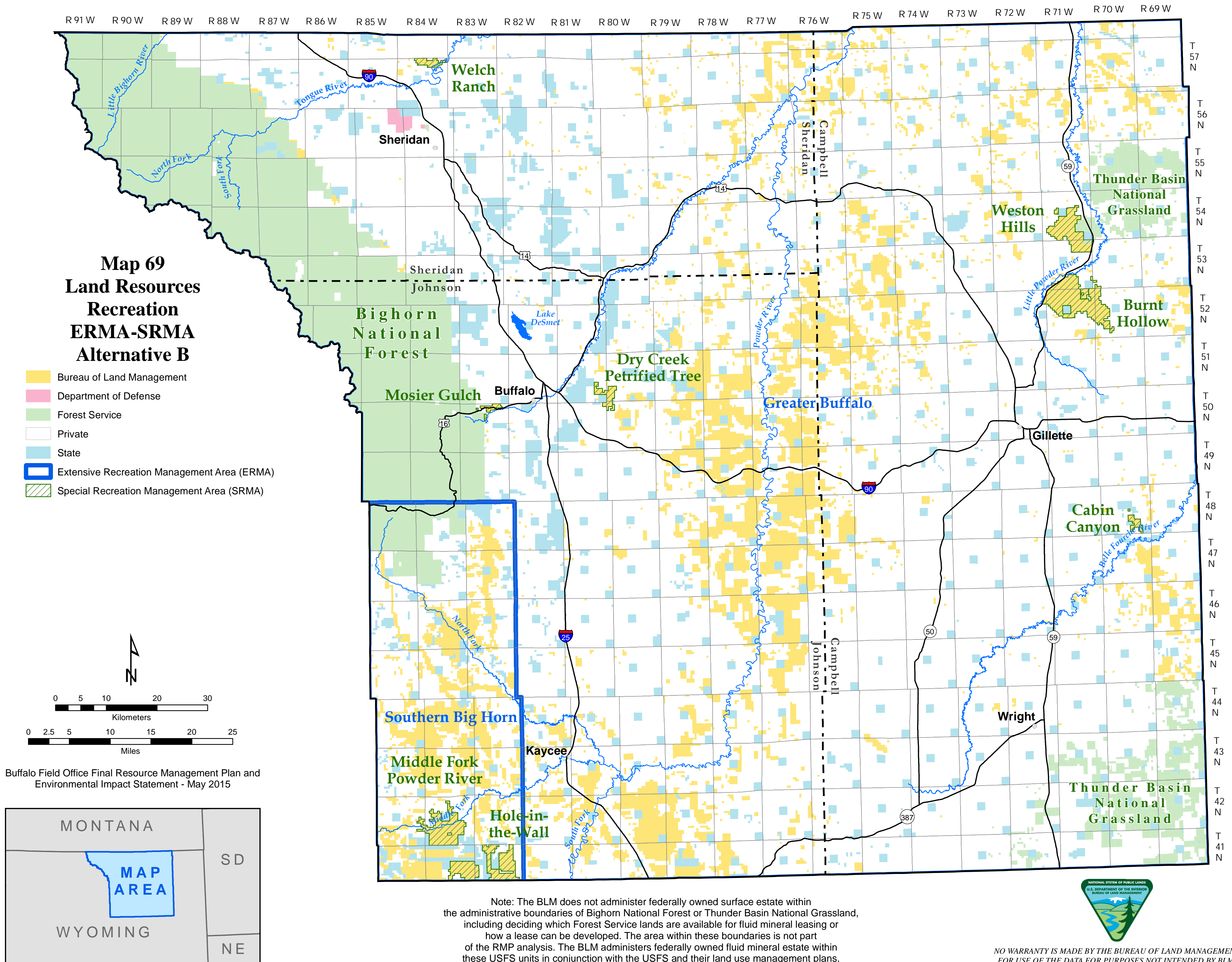
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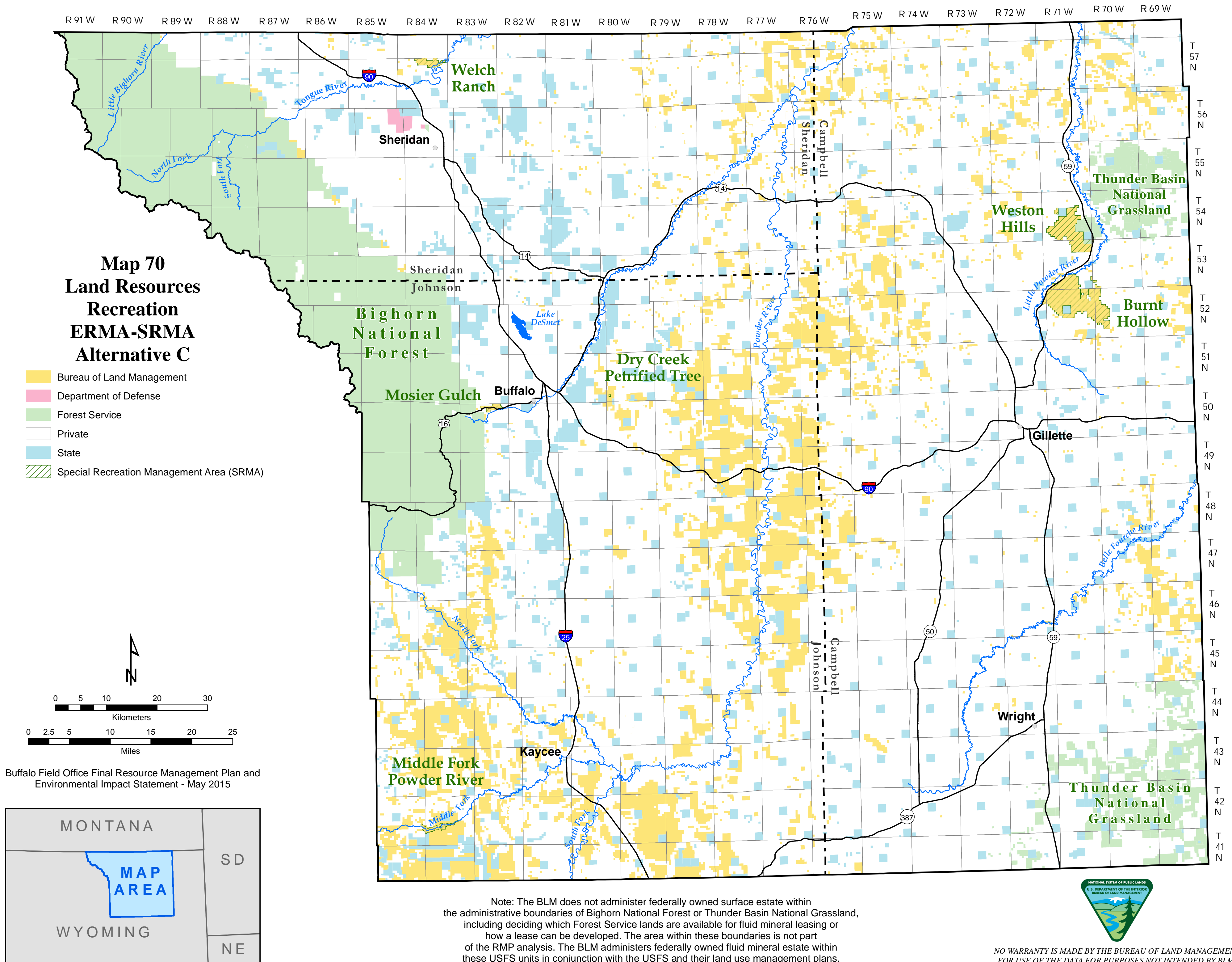


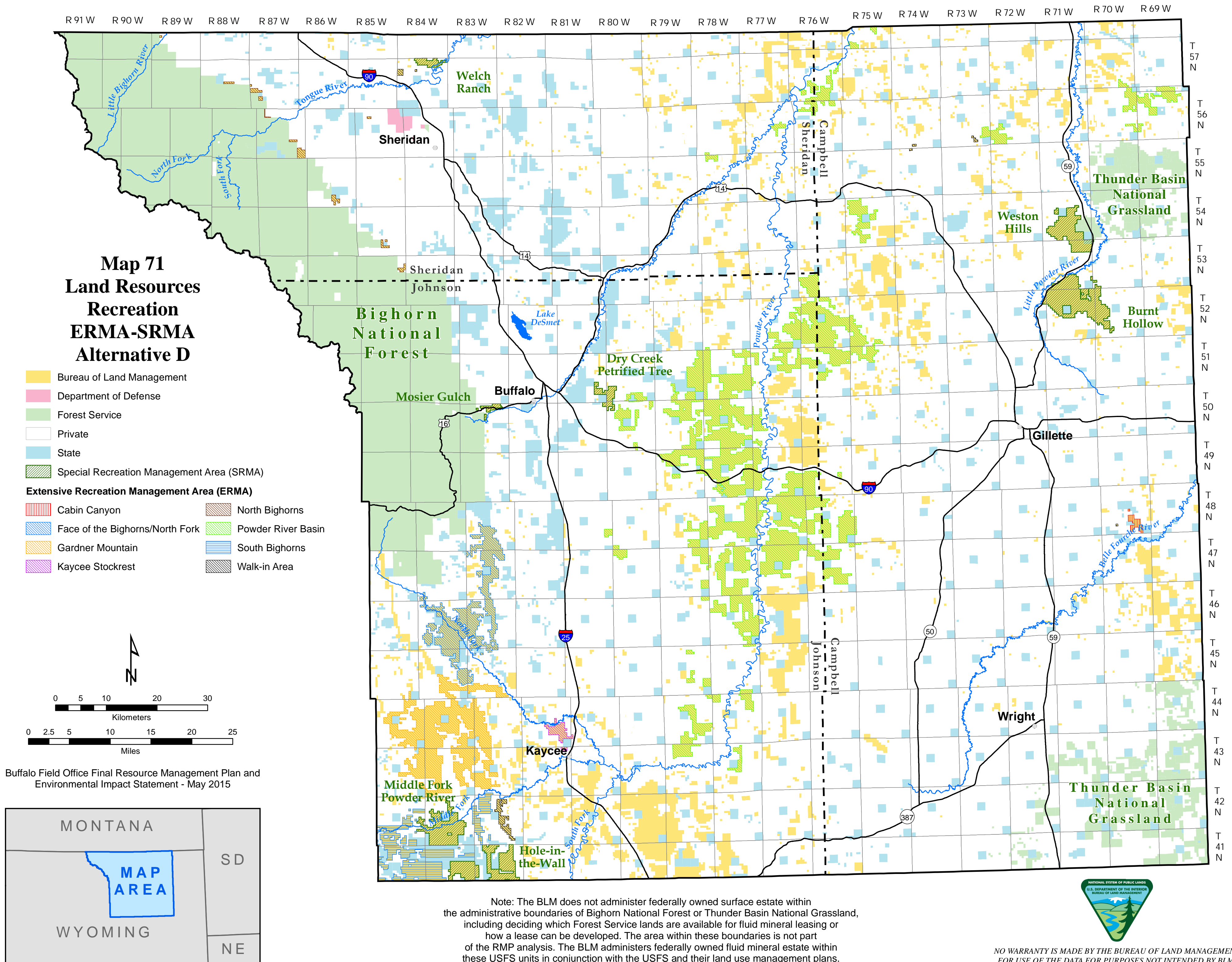
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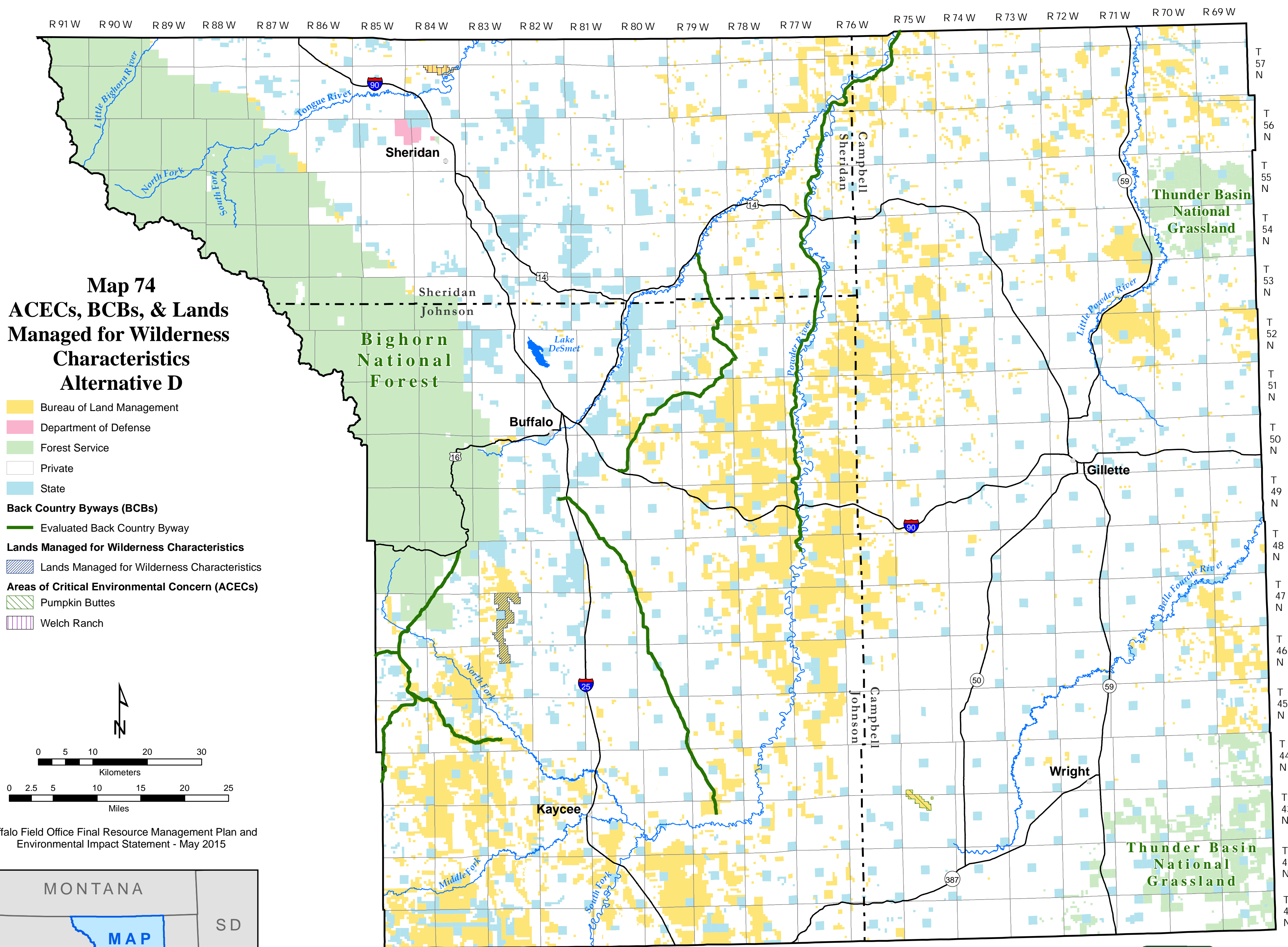


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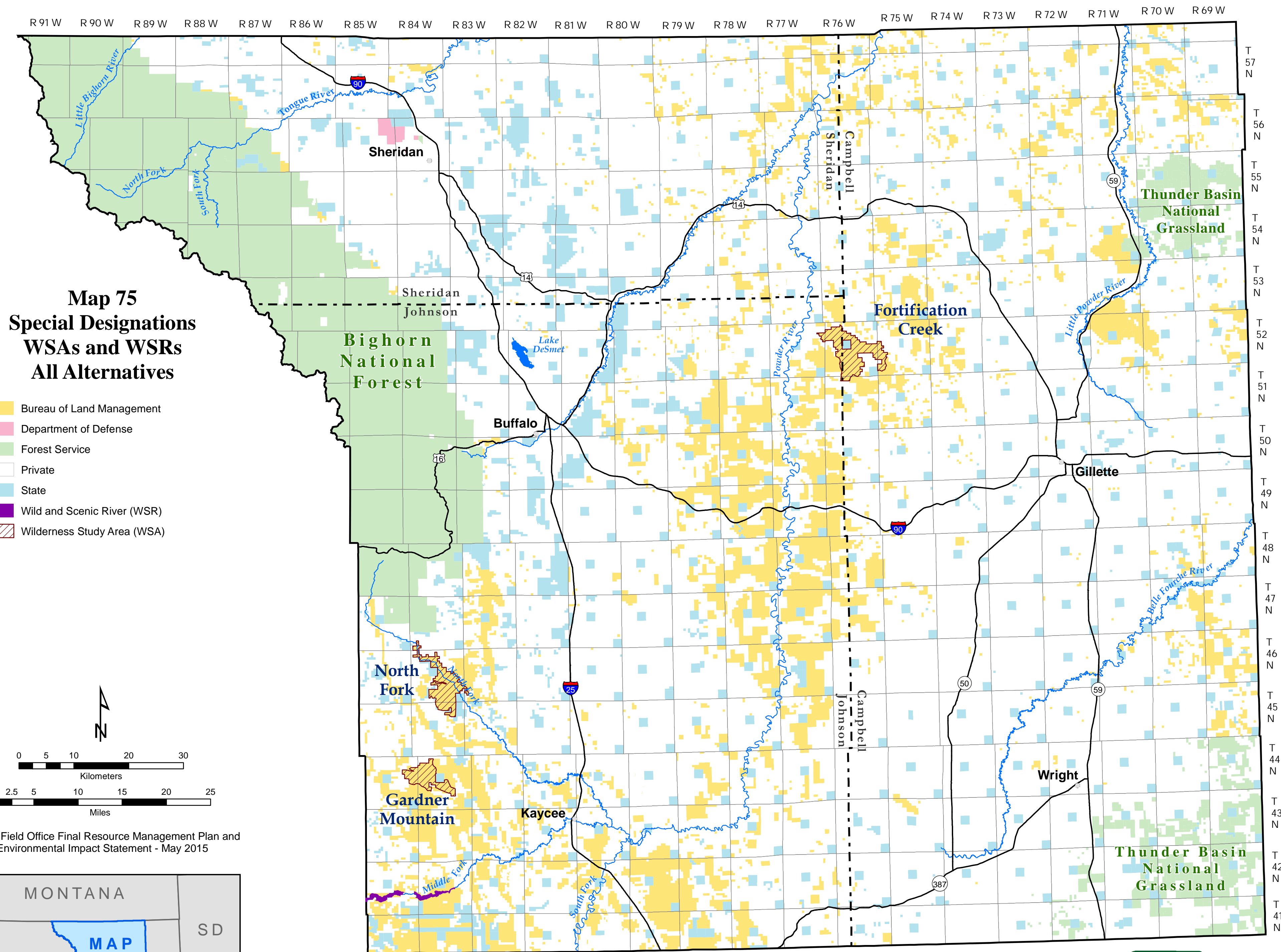
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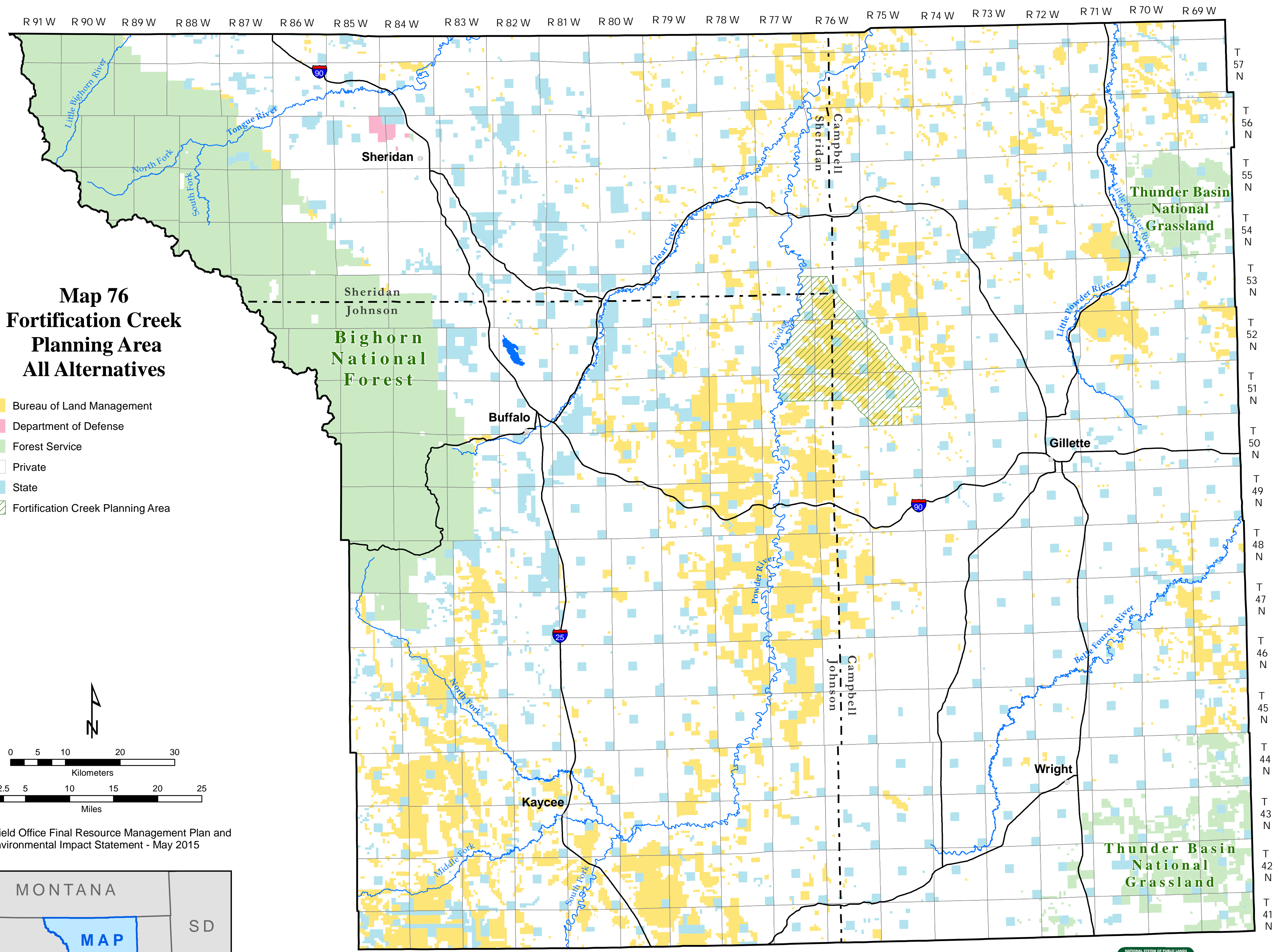
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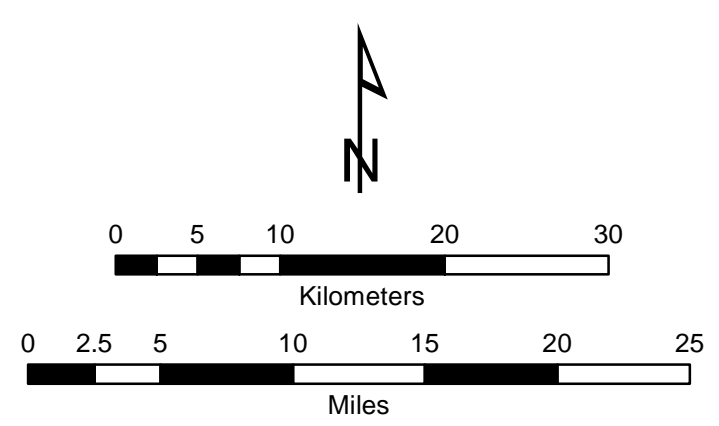


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Map 76
Fortification Creek
Planning Area
All Alternatives

- Bureau of Land Management
- Department of Defense
- Forest Service
- Private
- State
- Fortification Creek Planning Area



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Proposed Resource Management Plan and Final Environmental Impact Statement for the Buffalo Field Office Planning Area

Appendices

**U.S. Department of the Interior
Bureau of Land Management
Buffalo Field Office, Wyoming**

May 2015

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APPENDICES

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Appendix A. Legislation and Policy Pertaining to Specific Resources

General Plans, Policies, and Regulations for All Resources
Council on Environmental Quality (CEQ) Final Guidance for Department and Agencies on the Appropriate Use of Mitigation and Monitoring (2011)
Bureau of Land Management (BLM) Land Use Planning Handbook, H-1601-1, updated March 11, 2005
BLM Instruction Memorandum 2014-146, Guidance on Preparing Federal Register Notices (2014)
BLM National Environmental Policy Act Handbook H-1790-1 (2008)
BLM Planning Regulations 40 Code of Federal Regulations (CFR) 1600
Instruction Memorandum 2013-137, Peer Review of Influential Scientific Information (2013)
Federal Land Policy and Management Act
National Environmental Policy Act
Physical Resources
Clean Air Act
Clean Water Act of 1977, as amended
BLM Air Resources Manual 7300
Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the BLM in the State of Wyoming (1998)
Mineral Resources
2006 Oil and Gas Surface Operating Standards and Guidelines (Gold Book, 4th edition)
Energy Policy Act of 2005 (P.L. 109-58)
43 CFR Parts 3100 (oil and gas), 3150 (geophysical), 3200 (geothermal), 3400 (coal), 3500 (other leasable solids), 3600 (salable), and 3800 (locatable) 43 CFR
BLM Manual 2880, Mineral Leasing Act Rights-of-Way, Glossary of Terms (2012)
BLM National Notice-to-Lesseees
BLM Onshore Oil and Gas Orders
U.S. Department of the Interior Manual 3031601, Mineral Materials Disposals (2002)
U.S. Department of the Interior Manual 3031, Energy and Mineral Resource Assessments (1985)
Federal Coal Leasing Amendments Act of 1976. This act amended Section 2 of the Mineral Leasing Act of 1920 to require that all public lands available for coal leasing be offered competitively. Competitive leasing provides an opportunity for any qualified interested party to competitively bid for a federal coal lease.
Federal Oil and Gas Royalty Management Act of 1982
Federal Oil and Gas Royalty Simplification and Fairness Act of 1996
Federal Onshore Oil and Gas Leasing and Reform Act of 1987
General Mining Law of 1872. This law allowed the location of placer and lode mining claims, as well as patents, declaring “all valuable mineral deposits in lands belonging to the United States ... to be free and open to exploration and purchase.”
Integration of Best Management Practices into applications for permit to drill approvals and associated rights-of-way (ROW; WO IM 2007-021)
Instruction Memorandum WY 2005–14, Water Disposal and Land Application Disposal in the Powder River Basin. U.S. Department of the Interior, BLM (2005)
Instruction Memorandum 2013–101, Oil and Gas Leasing Reform (2013)
Materials Act of 1947 (as amended by the Surface Resources Act of 1955). Under this act, certain mineral and vegetative materials may be disposed of either through a contract of sale or a free-use permit. These mineral materials include common varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay. This act also provides for free use of material by government agencies or municipalities, or non-profit organizations if not used for commercial purposes.
Surface Resources Act of July 23, 1955. This act removed sand, gravel, cinders, pumice, pumicite, and clay from locatable mineral classification, unless they have some type of uncommon characteristic.
Mineral Leasing Act for Acquired Lands of 1947, as amended. This act authorizes and governs mineral leasing on acquired lands. It provides that minerals on these lands are subject to the federal mineral leasing system, even though the commodity may be locatable or salable on other types of lands retained by the federal government.

Mineral Leasing Act of 1920, as amended. Under this law, the BLM issues leases for development of oil and gas, deposits of coal, phosphate, potash, sodium, sulfur and other leasable minerals on public domain lands and on lands having federally-reserved minerals.
Mining and Minerals Policy Act of 1970. This act identifies the continuing federal policy to foster and encourage private enterprise in the development of a stable domestic minerals industry, and the orderly and economic development of domestic mineral resources.
Petrified Wood Act of 1962. This act provides for free collection of limited amounts of petrified wood by the public, and for sale of larger quantities for commercial purposes.
Surface Mining Control and Reclamation Act of 1977. This law requires reclamation of surface coal mining operations, imposes bonding requirements, and set up the US Office of Surface Mining, also called the US Office of Surface Mining, Reclamation, and Enforcement, to oversee reclamation.
Unitization Handbook H-3180-1 (Exploratory)
Unitization Manual 3180 (Exploratory)
Fire and Fuels Management
The Interagency Prescribed Fire Planning and Implementation Procedures Guide (April 2014), with BLM Supplement (December 2013)
Federal Wildland Fire Management Policy and Program Review (1995 and 2001) (DOI and USDA 1995), and Guidance for the Implementation of Federal Wildland Fire Management Policy (February 2009)
Healthy Forest Restoration Act of 2003, which aids or directs the implementation of the goals of the: <ul style="list-style-type: none"> • National Fire Plan (2000) • 10-Year Comprehensive Strategy Implementation Plan (2001) • Community Wildfire Protection Plans
BLM Manual M-9211 – Fire Planning Manual (September 2012)
BLM Manual MS-1111 Fire Business Management
BLM Manual MS-9200 – Fire Program management (in final revision)
BLM Manual 9212 – Fire Prevention (in revision)
BLM Manual MS-9214 – Fuels Management
BLM Manual MS-9238 – Fire Trespass (in final revision)
BLM Manual MS-9400 – Aviation Management
BLM Handbook H-9212-1 – Fire Prevention Handbook
BLM Handbook H-9214-1 – Fuels Management Handbook
BLM Handbook H-9218-1 – Reports and Statistics Handbook
BLM Handbook H-9238-1 – Fire Trespass Handbook
BLM Handbook H-9211-1 – Fire Planning Handbook (September 2012)
Instruction Memorandum 2014–114, Sage-Grouse Habitat and Wildland Fire Management (2014)
Instruction Memorandum 2013–128, Sage-Grouse Conservation in Fire Operations and Fuels Management (2013) (supersedes IM 2011–138)
Interagency Fire Management Plan Template (2009)
Interagency Standards for Fire and Aviation Operations (published annually)
National Fire Plan (2000)
Protecting People and Natural Resources: A Cohesive Fuels Treatment Strategy (2006)
Secretary of the Interior. Secretarial Order 3336. Rangeland Fire Prevention, Management and Restoration. (2015)
U.S. Department of the Interior/U.S. Department of Agriculture Western Governors’ Association, 2001; A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy and Implementation Plan (2001)
Biological Resources
Applicable federal and state laws that make the federal government responsible for control of weeds on federal lands and provide direction for their control.
Animal and Plant Health Inspection Service Plant Protection and Quarantine Memorandum of Understanding # 08-8100-0870-MU: Management of Grasshoppers and Mormon Crickets on Lands Subject to the Jurisdiction of the Department of the Interior
BLM Handbook H-4700-1, Wild Horses and Burros Management Handbook (2010)
BLM Manual 1737 – Riparian-Wetland Area Management (1992)
BLM Manual 1740-2 – Integrated Vegetation Management (2008)

BLM Manual 1745 – Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants (1992)
BLM Manual 4180 – Land Health (2009)
BLM Manual 6500 – Wildlife and Fisheries Management (1988)
BLM Manual 6720 – Aquatic Resource Management (1991)
BLM Manual 6840 – Special Status Species Management (2008)
BLM Manual 7100 – Soil Classification
BLM Manual 9011 – Chemical Pest Control (1992)
BLM Manual 9014 – Use of Biological Control Agents of Pests on Public Lands (1990)
BLM Manual Manual 9015 –Management and Coordination of noxious weeds activities
BLM Handbook H-9011-1 –Chemical Pest Control (1988)
BLM regulations contained in 43 CFR 8200
BLM National Sage-Grouse Habitat Conservation Strategy (2004)
Carlson-Foley Act (P.L. 90-583)
Cave Resources Protection Act (16 United States Code [U.S.C.] 4301 et seq.)
CFR, Title 50, Section 402 (50 CFR 402), Interagency Cooperation: Endangered Species Act
Clean Water Act of 1977, as amended
Department of the Interior Manual 517 – Integrated Pest Management
Department of the Interior Manual 601, Mineral Materials Disposals (2007)
Emergency Wetlands Resources Act of 1986 (P.L. 99-645;100 Stat. 3582)
Endangered Species Act
Executive Order 11987, Exotic Organisms
Executive Order 11988, Floodplain Management
Executive Order 11990, Protection of Wetlands
Executive Order 13112, Establishment of the Invasive Species Council
Executive Order 13186, Migratory Birds
Executive Order 12962, Recreational Fisheries (June 7, 1995)
Executive Order 13112, Invasive Species Control
Federal Noxious Weed Act of 1974 (P.L. 93-629) (as amended by section 15 Management of Undesirable Plants on Federal Lands, 1990) (superseded by Plant Protection Act of 2000; Secs. 2801 to 2813 repealed)
Final Environmental Impact Statement: Vegetation Treatment on BLM Lands in the 13 Western States (1991)
Fish and Wildlife 2000 – National and state policies
Fish and Wildlife Conservation Act of 1980
Fish and Wildlife Management Act of 1956
Healthy Forests Act of 2003
Instruction Memorandum 2006–073, Weed-Free Seed Use on Lands Administered by the BLM (2006)
Instruction Memorandum 2009–018, Process for Setting Priorities for Issuing Grazing Permits and Leases (2009)
Instruction Memorandum 2010–012, Greater Sage-Grouse Habitat Management Policy on Wyoming BLM Administered Public Lands Including the Federal Mineral Estate (2010)
Instruction Memorandum 2010–013, Oil and Gas Leasing Screen for Greater Sage-Grouse (2010)
Instruction Memorandum 2010–022, Managing Structures for the Safety of Sage-Grouse, Sharp-tailed Grouse, and Lesser Prairie-chicken (2009)
Instruction Memorandum 2010–181, White-Nose Syndrome (2010)
Instruction Memorandum 2011–138, Sage-Grouse Conservation Related to Wildland Fire and Fuels Management (2011)
Instruction Memorandum 2012–019, Greater Sage-Grouse Habitat Management Policy on Wyoming BLM Administered Public Lands Including the Federal Mineral Estate (2012)
Instruction Memorandum 2012-035, Interim Guidance on Exploration and Site Characterization for Potential Carbon Dioxide Geologic Sequestration (2011)
Instruction Memorandum 2012-043, Greater Sage-Grouse Interim Management Policies and Procedures
Instruction Memorandum 2012–044, BLM National Greater Sage-Grouse Land Use Planning Strategy (2012)
Instruction Memorandum 2013-176, Seed Collection Policy and Pricing (2013)
Neotropical Migratory Bird Conservation Act (P.L. 106-247)
North American Wetlands Conservation Act, as amended (P.L. 101-233; 16 U.S.C. 4401)
Noxious Weed Control and Eradication Act of 2004 (P.L. 108-412)

Northwest Area Noxious Weed Control Program Environmental Impact Statement (1985)
Plant Protection Act of 2000 (P.L. 106-224) (supersedes Federal Noxious Weed Act of 1974 (7 U.S.C. 2801 et seq.) except for Sec. 2814)
Public Rangelands Improvement Act of 1978
Riparian Habitat, Interior Department Manual 520
Riparian-Wetlands Initiative for the 1990s, U.S. Department of the Interior, BLM, January 22, 1992
Sikes Act of 1960, as amended
Soil and Water Resources Conservation Act of 1977 (16 U.S.C. 2001 et seq.)
Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming
Supplement to the Northwest Area Noxious Weed Control Program Final Environmental Impact Statement
Taylor Grazing Act of 1934 (43 U.S.C. 315)
The Bald and Golden Eagle Protection Act
The Migratory Bird Treaty Act
Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic Environmental Impact Statement, 2007 and Final Programmatic Environmental Report
Water Quality Act of 1987, as amended from the Federal Water Pollution Control Act of 1977 (Clean Water Act) as amended (33 U.S.C. 1251 et seq.)
Wyoming Executive Order 2008–2, Greater Sage-Grouse Core Area Protection
Wyoming Executive Order 2010–4, Greater Sage-Grouse Core Area Protection (replaces Executive Order 2008–2)
Wyoming Executive Order 2011–5, Greater Sage-Grouse Core Area Protection (replaces Executive Order 2010–4)
Wyoming Executive Order 2013–3, Greater Sage-Grouse Core Area – Grazing Adjustments
Heritage and Visual Resources
36 CFR Part 60: National Register of Historic Places – Identifies processes for the identification and evaluation of historic properties for the National Register, and specifies procedures for listing properties on the National Register
36 CFR Part 78: Waiver of Federal Agency Responsibilities under Section 110 of the National Historic Preservation Act – Identifies limited circumstances when Agencies may waive responsibilities under Section 110 and procedures to follow
36 CFR Part 800: Protection of Historic Properties – Identifies processes and procedures for federal agencies to follow to be in compliance with Section 106 and 110 of the National Historic Preservation Act
43 CFR 8400 – Visual Resource Management
43 CFR Part 10: Native American Graves Protection and Repatriation Regulations – Identifies processes and procedures for federal agencies to follow to comply with the Native American Graves Protection and Repatriation Act
43 CFR Part 7: Protection of Archaeological Resources – Identifies processes and procedures for federal agencies to follow to comply with the Archaeological Resources Protection Act
American Indian Religious Freedom Act of 1978 (P.L. 95-431; 92 Stat. 469; 42 U.S.C. 1996)
Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225; 16 U.S.C. 432, 433)
Archaeological Resources Protection Act of 1979 (P.L. 96-95; 93 Stat. 721; 16 U.S.C. 470aa et seq.) as amended (P.L. 100-555; P.L. 100-588)
BLM Handbook H-8270-1, General Procedural Guidance for Paleontological Resource Management (1998)
BLM Handbook 8410-1, Visual Resource Inventory
BLM Information Bulletin No. 2002-101, Cultural Resource Considerations in Resource Management Plans
BLM Information Bulletins 98-135, 98-164, and 2000-096
BLM Manuals:
8100: Cultural Resource Management
8120: Tribal Consultation under Cultural Resources
8130: Planning For Uses of Cultural Resources
8140: Protecting Cultural Resources
8150: Permitting Uses of Cultural Resources
8170: Interpreting Cultural Resources for the Public
Buffalo Resource Area: Resource Management Plan/Record of Decision
Executive Order 11593 – Protection and Enhancement of the Cultural Environment
Executive Order 13007 – Providing for American Indian and Alaska Native Religious Freedom and Sacred Land Protections

Executive Order 13084 – Consultation and Coordination with Indian Tribal Governments
Historic Sites Act of 1935 (P.L. 74-292; 49 Stat. 666; 16 U.S.C. 461)
Instruction Memorandum 2002–096, Use of Visual Resource Management Class I Designation in Wilderness Study Area (2002)
Instruction Memorandum 2005–14, Water Disposal and Land Application Disposal in the Powder River Basin (2005)
Instruction Memorandum 2010–022, Managing Structures for the Safety of Sage-grouse, Sharp-tailed Grouse, and Lesser Prairie-chicken (2009)
Instruction Memorandum 2012–067, Clarification of Cultural Resource Considerations for Off-Highway Vehicle Designations and Travel Management (2012)
Instruction Memorandum 2012–140, Collecting Paleontological Resources Under the Paleontological Resources Preservation Act of 2009 (2012)
Instruction Memorandum 2012–141, Confidentiality of Paleontological Locality Information Under the Omnibus Public Lands Act of 2009 (2012)
National Historic Preservation Act of 1966 as amended (P.L. 89-665; 80 Stat. 915; 16 U.S.C. 470)
Native American Graves Protection and Repatriation Act of 1990 (P.L. 101-601; 104 Stat. 3048; 25 U.S.C. 3001)
Powder River Basin Oil and Gas Project Environmental Impact Statement and Proposed Plan Amendment
Programmatic Agreement Among BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in which BLM will meet its Responsibilities Under the National Historic Preservation Act (1997)
Reservoir Salvage Act of 1960, as amended by Archeological and Historic Preservation Act of 1974 (P.L. 86-523; 74 Stat. 220, 221; 16 U.S.C. 469; P.L. 93-291; 88 Stat. 174; 16 U.S.C. 469)
State Protocol Agreement Between the Wyoming BLM State Director and the Wyoming State Historic Preservation Officer (2006)
Update to Buffalo Resource Area: Resource Management Plan/Record of Decision (2001)
Land Resources
40 CFR 2740, 2912, 2911, and 2920, Land Use Authorizations
43 CFR 2091
43 CFR 2930, Permits for Recreation on Public Lands
BLM Handbook H-8342, Travel and Transportation Handbook (2012)
BLM Handbook H-9600-1, Cadastral Survey Handbook
BLM Manual 1626 — Travel and Transportation and Management (2011)
BLM Manual 1740 — Renewable Resource Improvements and Treatments (2008)
BLM Manual H-2101–4 — Preacquisition Environmental Site Assessment (2000)
BLM Manual 2200–1 — Land Exchange Handbook (2005)
BLM Manual 6250 — National Scenic and Historic Trail Administration (2012)
BLM Manual 6280 — Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation (2012)
BLM Manual 6301 — Wilderness Characteristics Inventory (2011)
BLM Manual 6302 — Consideration of Lands with Wilderness Characteristics in the Land Use Planning Process (2011)
BLM Manual 6303 — Consideration of Lands with Wilderness Characteristics for Project-Level Decisions in Areas not Analyzed in Accordance with Manual 6302 (2011)
BLM Manual 6310 — Conducting Wilderness Characteristics Inventory on BLM Lands (2012)
BLM Manual 6320 — Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process (2012)
BLM Manual 6330 — Management of Wilderness Study Area (2012)
BLM Manual 6820 — Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation (2012)
BLM Manual 9113 — Roads Manual (1958)
BLM Manual 4180 – Rangeland Health Standards
BLM regulations contained in 43 CFR 4100 et seq.
BLM Wyoming Standards for Healthy Public Rangelands
Department of Interior Manual 600 DM 5, Standards for Federal Lands Boundary Evidence
Executive Order 12548 (1986): Establishment of annual fees for domestic livestock grazing on public rangelands
Federal Land Transfer Facilitation Act

Federal Land Policy and Management Act, Sections 102, 201, 202, 302, 304, 307, 309, 310, 401, 402, and 403
Hazardous Materials Transportation Act and Amendments
Interagency Ecological Site Handbook for Rangelands (2013)
Instruction Memorandum 2006–173, Travel and Transportation Management, Off-Highway Vehicle Management, Property, Engineering, Land Use Planning, and Lands and Realty (2006)
Instruction Memorandum 2008–014, Land Use Planning, Engineering, and All Resource Programs (2008)
Instruction Memorandum 2009–007, Process for Evaluating Status of Land Health and Making Determinations of Causal Factors When Land Health Standards Are Not Achieved (2009)
Instruction Memorandum 2009–043, Right-Of-Way Management, Wind Energy (2009)
Instruction Memorandum 2010–101, Oil and Gas Leasing Reform — Land Use Planning and Lease Parcel Reviews (2010)
Instruction Memorandum 2011–004, Transmittal of Revised Recreation and Visitor Services Land Use Planning Guidance (2011)
Instruction Memorandum 2011-154, Requirement to Conduct and Maintain Inventory Information for Wilderness Characteristics and to Consider Lands with Wilderness Characteristics in Land Use Plans (2011)
Instruction Memorandum 2012-032, Wyoming BLM Reclamation Policy (2012)
Instruction Memorandum 2012-169, Resource Management Plan Alternative Development for Livestock Grazing (2012)
Instruction Memorandum 2013-131, Guidance on Estimating Nonmarket Environmental Values (2013)
Memorandum of Agreement WY-7 between BLM and the Wyoming Recreation Commission, addresses land classifications and withdrawals to protect public lands generally, and specifically to protect historic trails.
Memorandum of Agreement WY-19 between BLM and the Wyoming Governor, addresses overall cooperation in public and state land management efforts
Memorandum of Agreement WY-20 between BLM and the Wyoming Game and Fish Commission, addresses a myriad of land and resource management issues, including classifications, land acquisition, disposal, and access
Memorandum of Agreement WY-21 between BLM and Region II and Region IV of the U.S. Forest Service, addresses overall coordination on a myriad of land and resource management issues
Memorandum of Agreement WY-63 between BLM, the U.S. Forest Service, Wyoming Department of Public Lands and the Wyoming Game and Fish Commission, addresses public land access and management of access problems
Memorandum of Agreement WY-65 between BLM and the Agricultural Stabilization and Conservation Service, addresses overall coordination on a myriad of land and resource management issues
Memorandum of Agreement WY-77 between BLM, the Agricultural Stabilization and Conservation Service, U.S. Forest Service, AES, and Wyoming State Conservation Commission, addresses overall coordination on conservation planning projects
Memorandum of Agreement WY-117 between BLM and the Wyoming Board of Land Commissioners, the Wyoming State Historic Preservation Office and the Advisory Council on Historic Preservation, addresses cultural resource protection in state exchanges
Memorandum of Agreement WY-118 between BLM and the Wyoming Board of Land Commissioners, addresses processing state exchanges
Memorandum of Agreement WY-119 between BLM and the Agricultural Stabilization and Conservation Service, addresses management of agricultural trespass
Memorandum of Agreement WY-121 between BLM and the National Park Service, addresses management of the Oregon National Historic Trails
Memorandum of Agreement WY-122 between BLM and the U.S. Forest Service, Wyoming Department of Public Lands, Wyoming Game and Fish Commission, Wyoming Recreation Commission, Wyoming Department of Agriculture, and the Wyoming State Planning Coordinator's Office, addresses access to public land
Memorandum of Agreement WY-131 between BLM and the Wyoming Game and Fish Department, addresses overall coordination on land and resource management
Memorandum of Agreement WY930-91-06-38 between BLM and the Wyoming Board of Land Commissioners, addresses exchange pooling
Memorandum of Agreement WY930-91-06-39 between BLM and the Wyoming Board of Land Commissioners, addresses exchange of state land in holdings in wilderness areas
Memorandum of Understanding between BLM and the Bureau of Reclamation addresses interaction and management of reclamation withdrawn lands
Omnibus Public Land Management Act of 2009 (P.L. 111–11)

Programmatic Agreement for historic preservation regarding how BLM will meet its responsibilities under the National Historic Preservation Act by Bob Bennett, BLM Wyoming State Director dated 03/08/2006
Public Rangelands Improvement Act of 1978 (P.L. 95-514)
Taylor Grazing Act of 1934
Transportation Safety Act of 1974
Special Designations
BLM Manual 1613, Areas of Critical Environmental Concern
BLM Manual 6400, Wild and Scenic Rivers (2012)
Socioeconomic Resources
Additional Guidance on the Treatment of Socioeconomic Issues in Land Use Plans, BLM IM-2002-167
American Folklife Preservation Act of 1976 (20 U.S.C. 2101)
American Indian Religious Freedom Act of 1978 (P.L. 95-341; 42 U.S.C. 1996 and 1996a)
Archaeological Resources Protection Act of 1979 (16 U.S.C. 470)
Civil Rights Act of 1964 (P.L. 88-352)
Clean Water Act of 1972, as amended (33 U.S.C. 1251 et seq.)
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (42 U.S.C. 9601 et seq.)
Environmental Justice Guidance under National Environmental Policy Act
Emergency Planning and Community Right-to-Know Act of 1986
Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
Executive Order 13006, Locating Federal Facilities on Historic Properties in Our Nation's Central Cities
Executive Order 13007, which mandates the protection and preservation of Indian religious practices
Executive Order 13148, Greening of the Government Through Leadership in Environmental Management, 2000
Executive Order 13175, Consultation and Coordination with Indian Tribal Governments
Federal Facilities Compliance Act of 1992 (P.L. 102-386)
Guidance on the Recommended Formats for Land Use Plans, Records of Decision, and Their Supporting Environmental Impact Statements, BLM IB-2002-056
Hazardous Materials Management, BLM Manual Section 1703
Instruction Memorandum 2002-164, Guidance to Address Environmental Justice in Land Use Plans and Related National Environmental Policy Act Document. (2002)
Indian General Allotment Act of 1887
Indian Mineral Development Act of 1982 (25 U.S.C. 2101 et seq.)
Indian Reorganization Act of 1934 (25 U.S.C. 461 et seq.)
Indian Self Determination and Education Assistance Act of 1975 (P.L. 93-658; 25 U.S.C. 450 et seq.)
Military Munitions and Explosives of Concern: A Handbook for Federal Land Managers with Emphasis on Unexploded Ordnance, Draft BLM Handbook H-1703-2
National Contingency Plan Regulations (40 CFR 300)
National Historic Preservation Act of 1966 (16 U.S.C. 470)
Native American Coordination and Consultation, BLM Manual 8160
Native American Graves Protection and Repatriation Act of 1990 (43 CFR 10)
Natural Resource Damage Assessment Regulations
Occupational Safety and Health Act of 1970 (29 U.S.C. 651 et seq.)
Oil Pollution Act of 1990 (33 U.S.C. 2715a)
Pre-acquisition Environmental Site Assessments, BLM Manual Handbook H-2101-4
Recreational and Public Purposes Act of 1926, as amended in 1988 (43 U.S.C. 869)
Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901 et seq.)
Rules applicable only within the State of Wyoming that have been adopted under the Surface Mining Control and Reclamation Act of 1977 (30 CFR 950)
Safe Water Drinking Act of 1974, as amended (42 U.S.C. 300 et seq.)
Secretarial Order 3206 for Implementing the Endangered Species Act
Surface Mining Control and Reclamation Act, Section 409 (P.L. 95-87, Section 401-C.1)
Use of the Economic Profile System in Planning, BLM IM 2003-169

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Appendix B. Greater Sage-Grouse Implementation Framework

Note: This appendix was revised following the release of the Buffalo Draft Resource Management Plan and Environmental Impact Statement.

Introduction

The Buffalo Resource Management Plan (RMP) provides specific goals, objectives, management actions, and required design features for the conservation of Greater Sage-Grouse in Wyoming. These are the commitments made to meet the federal agencies' national policy and direction for the conservation of Greater Sage-Grouse in light of the 2010 U.S. Fish and Wildlife Service (USFWS) listing decision as warranted but precluded from listing under the Endangered Species Act (ESA). Through the National Planning Strategy, Bureau of Land Management (BLM) and U.S. Forest Service (USFS) in coordination with USFWS have identified conservation measures to be included in the respective agencies' land use plans as the principal regulatory mechanisms to assure adequate conservation of the Greater Sage-Grouse and its habitat on public lands.

The measures identified in this RMP have been developed in coordination with not just the USFWS, but also the State of Wyoming, including the Wyoming Game and Fish Department (WGFD), and local cooperating agencies including conservation districts and counties.

Wyoming has established Core Population Areas to help delineate landscape planning units by distinguishing areas of high biological value. These areas are based on the locations of breeding areas and are intended to help balance Greater Sage-Grouse habitat requirements with demand for energy development (Doherty et al. 2011). The Proposed RMP is consistent with the Core Area Strategy, but contains additional restrictions to protect other resources, which results in added protections to Greater Sage-Grouse habitat and achieving conservation objectives identified in the COT Report on BLM-managed public lands. The COT Report indicates that the Core Area Strategy is a substantial regulatory mechanism that contributes to the conservation of Greater Sage-Grouse and balances the priorities of retaining a healthy Greater Sage-Grouse population on the landscape and energy development.

This appendix will introduce the framework for implementation of Greater Sage-Grouse conservation measures within the Buffalo Field Office. Implementation is a combination of permitting activities under the auspices of management direction provided in the Land Use Plan (LUP), undertaking specific activities in pursuit of the goals and objectives identified in the plan and monitoring of sage brush habitat and populations.

The implementation framework outlined here is focused specifically towards Greater Sage-Grouse and is reflective of how the national strategy will be assimilated into the existing statewide implementation efforts currently in place in Wyoming. This framework has been developed mindful of the varying scales at which implementation will be evaluated: at the local level to define successful conservation measures, at the state level to assess success of the statewide strategy, and across the species' range.

In 2013, the Director of USFWS tasked staff with the development of range-wide conservation objectives for the sage-grouse to define the degree to which threats need to be reduced or ameliorated to conserve sage-grouse so that it is no longer in danger of extinction or likely to

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Framework
Introduction*

become in danger of extinction in the foreseeable future. Recognizing that state wildlife agencies have management expertise and management authority for sage-grouse, the USFWS created a Conservation Objectives Team (COT) of state and USFWS representatives to accomplish this task.

The COT conservation framework consisted of (1) identifying sage-grouse population and habitat status and threats, (2) defining a broad conservation goal, (3) identifying priority areas for conservation, and (4) developing specific conservation objectives and measures. The COT used three parameters—population and habitat representation, redundancy, and resilience (Shaffer and Stein 2010, Redford *et al.* 2011)—as guiding concepts in developing the conservation goal, priority areas for conservation, conservation objectives, and measures.

The COT report identified priority areas for Greater Sage-Grouse population habitats as Priority Areas for Conservation or (PACs). PACs are recognized as key areas across the landscape that are necessary to maintain redundant, representative, and resilient populations” of the species. The COT Report describes maintaining the integrity of PACs as “the essential foundation for sage-grouse conservation.” PACs cover nearly 73 million acres across the west; within the Buffalo planning area, more than 1.2 million acres are considered priority habitat. Twenty-one percent of the priority habitat in the planning area is BLM-administered surface and 56 percent is BLM-administered minerals. Based upon 2007 lek counts and the population data contained in the COT Report, the Buffalo planning area contains an estimated four percent of the range-wide population of Greater Sage-Grouse (Table B.1, “Greater Sage-Grouse Habitat within the Buffalo Planning Area” (p. 1780)).

Table B.1. Greater Sage-Grouse Habitat within the Buffalo Planning Area

Populations/Subpopulations: Powder River Basin, Wyoming Portion, WAFWA Management Zone I (for the portion of the population that lies within the planning area; Wyoming 9-Plan (TBNG) removed)				
Surface Estate	Core Area Acres (%)	Connectivity Corridor Acres (%)	Priority Habitat Total (core + connectivity)	General Habitat Acres (%)
Private	716,859 (79)	235,843 (85)	952,702 (81)	3,772,508 (79)
State	76,634 (8)	16,467 (6)	93,100 (8)	391,374 (8)
BLM	112,451 (12)	24,989 (9)	137,440 (12)	628,162 (13)
Other	0 (0)	0 (0)	0 (0)	12,736 (0.3)
Total	905,944	277,300	1,183,244	4,804,779
Fluid Mineral Estate	Core Area Acres (%)	Connectivity Corridor Acres (%)	Priority Habitat Total (core + connectivity)	General Habitat Acres (%)
Non-federal	385,488 (43)	122,886 (44)	508,375 (43)	2,189,675 (46)
BLM	520,456 (57)	154,413 (56)	674,869 (57)	2,615,104 (54)
Total	905,944	277,300	1,183,244	4,804,779
% percent				
BLM Bureau of Land Management				
TBNG Thunder Basin National Grassland				
WAFWA Western Association of Fish and Wildlife Agencies				

The conservation objectives identified in the COT Report, targeted at maintaining redundant, representative, and resilient sage-grouse habitats and populations, is the basis by which the Greater Sage-Grouse elements of the Buffalo Proposed RMP were developed. Due to the variability in ecological conditions and the nature of the threats across the range of the sage-grouse, developing detailed, prescriptive species or habitat actions was not attainable at the range-wide scale. Specific strategies and actions necessary to achieve the conservation objectives have been developed by

BLM and USFS in cooperation with State and local governments to ensure implementation of activities to meet the objectives identified in the COT report.

B.1. COT Objective 1: Stop Population Declines and Habitat Loss

There is an urgent need to ‘stop the bleeding’ of continued population declines and habitat losses by acting immediately to eliminate or reduce the impacts contributing to population declines and range erosion. There are no populations within the range of sage-grouse that are immune to the threat of habitat loss and fragmentation. (COT Report, 2013)

The COT Report identified a series of threats to Greater Sage-Grouse habitat and the extent of those threats at the population scale. The management actions identified in the RMP were specifically designed to reduce the threats, as they were identified. The Buffalo RMP encompasses lands within Western Association of Fish and Wildlife Agencies (WAFWA) Management Zone I. To ensure that the threats are adequately addressed by the RMP, a strategy for reviewing activities and projects on public lands to determine the extent of their impact on Greater Sage-Grouse habitat has also been developed. The following outlines the process by which all activities on public lands will be reviewed.

The BLM/USFS will ensure that any activities or projects in Greater Sage-Grouse habitats would: (1) only occur in compliance with the Buffalo RMP Greater Sage-Grouse goals and objectives for priority management areas; and (2) maintain neutral or positive Greater Sage-Grouse population trends and habitat by avoiding, minimizing, and offsetting unavoidable impacts to assure a conservation gain at the scale of this land use plan and within Greater Sage-Grouse population areas, State boundaries, and WAFWA Management Zones through the application of mitigation for implementation-level decisions. The mitigation process will follow the regulations from the White House Council on Environmental Quality (CEQ) (40 CFR 1508.20; e.g., avoid, minimize, and compensate), hereafter referred to as the mitigation hierarchy, while also following Secretary of the Interior Order 3330 and consulting BLM, USFWS and other current and appropriate mitigation guidance. If it is determined that residual impacts to Greater Sage-Grouse from implementation-level actions would remain after applying avoidance and minimization measures to the extent possible, then compensatory mitigation projects will be used to offset residual impacts, or the project may be deferred or denied if necessary to achieve the goals and objectives for priority and general management areas in the Buffalo RMP.

To ensure that impacts from activities proposed in sage-grouse Core Areas are appropriately approved and mitigated as necessary, the BLM will apply mitigation measures and conservation actions and potentially modify the location, design, construction, and/or operation of proposed land uses or activities to comply with statutory requirements for environmental protection. The mitigation measures and conservation actions (Appendix D (p. 1863)) for proposed projects or activities in these areas will be identified as part of the National Environmental Policy Act (NEPA) environmental review process, through interdisciplinary analysis involving resource specialists, project proponents, government entities, landowners or other Surface Management Agencies. Those measures selected for implementation will be identified in the Record of Decision (ROD) or Decision Record (DR) for those authorizations and will inform a potential lessee, permittee, or operator of the requirements that must be met when using BLM-administered public lands and minerals to mitigate, per the mitigation hierarchy referenced above, impacts from the activity or project such that sage-grouse goals and objectives are met. Because these actions create a clear obligation for the BLM to ensure any proposed mitigation action adopted in

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*COT Objective 1: Stop Population Declines
and Habitat Loss*

the environmental review process is performed, there is assurance that mitigation will lead to a reduction of environmental impacts in the implementation stage and include binding mechanisms for enforcement (CEQ Memorandum for Heads of Federal Departments and Agencies 2011).

To achieve the goals and objectives for Core Areas in the Buffalo Planning Area, the BLM will assess all proposed land uses or activities such as road, pipeline, communication tower, or powerline construction, fluid and solid mineral development, range improvements, and recreational activities proposed for location in Core Areas in a step-wise manner. The following steps identify a screening process for review of proposed activities or projects in these areas. This process will provide a consistent approach and ensure that authorization of these projects, if granted, will appropriately mitigate impacts and be consistent with the LUP goals and objectives for sage-grouse. The following steps provide for a sequential screening of proposals.

Table B.2. Implementation of RMP Decisions to Address COT Threats

COT Threat	Threat Extent	Program Area	RMP Decision	Implementation Process	Tracking Mechanism
Sagebrush Elimination	Present but Localized	Fire and Fuels Management Grassland and Shrubland Communities Livestock Grazing Management			
Weeds/Annual Grasses	Present but Localized	Fire and Fuels Management Special Status Species Grassland and Shrubland Communities Invasive Species and Pest Management Rights-of-Way Travel and Transportation Management Recreation			
Energy	Present and Widespread	Soil Water/Riparian and Wetland Communities Leasables- Fluid Minerals Grassland and Shrubland Communities Invasive Species and Pest Management Wildlife Resources Special Status Species Visual Resources Rights-of-Way			
Fire	Present but Localized	Fire and Fuels Management Grassland and Shrubland Communities Livestock Grazing Management			
Grazing Range Management Structures	Present and Widespread	Livestock Grazing Management Special Status Species			
Free-Roaming Equids	Not Present	Wild Horse and Burro Management			

COT Threat	Threat Extent	Program Area	RMP Decision	Implementation Process	Tracking Mechanism
Conifer Encroachment	Present but Localized	Fire and Fuels Management Grassland and Shrubland Communities Special Status Species			
Agriculture and Urbanization	Present but Localized	Lands and Realty			
Mining	Present and Widespread	Locatable Minerals Leasable Minerals- Coal Salable Minerals Soil Water/Riparian and Wetland Communities Invasive Species and Pest Management Wildlife Resources Special Status Species Visual Resources Rights-of-Way			
Recreation	Present and Widespread	Recreation Travel and Transportation Management			
Infrastructure	Present and Widespread	Rights-of-Way Soil Water/Riparian and Wetland Communities Invasive Species and Pest Management Wildlife Resources Special Status Species Visual Resources			
COT Conservation Objectives Team RMP Resource Management Plan					

B.1.1. Step 1 – Determine Proposal Adequacy

This screening process is initiated upon formal submittal of a proposal for authorization for use of BLM/USFS lands. The actual documentation of the proposal would include at a minimum a description of the location, scale of the project and timing of the disturbance. The acceptance of the proposal(s) for review would be consistent with existing protocol and procedures for each type of use. Evaluating consistency with (at a minimum) State sage-grouse regulations.

B.1.2. Step 2 – Evaluate Proposal Consistency with LUP

Step 2.1

The proposal will be reviewed to determine whether it would be allowed as prescribed in the Land Use Plan. For example, some activities or types of development are prohibited in sage-grouse habitat, such as wind developments in Priority Habitat. Evaluation of projects will also include an assessment of the current state of the Adaptive Management hard and soft triggers. If the

Appendix B Greater Sage-Grouse Implementation Framework

proposal is for an activity that is specifically prohibited, the applicant should be informed that the application is being rejected since it would not be allowed, regardless of the design of the project.

Step 2.2

The proposal will be reviewed to determine whether it conforms with the Density and Disturbance Limitations. If the proposed activity occurs within a Priority Habitat Management Area (PHMA), evaluate whether the disturbance from the activity exceeds the limit on the amount of disturbance allowed within the activity or project area (Density and Disturbance Calculation Tool [DDCT] process). If current disturbance within the activity area or the anticipated disturbance from the proposed activity exceeds this threshold, the project would be deferred until such time as the amount of disturbance within the area has been reduced below the threshold, redesigned so as to not result in any additional surface disturbance (collocation) or redesigned to move it outside of PHMA. Should the project be a result of a valid existing right, BLM will work to minimize the disturbance and determine any residual impacts that may require appropriate mitigation.

The maximum density of disruptive activities and surface disturbance allowed will be analyzed via the DDCT, and will be conducted by the Federal Land Management Agency on federal land and the project proponent on non-federal (private, state) land per the RMP 9 revision.

State Agency Permit is needed, without a need for a federal permit:

The first point of contact for addressing sage-grouse issues for any state permit application should be the WGFD. Project proponents (proponents) need to have a thorough description of their project and identify the potential effects on sage-grouse prior to submitting an application to the permitting agency. Project proponents should contact WGFD at least 45-60 days prior to submitting their application. More complex projects will require more time. It is understood that WGFD has a role of consultation, recommendation, and facilitation, and has no authority to either approve or deny the project. The purpose of the initial consultation with the WGFD is to become familiar with the project proposal and ensure the project proponent understands the DDCT and recommended stipulations.

Federal Agency Permit is needed, with or without a State permit:

When a project requires federal action prior to approval, the proponent should contact the federal agency responsible for reviewing the action. The federal agency and the proponent will determine the best process for completing the DDCT and receiving recommendations from WGFD. Project proponents (proponents) need to have a thorough description of their project and identify the potential effects on sage-grouse prior to submitting an application to the permitting agency.

Maximum Density and Disturbance Process

Density and Disturbance Calculation

The DDCT is a spatially based tool that calculates both the average density of disruptive activities and total surface disturbance within the area affected by the project, or DDCT assessment area. The DDCT assessment area is created based on buffers around proposed projects (first buffer) in protected sage-grouse core areas, and subsequent buffers around any occupied, core area leks within the first buffer. A four mile buffer is used to identify 75 percent of the sage-grouse use around a lek. All activities will be evaluated within the context of maximum allowable disturbance (disturbance percentages, location and number of disturbances) of suitable

sage-grouse habitat (see Appendix 1 of Wyoming Executive Order 2011-5 for definition of suitable sage-grouse habitat and disturbance of suitable sage-grouse habitat) within the DDCT assessment area. This tool allows for better siting of projects rather than averaging the density/disturbance calculation per section.

All lands within core area boundaries are considered suitable habitat unless documented. Mapped unsuitable habitat is treated neither as suitable habitat, nor disturbance, which results in the area being removed from the DDCT assessment area altogether.

1. Density/Disturbance Calculation Tool (DDCT): Determine all occupied leks within a core population area that may be affected by the project by placing a four-mile boundary around the project boundary (as defined by the proposed area of disturbance related to the project) (see Figure B.1, “Four-Mile Buffer around the Proposed Project Boundary” (p. 1785)). All occupied leks located within the four-mile boundary and within a core population area will be considered in this assessment.

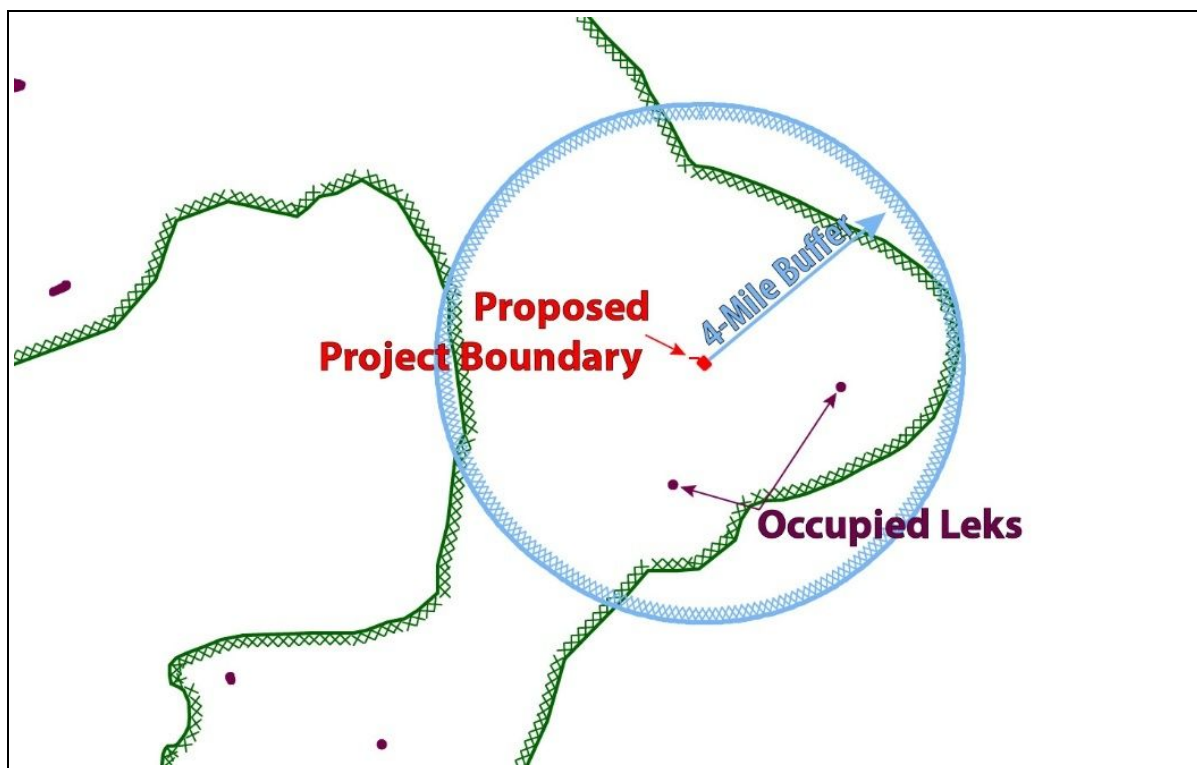


Figure B.1. Four-Mile Buffer around the Proposed Project Boundary

A four-mile boundary will then be placed around the perimeter of each of these lek(s) (see Figure B.2, “Four-Mile Boundary around Perimeter of Lek(s)” (p. 1785)).

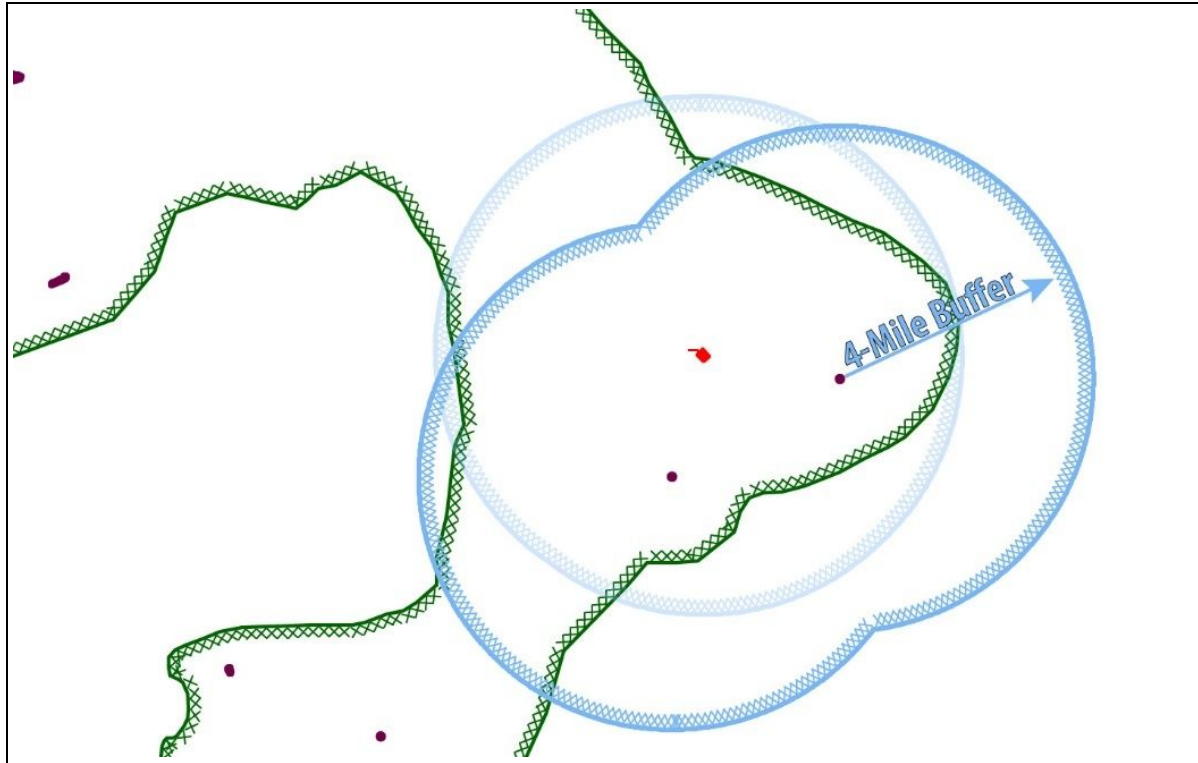


Figure B.2. Four-Mile Boundary around Perimeter of Lek(s)

The core population area within the combined four-mile buffer around both the leks and the project boundary creates the DDCT assessment area for each individual project (see Figure B.3, “DDCT Assessment Area” (p. 1786)).

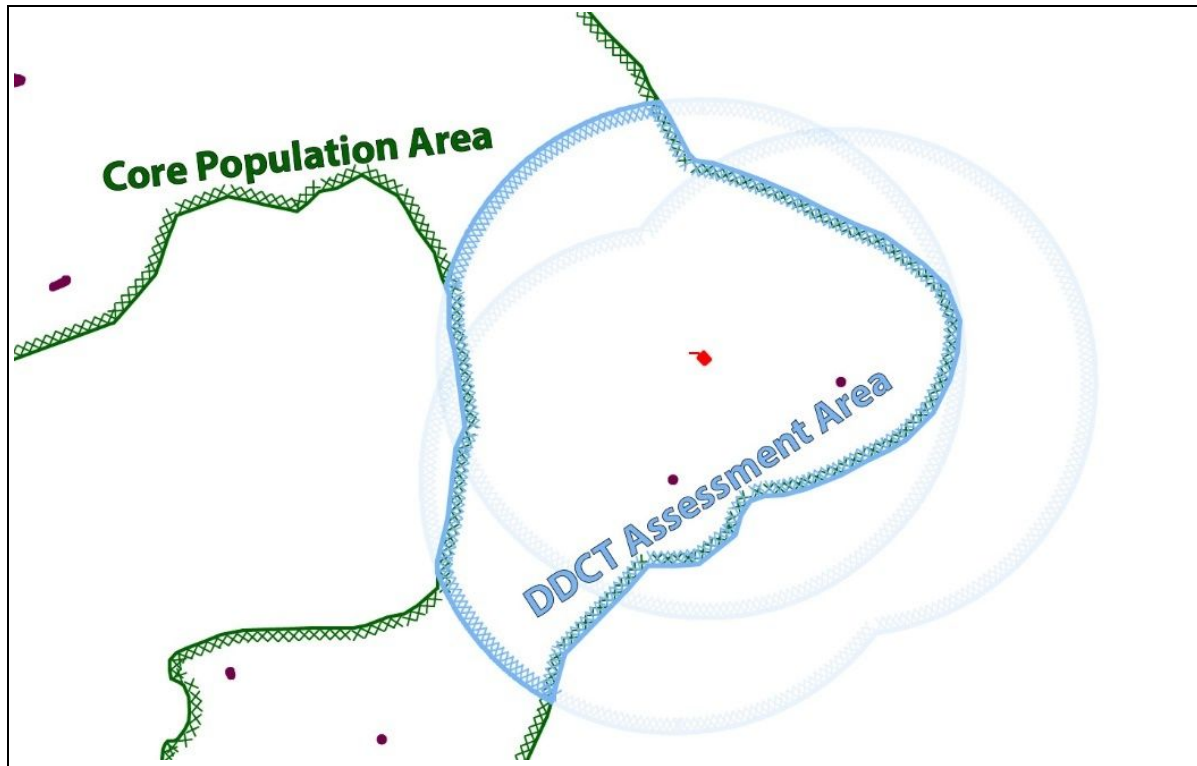


Figure B.3. DDCT Assessment Area

Disturbance will be analyzed for the DDCT assessment area as a whole and for each individual lek within the DDCT assessment area (see Figure B.4, “Existing Disturbance with Four-Mile Buffer” (p. 1788)).



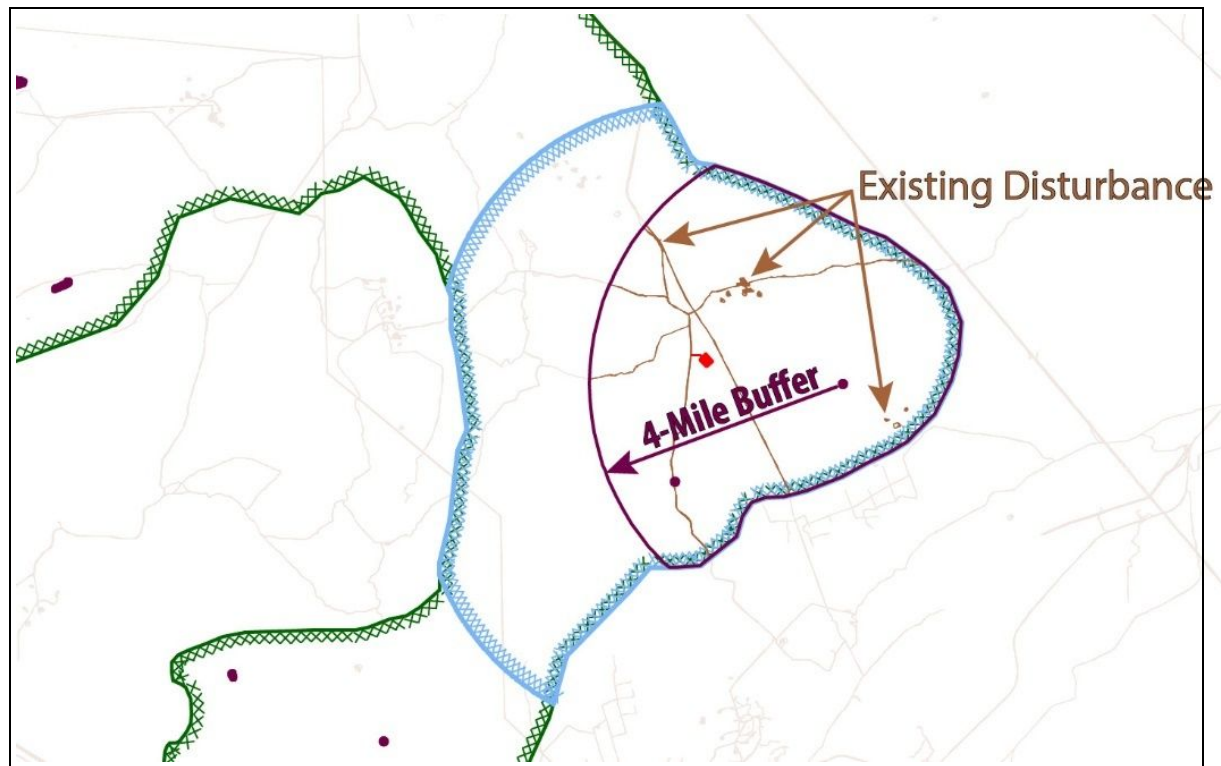
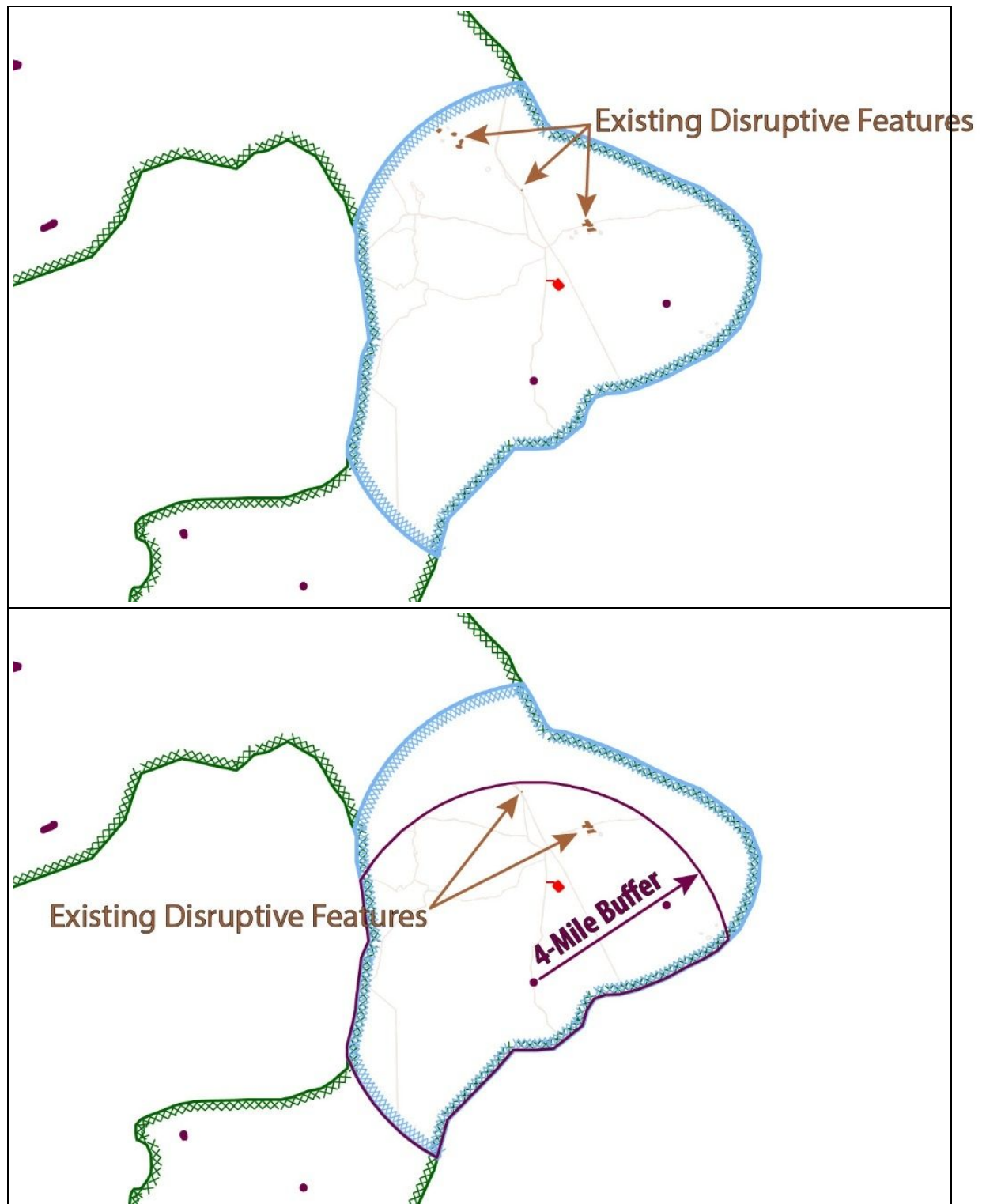


Figure B.4. Existing Disturbance with Four-Mile Buffer

Density of disruptive features will be analyzed for the DDCT assessment area as a whole and for each individual lek within the DDCT assessment area (see Figure B.5, “Density of Existing Disruptive Features in the DDCT Assessment Area” (p. 1790)).



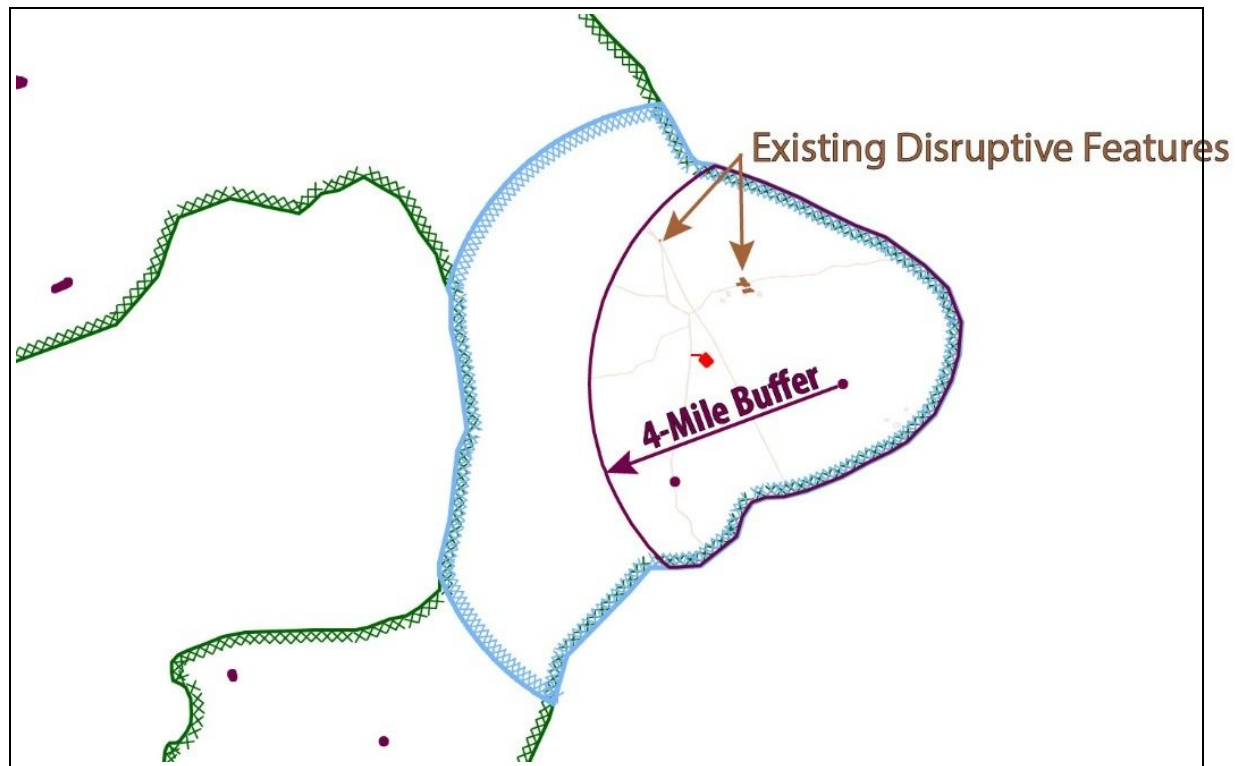


Figure B.5. Density of Existing Disruptive Features in the DDCT Assessment Area

If there are no leks identified for this assessment within the four-mile boundary around the project boundary, the DDCT assessment area will be that portion of the four-mile project boundary within the core population area.

2. Density and Disturbance Analysis: The total number of discrete disruptive activity features, as well as the total disturbance acres within the DDCT assessment area will be determined through an evaluation of:
 - a. Existing disturbance (sage-grouse habitat that is disturbed due to existing anthropogenic activity and wildfire).
 - b. Approved permits (that have approval for on the ground activity) not yet implemented.
 - c. Validating digitized disturbance through on the ground evaluation.

Permitting

The complete analysis package (DDCT results, mapbook, and Worksheet), and recommendations developed by consultation and review outlined herein will be forwarded to the appropriate permitting agency(s). WGFD recommendations will be included, as will other recommendations from project proponents and other appropriate agencies. Project proponent shall have access to all information used in developing recommendations. Where possible and when requested by the project proponent, State agencies shall provide the project proponent with potential development alternatives other than those contained in the project proposal.

If the permit for which a proponent has applied expires, another DDCT analysis is required before issuing a new permit. An additional DDCT is not required for Permit extensions or

renewals when no changes are being authorized. Any project will need to comply with the current Executive Order.

Step 2.3

The BLM/USFS's goal for any new activity or development proposal within core areas is to provide consistent implementation of project proposals which meet the BLM's LUP goals and the population management objectives of the State. Activities would be consistent with the strategy where it can be sufficiently demonstrated that no declines to core populations would be expected as a result of the proposed action. Published research suggests that impacts to sage-grouse leks associated primarily with infrastructure and energy development are discernible at a distance of at least 4 miles and that many leks within this radius have been extirpated as a direct result of development (Walker et al. 2007; Walker 2008). Research also suggests that an evaluation of habitats and sage-grouse populations that attend leks within an 11-mile radius from the project boundary in the context of "large" projects may be appropriate in order to consider all seasonal habitats that may be affected for birds that use the habitats associated with the proposal during some portion of the life-cycle of seasonally migratory sage-grouse (Connelly et al. 2000).

To determine the manner in which Greater Sage-Grouse may be impacted by proposed undertakings, the following will be reviewed in the site specific NEPA analysis to quantify the effects:

- Greater Sage-Grouse Habitat delineation maps.
- Current science recommendations.
- The 'Base Line Environment Report' (USGS) which identifies areas of direct and indirect effect for various anthropogenic activities.
- Consultation with agency or State Wildlife Agency biologist.
- Other methods needed to provide an accurate assessment of impacts.

If the proposal will not have a direct or indirect impact on either the habitat or population, document the findings in the NEPA and proceed with the appropriate process for review, decision and implementation of the project.

B.1.3. Step 3 – Apply Avoidance and Minimization Measures to Comply with Sage-Grouse Goals and Objectives

If the project can be relocated so as to not have an impact on sage-grouse and still achieve objectives of the proposal and the disturbance limitations, relocate the proposed activity and proceed with the appropriate process for review, decision and implementation (NEPA and DR). This Step does not consider redesign of the project to reduce or eliminate direct and indirect impacts, but rather authorization of the project in a physical location that will not impact Greater Sage-Grouse. If the preliminary review of the proposal concludes that there may be adverse impacts to sage-grouse habitat or populations in Step 2 and the project cannot be effectively relocated to avoid these impacts, proceed with the appropriate process for review, decision and implementation (NEPA and Decision Record) with the inclusion of appropriate mitigation requirements to further reduce or eliminate impacts to sage-grouse habitat and populations and achieve compliance with sage-grouse objectives. Mitigation measures could include design modifications of the proposal, site disturbance restoration, post project reclamation, etc (see Appendix D (p. 1863)). Compensatory or offsite mitigation may be required (Step 4) in situations where residual impacts remain after application of all avoidance and minimization measures.

Appendix B Greater Sage-Grouse Implementation Framework

Step 3 – Apply Avoidance and Minimization Measures to Comply with Sage-Grouse Goals and Objectives

May 2015

B.1.4. Step 4 – Apply Compensatory Mitigation or Reject / Defer Proposal

If screening of the proposal has determined that direct and indirect impacts cannot be eliminated through avoidance or minimization, evaluate the proposal to determine if compensatory mitigation can be used to offset the remaining adverse impacts and achieve sage-grouse goals and objectives. If the impacts cannot be effectively mitigated, reject or defer the proposal. The criteria for determining this situation could include but are not limited to:

- The current trend within the Priority Habitat is down and additional impacts, whether mitigated or not, could lead to further decline of the species or habitat.
- The proposed mitigation is inadequate in scope or duration, has proven to be ineffective or is unproven in terms of science based approach.
- The project would impact habitat that has been determined to be a limiting factor for species sustainability.
- Other site specific information and analysis that determined the project would lead to a downward change of the current species population or habitat and not comply with sage-grouse goals and objectives.

If, following application of available impact avoidance and minimization measures, the project can be mitigated to fully offset impacts and assure conservation gain to the species and comply with sage-grouse goals and objectives, proceed with the appropriate process for review, decision and implementation (NEPA and Decision Record).

Mitigation

General

In undertaking BLM/USFS management actions, and, consistent with valid existing rights and applicable law, in authorizing third party actions that result in habitat loss and degradation within PHMA, the BLM/USFS will require and assure mitigation that provides a net conservation gain to the species including accounting for any uncertainty associated with the effectiveness of such mitigation. This will be achieved by avoiding, minimizing, and compensating for impacts by applying beneficial mitigation actions. Mitigation will follow the regulations from the White House CEQ (40 CFR 1508.20; e.g., avoid, minimize, and compensate), hereafter referred to as the mitigation hierarchy. If impacts from BLM/USFS management actions and authorized third party actions that result in habitat loss and degradation remain after applying avoidance and minimization measures (i.e., residual impacts), then compensatory mitigation projects will be used to provide a net conservation gain to the species. Any compensatory mitigation will be durable, timely, and in addition to that which would have resulted without the compensatory mitigation (see Glossary Terms (p. 1841)).

The BLM/USFS, via the WAFWA Management Zone Greater Sage-Grouse Conservation Team, will develop a WAFWA Management Zone Regional Mitigation Strategy that will inform the NEPA decision making process including the application of the mitigation hierarchy for BLM/USFS management actions and third party actions that result in habitat loss and degradation. A robust and transparent Regional Mitigation Strategy will contribute to Greater Sage-Grouse habitat conservation by reducing, eliminating, or minimizing threats and compensating for residual impacts to Greater Sage-Grouse and its habitat.

*Appendix B Greater Sage-Grouse Implementation
Framework*

*Step 4 – Apply Compensatory Mitigation or
Reject / Defer Proposal*

The BLM's Regional Mitigation Manual MS-1794 serves as a framework for developing and implementing a Regional Mitigation Strategy. The following sections provide additional guidance specific to the development and implementation of a WAFWA Management Zone Regional Mitigation Strategy.

Developing a WAFWA Management Zone Regional Mitigation Strategy

The BLM/USFS, via the WAFWA Management Zone Greater Sage-Grouse Conservation Team, will develop a WAFWA Management Zone Regional Mitigation Strategy to guide the application of the mitigation hierarchy for BLM/USFS management actions and third party actions that result in habitat loss and degradation. The Strategy should consider any State-level Greater Sage-Grouse mitigation guidance that is consistent with the requirements identified in this Appendix. The Regional Mitigation Strategy should be developed in a transparent manner, based on the best science available and standardized metrics.

As described in Chapter 2, the BLM/USFS will establish a WAFWA Management Zone Greater Sage-Grouse Conservation Team (hereafter, Team) to help guide the conservation of Greater Sage-Grouse, within 90 days of the issuance of the Record of Decision. The Strategy will be developed within one year of the issuance of the Record of Decision.

The Regional Mitigation Strategy should include mitigation guidance on avoidance, minimization, and compensation, as follows:

- Avoidance
 - Include avoidance areas (e.g., right-of-way avoidance/exclusion areas, no surface occupancy areas) already included in laws, regulations, policies, and/or land use plans (e.g., Resource Management Plans, Forest Plans, State Plans); and,
 - Include any potential, additional avoidance actions (e.g., additional avoidance best management practices) with regard to Greater Sage-Grouse conservation.
- Minimization
 - Include minimization actions (e.g., required design features, best management practices) already included in laws, regulations, policies, land use plans, and/or land-use authorizations; and,
 - Include any potential, additional minimization actions (e.g., additional minimization best management practices) with regard to Greater Sage-Grouse conservation.
- Compensation
 - Include discussion of impact/project valuation, compensatory mitigation options, siting, compensatory project types and costs, monitoring, reporting, and program administration. Each of these topics is discussed in more detail below.
 - Residual Impact and Compensatory Mitigation Project Valuation Guidance
 - A common standardized method should be identified for estimating the value of the residual impacts and value of the compensatory mitigation projects, including accounting for any uncertainty associated with the effectiveness of the projects.
 - This method should consider the quality of habitat, scarcity of the habitat, and the size of the impact/project.
 - For compensatory mitigation projects, consideration of durability (see Glossary Terms (p. 1841)), timeliness (see Glossary Terms (p. 1841)), and the potential for failure (e.g., uncertainty associated with effectiveness) may require an upward adjustment of the valuation.

- The resultant compensatory mitigation project will, after application of the above guidance, result in proactive conservation measures for Greater Sage-Grouse (consistent with BLM Manual 6840 – Special Status Species Management, section .02).
- **Compensatory Mitigation Options**
 - Options for implementing compensatory mitigation should be identified, such as:
 - Utilizing certified mitigation/conservation bank or credit exchanges.
 - Contributing to an existing mitigation/conservation fund.
 - Authorized-user conducted mitigation projects.
 - For any compensatory mitigation project, the investment must be additional (i.e., additionality: the conservation benefits of compensatory mitigation are demonstrably new and would not have resulted without the compensatory mitigation project).
- **Compensatory Mitigation Siting**
 - Sites should be in areas that have the potential to yield a net conservation gain to the Greater Sage-Grouse, regardless of land ownership.
 - Sites should be durable (see Glossary Terms (p. 1841)).
 - Sites identified by existing plans and strategies (e.g., fire restoration plans, invasive species strategies, healthy land focal areas) should be considered, if those sites have the potential to yield a net conservation gain to Greater Sage-Grouse and are durable.
- **Compensatory Mitigation Project Types and Costs**
 - Project types should be identified that help reduce threats to Greater Sage-Grouse (e.g., protection, conservation, and restoration projects).
 - Each project type should have a goal and measurable objectives.
 - Each project type should have associated monitoring and maintenance requirements, for the duration of the impact.
 - To inform contributions to a mitigation/conservation fund, expected costs for these project types (and their monitoring and maintenance), within the WAFWA Management Zone, should be identified.
- **Compensatory Mitigation Compliance and Monitoring**
 - Mitigation projects should be inspected to ensure they are implemented as designed, and if not, there should be methods to enforce compliance.
 - Mitigation projects should be monitored to ensure that the goals and objectives are met and that the benefits are effective for the duration of the impact.
- **Compensatory Mitigation Reporting**
 - Standardized, transparent, scalable, and scientifically-defensible reporting requirements should be identified for mitigation projects.
 - Reports should be compiled, summarized, and reviewed in the WAFWA Management Zone in order to determine if Greater Sage-Grouse conservation has been achieved and/or to support adaptive management recommendations.
- **Compensatory Mitigation Program Implementation Guidelines**
 - Guidelines for implementing the State-level compensatory mitigation program should include holding and applying compensatory mitigation funds, operating a transparent and credible accounting system, certifying mitigation credits, and managing reporting requirements.

Incorporating the Regional Mitigation Strategy into NEPA Analyses

The BLM/USFS will include the avoidance, minimization, and compensatory recommendations from the Regional Mitigation Strategy in one or more of the NEPA analysis' alternatives for BLM/USFS management actions and third party actions that result in habitat loss and degradation and the appropriate mitigation actions will be carried forward into the decision.

*Appendix B Greater Sage-Grouse Implementation
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*Step 4 – Apply Compensatory Mitigation or
Reject / Defer Proposal*

Implementing a Compensatory Mitigation Program

The BLM/USFS need to ensure that compensatory mitigation is strategically implemented to provide a net conservation gain to the species, as identified in the Regional Mitigation Strategy. In order to align with existing compensatory mitigation efforts, this compensatory mitigation program will be managed at a State-level (as opposed to a WAFWA Management Zone, a Field Office, or a Forest), in collaboration with our partners (e.g., Federal, Tribal, and State agencies).

To ensure transparent and effective management of the compensatory mitigation funds, the BLM/USFS will enter into a contract or agreement with a third-party to help manage the State-level compensatory mitigation funds, within one year of the issuance of the Record of Decision. The selection of the third-party compensatory mitigation administrator will conform to all relevant laws, regulations, and policies. The BLM/USFS will remain responsible for making decisions that affect Federal lands.

B.2. COT Objective 2: Implement Targeted Habitat Management and Restoration

Some sage-grouse populations warrant more than the amelioration of the impacts from stressors to maintain sage-grouse on the landscape. In these instances, and particularly with impacts resulting from wildfire, it may be critical to not only remove or reduce anthropogenic threats to these populations but additionally to improve population health through active habitat management (e.g., habitat restoration). This is particularly important for those populations that are essential to maintaining range-wide redundancy and representation. (COT Report, 2013)

In many areas of Wyoming, amelioration of threats isn't enough. Activities must be taken to enhance the habitat for continued success of Greater Sage-Grouse. This objective identifies the areas where RMPs will put forth the commitments for habitat restoration and enhancement.

The Wyoming Game and Fish Department established local Greater Sage-Grouse working groups over 10 years ago. Each of these local working groups developed conservation plans which have served to guide conservation of Greater Sage-Grouse habitat at a local level. The management objectives for this federal land use plan were developed in coordination with the State of Wyoming, recognizing the ongoing work which has been done over the last 10 years in Wyoming as a result of the conservation efforts identified by each of the local working groups.

Upon completion of the planning process, with issuance of an Approved Plan and Record of Decision, subsequent implementation decisions will be put into effect by developing implementation (activity-level or project-specific) plans. These implementation decisions will be based upon the objectives identified in the Approved Plan and Record of Decisions, and will be coordinated with local working groups.

B.3. COT Objective 3: Develop and Implement State and Federal Conservation Strategies and Associated Incentive-based Conservation Actions and Regulatory Mechanisms

To conserve sage-grouse and habitat redundancy, representation, and resilience, state and federal agencies, along with interested stakeholders within range of the

sage-grouse should work together to develop a plan, including any necessary regulatory or legal tools (or use an existing plan, if appropriate) that includes clear mechanisms for addressing the threats to sage-grouse within PACs. Where consistent with state conservation plans, sage-grouse habitats outside of PACs should also be addressed. We recognize that threats can be ameliorated through a variety of tools within the purview of states and federal agencies, including incentive-based conservation actions or regulatory mechanisms. Federal land management agencies should work with states in developing adequate regulatory mechanisms. Federal land management agencies should also contribute to the incentive-based conservation and habitat restoration and rehabilitation efforts. In the development of conservation plans, entities (states, federal land management agencies, etc.) should coordinate with FWS. This will ensure that the plans address the threats contributing to the 2010 warranted but precluded determination, and that conservation strategies will meaningfully contribute to future listing analyses. (COT Report, 2013)

B.3.1. Implementation Working Groups

Implementation strategies for a landscape scale species requires coordination across multiple scales, as the work that is conducted at the local scale must be tracked and evaluated for overall success within core areas, the state of Wyoming across the region. As the Greater Sage-Grouse is formally managed by the State of Wyoming, and has a statewide strategy through Governor's Executive Order 2011-05, implementation must be evaluated at that scale as well. For this reason, Wyoming Plans will utilize multiple types of working groups, representing each of the scales at which implementation will be tracked.

National Level

In December 2011, Wyoming Governor Matt Mead and Secretary of the Interior Ken Salazar co-hosted a meeting to address coordinated conservation of the sage-grouse across its range. Ten states within the range of the sage-grouse were represented, as were the USFS, the Natural Resources Conservation Service (NRCS), and the Department of the Interior (DOI) — including representatives from the DOI's BLM and USFWS. The primary outcome of the meeting was the creation of a Sage-Grouse Task Force (Task Force) chaired by Governors Mead (WY) and Hickenlooper (CO) and the Director of the BLM. The Task Force was directed to develop recommendations on how to best advance a coordinated, multi-state, range-wide effort to conserve the sage-grouse, including the identification of conservation objectives to ensure the long-term viability of the species.

Regional Level

Regional Level Teams (Sage Grouse Implementation Group)

State Level

The Sage Grouse Implementation Team (SGIT) has been established through Wyoming Legislature (Wyoming Statute 9-19-101(a)) to review data and make recommendations to the Governor of Wyoming regarding actions and funding to enhance and restore Greater Sage-Grouse habitats in Wyoming. Additionally, the SGIT is responsible for making recommendations to the Governor regarding regulatory actions necessary to maintain Greater Sage-Grouse populations and Greater Sage-Grouse habitats.

Adaptive Management Working Group has been established in consultation with the SGIT to provide appropriate guidance for agencies with the ability to affect sage-grouse populations and/or habitat through their permitting authority. The AMWG includes BLM, USFS, USFWS, and State of Wyoming.

Local Level

In 2000, a Local Working Group was established by the Wyoming Game and Fish Department to develop and facilitate implementation of local conservation plans for the benefit of sage-grouse, their habitats, and whenever feasible, other species that use sagebrush habitats. This group prepared the Wyoming Greater Sage-Grouse Conservation Plan (Wyoming Sage-Grouse Working Group 2003) to provide coordinated management and direction across the state. In 2004, local Greater Sage-Grouse working groups were formed to develop and implement local conservation plans. Eight local working groups around Wyoming have completed conservation plans, many of which prioritize addressing past, present, and reasonably foreseeable threats at the state and local levels, and prescribe management actions for private landowners to improve Greater Sage-Grouse conservation at the local scale, consistent with Wyoming's Core Population Area Strategy.

B.3.2. Implementation Tracking

Because the State of Wyoming continues to retain management of the species, and through implementation of the Executive Order, BLM Wyoming will continue to coordinate tracking of populations, disturbance and conservation actions.

- DDCT GIS for tracking disturbance
- De-minimus Actions
- Population Counts
- Lek counts
- Conservation Actions

In addition to the tracking databases being maintained by the State of Wyoming, a national-Greater Sage-Grouse Land Use Plan Decision Monitoring and Reporting Tool is being developed to describe how the BLM and the USFS will consistently and systematically monitor and report implementation-level activity plans and implementation actions for all plans within the range of sage-grouse. A description of this tool for collection and reporting of tabular and spatially explicit data will be included in the Record of Decision or approved plan. The BLM and the USFS will provide data that can be integrated with other conservation efforts conducted by state and federal partners.

B.3.3. Public Involvement

A website where the public can quickly and easily access data concerning implementation will be developed and kept current on the Wyoming BLM database. Creating this website and maintaining it through the implementation cycle will be a vital part of implementation success. The public is welcome to provide implementation comments to the BLM any time during the cycle, but schedules for implementation planning decisions will be posted so the public can make timely comments. All Activity Plan Working Group meetings where recommendations are made to the BLM will be open to the public, and will provide for specific and helpful public involvement. This includes providing web-based information to the public prior to any Activity

Plan Working Group meetings; such that members of the public can provide input to the working session, both early and mid-way through the scheduled meetings.

The state sponsored Local Working Group (LWG) and Sage Grouse Implementation Team (SGIT) meetings are advertised and open to the public.

B.4. COT Objective 4: Proactive Conservation Actions

Proactive, incentive based, voluntary conservation actions (e.g., Candidate Conservation Agreements with Assurances, Natural Resources Conservation Service programs) should be developed and/or implemented by interested stakeholders and closely coordinated across the range of the species to ensure they are complimentary and address sage-grouse conservation needs and threats. These efforts need to receive full funding, including funding for necessary personnel. (COT Report, 2013)

In addition to the conservation activities identified through implementation of the Resource Management Plan in coordination with the Local Working Group Conservation Plans, BLM and USFS will continue to partner with other agencies and stakeholders to identify conservation actions to benefit Greater Sage-Grouse habitat. Actions which may occur could include Candidate Conservation Agreements (CCAs) with accompanying Candidate Conservation Agreements with Assurances (CCAAs) and designation of conservation easements.

CCAs are entered into when a potential threat to habitat is identified. BLM enters into CCAs with USFWS to identify potential threats and plan for conservation measures to address potential threats. The purpose of CCAs and the accompanying CCAAs for private lands is to prevent listing of any sensitive species under ESA.

BLM Wyoming has already entered into a Statewide CCA for range management on BLM lands in Wyoming. This CCA promotes proper livestock grazing and management through implementation of voluntary conservation measures and management practices that are consistent with Greater Sage-Grouse population management and habitat conservation objectives on BLM lands.

Conservation Easements are identified private lands with Greater Sage-Grouse habitat where the private landowners enter into voluntary agreements with the government to give up developmental rights which may adversely affect habitat. The most common way these areas may be used in Wyoming is for mitigation banks. Allowing development within some areas of historic Greater Sage-Grouse habitat or marginal habitat will require appropriate mitigation. In some cases the most appropriate mitigation may be for project proponents to buy credits at a conservation easement, thus creating a mitigation bank. Overall, the benefit is to the Greater Sage-Grouse, as it reduces the overall potential for fragmented habitat by ensuring there are areas with no development potential which could adversely affect the viability of the species.

Sweetwater River Conservancy Habitat Conservation Bank

The Sweetwater River Conservancy Habitat Conservation Bank is the first conservation bank established for Greater Sage-Grouse. Located in central Wyoming, the bank manages habitat for Greater Sage-Grouse allowing energy development and other activities to proceed on other lands within Wyoming. A conservation bank is a site or suite of sites established under an agreement with the USFWS, intended to protect, and improve habitat for species. Credits may be purchased which result in perpetual conservation easements and conservation projects on the land to offset

impacts occurring elsewhere. The Sweetwater River Conservancy Habitat Conservation Bank launched with 55,000 deeded acres of Greater Sage-Grouse habitat, and could expand up to 700,000 acres on other lands owned by the Sweetwater River Conservancy contingent upon demand (USFWS 2015).

Wyoming Landscape Conservation Initiative

The Wyoming Landscape Conservation Initiative is a long-term science based effort to assess and enhance aquatic and terrestrial habitats at a landscape scale in southwest Wyoming, while facilitating responsible development through local collaboration and partnership. Collaborative efforts address multiple concerns at a scale that considers all activities on the landscape, and can leverage resources that might not be available for single agency projects. Greater Sage-Grouse initiatives from the Wyoming Landscape Conservation Initiative have included habitat enhancement efforts (e.g., invasive weed treatment, prescribed grazing strategies), and Greater Sage-Grouse research studies (Wyoming Landscape Conservation Initiative 2013).

Powder River Basin Restoration Program

The Powder River Basin Restoration Program is a collaborative partnership to restore and enhance Greater Sage-Grouse habitat on a landscape level in the Powder River Basin. The basin encompasses 13,493,840 acres in northeast Wyoming and southeast Montana. Surface ownership is composed of approximately 70 percent private lands, 14 percent BLM-administered lands (including 8 percent in Wyoming and 6 percent in Montana), 8 percent Forest Service lands, and 8 percent States of Wyoming and Montana lands. Subsurface mineral ownership is 50 to 60 percent federal (BLM 2014).

The Powder River Basin Restoration Program is focusing on areas affected by the federal oil and gas development that has occurred over the past decade in the Powder River Basin in northeastern Wyoming. Its objectives are restoring or enhancing disturbed previously suitable habitat to suitable habitat for sagebrush obligate species, primarily Greater Sage-Grouse. This includes multiple sites affected by coal bed natural gas abandonment reclamation efforts, wildfires, and noxious and invasive plants. Priority will be given to those areas recognized as priority habitats (e.g., Core Population Areas and connectivity corridors).

Habitat objectives are meeting the needs for nesting, brood-rearing, and late brood-rearing. The program would contribute to efforts focused on the management and control of mosquitoes carrying West Nile virus and would include funding, labor, treatment locations, and other needs as determined.

Additionally, efforts would be coordinated to reduce fuels in and near Greater Sage-Grouse habitat, to enhance sagebrush stands, support restoration efforts, and reduce the risk of high-severity wildfire. Pine stands and juniper woodlands would be managed for structural diversity and to reduce fuels, especially near PHMA, human developments, and recreation areas.

Natural Resource Conservation Service Sage Grouse Initiative

The US Department of Agriculture, Natural Resources Conservation Service's Sage-Grouse Initiative (SGI) is working with private landowners in 11 western states to improve habitat for Greater Sage-Grouse (Manier et al. 2013). With 13.5 million acres of Greater Sage-Grouse habitat in private ownership within MZ II/VII (Manier et al. 2013, p. 118), a unique opportunity

exists for the Natural Resources Conservation Service to benefit Greater Sage-Grouse and to ensure the persistence of large and intact rangelands by implementing the SGI.

Participation in the SGI program is voluntary, but willing participants enter into binding contracts or easements to ensure that conservation practices that enhance Greater Sage-Grouse habitat, such as fence marking, protecting riparian areas, and maintaining vegetation in nesting areas, are implemented. Participating landowners are bound by a contract (usually 3 to 5 years) to implement, in consultation with Natural Resources Conservation Service staff, conservation practices if they wish to receive the financial incentives offered by the SGI. These financial incentives generally take the form of payments to offset costs of implementing conservation practices and easements or rental payments for long-term conservation.

While potentially effective at conserving Greater Sage-Grouse populations and habitat on private lands, incentive-based conservation programs that fund the SGI generally require reauthorization from Congress under subsequent farm bills, meaning future funding is not guaranteed.

B.5. COT Objective 5: Development of Monitoring Plans

A robust range-wide monitoring program must be developed and implemented for sage-grouse conservation plans, which recognizes and incorporates individual state approaches. A monitoring program is necessary to track the success of conservation plans and proactive conservation activities. Without this information, the actual benefit of conservation activities cannot be measured and there is no capacity to adapt if current management actions are determined to be ineffective. (COT Report, 2013)

B.5.1. The Greater Sage-Grouse (GRSG) Monitoring Framework

B.5.1.1. Introduction

The purpose of this BLM and USFS Greater Sage-grouse Monitoring Framework (hereafter, monitoring framework) is to describe the methods to monitor habitats and evaluate the implementation and effectiveness of the BLM planning strategy (BLM IM 2012-044) and the USFS Land Use Plans to conserve the species and its habitat. The regulations for the BLM (43 CFR 1610.4-9) and the USFS (36 CFR part 209, published July 1, 2010) require that land use plans establish intervals and standards, as appropriate, for monitoring and evaluations, based on the sensitivity of the resource to the decisions involved. Therefore, BLM and USFS will use the methods described herein to collect monitoring data to evaluate implementation and effectiveness of the Greater Sage-Grouse (hereafter, sage-grouse) planning strategy and the conservation measures contained in land use plans. The type of monitoring data to be collected at the land use plan scale will be described in the monitoring plan which will be developed after the signing of the ROD. For a summary of the frequency of reporting see Attachment A. Adaptive management will be informed by data collected at any and all scales.

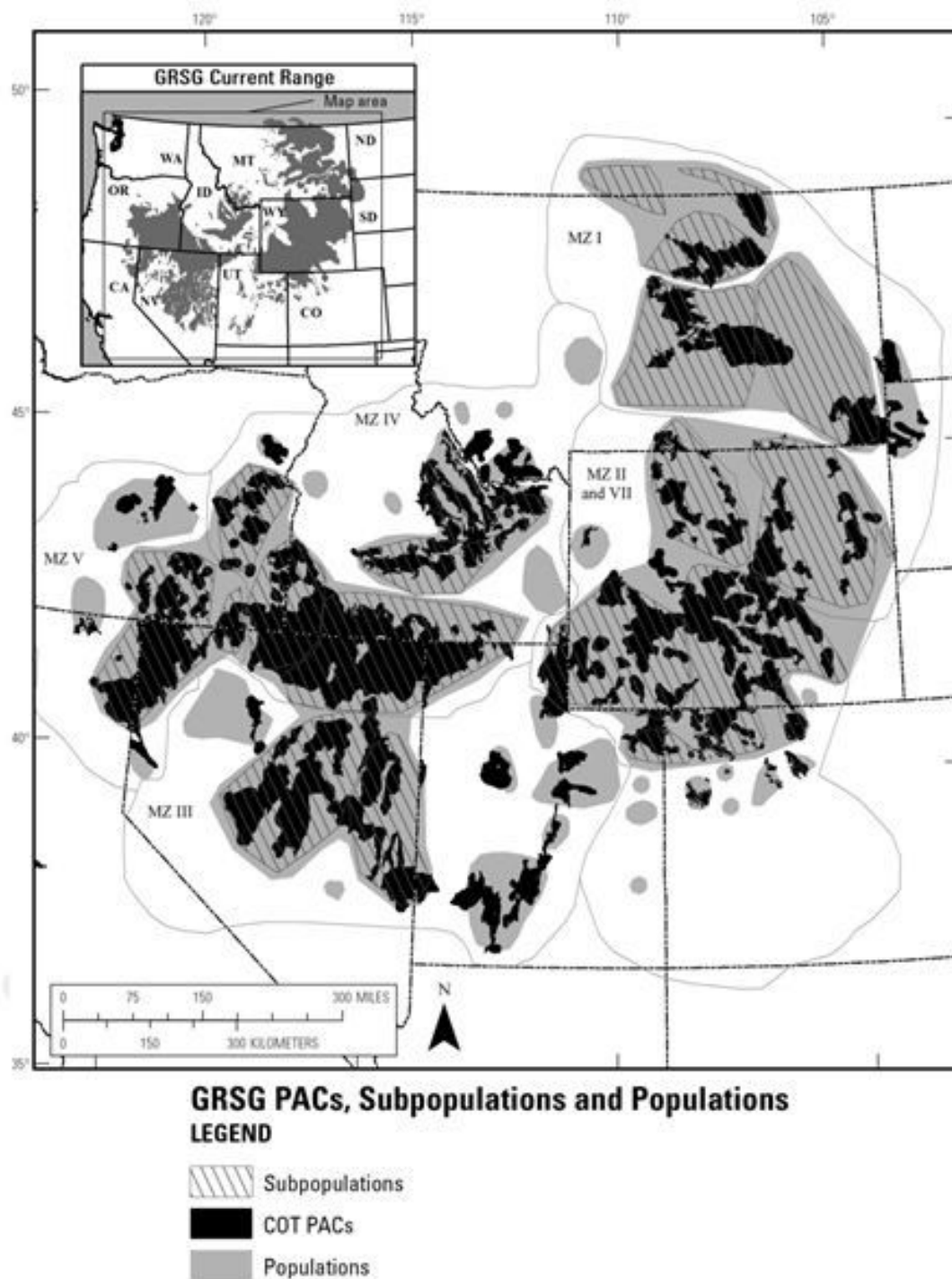
To ensure the BLM and USFS have the ability to make consistent assessments about sage-grouse habitats across the range of the species, this framework lays out the methodology for monitoring the implementation and evaluating the effectiveness of BLM/USFS actions to conserve the species and its habitat through monitoring that informs effectiveness at multiple scales. Monitoring efforts will include data for measurable quantitative indicators of sagebrush availability, anthropogenic

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disturbance levels, and sagebrush conditions. Implementation monitoring results will provide information to allow the BLM and USFS to evaluate the extent that decisions from the BLM resource management plans (RMP) and USFS land management plans (LMP) to conserve sage-grouse and its habitat have been implemented. Population monitoring information will be collected by state fish and wildlife agencies and will be incorporated into effectiveness monitoring as it is made available.

This multi-scale monitoring approach is necessary as sage-grouse are a landscape species and conservation is scale-dependent whereby conservation actions are implemented within seasonal habitats to benefit populations. The four orders of habitat selection (Johnson 1980) used in this monitoring framework are described by Connelly et al. (2003) and Stiver et al. (2014) as first order (broad scale), second order (mid-scale), third order (fine scale), and fourth order (site scale) to apply them to sage-grouse habitat selection. The various scales may show differences because of the methods used. The broad and mid-scale may provide a generalized direction, however the suitability baseline (pre-euro) is not considered an accurate baseline. The current baseline will provide better information on trends provided the data used in the analysis is sound. Based upon the management actions related to the BLM and Wyoming SGEQ, the broad and mid-scale may greatly underestimate the impacts of the threats outlined in the COT report. Habitat selection and habitat use by sage-grouse occurs at multiple scales and is driven by multiple environmental and behavioral factors. Managing and monitoring sage-grouse habitats are complicated by the differences in habitat selection across the range and habitat utilization by individual birds within a given season. Therefore, the tendency to look at a single indicator of habitat suitability or only one scale limits the ability for managers to identify the threats to sage-grouse and to respond at the appropriate scale. For descriptions of these habitat suitability indicators for each scale, see the Sage-grouse Habitat Assessment Framework (HAF) (Stiver et al. *in press*).

Monitoring methods and indicators in this monitoring framework are derived from the current peer-reviewed science. Range wide best-available datasets for broad and mid-scale monitoring will be acquired. If these existing datasets are not readily available or are inadequate, but are necessary to effectively inform the three measurable quantitative indicators (sagebrush availability, anthropogenic disturbance levels, and sagebrush conditions), the BLM will strive to develop datasets or obtain information to fill these data gaps. Datasets that are not readily available to inform the fine and site scale indicators will be developed. These data will be used to generate monitoring reports at the appropriate and applicable geographic scales, boundaries and analysis units: across the range of sage-grouse as defined by Schroeder et al. (2004), and clipped by WAFWA Management Zone (MZ) (Stiver et al. 2006) boundaries and other areas as appropriate for size (e.g., populations based on Connelly et al. 2004; Figure B.6, “Map of Greater Sage-Grouse Range, Populations, Subpopulations, and Priority Areas for Conservation as of 2013” (p. 1802)). This broad and mid-scale monitoring data and analysis will provide context for RMP/LMP areas; states; Greater Sage-Grouse Priority Habitat, General Habitat and other sage-grouse designated management areas; and Priority Areas for Conservation (PACs) as defined in the Greater Sage-grouse Conservation Objectives: Final Report (COT, U.S. Fish and Wildlife Service 2013). Throughout the remainder of the document, all of these areas will be referred to as “sage-grouse areas.”



Source: Schroeder et al. 2004, Connelly et al. 2004, USFWS 2013b

COT Conservation Objectives Team
PAC Priority Area for Conservation

Figure B.6. Map of Greater Sage-Grouse Range, Populations, Subpopulations, and Priority Areas for Conservation as of 2013

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This monitoring framework is divided into two sections. The broad- and mid-scale methods, described in Section B.5.1.2, “Broad and Mid-Scales” (p. 1804), provide a consistent approach across the range of the species to monitor implementation decisions and actions, mid-scale habitat attributes (e.g., sagebrush availability and habitat degradation), and population changes to determine the effectiveness of the planning strategy and management decisions. (See Table B.3, “Indicators for Monitoring Implementation of the Strategy, Decisions, Sage-Grouse Habitat, and Sage-Grouse Population at the Broad and Mid-scales” (p. 1804)) For sage-grouse habitat at the fine and site scales, described in Section B.5.1.3, “Fine and Site Scales” (p. 1828), this monitoring framework describes a consistent approach (e.g., indicators and methods) for monitoring sage-grouse seasonal habitats. Funding, support, and dedicated personnel for broad- and mid-scale monitoring will be renewed annually through the normal budget process. For an overview of BLM and USFS multiscale monitoring commitments (see Attachment A).

Table B.3. Indicators for Monitoring Implementation of the Strategy, Decisions, Sage-Grouse Habitat, and Sage-Grouse Population at the Broad and Mid-scales

Implementation		Habitat		Population (State Wildlife Agencies)
Geographic Scales		Availability	Degradation	Demographics
Broad Scale: From the range of sage-grouse to WAFWA Management Zones	BLM/USFS Planning Strategy goal and objectives	Distribution and amount of sagebrush within the range	Distribution and amount of energy, mining and infrastructure facilities	WAFWA Management Zone population trend
Mid-scale: From WAFWA Management Zone to populations	An analysis of RMP/LRMP decisions across the designated scale	Mid-scale habitat indicators (HAF 2014; Table 2 e.g., percent of sagebrush per unit area)	Distribution and amount of energy, mining and infrastructure facilities (Table 2)	Individual population trend
Fine Scale: PACs	A summary of DDCT actions related to BLM mineral and surface resources in conjunction with other ownerships	Areas that have greater than 5% sagebrush cover and non-habitat (unsuitable) that is less than 0.6 miles from the suitable habitat	Distribution and amount of anthropogenic disturbances and wildfire occurrences impacting specific PACs	PAC trends
Site Scale: DDCT Level	A summary of DDCT actions related to BLM mineral and surface resources	The available occupied habitat using the DDCT process	Distribution and amount of anthropogenic disturbances and wildfire occurrences impacting specific PACs	Individual lek trends
BLM Bureau of Land Management DDCT Density and Disturbance Calculation Tool PAC Priority Area for Conservation USFS U.S. Forest Service WAFWA Western Association of Fish and Wildlife Agencies				

B.5.1.2. Broad and Mid-Scales

First-order habitat selection, the broad scale, describes the physical or geographical range of a species. The first-order habitat of the sage-grouse is defined by populations of sage-grouse

associated with sagebrush landscapes, based on Schroeder et al. 2004, and Connelly et al. 2004, and on population or habitat surveys since 2004. An intermediate scale between the broad and mid scales was delineated by WAFWA from floristic provinces within which similar environmental factors influence vegetation communities. This scale is referred to as the WAFWA Sage-Grouse Management Zones (MZs). Although no indicators are specific to this scale, these MZs are biologically meaningful as reporting units.

Second-order habitat selection, the mid-scale, includes sage-grouse populations and PACs. The second order includes at least 40 discrete populations and subpopulations (Connelly et al. 2004). Populations range in area from 150 to 60,000 square miles and are nested within MZs. PACs range from 20 to 20,400 square miles and are nested within population areas.

Other mid-scale landscape indicators, such as patch size and number, patch connectivity, linkage areas, and landscape matrix and edge effects (Stiver et al. *in press*) will also be assessed. The methods used to calculate these metrics will be derived from existing literature (Knick et al. 2011; Leu and Hanser 2011; Knick and Hanser 2011).

Midscale indicators using the HAF can grossly underestimate the occupation of anthropogenic activities because of the use of 30m pixels (page Table II – X). The HAF removes ‘non’ habitat from the suitability availability. There are no parameters that are provided to protect adjacent suitable habitat from development on these nonhabitat parcels, thus making the adjacent nonhabitat a potential threat by indirect impacts.

The Wyoming BLM and USFS Offices will be actively participating in a fine and site scale monitoring that will more accurately reflect the impacts associated with direct and indirect effects of anthropogenic and wildfire impacts.

B.5.1.2.1. Implementation (Decision) Monitoring

Implementation monitoring is the process of tracking and documenting the implementation (or the progress toward implementation) of RMP/LMP decisions. The BLM and the USFS will monitor implementation of project-level and/or site-specific actions and authorizations, with their associated conditions of approval/stipulations for sage-grouse, spatially (as appropriate) within Priority Habitat, General Habitat, and other sage-grouse designated management areas, at a minimum, for the Buffalo planning area. These actions and authorizations, as well as progress toward completing and implementing activity-level plans, will be monitored consistently across all planning units and will be reported to BLM and USFS headquarters annually, as well as reported to the State of Wyoming with numerical and spatial data twice a year, and a HQ summary report every 5 years, for the Buffalo planning area. A national-level Greater Sage-Grouse Land Use Plan Decision Monitoring and Reporting Tool is being developed to describe how the BLM and the USFS will consistently and systematically monitor and report implementation-level activity plans and implementation actions for all plans within the range of sage-grouse. A description of this tool for collection and reporting of tabular and spatially explicit data will be included in the Record of Decision or approved plan. The BLM will provide data that can be integrated with other conservation efforts conducted by state and federal partners.

B.5.1.2.2. Habitat (Vegetation) Monitoring

The USFWS, in its 2010 listing decision for the sage-grouse, identified 18 threats contributing to the destruction, modification, or curtailment of sage-grouse habitat or range (75 FR 13910 2010).

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The BLM will, therefore, monitor the relative extent of these threats that remove sagebrush, both spatially and temporally, on all lands within an analysis area, and will report on amount, pattern, and condition at the appropriate and applicable geographic scales and boundaries. These 18 threats have been aggregated into three broad- and mid-scale measures to account for whether the threat predominantly removes sagebrush or degrades habitat (see Table B.4, “Relationship Between the Eighteen Threats and the Three Habitat Disturbance Measures for Monitoring” (p. 1806)). The three measures are:

1. Sagebrush Availability (percent of sagebrush per suitable unit area)
2. Habitat Degradation (percent of human activity per unit area)
3. Energy and Mining Density (facilities and locations per suitable unit area)

These three habitat disturbance measures will evaluate disturbance on all lands within priority habitat, regardless of land ownership. The direct area of influence will be assessed with the goal of accounting for actual removal of sagebrush on which sage-grouse depend (Connelly et al. 2000) and for habitat degradation as a surrogate for human activity. Measure 1 (sagebrush availability) examines where disturbances have removed plant communities that support sagebrush (or have broadly removed sagebrush from the landscape). Measure 1, therefore, monitors the change in sagebrush availability—or, specifically, where and how much of the sagebrush community is available on lands that can support sagebrush within the range of sage-grouse. The sagebrush community is defined as the ecological systems that have the capability of supporting sagebrush vegetation and seasonal sage-grouse habitats within the range of sage-grouse (see Section B.5.1.2.2.1, “Sagebrush Availability (Measure 1)” (p. 1807)). Measure 2 (see Section B.5.1.2.2.2, “Habitat Degradation Monitoring (Measure 2)” (p. 1817)) and Measure 3 (see Section B.5.1.2.2.3, “Energy and Mining Density (Measure 3)” (p. 1822)) focus on where habitat degradation is occurring within suitable sagebrush soils by using the footprint/area of direct disturbance and the number of facilities at the mid scale to identify the relative amount of degradation per geographic area of interest and in areas that have the capability of supporting sagebrush and seasonal sage-grouse use. Measure 2 (habitat degradation) not only quantifies footprint/area of direct disturbance but also establishes a surrogate for those threats most likely to have ongoing activity. Because energy development and mining activities are typically the most intensive activities in sagebrush habitat, Measure 3 (the density of active energy development, production, and mining sites) will help identify areas of particular concern for such factors as noise, dust, traffic, etc. that degrade sage-grouse habitat.

Table B.4. Relationship Between the Eighteen Threats and the Three Habitat Disturbance Measures for Monitoring

USFWS Listing Decision Threat	Sagebrush Availability	Habitat Degradation	Density of Energy and Mining
Agriculture	X		
Urbanization	X		
Wildfire	X		
Conifer encroachment	X		
Treatments	X		
Invasive Species	X		
Energy (oil and gas wells and development facilities)		X	X
Energy (coal mines)		X	X
Energy (wind towers)		X	X
Energy (solar fields)		X	X
Energy (geothermal)		X	X

USFWS Listing Decision Threat	Sagebrush Availability	Habitat Degradation	Density of Energy and Mining
Mining (active locatable, leasable, and salable developments)		X	X
Infrastructure (roads)		X	
Infrastructure (railroads)		X	
Infrastructure (power lines)		X	
Infrastructure (communication towers)		X	
Infrastructure (other vertical structures)		X	
Other developed rights of ways		X	
Note: Data availability may preclude specific analysis of individual layers. See the detailed methodology for more information.			
USFWS U.S. Fish and Wildlife Service			

The methods to monitor disturbance found herein differ slightly from methods used in the Sage-Grouse Baseline Environmental Report (BER) (Manier et al. 2013) that provided a baseline of datasets of disturbance across jurisdictions. One difference is that, for some threats, the data in the BER were for federal lands only. In addition, threats were assessed individually in that report, using different assumptions from those in this monitoring framework about how to quantify the location and magnitude of threats. The methodology herein builds on the BER methodology and identifies datasets and procedures to utilize the best available data across the range of the sage-grouse and to formulate a consistent approach to quantify impact of the threats through time. This methodology also describes an approach to combine the threats and calculate the three measures.

B.5.1.2.2.1. Sagebrush Availability (Measure 1)

Sage-grouse populations have been found to be more resilient where a percentage of the landscape is maintained in sagebrush (Knick and Connelly 2011), which will be determined by sagebrush availability. Measure 1 has been divided into two submeasures to describe sagebrush availability on the landscape:

- Measure 1a: the current amount of sagebrush on the geographic area of interest, and
- Measure 1b: the amount of sagebrush on the geographic area of interest compared with the amount of sagebrush the landscape of interest could ecologically support.

Measure 1a (the current amount of sagebrush on the landscape) will be calculated using this formula: [the existing updated sagebrush layer] divided by [the geographic area of interest]. The appropriate geographic areas of interest for sagebrush availability include the species' range, WAFWA MZs, populations, and PACs. In some cases these sage-grouse areas will need to be aggregated to provide an estimate of sagebrush availability with an acceptable level of accuracy.

Measure 1b (the amount of sagebrush for context within the geographic area of interest) will be calculated using this formula: [existing sagebrush divided by [pre-EuroAmerican settlement geographic extent of lands that could have supported sagebrush]. This measure will provide information to set the context for a given geographic area of interest during evaluations of monitoring data. The information could also be used to inform management options for restoration or mitigation and to inform effectiveness monitoring.

The sagebrush base layer for Measure 1 will be based on geospatial vegetation data adjusted for the threats listed in Table B.2, “Implementation of RMP Decisions to Address COT Threats” (p. 1782). The following subsections of this monitoring framework describe the methodology for determining both the current availability of sagebrush on the landscape and the context of the amount of sagebrush on the landscape at the broad and mid scales.

a. Establishing the Sagebrush Base Layer: The current geographic extent of sagebrush vegetation within the rangewide distribution of sage-grouse populations will be ascertained using the most recent version of the Existing Vegetation Type (EVT) layer in LANDFIRE (2013). LANDFIRE EVT was selected to serve as the sagebrush base layer for five reasons: 1) it is the only nationally consistent vegetation layer that has been updated multiple times since 2001; 2) the ecological systems classification within LANDFIRE EVT includes multiple sagebrush type classes that, when aggregated, provide a more accurate (compared with individual classes) and seamless sagebrush base layer across jurisdictional boundaries; 3) LANDFIRE performed a rigorous accuracy assessment from which to derive the rangewide uncertainty of the sagebrush base layer; 4) LANDFIRE is consistently used in several recent analyses of sagebrush habitats (Knick et al. 2011; Leu and Hanser 2011; Knick and Hanser 2011); and 5) LANDFIRE EVT can be compared against the geographic extent of lands that are believed to have had the capability of supporting sagebrush vegetation pre-EuroAmerican settlement [LANDFIRE Biophysical Setting (BpS)]. This fifth reason provides a reference point for understanding how much sagebrush currently remains in a defined geographic area of interest compared with how much sagebrush existed historically (Measure 1b). Therefore, the BLM and the USFS have determined that LANDFIRE provides the best available data at broad and mid scales to serve as a sagebrush base layer for monitoring changes in the geographic extent of sagebrush. The BLM and the USFS, in addition to aggregating the sagebrush types into the sagebrush base layer, will aggregate the accuracy assessment reports from LANDFIRE to document the cumulative accuracy for the sagebrush base layer. The BLM—through its Assessment, Inventory, and Monitoring (AIM) program and, specifically, the BLM’s landscape monitoring framework (Taylor et al. 2014) will provide field data to the LANDFIRE program to support continuous quality improvements of the LANDFIRE EVT layer. The sagebrush layer based on LANDFIRE EVT will allow for the mid-scale estimation of the existing percent of sagebrush across a variety of reporting units. This sagebrush base layer will be adjusted by changes in land cover and successful restoration for future calculations of sagebrush availability (Measures 1a and 1b).

This layer will also be used to determine the trend in other landscape indicators, such as patch size and number, patch connectivity, linkage areas, and landscape matrix and edge effects (Stiver et al. *in press*). In the future, changes in sagebrush availability, generated annually, will be included in the sagebrush base layer. The landscape metrics will be recalculated to examine changes in pattern and abundance of sagebrush at the various geographic boundaries. This information will be included in effectiveness monitoring (see Section B.5.1.2.4, “Effectiveness Monitoring” (p. 1824)).

Within the BLM, field office–wide existing vegetation classification mapping and inventories are available that provide a much finer level of data than what is provided through LANDFIRE. Where available, these finer-scale products will be useful for additional and complementary mid-scale indicators and local-scale analyses (see Section B.5.1.3, “Fine and Site Scales” (p. 1828)). The fact that these products are not available everywhere limits their utility for monitoring at the broad and mid scale, where consistency of data products is necessary across broader geographies.

The sagebrush layer based on LANDFIRE EVT will allow for the mid-scale estimation of existing percent sagebrush across a variety of reporting units. This sagebrush base layer will be adjusted by changes in land cover and successful restoration for future calculations of sagebrush availability (Measures 1a and 1b).

This layer will be used to determine the trend in other landscape indicators, e.g., patch size and number, patch connectivity, linkage areas, and landscape matrix and edge effects (Stiver et al. in press). In the future, changes in sagebrush availability, generated bi-annually, will be included in the sagebrush base layer. The landscape metrics will be recalculated to examine changes in pattern and abundance of sagebrush at the various geographic boundaries. This information will be included in effectiveness monitoring (see Section B.5.1.2.4, “Effectiveness Monitoring” (p. 1824)).

Data Sources for Establishing and Monitoring Sagebrush Availability

In much the same manner as how the LANDFIRE data was selected as the data source, described above, the criteria for selecting the datasets (see Table B.5, “Datasets for Establishing and Monitoring Changes in Sagebrush Activity” (p. 1809)) for establishing and monitoring the change in sagebrush availability, Measure 1, were threefold:

- Nationally consistent dataset available across the range
- Known level of confidence or accuracy in the dataset
- Continual maintenance of dataset and known update interval

Table B.5. Datasets for Establishing and Monitoring Changes in Sagebrush Activity

Dataset	Source	Update Interval	Most Recent Version Year	Use
BioPhysical Setting v1.1	LANDFIRE	Static	2008	Denominator for Sagebrush Availability (1.b.)
Existing Vegetation Type v1.2	LANDFIRE	Static	2010	Numerator for Sagebrush Availability
Cropland Data Layer	National Agricultural Statistics Service	Annual	2012	Agricultural Updates; removes existing sagebrush from numerator of sagebrush availability
National Land Cover Dataset Percent Imperviousness	Multi-Resolution Land Characteristics Consortium	5 Year	2011 available in March 2014	Urban Area Updates; removes existing sagebrush from numerator of sagebrush availability
Fire Perimeters	GeoMac	Annual	2013	< 1,000 acres Fire updates; removes existing sagebrush from numerator of sagebrush availability

Dataset	Source	Update Interval	Most Recent Version Year	Use
Burn Severity	Monitoring Trends in Burn Severity	Annual	2012 available in April 2014	> 1,000 acres Fire Updates; removes existing sagebrush from numerator of sagebrush availability except for unburned sagebrush islands
< less than > greater than				

LANDFIRE Existing Vegetation Type (EVT) Version 1.2

LANDFIRE EVT represents existing vegetation types on the landscape derived from remote sensing data. Initial mapping was conducted using imagery collected in approximately 2001. Since the initial mapping there have been two update efforts: version 1.1 represents changes before 2008, and version 1.2 reflects changes on the landscape before 2010. Version 1.2 will be used as the starting point to develop the sagebrush base layer.

Ecological systems from the LANDFIRE EVT to be used in the sagebrush base layer were determined by sage-grouse subject matter experts through the identification of the ecological systems that have the capability of supporting sagebrush vegetation and could provide suitable seasonal habitat for the sage-grouse (see Table B.6, “Ecological Systems in BpS and EVT Capable of Supporting Sagebrush Vegetation and Could Provide Suitable Seasonal Habitat for Greater Sage-Grouse” (p. 1810)). Two additional vegetation types that are not ecological systems were added to the EVT and are *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance and *Quercus gambelii* Shrubland Alliance. These alliances have species composition directly related to the Rocky Mountain Lower Montane - Foothill Shrubland ecological system and the Rocky Mountain Gambel Oak-Mixed Montane Shrubland ecological system, both of which are ecological systems in LANDFIRE BpS. In LANDFIRE EVT however, in some map zones, the Rocky Mountain Lower Montane - Foothill Shrubland ecological system and the Rocky Mountain Gambel Oak-Mixed Montane Shrubland ecological system were named *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance and *Quercus gambelii* Shrubland Alliance respectively.

Table B.6. Ecological Systems in BpS and EVT Capable of Supporting Sagebrush Vegetation and Could Provide Suitable Seasonal Habitat for Greater Sage-Grouse

Ecological System	Sagebrush Vegetation that the Ecological System has the Capability to Produce
Colorado Plateau Mixed Low Sagebrush Shrubland	<i>Artemisia arbuscula</i> ssp. <i>longiloba</i> <i>Artemisia bigelovii</i> <i>Artemisia nova</i> <i>Artemisia frigida</i> <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>
Columbia Plateau Scabland Shrubland	<i>Artemisia rigida</i>
Great Basin Xeric Mixed Sagebrush Shrubland	<i>Artemisia arbuscula</i> ssp. <i>longicaulis</i> <i>Artemisia arbuscula</i> ssp. <i>longiloba</i> <i>Artemisia nova</i> <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>
Inter-Mountain Basins Big Sagebrush Shrubland	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> <i>Artemisia tridentata</i> ssp. <i>xericensis</i> <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>

Ecological System	Sagebrush Vegetation that the Ecological System has the Capability to Produce
Inter-Mountain Basins Mixed Salt Desert Scrub	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> <i>Artemisia spinescens</i>
Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	<i>Artemisia arbuscula</i> ssp. <i>longiloba</i> <i>Artemisia nova</i> <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> <i>Artemisia tripartita</i> ssp. <i>rupicola</i>
Columbia Plateau Low Sagebrush Steppe	<i>Artemisia arbuscula</i> <i>Artemisia arbuscula</i> ssp. <i>longiloba</i> <i>Artemisia nova</i>
Inter-Mountain Basins Big Sagebrush Steppe	<i>Artemisia cana</i> ssp. <i>cana</i> <i>Artemisia tridentata</i> ssp. <i>tridentata</i> <i>Artemisia tridentata</i> ssp. <i>xericensis</i> <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> <i>Artemisia tripartita</i> ssp. <i>tripartita</i> <i>Artemisia frigida</i>
Inter-Mountain Basins Montane Sagebrush Steppe	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> <i>Artemisia nova</i> <i>Artemisia arbuscula</i> <i>Artemisia tridentata</i> ssp. <i>spiciformis</i>
Northwestern Great Plains Mixed grass Prairie	<i>Artemisia cana</i> ssp. <i>cana</i> <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <i>Artemisia frigida</i>
Northwestern Great Plains Shrubland	<i>Artemisia cana</i> ssp. <i>cana</i> <i>Artemisia tridentata</i> ssp. <i>tridentata</i> <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>
Western Great Plains Sand Prairie	<i>Artemisia cana</i> ssp. <i>cana</i>
Western Great Plains Floodplain Systems	<i>Artemisia cana</i> ssp. <i>cana</i>
Columbia Plateau Steppe and Grassland	<i>Artemisia</i> spp.
Inter-Mountain Basins Semi-Desert Shrub-Steppe	<i>Artemisia tridentata</i> <i>Artemisia bigelovii</i> <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>
Rocky Mountain Lower Montane-Foothill Shrubland	<i>Artemisia nova</i> <i>Artemisia tridentata</i> <i>Artemisia frigida</i>
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	<i>Artemisia tridentata</i>
Inter-Mountain Basins Curl-Leaf Mountain Mahogany Woodland and Shrubland	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <i>Artemisia arbuscula</i> <i>Artemisia tridentata</i>
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> Shrubland Alliance (EVT only)	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
<i>Quercus gambelii</i> Shrubland Alliance (EVT only)	<i>Artemisia tridentata</i>

Accuracy and Appropriate Use of LANDFIRE Datasets

Because of concerns over the thematic accuracy of individual classes mapped by LANDFIRE, all ecological systems listed in Table 4 will be merged into one value that represents the sagebrush base layer. With all ecological systems aggregated, the combined accuracy of the sagebrush base layer (EVT) will be much greater than if all categories were treated separately.

LANDFIRE performed the original accuracy assessment of their EVT product on a map zone basis. There are 20 LANDFIRE map zones that cover the historic range of sage-grouse as defined by Schroeder (2004). Attachment C lists the user and producer accuracies for the aggregated ecological systems that make up the sagebrush base layer and also defines user and producer

accuracies. The aggregated sagebrush base layer for monitoring had producer accuracies ranging from 56.7 percent to 100 percent and user accuracies ranging from 57.1 percent to 85.7 percent.

LANDFIRE EVT data are not designed to be used at a local level. In reports of the percent sagebrush statistic for the various reporting units (Measure 1a), the uncertainty of the percent sagebrush will increase as the size of the reporting unit gets smaller. LANDFIRE data should never be used at the 30m pixel level (900m² resolution of raster data) for any reporting. The smallest geographic extent for using the data to determine percent sagebrush is at the PAC level; for the smallest PACs, the initial percent sagebrush estimate will have greater uncertainties compared with the much larger PACs.

Agricultural Adjustments for the Sagebrush Base Layer

The dataset for the geographic extent of agricultural lands will come from the National Agricultural Statistics Service (NASS) Cropland Data Layer (CDL) (<http://www.nass.usda.gov/research/Cropland/Release/index.htm>). CDL data are generated annually, with estimated producer accuracies for “large area row crops ranging from the mid 80% to mid-90%,” depending on the state (http://www.nass.usda.gov/research/Cropland/sarsfaqs2.htm#Section3_18.0). Specific information on accuracy may be found on the NASS metadata website (<http://www.nass.usda.gov/research/Cropland/metadata/meta.htm>). CDL provided the only dataset that matches the three criteria (nationally consistent, known level of accuracy, and periodically updated) for use in this monitoring framework and represents the best available agricultural lands mapping product.

The CDL data contain both agricultural classes and nonagricultural classes. For this effort, and in the baseline environmental report (Manier et al. 2013), nonagricultural classes were removed from the original dataset. The excluded classes are:

Barren (65 & 131), Deciduous Forest (141), Developed/High Intensity (124), Developed/Low Intensity (122), Developed/Med Intensity (123), Developed/Open Space (121), Evergreen Forest (142), Grassland Herbaceous (171), Herbaceous Wetlands (195), Mixed Forest (143), Open Water (83 & 111), Other Hay/Non Alfalfa (37), Pasture/Hay (181), Pasture/Grass (62), Perennial Ice/Snow (112), Shrubland (64 & 152), Woody Wetlands (190).

The rule set for adjusting the sagebrush base layer for agricultural lands (and for updating the base layer for agricultural lands in the future) is that once an area is classified as agriculture in any year of the CDL, those pixels will remain out of the sagebrush base layer even if a new version of the CDL classifies that pixel as one of the nonagricultural classes listed above. The assumption is that even though individual pixels may be classified as a nonagricultural class in any given year, the pixel has not necessarily been restored to a natural sagebrush community that would be included in Table 4. A further assumption is that once an area has moved into agricultural use, it is unlikely that the area would be restored to sagebrush. Should that occur, however, the method and criteria for adding pixels back into the sagebrush base layer would follow those found in the Sagebrush Restoration Monitoring section of this monitoring framework.

Urban Adjustments for the Sagebrush Base Layer

The National Land Cover Dataset (NLCD) Percent Imperviousness was selected as the best available dataset to be used for urban updates. These data are generated on a five-year cycle and specifically designed to support monitoring efforts. Other datasets were evaluated and lacked

the spatial specificity that was captured in the NLCD product. Any new impervious pixel will be removed from the sagebrush base layer during the update process. Although the impervious surface layer includes a number of impervious pixels outside of urban areas, there are two reasons why this is acceptable for this process. First, an evaluation of national urban area datasets did not reveal a layer that could be confidently used in conjunction with the NLCD product to screen impervious pixels outside of urban zones because unincorporated urban areas were not being included thus leaving large chunks of urban pixels unaccounted for in this rule set. Secondly, experimentation with setting a threshold on the percent imperviousness layer that would isolate rural features proved to be unsuccessful. No combination of values could be identified that would result in the consistent ability to limit impervious pixels outside urban areas. Therefore, to ensure consistency in the monitoring estimates, it was determined to include all impervious pixels.

Fire Adjustments for the Sagebrush Base Layer

Two datasets were selected for performing fire adjustments and updates: GeoMac fire perimeters and Monitoring Trends in Burn Severity (MTBS). An existing data standard in the BLM requires that all fires of more than 10 acres are to be reported to GeoMac; therefore, there will be many small fires of less than 10 acres that will not be accounted for in the adjustment and monitoring attributable to fire. Using fire perimeters from GeoMac, all sagebrush pixels falling within the perimeter of fires less than 1,000 acres will be used to adjust and monitor the sagebrush base layer.

For fires greater than 1,000 acres, MTBS was selected as a means to account for unburned sagebrush islands during the update process of the sagebrush base layer. The MTBS program (<http://www.mtbs.gov>) is an ongoing, multiyear project to map fire severity and fire perimeters consistently across the United States. One of the burn severity classes within MTBS is an unburned to low-severity class. This burn severity class will be used to represent unburned islands of sagebrush within the fire perimeter for the sagebrush base layer. Areas within the other severity classes within the fire perimeter will be removed from the base sagebrush layer during the update process. Not all wildfires, however, have the same impacts on the recovery of sagebrush habitat, depending largely on soil moisture and temperature regimes. For example, cooler, moister sagebrush habitat has a higher potential for recovery or, if needed, restoration than does the warmer, dryer sagebrush habitat. These cooler, moister areas will likely be detected as sagebrush in future updates to LANDFIRE.

Conifer Encroachment Adjustment for the Sagebrush Base Layer

Conifer encroachment into sagebrush vegetation reduces the spatial extent of sage-grouse habitat (Davies et al. 2011; Baruch-Mordo et al. 2013). Conifer species that show propensity for encroaching into sagebrush vegetation resulting in sage-grouse habitat loss include various juniper species, such as Utah juniper (*Juniperus osteosperma*), western juniper (*Juniperus occidentalis*), Rocky Mountain juniper (*Juniperus scopulorum*), pinyon species, including singleleaf pinyon (*Pinus monophylla*) and pinyon pine (*Pinus edulis*), ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), and Douglas fir (*Pseudotsuga menziesii*) (Gruell et al. 1986; Grove et al. 2005; Davies et al. 2011).

A rule set for conifer encroachment was developed to be used for determination of the existing sagebrush base layer. To capture the geographic extent of sagebrush that is likely to experience conifer encroachment, ecological systems within LANDFIRE EVT version 1.2 (NatureServe 2011) were identified if they have the capability of supporting the conifer species (listed above) and have the capability of supporting sagebrush vegetation. Those ecological systems (see Table B.7, “Ecological Systems with Conifers Most Likely to Encroach into Sagebrush

Vegetation ” (p. 1814)) were deemed to be the plant communities with conifers most likely to encroach into sagebrush vegetation. Sagebrush vegetation was defined as including sagebrush species (Attachment B) that provide habitat for the Greater Sage-Grouse and are included in the Sage-Grouse Habitat Assessment Framework. An adjacency analysis was conducted to identify all sagebrush pixels that were directly adjacent to these conifer ecological systems and these immediately adjacent sagebrush pixels were removed from the sagebrush base layer.

Table B.7. Ecological Systems with Conifers Most Likely to Encroach into Sagebrush Vegetation

EVT Ecological Systems	Coniferous Species and Sagebrush Vegetation that the Ecological System has the Capability to Produce
Colorado Plateau Pinyon-Juniper Woodland	<i>Pinus edulis</i> <i>Juniperus osteosperma</i> <i>Artemisia tridentata</i> <i>Artemisia arbuscula</i> <i>Artemisia nova</i> <i>Artemisia tridentata</i> ssp. <i>tridentata</i> <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <i>Artemisia bigelovii</i> <i>Artemisia pygmaea</i>
Columbia Plateau Western Juniper Woodland and Savanna	<i>Juniperus occidentalis</i> <i>Pinus ponderosa</i> <i>Artemisia tridentata</i> <i>Artemisia arbuscula</i> <i>Artemisia rigida</i> <i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
East Cascades Oak-Ponderosa Pine Forest and Woodland	<i>Pinus ponderosa</i> <i>Pseudotsuga menziesii</i> <i>Artemisia tridentata</i> <i>Artemisia nova</i>
Great Basin Pinyon-Juniper Woodland	<i>Pinus monophylla</i> <i>Juniperus osteosperma</i> <i>Artemisia arbuscula</i> <i>Artemisia nova</i> <i>Artemisia tridentata</i> <i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	<i>Pinus ponderosa</i> <i>Artemisia tridentata</i> <i>Artemisia arbuscula</i> <i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
Rocky Mountain Foothill Limber Pine-Juniper Woodland	<i>Juniperus osteosperma</i> <i>Juniperus scopulorum</i> <i>Artemisia nova</i> <i>Artemisia tridentata</i>
Rocky Mountain Poor-Site Lodgepole Pine Forest	<i>Pinus contorta</i> <i>Pseudotsuga menziesii</i> <i>Pinus ponderosa</i> <i>Artemisia tridentata</i>

EVT Ecological Systems	Coniferous Species and Sagebrush Vegetation that the Ecological System has the Capability to Produce
Southern Rocky Mountain Pinyon-Juniper Woodland	<i>Pinus edulis</i> <i>Juniperus monosperma</i> <i>Artemisia bigelovii</i> <i>Artemisia tridentata</i> <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> <i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
Southern Rocky Mountain Ponderosa Pine Woodland	<i>Pinus ponderosa</i> <i>Pseudotsuga menziesii</i> <i>Pinus edulis</i> <i>Pinus contorta</i> <i>Juniperus</i> spp. <i>Artemisia nova</i> <i>Artemisia tridentata</i> <i>Artemisia arbuscula</i> <i>Artemisia tridentata</i> ssp. <i>vaseyana</i>

Invasive Annual Grasses Adjustments for the Sagebrush Base Layer

There are no invasive species datasets from 2010 to the present (beyond the LANDFIRE data) that meet the three criteria (nationally consistent, known level of accuracy, and periodically updated) for use in the determination of the sagebrush base layer. For a description of how invasive species land cover will be incorporated in the sagebrush base layer in the future, see the Monitoring Sagebrush Availability section below.

Sagebrush Restoration Adjustments for the Sagebrush Base Layer

There are no datasets from 2010 to the present that could provide additions to the sagebrush base layer from restoration treatments that meet the three criteria (nationally consistent, known level of accuracy, and periodically updated); therefore, no adjustments were made to the sagebrush base layer calculated from the LANDFIRE EVT (version 1.2) attributable to restoration activities since 2010. Successful restoration treatments before 2010 are assumed to have been captured in the LANDFIRE refresh.

b. Monitoring Sagebrush Availability

Updating the Sagebrush Availability Sagebrush Base Layer

Sagebrush availability will be updated annually by incorporating changes to the sagebrush base layer attributable to agriculture, urbanization, and wildfire. The monitoring schedule for the existing sagebrush base layer updates is as follows:

2010 Existing Sagebrush Base Layer = [Sagebrush EVT] minus [2006 Imperviousness Layer] minus [2009 and 2010 CDL] minus [2009/10 GeoMac Fires < 1,000 acres] minus [2009/10 MTBS Fires excluding unburned sagebrush islands] minus [Conifer Encroachment Layer]

2012 Existing Sagebrush Update = [Base 2010 Existing Sagebrush Layer] minus [2011 Imperviousness Layer] minus [2011 and 2012 CDL] minus [2011/12 GeoMac Fires < 1,000 acres] minus [2011/12 MTBS Fires that are greater than 1,000 acres, excluding unburned sagebrush islands within the perimeter]

2013 and beyond Existing Sagebrush Updates = [Previous Existing Sagebrush Update Layer] minus [Imperviousness Layer (if new data are available)] minus [Next 2 years of CDL] minus [Next 2 years of GeoMac Fires < 1,000 acres] minus [Next 2 years MTBS Fires that

are greater than 1,000 acres, excluding unburned sagebrush islands within the perimeter] plus [restoration/monitoring data provided by the field]

Sagebrush Restoration Updates

Restoration after fire, after agricultural conversion, after seedings of introduced grasses, or after treatments of pinyon pine and/or juniper, are examples of updates to the sagebrush base layer that can add sagebrush vegetation back in. When restoration has been determined to be successful through range wide, consistent, interagency fine and site-scale monitoring, the polygonal data will be used to add sagebrush pixels back into the broad and mid-scale sagebrush base layer.

Measure 1b – Context for the change in the amount of sagebrush in a landscape of interest

Measure 1b describes the amount of sagebrush on the landscape of interest compared with the amount of sagebrush the landscape of interest could ecologically support. Areas with the potential to support sagebrush were derived from the BpS data layer that describes sagebrush pre Euro-American settlement (biophysical setting (BpS) v1.2 of LANDFIRE). This measure (1b) will provide information during evaluations of monitoring data to set the context for a given geographic area of interest. The information could also be used to inform management options for restoration, mitigation and inform effectiveness monitoring.

The identification and spatial locations of natural plant communities (vegetation) that are believed to have existed on the landscape (BpS) were constructed based on an approximation of the historical (pre Euro-American settlement) disturbance regime and how the historical disturbance regime operated on the current biophysical environment. BpS is composed of map units which are based on NatureServe's (2011) terrestrial ecological systems classification.

The ecological systems within BpS used for this monitoring framework are those ecological systems that have the capability of supporting sagebrush vegetation and could provide seasonal habitat for the sage-grouse. These ecological systems are listed in Table 4 with the exception of the *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance and the *Quercus gambelii* Shrubland Alliance. Ecological systems selected included sagebrush species or subspecies that are included in the Sage-Grouse Habitat Assessment Framework and are found in Attachment B.

Attributable to the lack of any reference data, the BpS layer does not have an associated accuracy assessment. Visual inspection, however, of the BpS data reveals inconsistencies in the labeling of pixels among LANDFIRE map zones. The reason for these inconsistencies between map zones are the decision rules used to map a given ecological system will vary between map zones based on different physical, biological, disturbance and atmospheric regimes of the region. This can result in artificial edges in the map that are an artifact of the mapping process. However, metrics will be calculated at broad spatial scales using BpS potential vegetation type, not small groupings or individual pixels, therefore, the magnitude of these observable errors in the BpS layer is minor compared with the size of the reporting units. Therefore, since BpS will be used to identify broad landscape patterns of dominant vegetation, these inconsistencies will only have a minor impact on the percent sagebrush availability calculation.

LANDFIRE BpS data are not designed to be used at a local level. In reporting the percent sagebrush statistic for the various reporting units, the uncertainty of the percent sagebrush will increase as the size of the reporting unit gets smaller. LANDFIRE data should never be used at the pixel level (30m²) for any reporting. The smallest geographic extent use of the data for this

purpose is at the PAC level and for the smallest PACs the initial percent sagebrush remaining estimate will have greater uncertainties compared with the much larger PACs.

Tracking

BLM and USFS will analyze and monitor sagebrush availability (Measure 1) on a bi-annual basis and it will be used to inform effectiveness monitoring and initiate adaptive management actions as necessary. The 2010 estimate of sagebrush availability will serve as the base year and an updated estimate for 2012 will be reported in 2014 after all datasets become available. The 2012 estimate will capture changes attributable to fire, agriculture, and urban development. Subsequent updates will always include new fire and agricultural data and new urban data when available. Restoration data that meets criteria of adding sagebrush areas back into the sagebrush base layer will begin to be factored in as data allows. Attributable to data availability, there will be a two year lag (approximately) between when the estimate is generated and when the data used for the estimate becomes available (e.g., the 2014 sagebrush availability will be included in the 2016 estimate).

Future Plans

Geospatial data used to generate the sagebrush base layer will be available through BLM's EGIS Web Portal and Geospatial Gateway or through the authoritative data source. Legacy datasets will be preserved, so that trends may be calculated. Additionally, accuracy assessment data for all source datasets will be provided on the portal either spatially, where applicable, or through the metadata. Accuracy assessment information was deemed vital to share to help users understand the limitation of the sagebrush estimates and will be summarized spatially by map zone and included in the Portal.

LANDFIRE plans to begin a remapping effort in 2015. This remapping has the potential to greatly improve overall quality of the data products primarily through the use of higher quality remote sensing datasets. Additionally, BLM and the Multi-Resolution Land Characteristics Consortium (MRLC) are working to improve the accuracy of vegetation map products for broad and mid-scale analyses through the Grass/Shrub mapping effort in partnership with the MRLC. The Grass/Shrub mapping effort applies the Wyoming multi-scale sagebrush habitat methodology (Homer et al. 2009) to spatially depict fractional percent cover estimates for five components range and west-wide. These five components are percent cover of sagebrush vegetation, percent bare ground, percent herbaceous vegetation (grass and forbs combined), annual vegetation, and percent shrubs. One of the benefits of the design of these fractional cover maps is that they facilitate monitoring "with-in" class variation (e.g., examination of declining trend in sagebrush cover for individual pixels). This "with-in" class variation can serve as one indicator of sagebrush quality that cannot be derived from LANDFIRE's EVT information. The Grass/Shrub effort is not a substitute for fine scale monitoring, but will leverage fine scale data to support the validation of the mapping products. An evaluation will be conducted to determine if either dataset is of great enough quality to warrant replacing the existing sagebrush layers. The earliest possible date for this evaluation will not occur until 2018 or 2019 depending on data availability.

B.5.1.2.2.2. Habitat Degradation Monitoring (Measure 2)

The measure of habitat degradation will be calculated by combining the footprints of threats identified in Table 2. The footprint is defined as the direct area of influence of "active" energy and infrastructure; it is used as a surrogate for human activity. Although these analyses will try to summarize results at the aforementioned meaningful geographic areas of interest, some may

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be too small to report the metrics appropriately and may be combined (smaller populations, PACs within a population, etc.). Data sources for each threat are found in Table 6, Geospatial data sources for habitat degradation. Specific assumptions (inclusion criteria for data, width/area assumptions for point and line features, etc.) and methodology for each threat, and the combined measure, are detailed below. All datasets will be updated annually to monitor broad- and mid-scale year-to-year changes and to calculate trends in habitat degradation to inform adaptive management. A 5-year summary report will be provided to the USFWS.

a. Habitat Degradation Datasets and Assumptions

Energy (oil and gas wells and development facilities)

This dataset will compile information from three oil and gas databases: the proprietary IHS Enerdeq database, the BLM Automated Fluid Minerals Support System (AFMSS) database, and the proprietary Platts (a McGraw-Hill Financial Company) GIS Custom Data (hereafter, Platts) database of power plants. Point data from wells active within the last 10 years from IHS and producing wells from AFMSS will be considered as a 5-acre (2.0ha) direct area of influence centered on the well point, as recommended by the BLM WO-300 (Minerals and Realty Management). Plugged and abandoned wells will be removed if the date of well abandonment was before the first day of the reporting year (i.e., for the 2015 reporting year, a well must have been plugged and abandoned by 12/31/2014 to be removed). Platts oil and gas power plants data (subset to operational power plants) will also be included as a 5-acre (2.0ha) direct area of influence.

Additional Measure: Reclaimed Energy-related Degradation

This dataset will include those wells that have been plugged and abandoned. This measure thereby attempts to measure energy-related degradation that has been reclaimed but not necessarily fully restored to sage-grouse habitat. This measure will establish a baseline by using wells that have been plugged and abandoned within the last 10 years from the IHS and AFMSS datasets. Time lags for lek attendance in response to infrastructure have been documented to be delayed 2–10 years from energy development activities (Harju et al. 2010). Reclamation actions may require 2 or more years from the Final Abandonment Notice. Sagebrush seedling establishment may take 6 or more years from the point of seeding, depending on such variables as annual precipitation, annual temperature, and soil type and depth (Pyke 2011). This 10-year period is conservative and assumes some level of habitat improvement 10 years after plugging. Research by Hemstrom et al. (2002), however, proposes an even longer period—more than 100 years—for recovery of sagebrush habitats, even with active restoration approaches. Direct area of influence will be considered 3 acres (1.2ha) (J. Perry, personal communication, February 12, 2014). This additional layer/measure could be used at the broad and mid scale to identify areas where sagebrush habitat and/or potential sagebrush habitat is likely still degraded. This layer/measure could also be used where further investigation at the fine or site scale would be warranted to: (1) quantify the level of reclamation already conducted, and (2) evaluate the amount of restoration still required for sagebrush habitat recovery. At a particular level (e.g., population, PACs), these areas and the reclamation efforts/success could be used to inform reclamation standards associated with future developments. Once these areas have transitioned from reclamation standards to meeting restoration standards, they can be added back into the sagebrush availability layer using the same methodology as described for adding restoration treatment areas lost to wildfire and agriculture conversion (see the Monitoring Sagebrush Restoration under the Monitoring Sagebrush Availability section). This dataset will be updated annually from the IHS dataset.

Energy (coal mines)

Appendix B Greater Sage-Grouse Implementation Framework

The Greater Sage-Grouse (GRSG) Monitoring Framework

May 2015

Currently, there is no comprehensive dataset available that identifies the footprint of active coal mining across all jurisdictions. Therefore, point and polygon datasets will be used each year to identify coal mining locations. Data sources will be identified and evaluated annually and will include at a minimum: BLM coal lease polygons, U.S. Energy Information Administration mine occurrence points, U.S. Office of Surface Mining Reclamation and Enforcement coal mining permit polygons (as available), and U.S. Geological Survey (USGS) Mineral Resources Data System mine occurrence points. These data will inform where active coal mining may be occurring. Additionally, coal power plant data from Platts power plants database (subset to operational power plants) will be included. Aerial imagery will then be used to digitize manually the active coal mining and coal power plants surface disturbance in or near these known occurrence areas. While the date of aerial imagery varies by scale, the most current data available from Esri and/or Google will be used to locate (generally at 1:50,000 and below) and digitize (generally at 1:10,000 and below) active coal mine and power plant direct area of influence. Coal mine location data source and imagery date will be documented for each digitized coal polygon at the time of creation. Subsurface facility locations (polygon or point location as available) will also be collected if available, included in density calculations, and added to the active surface activity layer as appropriate (if an actual direct area of influence can be located).

Energy (wind energy facilities)

This dataset will be a subset of the Federal Aviation Administration (FAA) Digital Obstacles point file. Points where “Type_” = “WINDMILL” will be included. Direct area of influence of these point features will be measured by converting to a polygon dataset as a direct area of influence of 3 acres (1.2 hectares) centered on each tower point. See the BLM’s “Wind Energy Development Programmatic Environmental Impact Statement” (BLM 2005). Additionally, Platts power plants database will be used for transformer stations associated with wind energy sites (subset to operational power plants), also with a 3-acre (1.2 hectares) direct area of influence.

Energy (solar energy facilities)

This dataset will include solar plants as compiled with the Platts power plants database (subset to operational power plants). This database includes an attribute that indicates the operational capacity of each solar power plant. Total capacity at the power plant was based on ratings of the in-service unit(s), in megawatts. Direct area of influence polygons will be centered over each point feature representing 7.3 acres (3.0 hectares) per megawatt of the stated operational capacity, per the report of the National Renewable Energy Laboratory (NREL), “Land-Use Requirements for Solar Power Plants in the United States” (Ong et al. 2013).

Energy (geothermal energy facilities)

This dataset will include geothermal wells in existence or under construction as compiled with the IHS wells database and power plants as compiled with the Platts database (subset to operational power plants). Direct area of influence of these point features will be measured by converting to a polygon dataset of 3 acres (1.2 hectares) centered on each well or power plant point.

Mining (active developments; locatable, leasable, saleable)

This dataset will include active locatable mining locations as compiled with the proprietary InfoMine database. Aerial imagery will then be used to digitize manually the active mining surface disturbance in or near these known occurrence areas. While the date of aerial imagery varies by scale, the most current data available from Esri and/or Google will be used to locate

(generally at 1:50,000 and below) and digitize (generally at 1:10,000 and below) active mine direct area of influence. Mine location data source and imagery date will be documented for each digitized polygon at the time of creation. Currently, there are no known compressive databases available for leasable or saleable mining sites beyond coal mines. Other data sources will be evaluated and used as they are identified or as they become available. Point data may be converted to polygons to represent direct area of influence unless actual surface disturbance is available.

Infrastructure (roads)

This dataset will be compiled from the proprietary Esri StreetMap Premium for ArcGIS. Dataset features that will be used are: Interstate Highways, Major Roads, and Surface Streets to capture most paved and “crowned and ditched” roads while not including “two-track” and 4-wheel-drive routes. These minor roads, while not included in the broad- and mid-scale monitoring, may support a volume of traffic that can have deleterious effects on sage-grouse leks. It may be appropriate to consider the frequency and type of use of roads in a NEPA analysis for a proposed project. This fine- and site-scale analysis will require more site-specific data than is identified in this monitoring framework. The direct area of influence for roads will be represented by 240.2 feet, 84.0 feet, and 40.7 feet (73.2 meters, 25.6 meters, and 12.4 meters) total widths centered on the line feature for Interstate Highways, Major Roads, and Surface Streets, respectively (Knick et al. 2011). The most current dataset will be used for each monitoring update. Note: This is a related but different dataset than what was used in BER (Manier et al. 2013). Individual BLM/USFS planning units may use different road layers for fine- and site-scale monitoring.

Infrastructure (railroads)

This dataset will be a compilation from the Federal Railroad Administration Rail Lines of the USA dataset. Non-abandoned rail lines will be used; abandoned rail lines will not be used. The direct area of influence for railroads will be represented by a 30.8 feet (9.4 meters) total width (Knick et al. 2011) centered on the non-abandoned railroad line feature.

Infrastructure (power lines)

This line dataset will be derived from the proprietary Platts transmission lines database. Linear features in the dataset attributed as “buried” will be removed from the disturbance calculation. Only “In Service” lines will be used; “Proposed” lines will not be used. Direct area of influence will be determined by the kV designation: 1–199 kV (100 feet/30.5 meters), 200–399 kV (150 feet/45.7 meters), 400–699 kV (200 feet/61.0 meters), and 700-or greater kV (250 feet/76.2 meters) based on average right-of-way and structure widths, according to BLM WO-300 (Minerals and Realty Management).

Infrastructure (communication towers)

This point dataset will be compiled from the Federal Communications Commission (FCC) communication towers point file; all duplicate points will be removed. It will be converted to a polygon dataset by using a direct area of influence of 2.5 acres (1.0 hectare) centered on each communication tower point (Knick et al. 2011).

Infrastructure (other vertical structures)

This point dataset will be compiled from the FAA’s Digital Obstacles point file. Points where “Type_” = “WINDMILL” will be removed. Duplicate points from the FCC communication towers point file will be removed. Remaining features will be converted to a polygon dataset

using a direct area of influence of 2.5 acres (1.0 hectare) centered on each vertical structure point (Knick et al. 2011).

Other Developed Rights-of-Way

Currently, no additional data sources for other rights-of-way have been identified; roads, power lines, railroads, pipelines, and other known linear features are represented in the categories described above. The newly purchased IHS data do contain pipeline information; however, this database does not currently distinguish between above-ground and underground pipelines. If additional features representing human activities are identified, they will be added to monitoring reports using similar assumptions to those used with the threats described above.

b. Habitat Degradation Threat Combination and Calculation

The threats targeted for measuring human activity (see Table B.8, “Geospatial Data Sources for Habitat Degradation (Measure 2)” (p. 1821)) will be converted to direct area of influence polygons as described for each threat above. These threat polygon layers will be combined and features dissolved to create one overall polygon layer representing footprints of active human activity in the range of sage-grouse. Individual datasets, however, will be preserved to indicate which types of threats may be contributing to overall habitat degradation. This measure has been divided into three submeasures to describe habitat degradation on the landscape. Percentages will be calculated as follows:

Measure 2a. Footprint by geographic area of interest: Divide area of the active/direct footprint by the total area of the geographic area of interest (% disturbance in geographic area of interest).

Measure 2b. Active/direct footprint by historical sagebrush potential: Divide area of the active footprint that coincides with areas with historical sagebrush potential (BpS calculation from habitat availability) within a given geographic area of interest by the total area with sagebrush potential within the geographic area of interest (% disturbance on potential historical sagebrush in geographic area of interest).

Measure 2c. Active/direct footprint by current sagebrush: Divide area of the active footprint that coincides with areas of existing sagebrush (EVT calculation from habitat availability) within a given geographic area of interest by the total area that is current sagebrush within the geographic area of interest (% disturbance on current sagebrush in geographic area of interest).

Table B.8. Geospatial Data Sources for Habitat Degradation (Measure 2)

Degradation Type	Subcategory	Data Source	Direct Area of Influence	Area Source
Energy (oil & gas)	Wells	IHS; BLM (AFMSS)	5.0 acres (2.0 hectares)	BLM WO-300
	Power Plants	Platts (power plants)	5.0 acres (2.0 hectares)	BLM WO-300
Energy (coal)	Mines	BLM; USFS; Office of Surface Mining Reclamation and Envofrement; USGS Mineral Resources Data System	Polygon area (digitized)	Esri/ Google Imagery
	Power Plants	Platts (power plants)	Polygon area (digitized)	Esri Imagery

Degradation Type	Subcategory	Data Source	Direct Area of Influence	Area Source
Energy (wind)	Wind Turbines	Federal Aviation Administration	3.0 acres (1.2 hectares)	BLM WO-300
	Power Plants	Platts (power plants)	3.0 acres (1.2 hectares)	BLM WO-300
Energy (solar)	Fields/Power Plants	Platts (power plants)	7.3 acres (3.0 hectares)/megawatt	NREL
Energy (geothermal)	Wells	IHS	3.0 acres (1.2 hectares)	BLM WO-300
	Power Plants	Platts (power plants)	Polygon area (digitized)	Esri Imagery
Mining	Locatable Developments	InfoMine	Polygon area (digitized)	Esri Imagery
Infrastructure (roads)	Surface Streets (Minor Roads)	Esri StreetMap Premium	40.7 feet (12.4 meters)	USGS
	Major Roads	Esri StreetMap Premium	84.0 feet (25.6 meters)	USGS
	Interstate Highways	Esri StreetMap Premium	240.2 feet (73.2 meters)	USGS
Infrastructure (railroads)	ActiveLines	Federal Railroad Administration	30.8 feet (9.4 meters)	USGS
Infrastructure (powerlines)	1-199 kV Lines	Platts (transmission lines)	100 feet (30.5 meters)	BLM WO-300
	200-399 kV Lines	Platts (transmission lines)	150 feet (45.7m)	BLM WO-300
	400-699 kV Lines	Platts (transmission lines)	200 feet (61.0 meters)	BLM WO-300
	700+ kV Lines	Platts (transmission lines)	250 feet (76.2 meters)	BLM WO-300
Infrastructure (communication)	Towers	Federal Communications Commission	2.5 acres (1.0 hectare)	BLM WO-300

B.5.1.2.2.3. Energy and Mining Density (Measure 3)

The measure of density of energy and mining will be calculated by combining the locations of energy and mining threats identified in Table B.8, “Geospatial Data Sources for Habitat Degradation (Measure 2)” (p. 1821). This measure will provide an estimate of the intensity of human activity or the intensity of habitat degradation. The number of energy facilities and mining locations will be summed and divided by the area of meaningful geographic areas of interest to calculate density of these activities. Data sources for each threat are found in Table 6. Specific assumptions (inclusion criteria for data, width/area assumptions for point and line features, etc.) and methodology for each threat, and the combined measure, are detailed below. All datasets will be updated annually to monitor broad- and mid-scale year-to-year changes and 5-year (or longer) trends in habitat degradation.

a. Energy and Mining Density Datasets and Assumptions

Energy (oil and gas wells and development facilities) (See Section B.5.1.2.2.2, “Habitat Degradation Monitoring (Measure 2)” (p. 1817).)

Energy (coal mines) (See Section B.5.1.2.2.2, “Habitat Degradation Monitoring (Measure 2)” (p. 1817).)

Energy (wind energy facilities) (See Section B.5.1.2.2.2, “Habitat Degradation Monitoring (Measure 2)” (p. 1817).)

Energy (solar energy facilities) (See Section B.5.1.2.2.2, “Habitat Degradation Monitoring (Measure 2)” (p. 1817).)

Energy (geothermal energy facilities) (See Section B.5.1.2.2.2, “Habitat Degradation Monitoring (Measure 2)” (p. 1817).)

Mining (active developments; locatable, leasable, saleable) (See Section B.5.1.2.2.2, “Habitat Degradation Monitoring (Measure 2)” (p. 1817).)

b. Energy and Mining Density Threat Combination and Calculation

Datasets for energy and mining will be collected in two primary forms: point locations (e.g., wells) and polygon areas (e.g., surface coal mining). The following rule set will be used to calculate density for meaningful geographic areas of interest including standard grids and per polygon:

1. Point locations will be preserved; no additional points will be removed beyond the methodology described above. Energy facilities in close proximity (an oil well close to a wind tower) will be retained.
2. Polygons will not be merged, or features further dissolved. Thus, overlapping facilities will be retained, such that each individual threat will be a separate polygon data input for the density calculation.
3. The analysis unit (polygon or 640-acre section in a grid) will be the basis for counting the number of mining or energy facilities per unit area. Within the analysis unit, all point features will be summed, and any individual polygons will be counted as one (e.g., a coal mine will be counted as one facility within population). Where polygon features overlap multiple units (polygons or pixels), the facility will be counted as one in each unit where the polygon occurs (e.g., a polygon crossing multiple 640-acre sections would be counted as one in each 640-acre section for a density per 640-acre-section calculation).
4. In methodologies with different-sized units (e.g., MZs, populations, etc.) raw facility counts will be converted to densities by dividing the raw facility counts by the total area of the unit. Typically this will be measured as facilities per 640 acres.
5. For uniform grids, raw facility counts will be reported. Typically this number will also be converted to facilities per 640 acres.
6. Reporting may include summaries beyond the simple ones above. Zonal statistics may be used to smooth smaller grids to help display and convey information about areas within meaningful geographic areas of interest that have high levels of energy and/or mining activity.
7. Additional statistics for each defined unit may also include adjusting the area to include only the area with the historical potential for sagebrush (BpS) or areas currently sagebrush (EVT).

Individual datasets and threat combination datasets for habitat degradation will be available through the BLM’s EGIS web portal and geospatial gateway. Legacy datasets will be preserved so that trends may be calculated.

B.5.1.2.3. Population (Demographics) Monitoring

State wildlife management agencies are responsible for monitoring sage-grouse populations within their respective states. WAFWA will coordinate this collection of annual population data by state agencies. These data will be made available to the BLM according to the terms of the forthcoming Greater Sage-Grouse Population Monitoring Memorandum of Understanding (MOU) (2014) between WAFWA and the BLM. The MOU outlines a process, timeline, and responsibilities for regular data sharing of sage-grouse population and/or habitat information for

the purposes of implementing sage-grouse LUPs/amendments and subsequent effectiveness monitoring. Population areas were refined from the “Greater Sage-grouse (*Centrocercus urophasianus*) Conservation Objectives: Final Report” (COT 2013) by individual state wildlife agencies to create a consistent naming nomenclature for future data analyses. These population data will be used for analysis at the applicable scale to supplement habitat effectiveness monitoring of management actions and to inform the adaptive management responses.

B.5.1.2.4. Effectiveness Monitoring

Effectiveness monitoring will provide the data needed to evaluate BLM and USFS actions toward reaching the objective of the national planning strategy (BLM IM 2012-044) – to conserve sage-grouse populations and their habitat– and the objectives for the land use planning area. Effectiveness monitoring methods described here will encompass multiple larger scales, from areas as large as the WAFWA MZ to the scale of the Buffalo LUP. Effectiveness data used for these larger-scale evaluations will include all lands in the area of interest, regardless of surface ownership/management, and will help inform where finer-scale evaluations are needed, such as population areas smaller than an LUP or PACs within an LUP (described in Section B.5.1.3, “Fine and Site Scales” (p. 1828)). Data will also include the trend of disturbance within these areas of interest to inform the need to initiate adaptive management responses as described in the Buffalo land use plan.

The BLM and the USFS will coordinate with the State of Wyoming in evaluating the compliance of all actions within a sage-grouse core area. Evaluation of current disturbance, disruptions and conservation actions within a SG core area will be conducted to determine if all entities are in compliance with their specific standards and whether or not it indeed has not caused declines of sg populations. This approach also helps focus scarce resources to areas experiencing habitat loss, degradation, or population declines, without excluding the possibility of concurrent, finer-scale evaluations as needed where habitat or population anomalies have been identified through some other means.

To determine the effectiveness of the sage-grouse national planning strategy, the BLM and the USFS will evaluate the answers to the following questions and prepare a broad- and mid-scale effectiveness report:

1. Sagebrush Availability and Condition:
 - a. What is the amount of sagebrush availability and the change in the amount and condition of sagebrush?
 - b. What is the existing amount of sagebrush on the landscape and the change in the amount relative to the pre-EuroAmerican historical distribution of sagebrush (BpS)?
 - c. What is the trend and condition of the indicators describing sagebrush characteristics important to sage-grouse?
2. Habitat Degradation and Intensity of Activities:
 - a. What is the amount of habitat degradation and the change in that amount?
 - b. What is the intensity of activities and the change in the intensity?
 - c. What is the amount of reclaimed energy-related degradation and the change in the amount?
 - d. What is the population estimation of sage-grouse and the change in the population estimation?
3. How are the BLM and the USFS contributing to changes in the amount of sagebrush?
4. How are the BLM and the USFS contributing to disturbance?

The compilation of broad- and mid-scale data (and population trends as available) into an effectiveness monitoring report will occur on a 5-year reporting schedule (see Attachment A), which may be accelerated to respond to critical emerging issues (in consultation with the USFWS and state wildlife agencies). In addition, effectiveness monitoring results will be used to identify emerging issues and research needs and inform the BLM and the USFS adaptive management strategy (see the Adaptive Management section of this Environmental Impact Statement).

To determine the effectiveness of the sage-grouse objectives of the land use plan, the BLM and the USFS will evaluate the answers to the following questions and prepare a plan effectiveness report:

1. Is this plan meeting the sage-grouse habitat objectives?
2. Are sage-grouse areas within the LUP meeting, or making progress toward meeting, land health standards, including the Special Status Species/wildlife habitat standard?
3. Is the plan meeting the disturbance objective(s) within sage-grouse areas?
4. Are the sage-grouse populations within this plan boundary and within the sage-grouse areas increasing, stable, or declining?

The effectiveness monitoring report for this LUP will occur on a 5-year reporting schedule (see Attachment A) or more often if habitat or population anomalies indicate the need for an evaluation to facilitate adaptive management or respond to critical emerging issues. Data will be made available through the BLM's EGIS web portal and the geospatial gateway.

Methods

At the broad and mid scales (PACs and above) the BLM and the USFS will summarize the vegetation, disturbance, and (when available) population data. Although the analysis will try to summarize results for PACs within each sage-grouse population, some populations may be too small to report the metrics appropriately and may need to be combined to provide an estimate with an acceptable level of accuracy. Otherwise, they will be flagged for more intensive monitoring by the appropriate landowner or agency. The BLM and the USFS will then analyze monitoring data to detect the trend in the amount of sagebrush; the condition of the vegetation in the sage-grouse areas (MacKinnon et al. 2011); the trend in the amount of disturbance; the change in disturbed areas owing to successful restoration; and the amount of new disturbance the BLM and/or the USFS has permitted. These data could be supplemented with population data (when available) to inform an understanding of the correlation between habitat and PACs within a population. This overall effectiveness evaluation must consider the lag effect response of populations to habitat changes (Garton et al. 2011).

Calculating Question 1, National Planning Strategy Effectiveness: The amount of sagebrush available in the large area of interest will use the information from Measure 1a (see Section B.5.1.2.2.1, "Sagebrush Availability (Measure 1)" (p. 1807)) and calculate the change from the 2012 baseline to the end date of the reporting period. To calculate the change in the amount of sagebrush on the landscape to compare with the historical areas with potential to support sagebrush, the information from Measure 1b (see Section B.5.1.2.2.1, "Sagebrush Availability (Measure 1)" (p. 1807)) will be used. To calculate the trend in the condition of sagebrush at the mid scale, three sources of data will be used: the BLM's Grass/Shrub mapping effort (see Future Plans in Section B.5.1.2.2.1, "Sagebrush Availability (Measure 1)" (p. 1807)); the results from the calculation of the landscape indicators, such as patch size (described below); and the BLM's Landscape Monitoring Framework (LMF) and sage-grouse intensification effort (also described below). The LMF and sage-grouse intensification effort data are collected in a statistical sampling framework that allows calculation of indicator values at multiple scales.

Beyond the importance of sagebrush availability to sage-grouse, the mix of sagebrush patches on the landscape at the broad and mid scale provides the life requisite of space for sage-grouse dispersal needs (see the HAF). The configuration of sagebrush habitat patches and the land cover or land use between the habitat patches at the broad and mid scales also defines suitability. There are three significant habitat indicators that influence habitat use, dispersal, and movement across populations: the size and number of habitat patches, the connectivity of habitat patches (linkage areas), and habitat fragmentation (scope of unsuitable and non-habitats between habitat patches). The most appropriate commercial software to measure patch dynamics, connectivity, and fragmentation at the broad and mid scales will be used, along with the same data layers derived for sagebrush availability.

The BLM initiated the LMF in 2011 in cooperation with the Natural Resources Conservation Service (NRCS). The objective of the LMF effort is to provide unbiased estimates of vegetation and soil condition and trend using a statistically balanced sample design across BLM lands. Recognizing that sage-grouse populations are more resilient where the sagebrush plant community has certain characteristics unique to a particular life stage of sage-grouse (Knick and Connelly 2011, Stiver et al. in press), a group of sage-grouse habitat and sagebrush plant community subject matter experts identified those vegetation indicators collected at LMF sampling points that inform sage-grouse habitat needs. The experts represented the Agricultural Research Service, BLM, NRCS, USFWS, WAFWA, state wildlife agencies, and academia. The common indicators identified include: species composition, foliar cover, height of the tallest sagebrush and herbaceous plant, intercanopy gap, percent of invasive species, sagebrush shape, and bare ground. To increase the precision of estimates of sagebrush conditions within the range of sage-grouse, additional plot locations in occupied sage-grouse habitat (Sage-Grouse Intensification) were added in 2013. The common indicators are also collected on sampling locations in the NRCS National Resources Inventory Rangeland Resource Assessment (<http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/nri/?&cid=stelprdb1041620>).

The sage-grouse intensification baseline data will be collected over a 5-year period, and an annual sage-grouse intensification report will be prepared describing the status of the indicators. Beginning in year 6, the annual status report will be accompanied with a trend report, which will be available on an annual basis thereafter, contingent on continuation of the current monitoring budget. This information, in combination with the Grass/Shrub mapping information, the mid-scale habitat suitability indicator measures, and the sagebrush availability information will be used to answer Question 1 of the National Planning Strategy Effectiveness Report.

Calculating Question 2, National Planning Strategy Effectiveness: Evaluations of the amount of habitat degradation and the intensity of the activities in the area of interest will use the information from Measure 2 (see Section B.5.1.2.2.2, “Habitat Degradation Monitoring (Measure 2)” (p. 1817)) and Measure 3 (see Section B.5.1.2.2.3, “Energy and Mining Density (Measure 3)” (p. 1822)). The field office will collect data on the amount of reclaimed energy-related degradation on plugged and abandoned and oil/gas well sites. The data are expected to demonstrate that the reclaimed sites have yet to meet the habitat restoration objectives for sage-grouse habitat. This information, in combination with the amount of habitat degradation, will be used to answer Question 2 of the National Planning Strategy Effectiveness Report.

Calculating Question 3, National Planning Strategy Effectiveness: The change in sage-grouse estimated populations will be calculated from data provided by the state wildlife agencies, when available. This population data (see Section B.5.1.2.3, “Population (Demographics)

Monitoring” (p. 1823)) will be used to answer Question 3 of the National Planning Strategy Effectiveness Report.

Calculating Question 4, National Planning Strategy Effectiveness: The estimated contribution by the BLM or the USFS to the change in the amount of sagebrush in the area of interest will use the information from Measure 1a (see Section B.5.1.2.2.1, “Sagebrush Availability (Measure 1)” (p. 1807)). This measure is derived from the national datasets that remove sagebrush (Table 3). To determine the relative contribution of BLM and USFS management, the current Surface Management Agency geospatial data layer will be used to differentiate the amount of change for each management agency for this measure in the geographic areas of interest. This information will be used to answer Question 4 of the National Planning Strategy Effectiveness Report.

Calculating Question 5, National Planning Strategy Effectiveness: The estimated contribution by the BLM or the USFS to the change in the amount of disturbance in the area of interest will use the information from Measure 2a (see Section B.5.1.2.2.2, “Habitat Degradation Monitoring (Measure 2)” (p. 1817)) and Measure 3 (see Section B.5.1.2.2.3, “Energy and Mining Density (Measure 3)” (p. 1822)). These measures are all derived from the national disturbance datasets that degrade habitat (Table 6). To determine the relative contribution of BLM and USFS management, the current Surface Management Agency geospatial data layer will be used to differentiate the amount of change for each management agency for these two measures in the geographic areas of interest. This information will be used to answer Question 5 of the National Planning Strategy Effectiveness Report.

Answers to the five questions for determining the effectiveness of the national planning strategy will identify areas that appear to be meeting the objectives of the strategy and will facilitate identification of population areas for more detailed analysis. Conceptually, if the broad-scale monitoring identifies increasing sagebrush availability and improving vegetation conditions, decreasing disturbance, and a stable or increasing population for the area of interest, there is evidence that the objectives of the national planning strategy to maintain populations and their habitats have been met. Conversely, where information indicates that sagebrush is decreasing and vegetation conditions are degrading, disturbance in sage-grouse areas is increasing, and/or populations are declining relative to the baseline, there is evidence that the objectives of the national planning strategy are not being achieved. Such a determination would likely result in a more detailed analysis and could be the basis for implementing more restrictive adaptive management measures.

With respect to the land use plan area, the BLM and the USFS will summarize the vegetation, disturbance, and population data to determine if the LUP is meeting the plan objectives. Effectiveness information used for these evaluations includes BLM/USFS surface management areas and will help inform where finer-scale evaluations are needed, such as seasonal habitats, corridors, or linkage areas. Data will also include the trend of disturbance within the sage-grouse areas, which will inform the need to initiate adaptive management responses as described in the Buffalo land use plan.

Calculating Question 1, Land Use Plan Effectiveness: The condition of vegetation and the allotments meeting land health standards (as articulated in “BLM Handbook 4180-1, Rangeland Health Standards”) in sage-grouse areas will be used to determine the LUP’s effectiveness in meeting the vegetation objectives for sage-grouse habitat set forth in the plan. The field office/ranger district will be responsible for collecting this data. In order for this data to be consistent and comparable, common indicators, consistent methods, and an unbiased sampling

framework will be implemented following the principles in the BLM's AIM strategy (Taylor et al. 2014; Toevs et al. 2011; MacKinnon et al. 2011), in the BLM's Technical Reference "Interpreting Indicators of Rangeland Health" (Pellant et al. 2005), and in the HAF (Stiver et al. in press) or other approved WAFWA MZ-consistent guidance to measure and monitor sage-grouse habitats. This information will be used to answer Question 1 of the Land Use Plan Effectiveness Report.

Calculating Question 2, Land Use Plan Effectiveness: Sage-grouse areas within the LUP that are achieving land health stands (or, if trend data are available, that are making progress toward achieving them)—particularly the Special Status Species/wildlife habitat land health standard—will be used to determine the LUP's effectiveness in achieving the habitat objectives set forth in the plan. Field offices will follow directions in "BLM Handbook 4180-1, Rangeland Health Standards," to ascertain if sage-grouse areas are achieving or making progress toward achieving land health standards. One of the recommended criteria for evaluating this land health standard is the HAF indicators.

Calculating Question 3, Land Use Plan Effectiveness: The amount of habitat disturbance in sage-grouse areas identified in this LUP will be used to determine the LUP's effectiveness in meeting the plan's disturbance objectives. National datasets can be used to calculate the amount of disturbance, but field office data will likely increase the accuracy of this estimate. This information will be used to answer Question 3 of the Land Use Plan Effectiveness Report.

Calculating Question 4, Land Use Plan Effectiveness: The change in estimated sage-grouse populations will be calculated from data provided by the state wildlife agencies, when available, and will be used to determine LUP effectiveness. This population data (see Section B.5.1.2.3, "Population (Demographics) Monitoring" (p. 1823)) will be used to answer Question 4 of the Land Use Plan Effectiveness Report.

Results of the effectiveness monitoring process for the LUP will be used to inform the need for finer-scale investigations, initiate adaptive management actions as described in the Buffalo land use plan, initiate causation determination, and/or determine if changes to management decisions are warranted. The measures used at the broad and mid scales will provide a suite of characteristics for evaluating the effectiveness of the adaptive management strategy.

B.5.1.3. Fine and Site Scales

Fine-scale (third-order) habitat selected by sage-grouse is described as the physical and geographic area within home ranges during breeding, summer, and winter periods. At this level, habitat suitability monitoring should address factors that affect sage-grouse use of, and movements between, seasonal use areas. The habitat monitoring at the fine and site scale (fourth order) should focus on indicators to describe seasonal home ranges for sage-grouse associated with a lek or lek group within a population or subpopulation area. Fine- and site-scale monitoring will inform LUP effectiveness monitoring (see Section B.5.1.2.4, "Effectiveness Monitoring" (p. 1824)) and the hard and soft triggers identified in the LUP's adaptive management section.

The BLM and USFS will coordinate with the State of Wyoming to share conservation, disturbance and vegetation analysis data to provide a core by core evaluation to make necessary adjustments in activity, priorities and other actions.

Site-scale habitat selected by sage-grouse is described as the more detailed vegetation characteristics of seasonal habitats. Habitat suitability characteristics include canopy cover and height of sagebrush and the associated understory vegetation. They also include vegetation

associated with riparian areas, wet meadows, and other mesic habitats adjacent to sagebrush that may support sage-grouse habitat needs during different stages in their annual cycle.

As described in the Conclusion (see Section B.5.1.4, “Conclusion” (p. 1830)), details and application of monitoring at the fine and site scales will be described in the implementation-level monitoring plan for the Buffalo land use plan. The need for fine- and site-scale-specific habitat monitoring will vary by area, depending on proposed projects, existing conditions, habitat variability, threats, and land health. Examples of fine- and site-scale monitoring include: habitat vegetation monitoring to assess current habitat conditions; monitoring and evaluation of the success of projects targeting sage-grouse habitat enhancement and/or restoration; and habitat disturbance monitoring to provide localized disturbance measures to inform proposed project review and potential mitigation for project impacts. Monitoring plans should incorporate the principles outlined in the BLM’s AIM strategy (Toevs et al. 2011) and in “AIM-Monitoring: A Component of the Assessment, Inventory, and Monitoring Strategy” (Taylor et al. 2014). Approved monitoring methods are:

- “BLM Core Terrestrial Indicators and Methods” (MacKinnon et al. 2011);
- The BLM’s Technical Reference “Interpreting Indicators of Rangeland Health” (Pellant et al. 2005); and,
- “Sage-Grouse Habitat Assessment Framework: Multiscale Assessment Tool” (Stiver et al *in press*).

Other state-specific disturbance tracking models include: the BLM’s Wyoming Density and Disturbance Calculation Tool (<http://ddct.wygisc.org/>) and the BLM’s White River Data Management System in development with the USGS. Population monitoring data (in cooperation with state wildlife agencies) should be included during evaluation of the effectiveness of actions taken at the fine and site scales.

Fine- and site-scale sage-grouse habitat suitability indicators for seasonal habitats are identified in the HAF. The HAF has incorporated the Connelly et al. (2000) sage-grouse guidelines as well as many of the core indicators in the AIM strategy (Toevs et al. 2011). There may be a need to develop adjustments to height and cover or other site suitability values described in the HAF; any such adjustments should be ecologically defensible. To foster consistency, however, adjustments to site suitability values at the local scale should be avoided unless there is strong, scientific justification for making those adjustments. That justification should be provided. WAFWA MZ adjustments must be supported by regional plant productivity and habitat data for the floristic province. If adjustments are made to the site-scale indicators, they must be made using data from the appropriate seasonal habitat designation (breeding/nesting, brood-rearing, winter) collected from sage-grouse studies found in the relevant area and peer-reviewed by the appropriate wildlife management agency(ies) and researchers.

When conducting land health assessments, the BLM should follow, at a minimum, “Interpreting Indicators of Rangeland Health” (Pellant et al. 2005) and the “BLM Core Terrestrial Indicators and Methods” (MacKinnon et al. 2011). For assessments being conducted in sage-grouse designated management areas, the BLM should collect additional data to inform the HAF indicators that have not been collected using the above methods. Implementation of the principles outlined in the AIM strategy will allow the data to be used to generate unbiased estimates of condition across the area of interest; facilitate consistent data collection and rollup analysis among management units; help provide consistent data to inform the classification and interpretation of imagery; and provide condition and trend of the indicators describing sagebrush characteristics important to sage-grouse habitat (see Section B.5.1.2.4, “Effectiveness Monitoring” (p. 1824)).

B.5.1.4. Conclusion

This Greater Sage-Grouse Monitoring Framework was developed for all of the Final Environmental Impact Statements involved in the sage-grouse planning effort. As such, it describes the monitoring activities at the broad and mid scales and provides a guide for the BLM to collaborate with partners/other agencies to develop the Buffalo land use plan-specific monitoring plan.

B.5.1.5. The BLM Greater Sage-Grouse Disturbance and Monitoring Subteam Membership

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B.5.1.6. Literature Cited

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B.5.1.7. Attachments

ATTACHMENT A: AN OVERVIEW OF MONITORING COMMITMENTS

Table B.9. Monitoring Commitments Overview

	Broad and Mid-Scales					Fine & Site Scales
	Implementation	Sagebrush Availability	Habitat Degradation	Population	Effectiveness	
How will the data be used?	Tracking and documenting implementation of land use plan decisions and inform adaptive management	Tracking changes in land cover (sagebrush) and inform adaptive management	Tracking changes in disturbance (threats) to sage-grouse habitat and inform adaptive management	Tracking trends in sage-grouse populations (and/or leks; as determined by state wildlife agencies) and inform adaptive management	Characterizing the relationship among disturbance, implementation actions, and sagebrush metrics and inform adaptive management	Measuring seasonal habitat, connectivity at the fine scale, and habitat conditions at the site scale, calculating disturbance and inform adaptive management
Who is collecting the data?	BLM FO and USFS Forest	NOC and NIFC	National data sets (NOC), BLM FOs and USFS Forests as applicable	State wildlife agencies through WAFWA	Comes from other broad and mid-scale monitoring types, analyzed by the NOC	BLM FO and SO, USFS Forests and RO (with partners) including disturbance
How often are the data collected, reported and made available to USFWS?	Collected and reported annually; summary every 5 years	Updated and changes reported annually; summary reports every 5 years	Collected and changes reported annually; summary reports every 5 years	State data reported annually per WAFWA MOU; summary reports every 5 years	Collected and reported every 5 years (coincident with LUP evaluations)	Collection and trend analysis ongoing, reported every 5 years or as needed to inform adaptive management
What is the spatial scale?	Summarized by LUP with flexibility for reporting by other units	Summarized by PACs (size dependent) with flexibility for reporting by other units	Summarized by PACs (size dependent) with flexibility for reporting by other units	Summarized by PACs (size dependent) with flexibility for reporting by other units	Summarized by MZ, and LUP with flexibility for reporting by other units (e.g., PAC)	Variable (e.g., projects and seasonal habitats)
What are the potential personnel and budget impacts?	Additional capacity or re-prioritization of ongoing monitoring work and budget realignment	At a minimum, current skills and capacity must be maintained; data mgmt cost are TBD	At a minimum, current skills and capacity must be maintained; data mgmt and data layer purchase cost are TBD	No additional personnel or budget impacts for BLM or USFS	Additional capacity or re-prioritization of ongoing monitoring work and budget realignment	Additional capacity or re-prioritization of ongoing monitoring work and budget realignment

	Broad and Mid-Scales					Fine & Site Scales
	Implement- ation	Sagebrush Availability	Habitat Degradation	Population	Effectiveness	
Who has primary and secondary responsibilities for reporting?	1. BLM FO & SO; USFS Forest & RO 2. BLM & USFS Planning	1. NOC 2. WO	1. NOC 2. BLM SO, USFS RO & appropriate programs	1. WAFWA & state wildlife agencies 2. BLM SO, USFS RO, NOC	1. Broad and mid-scale at the NOC, LUP at BLM SO, USFS RO	1. BLM FO & USFS Forests 2. BLM SO & USFS RO
What new processes/ tools are needed?	National implementation data sets and analysis tools	Updates to national land cover data	Data standards and roll-up methods for these data	Standards in population monitoring (WAFWA)	Reporting methodologies	Data standards data storage; and reporting
BLM Bureau of Land Management FO Field Office LUP Land Use Plan MOU Memorandum of Understanding MZ Management Zone NIFC National Interagency Fire Center NOC National Operations Center PAC Priority Area of Concentration RO Regional Office SO State Office TBD To Be Determined USFS U.S. Forest Service USFWS U.S. Fish and Wildlife Service WAFWA Western Association of Fish and Wildlife Agencies						

ATTACHMENT B: LIST OF ALL SAGEBRUSH SPECIES AND SUBSPECIES INCLUDED IN THE SELECTION CRITERIA FOR BUILDING THE EVT AND BpS LAYERS

- *Artemisia arbuscula* subspecies *longicaulis*
- *Artemisia arbuscula* subspecies *longiloba*
- *Artemisia bigelovii*
- *Artemisia nova*
- *Artemisia papposa*
- *Artemisia pygmaea*
- *Artemisia rigida*
- *Artemisia spinescens*
- *Artemisia tripartita* subspecies *rupicola*
- *Artemisia tripartita* subspecies *tripartita*
- *Tanacetum nuttallii*
- *Artemisia cana* subspecies *bolanderi*
- *Artemisia cana* subspecies *cana*
- *Artemisia cana* subspecies *viscidula*
- *Artemisia tridentata* subspecies *wyomingensis*
- *Artemisia tridentata* subspecies *tridentata*
- *Artemisia tridentata* subspecies *vaseyana*
- *Artemisia tridentata* subspecies *spiciformis*
- *Artemisia tridentata* subspecies *xericensis*

- *Artemisia tridentata* variety *pauciflora*
- *Artemisia frigida*
- *Artemisia pedatifida*

ATTACHMENT C: USER AND PRODUCER ACCURACIES FOR AGGREGATED ECOLOGICAL SYSTEMS WITHIN LANDFIRE MAP ZONES

Table B.10. User and Producer Accuracies for Aggregated Ecological Systems within LANDFIRE Map Zones

LANDFIRE Map Zone Name	User Accuracy	Producer Accuracy	Percent of Map Zone within Historic Schroeder
Wyoming Basin	76.9%	90.9%	98.5%
Snake River Plain	68.8%	85.2%	98.4%
Missouri River Plateau	57.7%	100.0%	91.3%
Grand Coulee Basin of the Columbia Plateau	80.0%	80.0%	89.3%
Wyoming Highlands	75.3%	85.9%	88.1%
Western Great Basin	69.3%	75.4%	72.9%
Blue Mountain Region of the Columbia Plateau	85.7%	88.7%	72.7%
Eastern Great Basin	62.7%	80.0%	62.8%
Northwestern Great Plains	76.5%	92.9%	46.3%
Northern Rocky Mountains	72.5%	89.2%	42.5%
Utah High Plateaus	81.8%	78.3%	41.5%
Colorado Plateau	65.3%	76.2%	28.8%
Middle Rocky Mountains	78.6%	73.3%	26.4%
Cascade Mountain Range	57.1%	88.9%	17.3%
Sierra Nevada Mountain Range	0.0%	0.0%	12.3%
Northwestern Rocky Mountains	66.7%	60.0%	7.3%
Southern Rocky Mountains	58.6%	56.7%	7.0%
Northern Cascades	75.0%	75.0%	2.6%
Mogollon Rim	66.7%	100.0%	1.7%
Death Valley Basin	0.0%	0.0%	1.2%
<p>Note: There are two anomalous map zones with 0% user and producer accuracies, attributable to no available reference data for the ecological systems of interest.</p> <p>Note: User accuracy is a map-based accuracy that is computed by looking at the reference data for a class and determining the percentage of correct predictions for these samples. For example, if one selects any sagebrush pixel on the classified map, what is the probability that one will be standing in a sagebrush stand when one visits that pixel location in the field? Commission Error equates to including a pixel in a class when it should have been excluded (i.e., commission error = 1 – user’s accuracy).</p> <p>Note: Producer accuracy is a reference-based accuracy that is computed by looking at the predictions produced for a class and determining the percentage of correct predictions. In other words, if one knows that a particular area is sagebrush, what is the probability that the digital map will correctly identify that pixel as sagebrush? Omission Error equates to excluding a pixel that should have been included in the class (i.e., omission error = 1 – producer’s accuracy).</p> <p>% percent</p>			

B.6. COT Objective 6: Prioritize, Fund and Implement Research to Address Existing Uncertainties

Increased funding and support for key research projects that will address uncertainties associated with sage-grouse and sagebrush habitat management is essential. Effective amelioration of threats can only be accomplished if the mechanisms by which those threats are imposed on the redundancy, representation, and resilience of the species and its habitats are understood.” (COT Report, 2013)

In accordance with BLM policy, the Record of Decision and Approved Plan will establish intervals and standards for evaluations as part of the implementation strategy. Priorities will be established based on the identified threats in the planning area, the conservation objectives included as part of the Approved Plan, and any potential uncertainties associated with sage-grouse and associated habitat management. A part of this strategy will include development of a budget to accomplish each of the identified tasks and fund potential research topics to address any uncertainties.

As new science pertaining to sage-grouse and habitat is continuously evolving, refined management strategies may be necessary to ensure that BLM and USFS are utilizing the most current science, information, and data regarding sage-grouse. It is for this reason that BLM and USFS have collaborated with the State of Wyoming and USFWS to develop an adaptive management strategy as a part of the planning process.

B.6.1. Wyoming Greater Sage-Grouse Adaptive Management Plan

The Greater Sage-Grouse adaptive management plan provides a means of addressing and responding to negative impacts to Greater Sage-Grouse and its habitat before consequences become severe or irreversible. This adaptive management plan:

- utilizes science based soft and hard adaptive management triggers,
- addresses multiple scales of data, and
- utilizes an adaptive management working group.

B.6.1.1. Adaptive Management Triggers

Adaptive management triggers are essential for identifying when potential management changes are needed in order to continue meeting Greater Sage-Grouse conservation objectives. With respect to sage-grouse, all regulatory entities in Wyoming, including the BLM and FS, use soft and hard triggers. Soft and hard triggers are focused on three metrics: (1) number of active leks, (2) acres of available habitat, and (3) population trends based on annual lek counts.

Soft Triggers:

Soft triggers are indicators that management or specific activities may not be achieving the intended results of conservation action or that unanticipated changes to populations or habitats have occurred that have the potential to place habitats or populations at risk. The soft trigger is any deviation from normal trends in habitat or population in any given year. Metrics include, but are not limited to, annual lek counts, wing counts, aerial surveys, habitat monitoring, and DDCT evaluations. BLM and/or FS field offices, with the assistance of their respective land and resource management plan implementation groups, local WGFD offices, and local sage-grouse working

Appendix B Greater Sage-Grouse Implementation Framework

COT Objective 6: Prioritize, Fund and Implement Research to Address Existing Uncertainties

groups will evaluate the metrics with the Adaptive Management Working Group (AMWG) on an annual basis. The purpose of these strategies is to address localized Greater Sage-Grouse population and habitat changes by providing the framework in which management will change if monitoring identifies negative population and habitat anomalies in order to avoid crossing a hard trigger threshold.

Hard Triggers:

Hard triggers are indicators that management is not achieving desired conservation results. Hard triggers would be considered an indicator that the species is not responding to conservation actions, or that a larger-scale impact or set of impacts is having a negative effect.

Within the range of normal population variables, hard triggers shall be determined to take effect when two of the three metrics exceeds 60 percent of normal variability for the area under management in a single year, or when any of the three metrics exceeds 40 percent of normal variability for a three year time period within a five-year range of analysis. A minimum of three consecutive years in a five-year period is used to determine trends (i.e., Y1-2-3, Y2-3-4, Y3-4-5).

B.6.1.2. Adaptive Management Response

Soft Triggers Response:

Soft triggers require immediate monitoring and surveillance to determine causal factors and may require curtailment of activities in the short- or long-term, as allowed by law. The project level adaptive management strategies will identify appropriate responses where the project's activities are identified as the causal factor. The management agency (BLM and/or FS) and the AMWG will implement an appropriate response strategy to address causal factors not attributable to a specific project or to make adjustments at a larger regional or state-wide level.

Hard Trigger Response:

Upon determination that a hard trigger has been tripped, the BLM and/or FS will immediately defer issuance of discretionary authorizations for new actions for a period of 90 days. In addition, within 14 days of a determination that a hard trigger has been tripped, the AMWG will convene to develop an interim response strategy and initiate an assessment to determine the causal factor or factors (hereafter called the causal factor assessment).

Interim Strategy

An interim response strategy will be developed, and implemented to the extent permitted by law, within 90 days of determination that a hard trigger has been tripped. The technical team (see Implementation Groups below) will be consulted to identify the scope and scale of the interim strategy. Based on the recommendation of the AMWG, the BLM and/or FS will implement an interim response strategy through an Instruction Memorandum or other management mechanisms to direct management until the causal factor(s) and appropriate response(s) can be determined. The interim response strategy will consist of appropriate management measures undertaken at the project stage, supported by the best available science, to address the specific metric which has been tripped and may include deferral of some activities as appropriate. Measures that were analyzed in this EIS and the COT, NTT reports, and NPT guidance will be reviewed in addition to current science to identify the most appropriate measures to be implemented as part of the interim response strategy. The BLM and/or FS will comply with all applicable law in implementing

such response(s), and, if applicable, will undertake a plan amendment or revision under BLM and/or FS's planning regulations and policies.

The interim strategy will be implemented for the biologically significant unit (BSU), which, in Wyoming, is the Core Area, regardless of whether the Core Area crosses multiple planning boundaries. If it has been identified that more than one Core Area has the same hard triggers being tripped, or is trending towards triggers being tripped, the interim strategy will be implemented at the appropriate scale.

Causal Factor Assessment

The causal factor assessment will be completed within 180 days of determination that a hard trigger threshold has been crossed. Once the causal factor assessment is completed by the AMWG, the interim response strategy will be modified to adequately address the causal factors in consultation with the technical team. If a causal factor or factors cannot be identified, the interim response strategy shall stay in place until the cause can be determined and any new planning decision can be implemented.

B.6.1.3. EIS Level Projects

Each major project (EIS level) will include adaptive management strategies in support of the population management objectives for Greater Sage-Grouse set by the State of Wyoming, and will be consistent with the Wyoming Greater Sage-Grouse Adaptive Management Plan. These adaptive management strategies will be developed in partnership with the AMWG, WGFD, project proponents, partners, and stakeholders, incorporating the best available science.

In making amendments to this plan, the BLM will coordinate with the FWS as BLM continues to meet its objective of conserving, enhancing and restoring GRSG habitat by reducing, minimizing or eliminating threats to that habitat.

B.6.1.4. Implementation Groups

Sage-Grouse Implementation Team

The State of Wyoming's strategy is implemented by the SGIT, established by Executive Order in 2008 and codified in 2014 by the Wyoming Legislature (W.S. § 9-19-101). The SGIT is a Governor appointed body with representation by federal agencies (BLM, USFS, USFWS, NRCS), state agencies (Wyoming Game and Fish Commission, Department of Agriculture, Department of Environmental Quality, Wildlife and Natural Resource Trust Fund, Oil and Gas Conservation Commission, and Office of State Lands and Investments), the Wyoming Legislature, county governments, energy developers, mining companies, landowners, and non- governmental organizations. The BLM, USFWS, NRCS, and the USFS all have an equal role in the SGIT.

Land and Resource Management Plan – Implementation Teams

Land and Resource Management Plans are implemented through implementation teams. These implementation teams include cooperating agencies who participated in the development of this land use plan representing local, state, and federal agencies. These implementation teams will coordinate with the AMWG and others to evaluate metrics and management responses necessary to meet Greater Sage-Grouse conservation objectives within their planning area.

*Appendix B Greater Sage-Grouse Implementation
Framework*

*Wyoming Greater Sage-Grouse Adaptive
Management Plan*

Adaptive Management Working Group and Technical Team

An AMWG will be established in consultation with the SGIT to provide appropriate guidance for agencies with the ability to affect sage-grouse populations and/or habitat through their permitting authority. The AMWG will include BLM, USFS, USFWS, and State of Wyoming. The purpose of this group will be to initiate a response strategy should it be determined that a hard trigger has been tripped or if soft triggers are showing a trend across a region. A hard trigger may be tripped at any time, thus, upon identification of such event, current available population and habitat data will be reviewed by the AMWG with the assistance of a technical team comprised of agency biologists, scientists familiar with the Management Zone in question, and other individuals as appropriate (e.g., habitat managers, respective landowners, other appropriate representatives) to confirm that a hard trigger has been tripped. Upon verification of data showing that a hard trigger has been tripped, the AMWG will convene within 14 days.

The AMWG will review monitoring data which has been collected by the appropriate local sage-grouse working groups in conformance with data collection standards. This group will meet annually to review all data collected in the prior year regarding Greater sage-grouse populations and habitats. Monitoring data will have been analyzed (by WGFD for population based metrics (leks, wing counts, etc. and by land managers [BLM, USFS, State of Wyoming] for habitat based metrics [DDCT, etc.]) Should the monitoring data suggest a trend toward a soft or hard trigger being tripped, they will 1. Identify what metric is indicating that trend (population or habitat); and 2. Identify a technical team to review the data and compile a range of activities which may be causing the trend. Should review of the monitoring data identify that multiple soft triggers have been tripped in one Core Area, or the same triggers have been tripped across multiple Core Areas, the technical team will be tasked with verifying the scope and intensity of the trends.

Once the analysis of the trends has been completed by the technical team and reported back to the AMWG, the AMWG will make recommendations to the appropriate land managing agency regarding an interim adaptive management strategy to be implemented. Implementation will occur via the appropriate regulations and policy applicable for that agency. At that time, the State of Wyoming will conduct a review of the regulatory authority implementing the Sage Grouse Core Area Strategy to determine if a State of Wyoming adaptive management strategy is warranted.

Upon review of the annual data by the AMWG and technical team, the State of Wyoming, as part of the AMWG, will contact neighboring states within the respective Management Zone to inform them of any findings. Should a hard trigger be tripped, the trigger which has been tripped and any recommended adaptive management strategy being implemented will be shared with the appropriate neighboring state(s). Should the need arise for implementation of a multi-state adaptive management strategy; the AMWG will coordinate to develop an effective response.

B.6.1.5. Small Leks

Small leks will be given special consideration. Due to geographic variations a definition of “small” is not provided, rather determination of “small” will be made by the AMWG based upon recommendations of the scientific community. Generally, “small” is considered 10 or fewer males for a three year time period within a five-year range of analysis. If a trigger is hit based upon such a lek, then the adaptive management working group will evaluate the site-specific circumstances and determine appropriate remedial action.

Glossary Terms

Additionality:

The conservation benefits of compensatory mitigation are demonstrably new and would not have resulted without the compensatory mitigation project. (BLM Manual Section 1794).

Avoidance mitigation:

Avoiding the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20(a)) (e.g., may also include avoiding the impact by moving the proposed action to a different time or location).

Compensatory mitigation:

The restoration, creation, enhancement, and/or preservation of impacted resources (adopted and modified from 33 CFR 332), such as on-the-ground actions to improve and/or protect habitats (e.g., chemical vegetation treatments, land acquisitions, conservation easements).

Compensatory mitigation projects:

Specific, on-the-ground actions to improve and/or protect habitats (e.g., chemical vegetation treatments, land acquisitions, conservation easements).

Compensatory mitigation sites:

The durable areas where compensatory mitigation projects will occur.

Durability (protective and ecological):

The maintenance of the effectiveness of a mitigation site and project for the duration of the associated impacts, which includes resource, administrative/legal, and financial considerations.

Minimization mitigation:

Minimizing impacts by limiting the degree or magnitude of the action and its implementation (40 CFR 1508.20 (b)).

Residual impacts:

Impacts from an authorized land use that remain after applying avoidance and minimization mitigation; also referred to as unavoidable impacts.

Timeliness:

The lack of a time lag between impacts and the achievement of compensatory mitigation goals and objectives (BLM Manual Section 1794).

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Appendix C. Public Involvement, Consultation, and Coordination

C.1. Introduction

Public involvement, consultation, and coordination initiated prior to and occurred throughout preparation of the Buffalo Resource Management Plan (RMP) revision and associated Environmental Impact Statement (EIS). The Bureau of Land Management (BLM) incorporated public involvement, consultation, and coordination through public meetings, informal meetings, individual contacts, news releases, planning bulletins, workshops, a planning website, and the Federal Register. This appendix describes the public involvement process, as well as other key consultation and coordination activities undertaken to prepare the EIS in support of the RMP revision.

The BLM decision-making process is conducted in accordance with the requirements of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations implementing NEPA, and the United States (U.S.) Department of the Interior (DOI) and BLM policies and procedures implementing NEPA. NEPA and the associated regulatory and policy framework require that all federal agencies involve the interested public and potentially affected parties in their decision-making, consider reasonable alternatives to proposed actions, and prepare environmental documents that disclose the potential impacts of proposed actions and alternatives.

A Notice of Intent (NOI) published in the Federal Register on November 14, 2008, formally announced the BLM's intent to revise the existing plans and prepare the associated EIS. The NOI initiated the scoping process and invited participation of affected and interested agencies, organizations, and members of the public in determining the scope and issues to be addressed by alternatives and analyzed in the EIS. The BLM solicited additional public involvement, including cooperating agency meetings and workshops, to help identify issues to be addressed in developing a full range of land management alternatives. Following release of the Draft RMP and EIS on June 28, 2013, the BLM hosted four public meetings in August 2013 to respond to questions and solicit comments on the Draft RMP and EIS. Table C.1, "Public Involvement, Coordination, and Consultation Events" (p. 1843) lists public involvement, coordination, and consultation events.

Table C.1. Public Involvement, Coordination, and Consultation Events

Date	Location	Event
December 1, 2008	Wright, Wyoming	Public Scoping Meeting
December 2, 2008	Buffalo, Wyoming	Public Scoping Meeting
December 3, 2008	Gillette, Wyoming	Public Scoping Meeting
December 4, 2008	Sheridan, Wyoming	Public Scoping Meeting
December 5, 2008	Kaycee, Wyoming	Public Scoping Meeting
October 22, 2008	Buffalo, Wyoming	Socioeconomic Workshop
October 22-23, 2008	Buffalo, Wyoming	Cooperating Agency Training
May 20 – 22, 2009	Buffalo, Wyoming	Goals and Objectives Development Workshop
June 17 – 18, 2009	Buffalo, Wyoming	Range of Alternatives Development Workshop
July 15 – 16, 2009	Buffalo, Wyoming	Range of Alternatives Development Workshop

Date	Location	Event
August 19 – 20, 2009	Buffalo, Wyoming	Range of Alternatives Development Workshop
September 16 – 17, 2009	Buffalo, Wyoming	Range of Alternatives Development Workshop
October 7 – 8, 2009	Buffalo, Wyoming	Range of Alternatives Development Workshop
December 14, 2009	Buffalo, Wyoming	Open House
December 15, 2009	Gillette, Wyoming	Open House
April 27 – 29, 2010	Buffalo, Wyoming	Preferred Alternative Development Workshop
August 5, 2013	Buffalo, Wyoming	Open House
August 6, 2013	Gillette, Wyoming	Open House
August 19, 2013	Sheridan, Wyoming	Open House
August 20, 2013	Kaycee, Wyoming	Open House

C.2. Public Involvement

In accordance with CEQ scoping guidance, the BLM provided opportunities for public involvement as an integral part of revising the RMP and preparing the EIS. CEQ scoping guidance defines scoping as the process by which lead agencies solicit input from the public and interested agencies on the nature and extent of issues and impacts to be addressed and the methods by which they will be evaluated. The scoping report, which summarizes public participation during scoping and issues identified during the scoping process, is available on the Buffalo RMP website at <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo.html>.

The intent of the scoping process is to provide an opportunity for the public, tribes, other government agencies, and interest groups to learn about the project and provide input on the planning issues, impacts, and potential alternatives that will be addressed in the EIS, and the extent to which those issues will be analyzed. In general, public involvement during scoping assists the agency through the following:

- Broadening the information base for decision-making.
- Informing the public about the EIS and proposed RMP and the potential impacts associated with various management decisions.
- Ensuring public needs and viewpoints are brought to the attention of the agency.
- Determining the scope and the significant issues to be analyzed in depth in the EIS.

Scoping Period

The scoping process for the Buffalo RMP revision began with the publication of the NOI in the Federal Register on November 14, 2008 and went through January 5, 2009. The scoping period provides an opportunity for the public to identify potential planning issues and concerns associated with the RMP and EIS. Information obtained by the BLM during scoping is combined with issues identified by the agencies to form the scope of the EIS.

Public Notification of Scoping

News Release

The BLM issued a news release to local media on August 13, 2008 announcing plans to revise the Buffalo RMP. On November 10, 2008, the BLM issued a news release describing the

public scoping period and listing the time, date, and location of the public scoping meetings. The news releases went out to numerous radio stations and newspapers within and outside of the planning area.

Planning Bulletin

Another means of outreach prior to the public scoping meetings included a bulletin announcing the scoping meetings. This bulletin included general information about the planning process and planning area for the RMP; contact information and comment submission instructions; and a list of the dates, times, and locations of the public scoping meetings. The BLM mailed the bulletin to potentially interested individuals and organizations who had participated in past BLM projects.

Website

The website provides background information on the project, a description of the scoping process and meeting locations, instructions on how to submit comments, a general overview of potential planning topics, and copies of public information documents such as the NOI and the existing plan. The website is one of the methods used to communicate project news and updates to the public. The website may be accessed at: <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo.html>.

Scoping Meetings

During the week of December 1, 2008, the BLM hosted scoping meetings in five locations across the planning area. All meetings ran from 3:00 p.m. until 8:00 p.m. Table C.1, “Public Involvement, Coordination, and Consultation Events” (p. 1843) lists the scoping meeting locations and dates. The five public scoping meetings provided the public with an opportunity to learn and ask questions about the project and the planning process and to submit their issues and concerns to the BLM. The BLM gave two formal presentations, one at 3:30 p.m. and one at 6:00 p.m., each of which was followed by an open house format discussion between the BLM and meeting attendees. The formal presentations were designed to provide participants a good foundation in the RMP revision process, how to provide effective comments, and some of the resource issues to be covered in the RMP revision. Each formal presentation also included a question and answer session. The open house portions of the meetings were designed to allow attendees to learn about the project at their own pace and to enable them to ask BLM representatives questions in an informal one-on-one setting.

In addition to members of the BLM interdisciplinary team, a total of 129 people attended the scoping meetings. The BLM provided four handouts and displayed a series of four 3-panel table top boards at each scoping meeting.

The BLM encouraged meeting attendees to comment by submitting written comment forms (either at the meetings or via mail), or by sending an email. Comment forms were available to attendees at all meetings, as was a computer kiosk where the public could type and submit their comments. The BLM also provided an easel with a pad of paper for meeting attendees to write comments on.

Open Houses/Public Meetings

The BLM held two open house meetings in December 2009 in Buffalo and Gillette, Wyoming. Similar to the public scoping meetings, the open house meetings provided the public an opportunity to ask questions of BLM staff and learn about the progress of the project. Several

*Appendix C Public Involvement, Consultation,
and Coordination
Scoping Meetings*

BLM specialists and other representatives of the BLM were in attendance to provide information and address questions and concerns.

Mailing List

The BLM compiled a list of 1,217 individuals, agencies, and organizations that participated in past BLM projects or requested to be on the general mailing list. The BLM mailed the initial planning bulletin to each individual on this list. Visitors to the scoping meetings were asked to sign in and provide their mailing address so that they could also be added to the mailing list. Other additions to the mailing list include those individuals who have submitted requests to be added to the list. Duplicate entries, changes of address, and return-to-sender mailings were deleted from the official project mailing list as identified. Through this process, the general mailing list was revised to approximately 1,500 entries. Requests to be added to or to remain on the official mailing list will continue to be accepted throughout the planning process.

Planning Bulletins

Periodic planning bulletins have been and are being developed and distributed to keep the public informed of the Buffalo RMP revision. Eight planning bulletins have been emailed and mailed to individuals on the Buffalo RMP mailing. The planning bulletins have also been made available for download on the Buffalo RMP revision website.

Website

The Buffalo RMP revision website can be found at: <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo.html>. The site provides individuals with RMP news and information and access to documents related to the revision. The website serves as a virtual repository for documents related to the development of the RMP, including announcements, planning bulletins, and documents. The documents are available in PDF format to ensure they are accessible to the widest range of interested parties. The website provides the public an opportunity to submit their comments for consideration as part of the planning process and to be added to the project mailing list.

Public Comment Period on the Draft RMP and EIS

A Notice of Availability announcing release of the Draft RMP and EIS was published in the Federal Register on June 28, 2013, initiating the 90-day public comment period. The public comment period closed on September 26, 2013. During the public comment period, the public was provided the opportunity to review and comment on the Draft RMP and EIS.

Notification

The BLM issued a press release on July 19, 2013 announcing the dates, times, and locations of the public meetings. The BLM also distributed a newsletter via U.S. mail and email to individuals on the BLM mailing list, which provided dates and locations of the public meetings. In addition to news releases and other notifications from the BLM regarding the comment period, some members of the public received notification from other sources. Several articles and news bulletins regarding the release of the Draft RMP and EIS were published in local newspapers. Many of the articles listed the dates for the public meetings.

Public Meetings

During the public comment period, the BLM hosted four public meetings in August 2013 in towns and cities throughout the planning area (see Table C.1, “Public Involvement, Coordination, and Consultation Events” (p. 1843) for meeting dates and locations). The public meetings provided

the opportunity for the public to ask questions and submit comments. The meetings were held in an open house format with a formal presentation provided by BLM managers. BLM managers, resource specialists and other representatives of the BLM were present during these meetings to discuss the RMP and answer questions.

Comment Analysis

Based on comments received during this period, the BLM revised the RMP where appropriate. Changes made to the Draft RMP and EIS based on comments are reflected in the Proposed RMP and Final EIS. The Comment Analysis Report summarizes all substantive comments received during the 90-day public comment period and the BLM responses to those comments, including how the document was revised based on comments. The report is presented in Appendix Y (p. 2671).

Future Public Involvement

Public participation efforts will be ongoing throughout the remainder of the process of revising the RMP and developing the EIS. The Proposed RMP and Final EIS considered all substantive oral and written comments received during the 90-day public comment period for the Draft RMP and EIS. Members of the public with standing will have the opportunity to protest the content of the Proposed RMP and Final EIS during the specified 30-day protest period. The Record of Decision will be issued by the BLM following the Governor's Consistency Review and protest resolution.

C.3. Consultation and Coordination

This section documents the consultation and coordination efforts undertaken by the BLM throughout the process of revising the RMP and developing the EIS. Title II, Section 202 of the Federal Land Policy and Management Act (FLPMA) directs the BLM to coordinate inventory, planning, and management efforts with the land use planning and management programs of Native American Tribes, other federal departments, and agencies of the state and local governments as part of its land use planning process, to the extent consistent with the laws governing the administration of the public lands. The BLM is directed to integrate NEPA requirements with other environmental review and consultation requirements to reduce paperwork and delays (40 Code of Federal Regulations 1500.4-5). The BLM accomplished coordination with other agencies and consistency with other plans through ongoing communications, meetings, and collaborative efforts with the BLM Interdisciplinary Team, which includes BLM specialists, and federal, state, and local agencies.

The BLM is aware that there are specific State laws and local plans relevant to aspects of public land management that are discrete from, and independent of, Federal law. However, BLM is bound by Federal law. As a consequence, there may be inconsistencies that cannot be reconciled. The FLPMA and its implementing regulations require that BLM's land use plans be consistent with State and local plans only if those plans are consistent with the purposes, policies, and programs of federal laws and regulations applicable to public lands. Where State and local plans conflict with the purposes, policies, and programs of Federal law there will be an inconsistency that cannot be resolved. While County and Federal planning processes, under FLPMA, are required to as integrated and consistent as practical, the Federal agency planning process is not bound by or subject to County plans, planning processes, or planning stipulations.

Cooperating Agencies

The BLM invited local, state, federal, and tribal representatives to participate as cooperating agencies on the Buffalo RMP revision and EIS. The BLM invited the following entities to participate because they have jurisdiction by law or because they could offer special expertise:

Counties

- Campbell County Commission
- Crook County Commission
- Johnson County Commission
- Sheridan County Commission

Conservation Districts

- Campbell County Conservation District
- Lake DeSmet Conservation District
- Powder River Conservation District
- Sheridan County Conservation District

Wyoming State Agencies

- Office of the Governor
- Office of State Lands and Investments
- Wyoming Department of Agriculture
- Wyoming Department of Environmental Quality
- Wyoming Department of Revenue
- Wyoming Department of State Parks and Cultural Resources
- Wyoming Department of Transportation
- Wyoming Game and Fish Department
- Wyoming Oil and Gas Conservation Commission
- Wyoming State Engineer's Office
- Wyoming State Forestry Division
- Wyoming State Geological Survey
- Wyoming State Historic Preservation Office
- Wyoming State Planning Office
- Wyoming Trails
- Wyoming Water Development Commission

Federal Agencies

- Bighorn National Forest
- Medicine Bow-Routt National Forest, Thunder Basin National Grasslands
- U.S. DOI – Office of Surface Mining
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Nuclear Regulatory Commission

Tribes

- Cheyenne River Sioux
- Oglala Lakota Nation
- Rosebud Sioux Tribe
- Ft. Peck Sioux Tribe
- Standing Rock Sioux Tribe
- Lower Brule Sioux Tribe

- Yankton Sioux Tribe
- The Sisseton-Wahpeton Oyate
- Crow Creek Sioux Tribe
- Santee Sioux Tribe of Nebraska
- Northern Cheyenne Tribe
- Northern Arapaho Tribe
- Crow Nation
- Eastern Shoshone Tribe
- Three Affiliated Tribes

The BLM formally invited the cooperating agencies to participate in developing the alternatives and RMP and EIS, and to provide data and other information relative to their agency responsibilities, goals, mandates, and expertise. Cooperating agencies provided input during the initial scoping process. The BLM held general meetings with cooperators to discuss procedures and processes. The BLM and cooperating agencies held several workshops to develop goals and objectives, a range of alternatives, and the Preferred Alternative between May 2009 and April 2010. Cooperating agencies have also provided comments on draft RMP related documents throughout the revision process.

In addition, the following federal Congressional Offices participated in the meetings with cooperating agencies.

- U.S. Senator Michael Enzi's Office
- U.S. Senator John Barrasso's Office
- U.S. Representative Cynthia Lummis' Office

Endangered Species Act Consultation

The Buffalo Field Office (BFO) contacted the U.S. Fish and Wildlife Service (USFWS) regarding Section 7 of the Endangered Species Act and the Buffalo RMP revision. The BLM sent a scoping letter to the USFWS requesting comments concerning Section 7 consultation and the Buffalo RMP revision project. On January 5, 2010 the USFWS provided comments on (1) Threatened and Endangered species, (2) migratory birds, and (3) wetlands and riparian areas. Within these comments the USFWS provided a list of Threatened and Endangered species likely to occur on BLM-administered land in the BFO, for evaluating BLM Section 7 responsibilities. The USFWS was also provided opportunities to comment on the draft RMP and EIS. Consultation letters concerning the Buffalo RMP revision project are located at the end of this appendix. The BFO will continue consultation with the USFWS regarding the RMP revision through completion of the final biological assessment (Appendix I (p. 2025)) and Proposed RMP and Final EIS.

Native American Consultation

Consultation with Native American tribes is part of the National Historic Preservation Act (NHPA) compliance process, the NEPA process and a requirement of FLPMA. The BLM invited numerous Native American tribes to be cooperating agencies as part of the RMP revision. The Northern Cheyenne Tribe accepted the invitation and attended cooperator meetings.

BFO invited Native American tribes to comment on interests or concerns related to management in the planning area and asked tribes to identify any places of traditional religious or cultural importance within the planning area. An example consultation letter between the Native

American tribes and the BLM is located at the end of this appendix. In November of 2010, May of 2011, June of 2011, February of 2012, May of 2012, and June of 2012, the BLM met with representatives from the Standing Rock, Cheyenne River Sioux, Rosebud Sioux, Crow Creek Sioux, Lower Brule Sioux, Oglala Lakota, Sisseton Wahpeton Oyate, Yankton Sioux, Flandreau Santee, Fort Peck, Three Affiliated, Crow, Northern Arapaho, and Northern Cheyenne Tribes to coordinate and discuss the RMP. The Northern Cheyenne Tribe is a cooperating agency for this planning effort and their representatives attended formal cooperators meetings. BFO also travelled to the headquarters of the Northern Cheyenne Tribe in Lama, Deer, Montana to discuss the RMP with tribal representatives and Northern Cheyenne Cultural Commission in January of 2014. These meetings were not considered government-to-government consultation by either party, but the BLM did take note of several tribal concerns from official tribal representatives and elected officials. The BLM will continue efforts toward government-to-government consultation with all interested tribes after publication of this draft and throughout the remainder of the RMP process.

C.4. Distribution List

The BLM distributed the Proposed RMP and Final EIS to the following entities for their review and comment.

TRIBAL GOVERNMENTS

- Cheyenne River Sioux
- Oglala Lakota Nation
- Rosebud Sioux Tribe
- Ft. Peck Sioux Tribe
- Standing Rock Sioux Tribe
- Lower Brule Sioux Tribe
- Yankton Sioux Tribe
- The Sisseton-Wahpeton Oyate
- Crow Creek Sioux Tribe
- Santee Sioux Tribe of Nebraska
- Northern Cheyenne Tribe
- Northern Arapaho Tribe
- Crow Nation
- Eastern Shoshone Tribe
- Three Affiliated Tribes

LOCAL GOVERNMENTS (COUNTIES, CITIES, TOWNS)

Campbell County, Wyoming

- Campbell County Commission
- Campbell County Conservation District
- City of Gillette
- Town of Wright

Crook County, Wyoming

- Crook County Commission

Johnson County, Wyoming

- Johnson County Commission

- Lake DeSmet Conservation District
- Powder River Conservation District
- City of Buffalo
- Town of Kaycee

Sheridan County, Wyoming

- Sheridan County Commission
- Sheridan Conservation District
- City of Sheridan

WYOMING STATE AGENCIES

- Office of the Governor, Environmental Policy Division
- Business Council
- Department of Environmental Quality
 - Air Quality Division
 - Land Quality Division
 - Water Quality Division
- Department of Agriculture
- Department of State Parks and Cultural Resources
 - State Museum
- Department of Transportation
- State Planning Office
- Game and Fish Department
- State Geologic Survey
- Office of State Lands and Investments
- State Engineer's Office
- State Historic Preservation Office
- Department of Administration and Information
- Department of Employment, Research, and Planning Division

WYOMING STATE BOARDS/COMMISSIONS

- Air Quality Advisory Board
- Board of Wildlife Commissioners
- Natural Gas Pipeline Authority
- Agriculture Board
- Environmental Quality Council
- Farm Bureau Federation
- Land Quality Advisory Board
- Livestock Board
- Mining Council
- Oil and Gas Conservation Commission
- State Board of Outfitters and Professional Guides
- State Grazing Board
- Trails Council

WEED AND PEST CONTROL DISTRICTS

- Campbell County Weed and Pest Control District
- Johnson County Weed and Pest Control District
- Sheridan County Weed and Pest Control District

LOCAL GOVERNMENT ASSOCIATIONS/COUNCILS

- Wyoming Association of Municipalities
- Wyoming County Commissioners Association
- Wyoming Association of Conservation Districts

NON-GOVERNMENT ORGANIZATIONS

- Alliance for Historic Wyoming
- Audubon Society
- Audubon Wyoming
- Biodiversity Conservation Alliance
- Coalbed Natural Gas Alliance
- Foundation for North American Wild Sheep
- Independent Petroleum Association of Mountain States
- Izaak Walton League
- National Wildlife Federation
- Natural Resources Defense Council
- Petroleum Association of Wyoming
- Powder River Basin Resource Council
- Public Lands Foundation
- Rocky Mountain Elk Foundation
- Sierra Club
- The Conservation Fund
- The Land Trust Alliance
- The Nature Conservancy
- The Wilderness Society
- The Wildlife Society
- Trout Unlimited
- Western Watersheds Project
- Wildlife Habitat Council
- Wyoming Livestock Roundup
- Wyoming Mining Association
- Wyoming Natural Diversity Database
- Wyoming Nature Conservancy
- Wyoming Outdoor Council
- Wyoming Stockgrowers Association
- Wyoming Wilderness Association
- Wyoming Wildlife Federation
- Wyoming Wildlife Trust Fund
- Wyoming Woolgrowers Association

CONGRESSIONAL DELEGATION

- U.S. Senator Michael Enzi
- U.S. Senator John Barrasso
- U.S. Representative Cynthia Lummis

U.S. DEPARTMENT OF THE INTERIOR

- Bureau of Indian Affairs
- U.S. Bureau of Reclamation
- National Park Service

- Office of Environmental Policy and Compliance
- Natural Resources Library
- Office of Surface Mining
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
 - Washington, D.C.
 - Cheyenne, Wyoming
- Bureau of Land Management
 - Washington, D.C.
 - Wyoming State Office, Cheyenne
 - Wyoming District Offices: Casper, Rock Springs, Worland
 - Wyoming Field Offices: Casper, Cody, Kemmerer, Lander, Newcastle, Pinedale, Rawlins, Rock Springs, and Worland

OTHER FEDERAL AGENCIES

- U.S. Environmental Protection Agency
- U.S. Department of Agriculture Forest Service
 - Bighorn National Forest
 - Medicine Bow-Routt National Forest and Thunder Basin National Grassland
- U.S. Department of Agriculture Natural Resources Conservation Service
- U.S. Army Corps of Engineers
- Department of Energy Western Area Power Administration
- Federal Highway Administration
- Federal Energy Regulatory Commission
- U.S. Government Printing Office
- National Oceanic and Atmospheric Administration National Weather Service

LIBRARIES

- Library of Congress
- University of Wyoming Library
- Campbell County Library
- Johnson County Library
- Sheridan County Public Library

EDUCATIONAL INSTITUTIONS

- University of Wyoming
- Wyoming Community College Commission
- Northern Wyoming Community College District
 - Buffalo Campus
 - Gillette Campus
 - Sheridan Campus

NEWSPAPERS

- Buffalo Bulletin, Buffalo, Wyoming
- Billings Gazette, Billings, Montana
- Casper Star Tribune, Casper, Wyoming
- Casper Journal, Casper, Wyoming
- Douglas Budget, Douglas, Wyoming
- Gillette News-Record, Gillette, Wyoming

- Glenrock Independent, Glenrock, Wyoming
- Guernsey Gazette, Guernsey, Wyoming
- High Plains Sentinel, Wright, Wyoming
- Kaycee Community Voice, Kaycee, Wyoming
- Lingle Guide, Lingle, Wyoming
- Lusk Herald, Lusk, Wyoming
- Moorcroft Leader, Moorcroft, Wyoming
- Newcastle Newsletter Journal, Newcastle, Wyoming
- Our Town, Casper, Wyoming
- Platte County Record Times, Wheatland, Wyoming
- Sheridan Press, Sheridan, Wyoming
- Sundance Times, Sundance, Wyoming
- Torrington Telegram, Torrington, Wyoming
- Weston County Gazette, Upton, Wyoming
- Wyoming Associated Press
- Wyoming Business Report
- Wyoming Livestock Roundup

RADIO

- KLGT-FM/KBBS-AM, Buffalo
- KTWO-AM/KMGW-FM/KWYY-FM, Casper
- KRVK-FM/KKTL-AM/KTRS-FM, Casper
- KASS/KQLT/K MLD/KHOC/KVOC/KERM-KGOS, Casper
- KKTY-AM, Douglas
- KYOD- FM, Douglas
- KIML-AM/KAML-FM, Gillette
- KGOS-AM/KERM-FM, Torrington
- KASL-AM, Newcastle
- KWYO-AM/KROE-AM/KZWY-FM/KYTI-FM, Sheridan
- KBFS-AM/KYDT-FM, Sundance
- KYCN-AM/KZEW-FM, Wheatland
- Northern Broadcasting System, Montana
- Wyoming Public Radio, Laramie
- Wyoming Outdoor Radio

C.5. Consultation Letters

Section 7 Consultation Letter



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

In Reply Refer To:
ES-61411/W.02/WY09FA0031

JAN 05 2009

Memorandum

To: Field Manager, Bureau of Land Management, Buffalo Field Office; Buffalo, Wyoming

From: *Joe* Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming *Scott Hicks*

Subject: Scoping Comments for Buffalo Resource Management Plan

Thank you for the opportunity to provide scoping comments on the proposed Buffalo Resource Management Plan (RMP). The Buffalo RMP will replace the current Buffalo RMP. The revised Buffalo Field Office RMP will provide future direction for managing approximately 800,000 acres of U.S. Bureau of Land Management (Bureau)-administered surface land and 4.7-million acres of Bureau-administered mineral estate in Campbell, Johnson, and Sheridan counties in north-central Wyoming. Emerging issues and changing laws necessitate revision of the Buffalo RMP as described in the 2008 scoping notice. The Bureau is requesting the help of the public in identifying additional issues to be addressed in the planning effort.

In response to your request to review the proposed action, we are providing you with comments on (1) threatened and endangered species, (2) migratory birds, and (3) wetlands and riparian areas. The Service provides recommendations for protective measures for threatened and endangered species in accordance with the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Protective measures for migratory birds are provided in accordance with the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703 and the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668. Wetlands are afforded protection under Executive Orders 11990 (wetland protection) and 11988 (floodplain management), as well as section 404 of the Clean Water Act. Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956, as amended, 70 Stat. 1119, 16 U.S.C. 742a-742j.

Threatened and Endangered Species

The following threatened or endangered species could occur in the project area:

Black-footed ferret: Black-footed ferrets (*Mustela nigripes*) may be affected if prairie dog towns are impacted. Please be aware that black-footed ferret surveys are no longer recommended in black-tailed prairie dog towns (see our February 2, 2004, letter previously provided to your

office). However, we encourage the Bureau to protect all prairie dog towns for their value to the prairie ecosystem and the many species that rely on them. We further encourage you to analyze potentially disturbed prairie dog towns for their value to future black-footed ferret reintroduction.

Blowout penstemon: Blowout penstemon (*Penstemon haydenii*) is a perennial herb with stems less than 12 inches tall. The inflorescence is 2-6 inches long and has 6-10 compact whorls of milky-blue to pale lavender flowers. Blowout penstemon was listed as endangered on October 1 1987. Blowout penstemon is known from multiple populations in western Nebraska (Fertig 2001). The plant's current known range in Wyoming consists of the Ferris dunes area in northwest Carbon County where the plant is restricted to two habitat types: steep, northwest facing slopes of active sand dunes with less than 5 percent vegetative cover; and on north facing sandy slopes, on the lee side of active blowouts with 25-40 percent vegetative cover. Known populations in Wyoming are found between 6680-7440 feet (Fertig 2001). However, recent surveys have indicated that systematic surveys may be warranted in some lower elevations (below 6700 feet) in Wyoming where active sand blowout features occur (BLM 2005, Fertig 2001).

Blowouts are formed as strong winds deposit sands from the windward side of a dune to the leeward side and result in a sparsely vegetated crater-like depression. Associated vegetation includes blowout grass, thickspike wheatgrass, lemon scurfpea, Indian ricegrass and western wheatgrass. Threats to the plant occur when sand dunes are removed or overly disturbed by vehicular traffic. Surveys should be conducted from mid-June to early-July when flowering occurs by knowledgeable botanists trained in conducting rare plant surveys. The Service does not maintain a list of "qualified" surveyors but can refer those wishing to become familiar with the blowout penstemon to experts who can provide training/services.

Ute ladies'-tresses: Ute ladies'-tresses (*Spiranthes diluvialis*) is a perennial, terrestrial orchid, 8 to 20 inches tall, with white or ivory flowers clustered into a spike arrangement at the top of the stem. *S. diluvialis* typically blooms from late July through August; however, depending on location and climatic conditions, it may bloom in early July or still be in flower as late as early October. *S. diluvialis* is endemic to moist soils near wetland meadows, springs, lakes, and perennial streams where it colonizes early successional point bars or sandy edges. The elevation range of known occurrences is 4,200 to 7,000 feet (although no known populations in Wyoming occur above 5,500 feet) in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. Soils where *S. diluvialis* have been found typically range from fine silt/sand, to gravels and cobbles, as well as to highly organic and peaty soil types. *S. diluvialis* is not found in heavy or tight clay soils or in extremely saline or alkaline soils. *S. diluvialis* seems intolerant of shade and small scattered groups are found primarily in areas where vegetation is relatively open. Surveys should be conducted by knowledgeable botanists trained in conducting rare plant surveys. *S. diluvialis* is difficult to survey for primarily due to its unpredictability of emergence of flowering parts and subsequent rapid desiccation of specimens. The Service does not maintain a list of "qualified" surveyors but can refer those wishing to become familiar with the orchid to experts who can provide training or services.

Species of Concern

Greater Sage-grouse: The Service is currently conducting a review to determine if the greater sage-grouse (*Centrocercus urophasianus*) warrants listing. Greater sage-grouse are dependent on sagebrush habitats year-round. Habitat loss and degradation, as well as loss of population connectivity have been identified as important factors contributing to the decline of greater sage-

grouse populations rangewide (Braun 1998, Wisdom *et al.* 2002). Therefore, any activities that result in loss or degradation of sagebrush habitats that are important to this species should be closely evaluated for their impacts to sage-grouse. If important breeding habitat (leks, nesting, or brood rearing habitat) is present in the project area, the Service recommends no project-related disturbance March 1 through June 30, annually. Minimization of disturbance during lek activity, nesting, and brood rearing is critical to sage-grouse persistence within these areas. Likewise, if important winter habitats are present (Doherty *et al.* 2008), we recommend no project-related disturbance November 15 through March 14, annually.

We recommend you contact the Wyoming Game and Fish Department to identify important greater sage-grouse habitats within the project area, and appropriate mitigative measures to minimize potential impacts from the proposed project. The Service recommends surveys and mapping of important greater sage-grouse habitats where local information is not available. The results of these surveys should be used in project planning, to minimize potential impacts to this species. No project activities that may exacerbate habitat loss or degradation should be permitted in important habitats. Additionally, unless site-specific information is available, greater sage-grouse habitat should be managed following the guidelines by Connelly *et al.* 2000 (also known as the Western Association of Fish and Wildlife Agencies [WAFWA] guidelines).

In Wyoming, information suggests that greater sage-grouse populations are negatively affected by energy development activities, especially those that degrade important sagebrush habitat, even when mitigative measures are implemented (Braun 1998, Lyon 2000, Naugle *et al.* 2006). Greater sage-grouse populations can repopulate areas developed for resource extraction after habitat reclamation for the species (Braun 1987). However, there is no evidence that populations attain their previous levels and reestablishment of sage-grouse in a reclaimed area may take 20 to 30 years, or longer (Braun 1998). Therefore, this project should be carefully evaluated for long-term and cumulative effects on the greater sage-grouse, since reclamation may not restore populations to pre-activity levels. The Bureau should ensure this activity does not exacerbate greater sage-grouse declines on either a local or range-wide level.

Black-tailed prairie dog: The Service is currently conducting a review to determine if the black-tailed prairie dog (*Cynomys ludovicianus*) warrants listing under the Act (73 FR 73211). The black-tailed prairie dog may be found scattered in remnant populations throughout much of the range that it once occupied. A significant portion of existing occupied habitat rangewide occurs in a few large complexes. We encourage you to protect all prairie dog towns for their value to the prairie ecosystem and the many species that rely on them.

Migratory Birds

Under the MBTA and BGEPA, the Federal agency has a mandatory obligation to protect the many species of migratory birds, including eagles and other raptors which may occur on lands under its jurisdiction. Of particular focus are the species identified in the Service's *Birds of Conservation Concern 2002*. In accordance with the Fish and Wildlife Coordination Act (16 USC 2912 (a)(3)), this report identifies "species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing" under the Act. This report is intended to stimulate coordinated and proactive conservation actions among Federal, State, and private partners and is available at <http://www.fws.gov/migratorybirds/reports/bcc2002.pdf>.

In order to promote the conservation of migratory bird populations and their habitats, the Service recommends that the Federal agency implement those strategies outlined within the Memorandum of Understanding directed by the President of the U.S. under Executive Order 13186, where possible.

During project planning analysis of the following information is recommended to determine project effects to migratory birds:

1. The current status and habitat use of migratory birds in the project area. This may include number of individuals, breeding pairs, population trends, and active nests within and adjacent to the project area.
2. An analysis of the effects of the proposed action on migratory birds and their habitats. Measures that will reduce or eliminate adverse impacts to migratory birds, including protective buffers, seasonal restrictions, maintenance of habitat within the project area, raptor-proofing power lines, and netting of waste pits.
3. The projected short and long term impacts to migratory birds and their trends during and after project completion using monitoring, modeling and current literature.

Potential adverse effects to migratory birds from power lines should be identified and every attempt to mitigate such effects should be implemented. Structures that are identified as affecting birds should be made safe to prevent subsequent mortalities. If you determine that power poles and/or stretches of power line are resulting in electrocution of migratory birds, especially raptors, the Service requests that specific information be documented regarding these mortalities. Based on regulations pursuant to the MBTA and BGEPA, migratory bird carcasses may only be collected, possessed or moved by state game wardens, Service refuge officers, Service special agents, or persons holding a valid salvage permit issued by the Service and the applicable state. When a migratory bird mortality is observed the Service recommends that as much of the following information as possible be documented: legal location, GPS location, all identifying numbers from the nearest power pole, date of observation, species, photographs of pole (top section), and the dead bird, and directions to the scene. Please contact our office with the information and call or email Dominic Domenici of the Service's Law Enforcement Office at 307-261-6365 /dominic_domenici@fws.gov to report your observation and obtain further guidance. The Service appreciates your efforts to protect migratory birds.

Wetlands

The functions and values of wetlands are well documented and are especially important in the arid west. Substantial degradation diminishes the effectiveness of wetlands to function as food, cover, and breeding sites for wetland dependent species; sediment transport systems; water retention/storage sites; contaminant sinks; and chemical exchange sites. To ensure the Service has sufficient information to assess project impacts on wetlands, assessments should include:

1. An enumeration of the acreage of wetlands, by type, impacted by the proposed action.
2. A discussion of why wetlands cannot be avoided.
3. A description of the functions and values of the wetlands, including sediment transport, water storage, habitat for aquatic and terrestrial organisms, and contaminant sinks, as well as the potential risks of water removal for these functions and values.

4. Measures that will reduce or eliminate adverse impacts to wetlands such as a mitigation plan to offset unavoidable impacts, protective buffers, seasonal and physical restrictions, maintenance of the natural hydrograph, and development and implementation of a monitoring program to track the effectiveness of mitigation measures.
5. Results of wetland monitoring or management activities in, or adjacent to, the proposed project site.
6. The anticipated short and long term effects to wetland and riparian areas during and after project completion.

We recommend addressing each of the above concerns where applicable to the project. We appreciate your efforts to ensure the conservation of Wyoming's natural resources. If you have questions regarding this letter or resources described above, please contact Alex Schubert of my office at the letterhead address or phone (307) 772-2374, extension 238.

cc: WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (M. Flanderka)
WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)

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Tribal Consultation Letter

*Llone
9-19-08*

SEP 22 2008

In Reply Refer To:
1610/Buffalo RMP Revision

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Mr. Carl Venne
Crow Tribal Council
P.O. Box 159
Crow Agency, MT 59022

Dear Mr. Venne:

The Buffalo Field Office is revising its 1985 land use plan. The revised Buffalo Resource Management Plan (RMP) will serve as our general direction for all resource and land use management decisions for the BLM-administered public lands and resources in our administrative area. The plan will guide the use, protection, and management of natural and cultural resources on the public lands in Campbell, Johnson, and Sheridan counties in Wyoming.

In an effort to keep you informed of the status of our planning effort, we are contacting tribes who have previously expressed cultural concerns relating to the planning area, or whose traditional lands coincide with the planning area. We greatly appreciate the coordination we have accomplished with you in the past and would like to continue our relationship.

We would like to invite you to become a cooperating agency. Cooperating agency status is available to government entities with jurisdiction by law or special expertise. A cooperating agency provides staff to the BLM planning team to develop analysis for which they have particular expertise. The cooperating agency must develop a Memorandum of Understanding with the federal agency and must fund its own participation. Please note that the tribe's participation as a cooperating agency does not satisfy the BLM's obligation to consult on a government-to-government basis. Therefore, regardless of your tribe's decision to participate or not as a cooperating agency, our government-to-government consultation will continue.

Enclosed for your consideration are several documents: 1) a cooperating agency return form and self-addressed, stamped envelope for ease in responding to our invitation, 2) two announcements on no-cost training opportunities sponsored by the BLM in the near future along with a listing of hotel accommodations in the Buffalo area, and 3) an example Memorandum of Understanding to be executed should you accept our invitation to become a cooperator in the RMP revision.

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CASPER FIELD OFFICE
BUREAU OF LAND
MANAGEMENT

We value your knowledge, concerns, and perspectives relating to the planning area. If you would like further information regarding cooperating agency status, please contact Linda Stone, Project Manager, at 307-261-7520. With regard to cultural heritage issues, you may wish to contact Buck Damone, Archaeologist, at 307-684-1100.

Sincerely,

/s/ Paul Beels

Acting Field Manager
Buffalo Field Office

Chris E. Hanson
Field Manager, Casper

5 Attachments:

- 1 – Cooperating Agency Return Form
- 2 – Planning Nuts & Bolts Training
- 3 – Cooperating Agency Training with Economic Profile System Workshop
- 4 – List of Buffalo Motels
- 5 – Example Memorandum of Understanding

cc: Mr. Dale Old Horn
Crow Tribal Cultural Resources
P.O. Box 159
Crow Agency, MT 59022

bcc: Buffalo RMP Revision – Administrative Record (LStone)
L.Stone:lms:09/19/08

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MANAGEMENT

Appendix D. Best Management Practices

Best management practices (BMPs) are environmental protection measures developed by governmental bodies, industry, and scientific or other working groups. BMPs are state-of-the-art mitigation measures applied on a site-specific basis to reduce, prevent, or avoid adverse environmental or social impacts. These practices are applied to help ensure that development is conducted in an environmentally responsible manner. Some BMPs are as simple as choosing a paint color that helps oil and natural gas equipment blend with the natural surroundings, turning development almost invisible. Other BMPs may reduce the amount of vegetation lost to development, may speed the re-growth of vegetation, or may reduce the amount of wildlife disturbance in important habitats. Public land users are encouraged to review these practices, incorporate them where appropriate, or develop better methods for achieving the same goal.

The purpose of this section is not to select certain practices or designs and require that only those be used. It is not possible to evaluate all the known practices and make determinations as to which are best. BMPs should be matched and adapted to meet the site-specific requirements of the management action, project and local environment. No one management practice is best suited to every site or situation. BMPs must be adaptive and monitored regularly to evaluate effectiveness.

The following sources contain information regarding the development and implementation of BMPs. These references are not to be considered as exclusive sources of information; rather, they should be used as a starting point when evaluating specific BMPs during project design and implementation.

D.1. Bureau of Land Management (BLM) BMP Resources

BLM BMPs: This website provides an introduction to BLM BMPs with links to BLM contacts, specific resources, and other BMP links, and other resources related to BLM BMPs.
<http://www.blm.gov/bmp/>

General Information for Oil and Gas BMPs: This resource provides general information regarding BLM BMPs for oil and gas development. A sample of BMPs are provided with a brief description of types of BMPs and terminology.
http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/general_information.html

BMP Frequently Asked Questions: The link below provides responses to frequently asked questions regarding BLM BMPs.
http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/frequently_asked_questions.html

BMP Technical Information: The slide shows at the link below provide a detailed look at a menu of possible oil and natural gas development BMPs. These slide shows are only a starting point and are not intended to serve as a comprehensive list of BMPs.
<http://www.blm.gov/nhp/efoia/wo/fy05/im2005-069.htm>

Oil and Gas Exploration – The Gold Book: The publication Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (commonly referred to as The Gold Book) was developed to assist operators by providing information on the requirements for obtaining permit approval and conducting environmentally responsible oil and gas operations on

federal lands and on private surface over federal minerals (split-estate). Split-estate surface owners will also find the Gold Book to be a useful reference guide. In 2007, the Gold Book was updated to incorporate changes resulting from the new Onshore Oil and Gas Order No. 1 regulations.
http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html

Visual Resources: There are numerous design techniques that can be used to reduce the visual impacts from surface-disturbing projects. The techniques described here should be used in conjunction with BLM's visual resource contrast rating process wherein both the existing landscape and the proposed development or activity are analyzed for their basic elements of form, line, color, and texture.
http://www.blm.gov/wo/st/en/prog/Recreation/recreation_national/RMS/2.html

While written for renewable energy development, Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands (BLM 2013a) provides visual BMPs applicable to many land use activities.
http://www.blm.gov/wo/st/en/prog/energy/renewable_energy.html

Renewable Energy Development BMPs: The following resources provide information on BMPs related to renewable energy development.

- Wind Energy Development Programmatic Environmental Impact Statement [EIS]: The scope of the Wind Energy Programmatic EIS analysis includes an assessment of the positive and negative environmental, social, and economic impacts; discussion of relevant mitigation measures to address these impacts; and identification of appropriate, programmatic policies and BMPs to be included in the proposed Wind Energy Development Program.
<http://windeis.anl.gov/documents/fpeis/index.cfm>
- BLM Instruction Memorandum [IM] 2009-043, Rights-of-Way [ROW], Wind Energy: This IM further clarifies the BLM Wind Energy Development policies and BMPs provided in the Wind Energy Development Programmatic EIS.
http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2009/IM_2009-043.html
- Record of Decision for the Geothermal Resource Leasing Programmatic Environmental Impact Statement: This ROD provides a list of sample BMPs that have been collected from various BLM and United States Forest Service documents addressing geothermal and fluid mineral leasing and development, including resource management plans (RMPs), forest plans, and environmental reports for geothermal leasing and development. The document provides guidance on incorporating BMPs, as appropriate, into the geothermal permit application or as Conditions of Approval (COAs).
http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/geothermal_eis/final_programmatic.Par.90935.File.dat/ROD_Geothermal_12-17-08.pdf
- Solar Energy Development Programmatic Environmental Impact Statement: This Programmatic EIS is currently under development (as of Summer 2011) and when finalized will include policies and mitigation measures adopted as part of the proposed solar energy deployment program. The Solar Energy Development Programmatic EIS will identify for the Department of Energy, industry, and stakeholders the best practices for deploying solar energy and ensuring minimal impact to natural and cultural

resources on BLM-administered lands or other federal, state, tribal, or private lands.
<http://www.solareis.anl.gov/>

General Information for Management of Land Boundaries BMPs: The Departmental Manual 600 Chapter 5, Standards for Federal Lands Boundary Evidence and BLM H-9600-1, Cadastral Survey Handbook, provides general information regarding BLM BMPs for management of public land boundaries. Samples of BMPs are available with a brief description of types of BMPs and terminology. http://www.blm.gov/wo/st/en/prog/more/cadastralsurvey/cadastral_review_of.html.

D.2. Other Agency BMP Resources

U.S. Environmental Protection Agency (EPA) BMP Resources

Healthy Watersheds: This resource provides conservation approaches and tools designed to ensure healthy watersheds remain intact. The website provides example approaches that are generally site-specific, and watershed managers are encouraged to use the examples as guidance in developing local conservation strategies. The website also supplies outreach strategies to encourage stakeholder engagement in conservation and protection of healthy watersheds.
<http://www.epa.gov/owow/nps/>

Storm Water BMPs: This online menu provides BMPs designed to meet the minimum requirements for six control measures specified by the EPA's Phase II Stormwater Program. The control measures include public education, public involvement, illicit discharge detection and elimination, construction, post-construction, and pollution prevention/good housekeeping. The menu also provides case studies assessing the performance of various storm water BMPs.
<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cfm>

Pasture, Rangeland, and Grazing Operations BMPs: The link below provides BMPs compiled by the EPA to prevent or reduce pollution associated with livestock grazing. Topics include practices to reduce methane production, managing nonpoint source pollution, controlled grazing, reducing animal feeding operation pollution, and manure management.
<http://www.epa.gov/oecaagct/anprgbmp.html>

U.S. Department of Agriculture – Natural Resources Conservation Service (NRCS) BMP Resources

National Conservation Practice Standards: This website provides links for national conservation practices developed by the NRCS on topics such as herbaceous wind barriers, feed management, forest stand improvement, and irrigation management. The conservation practice standard contains information on why and where the practice is applied, and sets forth the minimum quality criteria that must be met during the application of that practice in order for it to achieve its intended purpose.
<http://www.nrcs.usda.gov/Technical/Standards/nhcp.html>

National Range and Pasture Handbook: Developed by NRCS grazing land specialists, this handbook provides a source of expertise to guide cooperators in solving resource problems and in sustaining or improving their grazing lands resources and operations.
<http://www.glti.nrcs.usda.gov/technical/publications/nrph.html>

Wyoming Game and Fish Department BMP Resources

Aquatic Invasive Species: This resource provides information about how to recognize aquatic invasive species and how to avoid introducing them or spreading them through Wyoming's waters. The website contains links to external resources including a link to waterbodies in the United States currently known to be impacted by zebra and quagga mussels. The website also contains information about how to decontaminate equipment and watercraft suspected of harboring aquatic invasive species. <http://gf.state.wy.us/fish/AIS/index.asp>

D.3. Greater Sage-Grouse: Required Design Features and Best Management Practices

D.3.1. Required Design Features

Required Design Features (RDFs) are required for certain activities in Greater Sage-Grouse habitat. RDFs apply to locatable minerals to the extent permitted by applicable law and subject to valid existing rights. RDFs establish the minimum specifications for certain activities to help mitigate adverse impacts. However, the applicability and overall effectiveness of each RDF cannot be fully assessed until the project level when the project location and design are known. Because of site-specific circumstances, some RDFs may not apply to some projects (e.g., a resource is not present on a given site) and/or may require slight variations (e.g., a larger or smaller protective area). All variations in RDFs would require that at least one of the following be demonstrated in the National Environmental Policy Act (NEPA) analysis associated with the project/activity:

- A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g., due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable.
- An alternative RDF is determined to provide equal or better protection for Greater Sage-Grouse or its habitat.
- A specific RDF will provide no additional protection to Greater Sage-Grouse or its habitat.

The practices listed in this section are from the BLM National Technical Team (NTT) report (BLM 2012h) and are treated in the RMP as RDFs to ensure regulatory certainty for the conservation of Greater Sage-Grouse. The BLM will adopt them as operational requirements, through issuance of the RMP Record of Decision (ROD). The RDFs are primarily written for priority Greater Sage-Grouse habitat (Core Populations Areas and Connectivity Corridors). Within general habitat, the RDFs applied are determined on a project specific basis. The BLM may add additional RDFs as deemed necessary by further environmental analysis and as developed through coordination with other federal, state, and local regulatory and resource agencies. Because practices change, based on new information, the RDFs will be updated periodically.

The EIS for the RMP may not decide or dictate the exact wording or inclusion of the RDFs. Rather, they are used in the RMP process as a tool to help develop the RMP alternatives and to provide a baseline for comparative impact analysis in arriving at RMP decisions. They will be used in the same manner in analyzing activity plans and other site-specific proposals. Design features and management practices and their wording can be a matter of policy. As such, specific wording is subject to change primarily through administrative review, not through the RMP and

EIS process. Any further changes that may be made in the continuing refinement of these RDFs and any development of program-specific standard stipulations will be handled in another forum, including appropriate public involvement and input.

BLM reserves the right to modify the operations of surface-disturbing or disruptive activities as part of the statutory requirements for environmental protection. Those measures selected for implementation will be identified in the site-specific ROD or decision record for those activities and will inform a potential lessee, permittee, or operator of the requirements that must be met when using BLM-administered public lands and minerals. These measures have been written in a format that will allow for either their direct use as stipulations or operating standards or in addition to specific or specialized mitigation following the submission of a detailed development plan or other project proposal and an environmental analysis. These operating standards are given as acceptable methods for mitigating anticipated effects and achieving the desired plan outcomes but are not prescribed as the only method for achieving the outcomes.

Because of site-specific circumstances, some RDFs may not apply to all activities (e.g., a resource or conflict is not present on a given site) and/or may require slight variations. Proposed variations will be analyzed and may be applied in the site specific permitting process. All variations will require appropriate analysis and disclosure as part of activity authorization. It is anticipated that variations will be approved in very limited circumstances and only in coordination with the Wyoming Game and Fish Department (WGFD) and/or U.S. Fish and Wildlife Department (USFWS).

Project proponents are encouraged to include all appropriate RDFs in their proposals. The BLM will require application of all appropriate measures, warranted by site-specific analysis, in order to avoid, minimize, rectify, reduce, or compensate for impacts. RDFs not included in project proposals and determined appropriate from the site-specific analysis will be required as COAs. Additional COAs developed through consultation with other federal, state, and local regulatory and resource agencies may be applied when supported by site-specific analysis.

The proponent must implement all identified measures because they are commitments made as part of the BLM decision. Because the decision document creates a clear obligation for the BLM to ensure any proposed mitigation adopted in the environmental analysis is performed, there is the expectation that applied mitigation will lead to a reduction of environmental impacts in the implementation stage and include binding mechanisms for enforcement (Council on Environmental Quality Memorandum for Heads of Federal Departments and Agencies 2011). The determination of adequate application of the mitigation measures and conservation actions for specific projects will remain with the BLM's authorized officer.

Those resource activities or programs currently without a standardized set of permit or operation stipulations can use the RDFs for Greater Sage-Grouse as stipulations or as COAs or as a baseline for developing specific stipulations for a given activity or program.

At the project level, to prioritize certain general habitat areas over marginal or substandard habitat, consideration should be given to:

- The capability of the habitat to provide connectivity among Greater Sage-Grouse Core Population Areas;
- Habitats occupied by Greater Sage-Grouse where enhancing habitat can offset losses to habitat or populations elsewhere; and

- The potential to replace lost priority habitat or needed changes in priority habitat resulting from perturbations or disturbances to support Greater Sage-Grouse objectives.

Lands and Realty

- Where existing leases or ROWs have had some level of development (road, fence, well, etc.) and are no longer in use, reclaim the site by removing these features and restoring the habitat. Within designated priority habitat, reclaim by removing these features and restoring the habitat of these ROW that are no longer in use.

West Nile virus

- Increase the size of ponds to accommodate a greater volume of water than is discharged. This will result in un-vegetated and muddy shorelines that breeding *Cx. tarsalis* avoid (De Szalay and Resh 2000). This modification may reduce *Cx. tarsalis* habitat but could create larval habitat for *Culicoides sonorensis*, a vector of blue tongue disease, and should be used sparingly (Schmidtman et al. 2000). Steep shorelines should be used in combination with this technique whenever possible (Knight et al. 2003).
- Build steep shorelines to reduce shallow water (greater than 60 centimeters) and aquatic vegetation around the perimeter of impoundments (Knight et al. 2003). Construction of steep shorelines also will create more permanent ponds that are a deterrent to colonizing mosquito species like *Cx. tarsalis* which prefer newly flooded sites with high primary productivity (Knight et al. 2003).
- Maintain the water level below that of rooted vegetation for a muddy shoreline that is unfavorable habitat for mosquito larvae. Rooted vegetation includes both aquatic and upland vegetative types. Avoid flooding terrestrial vegetation in flat terrain or low lying areas. Aquatic habitats with a vegetated inflow and outflow separated by open water produce 5-10 fold fewer *Culex* mosquitoes than completely vegetated wetlands (Walton and Workman 1998). Wetlands with open water also had significantly fewer stage III and IV instars which may be attributed to increased predator abundances in open water habitats (Walton and Workman 1998).
- Construct dams or impoundments that restrict down slope seepage or overflow by digging ponds in flat areas rather than damming natural draws for effluent water storage, or lining constructed ponds in areas where seepage is anticipated (Knight et al. 2003).
- Line the channel where discharge water flows into the pond with crushed rock, or use a horizontal pipe to discharge inflow directly into existing open water, thus precluding shallow surface inflow and accumulation of sediment that promotes aquatic vegetation.
- Line the overflow spillway with crushed rock, and construct the spillway with steep sides to preclude the accumulation of shallow water and vegetation.
- Fence pond site to restrict access by livestock and other wild ungulates that trample and disturb shorelines, enrich sediments with manure and create hoof print pockets of water that are attractive to breeding mosquitoes.

Fluid Minerals

- Use only closed-loop systems for drilling operations, with no reserve pits.
- Require noise shields when drilling during the lek, nesting, brood-rearing, and wintering seasons.
- Design new transmission towers with anti-perching devices and retrofit existing towers to discourage use by raptors.
- Locate new compressor stations outside priority habitats and design them to reduce noise that may be directed towards priority habitat.
- Locate man camps outside priority Greater Sage-Grouse habitats.

- Roads (Priority Habitat Area)
 - Design roads to an appropriate standard no higher than necessary to accommodate their intended purpose.
 - Locate roads to avoid important areas and habitats.
 - Coordinate road construction and use among ROW holders.
 - Construct road crossing at right angles to ephemeral drainages and stream crossings.
 - Establish slow speed limits on BLM system roads to reduce vehicle/wildlife collisions or design roads to be driven at slower speeds.
 - Establish trip restrictions (Lyon and Anderson 2003) or minimization through use of telemetry and remote well control (e.g., Supervisory Control and Data Acquisition).
 - Do not issue ROWs to counties on newly constructed energy development roads, unless for a temporary use consistent with all other terms and conditions included in this document.
 - Restrict vehicle traffic to only authorized users on newly constructed routes (use signing, gates, etc.).
 - Apply dust abatement practices on roads and pads.
 - Close and rehabilitate duplicate roads.
- Roads (General Habitat)
 - Design roads to an appropriate standard no higher than necessary to accommodate their intended purpose.
 - Do not issue ROWs to counties on energy development roads, unless for a temporary use consistent with all other terms and conditions included in this document.
 - Establish speed limits to reduce vehicle/wildlife collisions or design roads to be driven at slower speeds.
 - Coordinate road construction and use among ROW holders.
 - Construct road crossing at right angles to ephemeral drainages and stream crossings.
 - Apply dust abatement practices on roads and pads.
 - Close and reclaim duplicate roads, by restoring original landform and establishing desired vegetation.
- Operations (Priority Habitat)
 - Clean up refuse to avoid attracting predators (Bui et al. 2010).
 - Cluster disturbances, operations (fracture stimulation, liquids gathering, etc.), and facilities.
 - Use directional and horizontal drilling to reduce surface disturbance.
 - Place infrastructure in already disturbed locations where the habitat has not been restored.
 - Consider using oak (or other material) mats for drilling activities to reduce vegetation disturbance and for roads between closely spaced wells to reduce soil compaction and maintain soil structure to increase likelihood of vegetation reestablishment following drilling.
 - Apply a phased development approach with concurrent reclamation.
 - Place liquid gathering facilities outside of priority areas. Have no tanks at well locations within priority areas (minimizes perching and nesting opportunities for ravens and raptors and truck traffic). Pipelines must be under or immediately adjacent to the road (Bui et al. 2010).
 - Use remote monitoring techniques for production facilities and develop a plan to reduce the frequency of vehicle use (Lyon and Anderson 2003).
 - Restrict the construction of tall facilities and fences to the minimum number and amount needed.
 - Site and/or minimize linear ROWs to reduce disturbance to sagebrush habitats.
 - Collocate new utility developments (powerlines, pipelines, etc.) and transportation routes in existing utility or transportation corridors.
 - Bury new distribution powerlines except when an existing line is already in place.

- Collocate powerlines, flow lines, and small pipelines under or immediately adjacent to existing roads (Bui et al. 2010).
- Design or site permanent structures which create movement (e.g., a pump jack) to minimize impacts to Greater Sage-Grouse.
- Cover (e.g., fine mesh netting or use other effective techniques) all drilling and production pits and tanks regardless of size to reduce Greater Sage-Grouse mortality.
- Equip tanks and other above ground facilities with structures or devices that discourage nesting of raptors and corvids.
- Control the spread and effects of non-native plant species (Evangelista et al. 2011) (e.g., by washing vehicles and equipment).
- **Operations (General Habitat)**
 - Cluster disturbances, operations (fracture stimulation, liquids gathering, etc.), and facilities.
 - Use directional and horizontal drilling to reduce surface disturbance.
 - Clean up refuse (Bui et al. 2010).
 - Restrict the construction of tall facilities and fences to the minimum number and amount needed.
 - Cover (e.g., fine mesh netting or use other effective techniques) all drilling and production pits and tanks regardless of size to reduce Greater Sage-Grouse mortality.
 - Equip tanks and other above ground facilities with structures or devices that discourage nesting of raptors and corvids.
 - Use remote monitoring techniques for production facilities and develop a plan to reduce the frequency of vehicle use.
 - Control the spread and effects from non-native plant species. (e.g., by washing vehicles and equipment.)
 - Apply West Nile Virus (WNV) BMPs (Doherty 2007).
- **Reclamation**
 - Include objectives for ensuring habitat restoration to meet sage-grouse habitat needs in reclamation practices/sites (Pyke 2011). Address post reclamation management in reclamation plan such that goals and objectives are to protect and improve Greater Sage-Grouse habitat needs.
 - Maximize the area of interim reclamation on long-term access roads and well pads including reshaping, topsoiling and revegetating cut and fill slopes.
 - Restore disturbed areas at final reclamation to the pre-disturbance landforms and desired plant community.
 - Implement irrigation during interim or final reclamation for sites where establishment of seedlings has been shown or is expected to be difficult due to dry conditions.
 - Use mulching, soil amendments, and/or erosion blankets to expedite reclamation and to protect soils.

Locatable Minerals

RDFs apply to locatable minerals to the extent permitted by applicable law and subject to valid existing rights.

- **Locate new compressor stations outside priority habitats and design them to reduce noise that may be directed towards priority habitat.**
- **Locate man camps outside priority sage-grouse habitats.**
- **Roads**
 - Design roads to an appropriate standard no higher than necessary to accommodate their intended purpose.
 - Locate roads to avoid important areas and habitats.

- Coordinate road construction and use among ROW holders.
- Construct road crossing at right angles to ephemeral drainages and stream crossings.
- Establish speed limits on BLM system roads to reduce vehicle/wildlife collisions or design roads to be driven at slower speeds.
- Do not issue ROWs to counties on mining development roads, unless for a temporary use consistent with all other terms and conditions included in this document.
- Restrict vehicle traffic to only authorized users on newly constructed routes (e.g., use signing, gates, etc.).
- Use dust abatement practices on roads and pads.
- Close and reclaim duplicate roads, by restoring original landform and establishing desired vegetation.
- **Operations**
 - Cluster disturbances associated with operations and facilities as close as possible.
 - Place infrastructure in already disturbed locations where the habitat has not been restored.
 - Restrict the construction of tall facilities and fences to the minimum number and amount needed.
 - Site and/or minimize linear ROWs to reduce disturbance to sagebrush habitats.
 - Place new utility developments (powerlines, pipelines, etc.) and transportation routes in existing utility or transportation corridors.
 - Bury power lines.
 - Cover (e.g., fine mesh netting or use other effective techniques) all pits and tanks regardless of size to reduce sage-grouse mortality.
 - Equip tanks and other above ground facilities with structures or devices that discourage nesting of raptors and corvids.
 - Control the spread and effects of non-native plant species (Gelbard and Belnap 2003; Bergquist et al. 2007).
 - Apply WNV BMPs (Doherty 2007).
 - Require Greater Sage-Grouse-safe fences around sumps.
 - Clean up refuse (Bui et al. 2010).
 - Locate man camps outside of priority Greater Sage-Grouse habitats.
- **Reclamation**
 - Include restoration objectives to meet Greater Sage-Grouse habitat needs in reclamation practices/sites.
 - Address post reclamation management in reclamation plan such that goals and objectives are to protect and improve sage-grouse habitat needs.
 - Maximize the area of interim reclamation on long-term access roads and well pads including reshaping, topsoiling and revegetating cut and fill slopes.
 - Restore disturbed areas at final reclamation to pre-disturbance landform and desired plant community.
 - Irrigate interim reclamation as necessary during dry periods.

Solid Minerals – Coal

- For coal mining operations on existing leases: in priority sage-grouse habitat areas, place any new appurtenant facilities outside of priority areas. Where new appurtenant facilities associated with the existing lease cannot be located outside the priority sage-grouse habitat area, co-locate new facilities within existing disturbed areas. If this is not possible, then build any new appurtenant facilities to the absolute minimum standard necessary.

Fuels Management (Original source BLM IM 2011-138)

- Design fuels treatment objective to protect existing sagebrush ecosystems, modify fire behavior, restore native plants, and create landscape patterns which most benefit sage-grouse habitat.
- Provide training to fuels treatment personnel on sage-grouse biology, habitat requirements, and identification of areas utilized locally.
- Use fire prescriptions that minimize undesirable effects on vegetation or soils (e.g., minimize mortality of desirable perennial plant species and reduce risk of hydrophobicity).
- Ensure proposed sagebrush treatments are planned with interdisciplinary input from BLM and/or state wildlife agency biologist and that treatment acreage is conservative in the context of surrounding Greater Sage-Grouse seasonal habitats and landscape.
- Ensure that treatments are configured in a manner (e.g., strips) that promotes use by sage-grouse (Connelly et al. 2000).
- Incorporate roads and natural fuel breaks into fuel break design.
- Power-wash all vehicles and equipment involved in fuels management activities prior to entering the area to minimize the introduction of undesirable and/or invasive plant species.
- Design vegetation treatment in areas of high frequency to facilitate firefighting safety, reduce the risk of extreme fire behavior; and to reduce the risk and rate of fire spread to sage-grouse priority habitats.
- Give priority for implementing specific sage-grouse habitat restoration projects in annual grasslands first to sites which are adjacent to or surrounded by sage-grouse priority habitat. Annual grasslands are second priority for restoration when the sites not adjacent to priority habitat, but within two miles of priority habitat. The third priority for annual grasslands habitat restoration projects are sites beyond two miles of priority habitat. The intent is to focus restoration outward from existing, intact habitat.
- As funding and logistics permit, restore annual grasslands to a species composition characterized by perennial grasses, forbs, and shrubs.
- Emphasize the use of native plant species, recognizing that non-native species may be necessary depending on the availability of native seed and prevailing site conditions.
- Remove standing and encroaching trees within at least 100 meters of occupied sage-grouse leks and other habitats (e.g., nesting, wintering, and brood rearing) to reduce the availability of perch sites for avian predators, as appropriate, and resources permit.
- Reduce the risk of vehicle or human-caused wildfires and the spread of invasive species by planting perennial vegetation (e.g., green-strips) paralleling road ROW.
- Strategically place and maintain pre-treated strips/areas (e.g., mowing, herbicide application, and strictly managed grazed strips) to aid in controlling wildfire should wildfire occur near key habitats or important restoration areas (such as where investments in restoration have already been made).
- In priority habitat, design and implement fuels treatments with an emphasis on protecting existing sagebrush ecosystems.
 - Do not reduce sagebrush canopy cover to less than 15 percent (Connelly et al. 2000; Hagen et al. 2007) unless a fuels management objective requires additional reduction in sagebrush cover to meet strategic protection of priority sage-grouse habitat and conserve habitat quality for the species. Closely evaluate the benefits of fuel break against the additional loss of sagebrush cover in the Environmental Assessment process.
 - Apply appropriate seasonal restrictions for implementing fuels management treatments according to the type of seasonal habitats present in a priority area.
 - Allow no fuels treatments in known winter range unless the treatments are designed to strategically reduce wildfire risk around or in the winter range and will maintain winter range habitat quality.

- Do not use fire to treat sagebrush in less than 12-inch precipitation zones (e.g., Wyoming big sagebrush or other xeric sagebrush species; Connelly et al. 2000; Hagen et al. 2007; Beck et al. 2009). However, if as a last resort and after all other treatment opportunities have been explored and site specific variables allow, the use of prescribed fire for fuel breaks that would disrupt the fuel continuity across the landscape would be considered, in stands where cheatgrass is a very minor component in the understory (BLM 2012h).
- If prescribed fire is to be used for vegetation treatments, the burn plan will clearly indicate how the Conservation Objective Team objectives will be met by its use, and why alternative techniques were not selected.
- A risk assessment will be completed for implementation of prescribed fire in relation to the Greater Sage-Grouse goals and objectives.
- Monitor and control invasive vegetation post treatment.
- Rest treated areas from grazing for two full growing seasons unless vegetation recovery dictates otherwise (WGFD 2011).
- Require use of native seeds for fuels management treatment based on availability, adaptation (site potential), and probability of success (Richards et al. 1998). Where probability of success or native seed availability is low, non-native seeds may be used as long as they meet sage-grouse habitat objectives (Pyke 2011).
- Design post fuels management projects to ensure long term persistence of seeded or pretreatment native plants. This may require temporary or long-term changes in livestock grazing management, or other activities to achieve and maintain the desired condition of the fuels management project (Eiswerth and Shonkwiler 2006).
- Design fuels management projects in sage-grouse habitat to strategically and effectively reduce wildfire threats in the greatest area. This may require fuels treatments implemented in a more linear versus block design (Launchbaugh et al. 2007).
- During fuels management project design, consider the utility of using livestock to strategically reduce fine fuels (Diamond et al. 2009), and implement grazing management that will accomplish this objective (Davies et al. 2011; Launchbaugh et al. 2007). Consult with ecologists to minimize impacts to native perennial grasses.
- Restore annual grasslands to a species composition characterized by perennial grasses, forbs, and shrubs.
- Reduce the risk of vehicle or human-caused wildfires and the spread of invasive species by planting perennial vegetation (e.g., green-strips) paralleling road ROWs.
- Strategically place and maintain pre-treated strips/areas (e.g., mowing, herbicide application, and strictly managed grazed strips) to aid in controlling wildfire should wildfire occur near habitats or important restoration areas (such as where investments in restoration have already been made).

Fire Management (Original source BLM IM 2011-138)

- Develop state-specific sage-grouse toolboxes containing maps, a list of Resource Advisors (READs), contact information, local guidance, and other relevant information.
- Provide localized maps to dispatch offices and extended attack incident commanders for use in prioritizing wildfire suppression resources and designing suppression tactics.
- Assign a sage-grouse READ to all extended attack fires in or near priority Greater Sage-Grouse habitat. Prior to the fire season, provide training to sage-grouse READs on wildfire suppression organization, objectives, tactics, and procedures to develop a cadre of qualified individuals.
- On critical fire weather days, pre-position additional fire suppression resources to optimize a quick and efficient response in sage-grouse habitat areas.
- During periods of multiple fires, ensure line officers are involved in setting priorities.

- Locate wildfire suppression facilities (i.e., base camps, spike camps, drop points, staging areas, heli-bases) in areas where physical disturbance to sage-grouse habitat can be minimized. These include disturbed areas, grasslands, near roads/trails or in other areas where there is existing disturbance or minimal sagebrush cover.
- Power-wash all firefighting vehicles, to the extent possible, including engines, water tenders, personnel vehicles, and All-Terrain Vehicles prior to deploying in or near sage-grouse habitat areas to minimize noxious weed spread.
- Minimize unnecessary cross-country vehicle travel during fire operations in sage-grouse habitat.
- Minimize burnout operations in a sage-grouse habitat areas by constructing direct fireline whenever safe and practical to do so.
- Utilize retardant and mechanized equipment to minimize burned acreage during initial attack.
- As safety allows, conduct mop-up where the black adjoins unburned islands, dog legs, or other habitat features to minimize sagebrush loss.
- Protect wildland areas from wildfire originating on private lands, infrastructure corridors, and recreational areas.
- Design post Emergency Stabilization and Rehabilitation (ES&R) management to ensure long term persistence of seeded or pre-burn native plants. This may require temporary or long-term changes in livestock grazing and travel management, etc., to achieve and maintain the desired condition of ES&R projects to benefit sage-grouse (Eiswerth and Shonkwiler 2006).
- Post fire recovery must include establishing adequately sized exclosures (free of livestock grazing) that can be used to assess recovery.
- Where burned sage-grouse habitat cannot be fenced from other unburned habitat, the entire area (e.g., allotment/pasture) should be closed to grazing until recovered.
- Mowing of grass will be used in any fuelbreak fuels reduction project (roadsides or other areas).
- Any fuels treatments will focus on interfaces with human habitation or significant existing disturbances.
- In priority sage-grouse habitat areas, prioritize suppression immediately after firefighter and public safety to conserve the habitat.
- Prioritize native seed allocation for use in sage-grouse habitat in years when preferred native seed is in short supply.
- Use native plant seeds for vegetation seedings based on availability, adaptation (site potential), and probability of success (Richards et al. 1998). Where probability of success or native seed availability is low, non-native seeds may be used as long as they meet sage-grouse habitat conservation objectives (Pyke 2011).
- In fire prone areas where sagebrush seed is required for sage-grouse habitat restoration, consider establishing seed harvest areas that are managed for seed production (Armstrong 2007) and are a priority for protection from outside disturbances.
- Consider potential changes in climate (Miller et al. 2011) when proposing post-fire seedings using native plants. Consider seed collections from the warmer component within a species' current range for selection of native seed (Kramer and Havens 2009).

Habitat Restoration/Vegetation Management

- Include sage-grouse habitat parameters as defined by Connelly et al. (2000), Hagen et al. (2007) or if available, State Sage-Grouse Conservation plans and appropriate local information in habitat restoration objectives. Make meeting these objectives within priority sage-grouse habitat areas the highest restoration priority.

Recreation

- Only allow Special Recreation Permits in priority habitat that have neutral or beneficial effects to priority habitat areas.
- Do not construct new recreation facilities (e.g., campgrounds, trails, trailheads, staging areas) within Core/Connectivity Areas unless the development would have a neutral effect or be beneficial to Greater Sage-Grouse habitat (such as concentrating recreation, diverting use away from critical areas, etc.), or unless the development is required for visitor safety or resource protection.

Travel and Transportation Management

- Use existing roads, or realignments as described above to access valid existing rights that are not yet developed. If valid existing rights cannot be accessed via existing roads, then build any new road constructed to the absolute minimum standard necessary, and add the surface disturbance to the total disturbance in the priority area. If that disturbance exceeds 3 percent for that area, then make additional, effective mitigation necessary to offset the resulting loss of sage-grouse habitat.
- Allow no upgrading of existing routes that would change route category (road, primitive road, or trail) or capacity unless the upgrading would have minimal impact on sage-grouse habitat, is necessary for motorist safety, or eliminates the need to construct a new road.
- Limit route construction to realignments of existing designated routes if that realignment has a minimal impact on sage-grouse habitat, eliminates the need to construct a new road, or is necessary for motorist safety.
- Among other designation criteria from 43 Code of Federal Regulations (CFR) 8342.1(b), “areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats. Special attention will be given to protect endangered or threatened species and their habitats.”
- Conduct restoration of roads, primitive roads and trails not designated in travel management plans. This also includes primitive route/roads that were not designated in Wilderness Study Areas and within lands with wilderness characteristics that have been selected for protection.
- In priority habitat, limit motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed.
- Where off-road vehicles are causing or will cause considerable adverse effects upon soil, vegetation, wildlife, wildlife habitat, cultural resources, historical resources, threatened or endangered species, wilderness suitability, other authorized uses, or other resources, the affected areas shall be immediately closed to the type(s) of vehicle causing the adverse effect until the adverse effects are eliminated and measures implemented to prevent recurrence. This may include closure of routes or areas. (43 CFR 8341.2).
- When reseeding roads, primitive roads, and trails in priority habitat, use appropriate seed mixes and consider the use of transplanted sagebrush.

Rights-of-Ways and Corridors

- Evaluate and take advantage of opportunities to remove or modify existing powerlines within priority sage-grouse habitat areas. When possible, require perch deterrents on existing or new overhead facilities.
- Where existing leases or ROWs have had some level of development (road, fence, well, etc.) and are no longer in use, reclaim the site by removing these features and restoring the habitat. Within designated priority habitat reclaim by removing these features and restoring the habitat of these ROW that are no longer in use.
- Where new ROWs are necessary, co-locate new ROWs within existing ROWs where possible.

Additional RDFs Identified During the National Greater Sage-Grouse Planning Strategy

Fire and Fuels Management

- Work cooperatively with permittees, lessees and other landowners to develop grazing management strategies that integrate both public and private lands into single management units.
- Avoid using prescribed fire in Greater Sage-Grouse habitat unless evaluation of site-specific conditions demonstrate that there would be a net benefit for Greater Sage-Grouse. If prescribed fire is used in Greater Sage-Grouse habitat, include an analysis in the NEPA document that indicates how Greater Sage-Grouse goals and objectives will be addressed and met by its use, why alternative techniques were not selected, and a risk assessment to address how potential threats to Greater Sage-Grouse habitat would be minimized.
- If prescribed fire is to be used at the implementation level, at a minimum, the burn plan will indicate how Conservation Objective Team/land use plan objectives would be addressed and met and why alternative techniques were not selected.
- Avoid prescribed fire as a vegetation or fuels treatment in Wyoming big sagebrush or other xeric sagebrush species, or in areas with a potential for post-fire exotic annual dominance. However, after other treatment opportunities have been explored and as site-specific variables allow, prescribed fire could be used in these areas to meet specific fuels objectives that would maintain, improve, or restore Greater Sage-Grouse priority habitat (e.g., creation of fuel breaks that would disrupt the fuel continuity across the landscape in stands where annual invasive grasses are a minor component in the understory, burning slash piles from conifer reduction treatments, used as a component with other treatment methods to combat annual grasses and restore native plant communities).
- Allow no treatments in known winter range unless the treatments are designed to strategically reduce wildfire risk around and/or in the winter range and would protect, maintain, increase, or enhance winter range habitat quality.

Conifer Removal

- Remove conifers encroaching into sagebrush habitats. Prioritize treatments closest to occupied Greater Sage-Grouse habitats and near occupied leks, and where juniper encroachment is phase 1 or phase 2. Use of site-specific analysis and principles like those included in the FIAT report and other ongoing modeling efforts to address conifer encroachment will help refine the location for specific priority areas to be treated.

Livestock Grazing Management

- Work cooperatively with permittees, lessees and other landowners to develop grazing management strategies that integrate both public and private lands into single management units.

D.3.2. Best Management Practices

The management practices in this section are additional practices available for consideration at the project level; BMPs are discretionary. Proponents are encouraged to apply appropriate measures to project proposals to minimize adverse impacts to Greater Sage-Grouse.

Recommendations from Scoping for BLM's National Greater Sage-Grouse Land Use Planning Strategy

Fluid Minerals

- Any oil, gas, geothermal activity will be conducted to maximize avoidance of impacts, based on evolving scientific knowledge of impacts.
- Prohibit the surface disposal of coalbed methane wastewater, as well as the construction of evaporation or infiltration reservoirs to hold wastewater. Inject coalbed methane wastewater underground into a formation of equal or lower water quality.
- Any oil, gas, or geothermal activity will be conducted to maximize avoidance of impacts, based on evolving scientific knowledge of impacts.

Fuels and Fire Management

- Monitor and control invasive vegetation in treated, burned, or restored sagebrush steppe. Rapidly restore burned or disturbed sagebrush steppe to prevent incursion of invasive plants.
- Vehicles will be washed following projects in known invasive species infestation areas.
- Design and implement fuels treatments with an emphasis on protecting existing sagebrush ecosystems.
 - Retain sagebrush canopy cover at what is expected for that ecological site, consistent with sage-grouse habitat objectives (Connelly et al. 2000; Hagen et al. 2007) unless a fuels management objective requires additional reduction in sagebrush cover to meet strategic protection of sage-grouse habitat and conserve habitat quality for the species.
 - Closely evaluate the benefits of the fuel break against the additional loss of sagebrush cover in future National Environmental Policy Act documents.
 - Apply appropriate seasonal restrictions for implementing fuels management treatments according to the type of seasonal habitats present.
 - Allow no fuels treatments in known winter range unless the treatments are designed to strategically reduce wildfire risk around or in the winter range and will maintain winter range habitat quality.
 - Do not use fire to treat sagebrush in less than 12-inch precipitation zones (e.g., Wyoming big sagebrush or other xeric sagebrush species; Connelly et al. 2000; Hagen et al. 2007; Beck et al. 2009). However, if as a last resort and after all other treatment opportunities have been explored and site specific variables allow, the use of prescribed fire for fuel breaks that would disrupt the fuel continuity across the landscape could be considered, in stands where cheatgrass is a very minor component in the understory (BLM 2012h).
 - Design post fuels management projects to ensure long term persistence of seeded or pre-treatment native plants, including sagebrush. This may require temporary or long-term changes in livestock grazing management, travel management, or other activities to achieve and maintain the desired condition of the fuels management project (Eiswerth and Shonkwiler 2006).
- Adjust grazing management in advance of predicted drought so that, to the degree possible, sagebrush habitat continues to meet sage-grouse habitat objectives. During drought periods, prioritize evaluating effects of the drought in sage-grouse habitat areas relative to their biological needs, as well as drought effects on ungrazed reference areas. Since there is a lag in vegetation recovery following drought (Thurow and Taylor 1999; Cagney et al. 2010), ensure that post-drought management allows for vegetation recovery that meets sage-grouse needs in sage-grouse habitat areas based on sage-grouse habitat objectives.

- Ensure that vegetation treatments create landscape patterns which most benefit sage-grouse. Only allow treatments that are demonstrated to benefit sage-grouse and retain sagebrush height and cover consistent with sage-grouse habitat objectives (this includes treatments that benefit livestock as part of an Allotment Management Plan [AMP]/Conservation Plan to improve sage-grouse habitat).
- Evaluate existing structural range developments and location of supplements (salt or protein blocks) to document that they conserve, enhance or restore sage-grouse habitat.
- Include sage-grouse habitat objectives in habitat restoration projects. Make meeting these objectives within occupied sage-grouse habitat the highest restoration priority.
- Design post restoration management to ensure long term Greater Sage-Grouse persistence. This could include changes in livestock grazing management and travel management, etc., to achieve and maintain the desired condition of the restoration effort that benefits sage-grouse (Eiswerth and Shonkwiler 2006).
- Avoid sagebrush reduction/treatments to increase livestock or big game forage in occupied habitat and include plans to restore high-quality habitat in areas with invasive species.
- In sage-grouse habitat, ensure that soil cover and native herbaceous plants are at their Ecological Site Description (ESD) potential to help protect against invasive plants.
- Consider potential changes in climate (Miller et al. 2011) when proposing post-fire seedings using native plants. Consider seed collections from the warmer component within a species' current range for selection of native seed (Kramer and Havens 2009).
- Establish and strengthen networks with seed growers to assure availability of native seed for restoration projects.
- Post fire recovery will include establishing adequately sized exclosures (free of livestock grazing) that can be used to assess recovery.
- Where burned sage-grouse habitat cannot be fenced from other unburned habitat, the entire area (e.g., allotment/pasture) should be closed to grazing until recovered.
- Mowing of grass will be used in any fuelbreak fuels reduction project (roadsides or other areas).

Vegetation Management

- Composition, function, and structure of native vegetation communities will meet ESD and will provide for healthy, resilient, and recovering sage-grouse habitat components.
- Avoid sagebrush reduction/treatments to increase livestock or big game forage in occupied habitat and include plans to restore high-quality habitat in areas with invasive species.
- Include sage-grouse habitat parameters as defined by Connelly et al. (2000), Hagen et al. (2007), or if available State Sage-Grouse Conservation Plans and appropriate local information in habitat restoration objectives. Make meeting these objectives within priority sage-grouse habitat areas the highest restoration preference.
- Design post restoration management to ensure long term persistence. This could include changes to livestock grazing management and travel management, etc., to achieve and maintain the desired condition of the restoration effort that benefits sage-grouse (Eiswerth and Shonkwiler 2006).
- Consider potential changes in climate (Miller et al. 2011) when proposing restoration seedings using native plants. Consider collection from warmer component of the species current range when selecting native species (Kramer and Havens 2009).

Invasive Species and Pest Management

- In sage-grouse habitat, ensure that soil cover and native herbaceous plants are at their ESD potential to help protect against invasive plants.

Travel and Transportation Management

- Limit route construction to realignments of existing designated routes if that realignment has a minimal impact on sage-grouse habitat, eliminates the need to construct a new road, or is necessary for motorist safety. Mitigate any impacts with methods that have been demonstrated to be effective to offset the loss of sage-grouse habitat.
- Use existing roads, or realignments to access valid existing rights. If valid existing rights cannot be accessed via existing roads, then, following the lek prohibitions, build any new road constructed to the absolute minimum standard necessary, and add the surface disturbance to the total disturbance. If the disturbance cap is exceeded, then make additional, mitigation that has been demonstrated to be effective to offset the resulting loss of sage-grouse habitat.
- During subsequent travel management planning, all routes within Priority Habitat would undergo a route evaluation to determine its purpose and need and the potential resource and/or user conflicts from motorized travel. Where resource and/or user conflicts outweigh the purpose and need for the route, the route would be considered for closure or considered for relocation outside of sensitive Greater Sage-Grouse habitat.
- During implementation-level travel planning, threats to Greater Sage-Grouse and their habitat would be considered when evaluating route designations and/or closures.
- During subsequent travel management planning, routes within Priority Habitat that do not have a purpose or need would be considered for closure.
- During subsequent travel management planning, routes within Priority Habitat that are duplicative, parallel, or redundant would be considered for closure.
- During subsequent travel management planning, off-highway vehicle (OHV) timing limitations would be considered in important seasonal habitats where OHV use is a threat.
- During subsequent travel management planning, consider limiting snow machine travel to designated routes or consider seasonal closures in Greater Sage-Grouse wintering areas.
- During subsequent travel management planning, routes in Priority Habitat not required for public access or recreation with a current administrative/agency purpose or need would be evaluated for administrative access only.
- During subsequent travel management planning, prioritize restoration of routes not designated in a Travel Management Plan within Priority Habitat.
- During subsequent travel management planning, consider using seed mixes or transplant techniques that will maintain or enhance Greater Sage-Grouse habitat when rehabilitating linear disturbances.
- During subsequent travel management planning, consider scheduling road maintenance to avoid disturbance during sensitive periods and times to the extent practicable. Use time of day limits to reduce impacts on Greater Sage-Grouse during breeding and nesting periods.

Livestock Grazing Management

- Reduce grazing in advance of predicted drought so that, to the degree possible, sagebrush habitat continues to meet sage-grouse habitat objectives. During drought periods, prioritize evaluating effects of the drought in sage-grouse habitat areas relative to their biological needs, as well as drought effects on ungrazed reference areas. Since there is a lag in vegetation recovery following drought (Thurow and Taylor 1999), ensure that post-drought management allows for vegetation recovery that meets sage-grouse needs in sage-grouse habitat areas based on sage-grouse habitat objectives.
- Avoid grazing and trailing within lekking, nesting, brood-rearing, and winter habitats during periods of the year when these habitats are utilized by sage-grouse.
- Any vegetation treatment plan must include pretreatment data on wildlife and habitat condition, establish non-grazing exclosures, and include long-term monitoring where treated areas are

monitored for at least three years before grazing returns. Continue monitoring for five years after livestock are returned to the area, and compare to treated, ungrazed exclosures, as well as untreated areas.

- Implement management actions (grazing decisions, AMP/Conservation Plan development, or other agreements) to modify grazing management to meet seasonal sage-grouse habitat requirements (Connelly et al. 2011). Consider singly, or in combination, changes in:
 1. Season or timing of use;
 2. Number of livestock (includes temporary non-use or livestock removal);
 3. Distribution of livestock use;
 4. Intensity of use; and
 5. Type of livestock (e.g., cattle, sheep, horses, llamas, yaks, alpacas and goats) (Briske et al. 2011).
- During drought periods, prioritize evaluating effects of the drought in priority sage-grouse habitat areas relative to their needs for food and cover. Since there is a lag in vegetation recovery following drought (Thurrow and Taylor 1999; Cagney et al. 2010), ensure that post-drought management allows for vegetation recovery that meets sage-grouse needs in priority sage-grouse habitats.
- Reduce hot season grazing on riparian and meadow complexes to promote recovery or maintenance of appropriate vegetation and water quality. Utilize fencing/herding techniques or seasonal use or livestock distribution changes to reduce pressure on riparian or wet meadow vegetation used by sage-grouse in the hot season (summer) (Aldridge and Brigham 2002; Crawford et al. 2004; Hagen et al. 2007).
- In priority habitat, only allow treatments that conserve, enhance or restore sage-grouse habitat (this includes treatments that benefit livestock as part of an AMP/Conservation Plan to improve sage-grouse habitat).
- Prioritize completion of land health assessments and evaluations and processing grazing permits within priority sage-grouse habitat areas. Focus this process on allotments that have the best opportunities for conserving, enhancing or restoring habitat for sage-grouse. Utilize sage-grouse habitat objectives to conduct land health assessments to determine if standards of rangeland health are being met.
- Design any new structural range improvements to conserve, enhance, or restore sage-grouse habitat through an improved grazing management system relative to sage-grouse objectives. Structural range improvements, in this context, include but are not limited to: cattleguards, fences, enclosures, corrals or other livestock handling structures; pipelines, troughs, storage tanks (including moveable tanks used in livestock water hauling), windmills, ponds/reservoirs, solar panels and spring developments.
- Evaluate the role of existing seedings that are currently composed of primarily introduced perennial grasses in and adjacent to sage-grouse habitat to determine if they should be restored to sagebrush or habitat of higher quality for sage-grouse. If these seedings provide value in conserving or enhancing sage-grouse habitats, then no restoration would be necessary. Assess the compatibility of these seedings for sage-grouse habitat during the land health assessments.
- Evaluate existing structural range improvements and location of supplements (salt or protein blocks) to make sure they conserve, enhance or restore sage-grouse habitat.
- Design all range projects in a manner that minimizes potential for invasive species establishment. Monitor for, and treat invasive species associated with existing range developments (Gelbard and Belnap 2003; Bergquist et al. 2007).
- When developing or modifying water developments, use applicable BMPs to mitigate potential impacts from WNV (Clark et al. 2006; Doherty 2007; Walker et al. 2007b; Walker and Naugle 2011).

- Restore seedings of introduced perennial grass to sagebrush habitat where feasible, unless the seedings offer a specific purpose related to achievement of sage-grouse habitat objective. An example of a related purpose would be a seeded pasture that supports a grazing strategy beneficial to sagebrush habitat in associated pastures.

Sage-Grouse in Fire Operations and Fuels Management (BLM IM 2013-128) (BLM 2013d)

Washington Office (WO) IM 2013-128 supersedes WO IM 2011-138 (June 13, 2011) and Fire and Aviation IM 2012-017 (May 14, 2012).

Fire Operations

1. Compile district-level information into state-wide sage-grouse tool boxes. Tool boxes will contain maps, listing of READs, contact information, local guidance, and other relevant information for each district, which will be aggregated into a state-wide document.
2. Provide localized maps to dispatch offices and extended attack incident commanders for use in prioritizing wildfire suppression resources and designing suppression tactics.
3. Assign a READ with sage-grouse expertise, or who has access to sage-grouse expertise, to all extended attack fires in or near sage-grouse habitat areas. Prior to the fire season, provide training to sage-grouse READs on wildfire suppression organization, objectives, tactics, and procedures to develop a cadre of qualified individuals.
4. On critical fire weather days, pre-position additional fire suppression resources to optimize a quick and efficient response in sage-grouse habitat areas.
5. As appropriate, utilize existing fuel breaks, such as roads or discrete changes in fuel type, as control lines in order to minimize fire spread.
6. During periods of multiple fires, ensure line officers are involved in setting priorities.
7. To the extent possible, locate wildfire suppression facilities (i.e., base camps, spike camps, drop points, staging areas, heli-bases, etc.) in areas where physical disturbance to sage-grouse habitat can be minimized. These include disturbed areas, grasslands, near roads/trails or in other areas where there is existing disturbance or minimal sagebrush cover.
8. Power-wash all firefighting vehicles, to the extent possible, including engines, water tenders, personnel vehicles, and all-terrain vehicles prior to deploying in or near sage-grouse habitat areas to minimize noxious weed spread.
9. Minimize unnecessary cross-country vehicle travel during fire operations in sage-grouse habitat.
10. Minimize burnout operations in key sage-grouse habitat areas by constructing direct fireline whenever safe and practical to do so.
11. Utilize retardant, mechanized equipment, and other available resources to minimize burned acreage during initial attack.
12. As safety allows, conduct mop-up where the black adjoins unburned islands, dog legs, or other habitat features to minimize sagebrush loss.
13. Adequately document fire operation activities in sage-grouse habitat for potential follow-up coordination activities.

Fuels Management

1. Where applicable, design fuels treatment objectives to protect existing sagebrush ecosystems, modify fire behavior, restore native plants, and create landscape patterns which most benefit sage-grouse habitat.

2. Provide training to fuels treatment personnel on sage-grouse biology, habitat requirements, and identification of areas utilized locally.
3. Use burning prescriptions which minimize undesirable effects on vegetation or soils (e.g., minimize mortality of desirable perennial plant species and reduce risk of annual grass invasion).
4. Ensure proposed sagebrush treatments are planned with full interdisciplinary input pursuant to NEPA and coordination with state fish and wildlife agencies, and that treatment acreage is conservative in the context of surrounding sage-grouse seasonal habitats and landscape.
5. Where appropriate, ensure that treatments are configured in a manner that promotes use by sage-grouse.
6. Where applicable, incorporate roads and natural fuel breaks into fuel break design.
7. Power-wash all vehicles and equipment involved in fuels management activities, prior to entering the area, to minimize the introduction of undesirable and/or invasive plant species.
8. Design vegetation treatments in areas of high fire frequency which facilitate firefighter safety, reduce the potential acres burned, and reduce the fire risk to sage-grouse habitat. Additionally, develop maps for sage-grouse habitat which spatially display current fuels treatment opportunities for suppression resources.
9. Give priority for implementing specific sage-grouse habitat restoration projects in annual grasslands, first to sites which are adjacent to or surrounded by preliminary priority habitat or that reestablish continuity between priority habitats. Annual grasslands are a second priority for restoration when the sites are not adjacent to preliminary priority habitat, but within two miles of preliminary priority habitat. The third priority for annual grassland habitat restoration projects are sites beyond two miles of preliminary priority habitat. The intent is to focus restoration outward from existing, intact habitat.
10. As funding and logistics permit, restore annual grasslands to a species composition characterized by perennial grasses, forbs, and shrubs or one of that referenced in land use planning documentation.
11. Emphasize the use of native plant species, recognizing that non-native species may be necessary depending on the availability of native seed and prevailing site conditions.
12. Remove standing and encroaching trees within at least 100 meters of occupied sage-grouse leks and other habitats (e.g., nesting, wintering and brood rearing) to reduce the availability of perch sites for avian predators, as resources permit.
13. Protect wildland areas from wildfire originating on private lands, infrastructure corridors, and recreational areas.
14. Reduce the risk of vehicle- or human-caused wildfires and the spread of invasive species by planting perennial vegetation (e.g., green-strips) paralleling road ROWs.
15. Strategically place and maintain pre-treated strips/areas (e.g., mowing, herbicide application, etc.) to aid in controlling wildfire, should wildfire occur near preliminary priority habitat or important restoration areas (such as where investments in restoration have already been made).

Local Unit Fire Program

Many local units with sage-grouse habitats have established protocols that address sage-grouse and fire suppression activities. Examples of these protocols are:

Preseason:

- Ensuring that land use plans, RMPs, and fire management plans are current and include guidance for management of sage-grouse and sage-grouse habitat.

- Conducting informational meetings and workshops with federal, state, and local cooperators to share sage-grouse information such as location of habitats, BMPs for suppression activities in habitat areas, rehabilitation priorities in habitat areas, etc.
- Ensure BLM Multi-Area Coordination representatives at all levels (local, geographic, and national) understand sage-grouse issues and that it is a high agency priority.

Initial Attack:

- Ensuring that interagency fire managers update pre-planned responses within the dispatch zone to align the initial attack response with protection priorities and resource values.
- Encouraging dispatch centers to utilize Geographical Information System (GIS) maps in Wildland Fire Computer Aided Dispatch System to determine if new starts are within sage-grouse habitat or in close proximity to other identified values or assets, and relay that information to responders.
- Briefing all local initial attack crews on awareness of sage-grouse habitat during response and suppression, and ensuring they review and are familiar with BMPs.
- Ensuring out-of-area resources (severity crews, overhead, etc.) receive a full briefing, which includes (among other things) awareness of sage-grouse habitat during response and suppression, and ensuring they review and are familiar with the sage-grouse suppression BMPs.

Extended Attack:

- Ensuring field or district officers and READs are present to brief incoming incident management teams, which may be unfamiliar with sage-grouse issues.
- Ensuring READs are assigned to fires in the zone whenever fire suppression activities may affect resource values, including sage-grouse habitat.
- Ensuring READs are assigned to incidents as early as possible.
- Ensuring READs participate in annual READ workshops which address (among other things) sage-grouse concerns and BMPs.
- Ensuring READs have access to pre-built kits which include: hard copy and electronic resource information, GIS sage-grouse habitat data, fire suppression BMPs for sage-grouse, and rehabilitation guidelines.
- Ensuring sage-grouse issues are addressed throughout the Wildland Fire Decision Support System process (particularly in decision documents), and specified in delegations of authority to Incident Management Teams and Incident Commanders.
- Ensuring READs are assigned to large incidents managed by an incident management team for the duration of the incident. Ensure that, per delegations of authority, READs are included in planning meetings, firefighter briefings, and provide input to the Incident Action Plan.

Post Incident:

- Ensuring READs complete a READ Report upon demobilization of an incident. This report should summarize suppression actions, suppression damage, and damage caused by the fire itself. The READ Report should provide preliminary recommendations for stabilization, rehabilitation, and restoration and vetted by the Emergency Stabilization Rehabilitation Interdisciplinary Team prior to preparation of the Emergency Stabilization Rehabilitation Plan. This preliminary assessment (READ Report) and subsequent Emergency Stabilization Rehabilitation Plan should include impacts to sage-grouse habitat and recommendations for mitigation.

BLM National Sage-Grouse Habitat Conservation Strategy (BLM 2004b)

- Develop cooperative agreements with other land owners to maintain sagebrush patches within developed lands (housing developments, croplands, business developments etc.). Avoid the impact of construction and operations by not placing mines, oil and gas and geothermal drilling sites and facilities, roads, and mineral material disposal sites in or next to sensitive habitats such as Greater Sage-Grouse leks, nesting, early brood-rearing, breeding, and wintering habitat. When habitat loss cannot be avoided, stipulations, COAs, or mitigating measures should be developed to reduce impacts on Greater Sage-Grouse habitats.
- Whenever feasible and environmentally preferred, avoid surface occupancy by roads, livestock management facilities, well pads, powerlines, fences, or other structures adjacent to occupied leks. Signage, including Off Highway Vehicle designations, identifying and/or protecting sensitive areas should be considered. Dust abatement measures should be employed.
- Locate or construct facilities such as oil and gas compressor stations so that the noise from the station does not disturb grouse activities at the lek. Installing mufflers and baffle panels, berm the station (where invasive weeds are not an issue), or placing restrictions on how close these facilities can be located to leks, nesting and early brood-rearing habitat should be considered. New recreational facilities such as campgrounds should also be located so that the noise does not disturb grouse activities at the lek. Construction and/or maintenance should be scheduled to minimize conflicts with any known leks. Greater Sage-Grouse are sensitive to noise levels from all activities during early evening and morning hours when strutting occurs during March and April, so actions to reduce noise levels during these periods should be taken.
- Reduce habitat loss associated with mineral exploration and development by consolidating facilities as much as possible. The possibility of burying utility and flow lines beneath or along roads, centralizing tank batteries, and drilling multiple wells from a single location should be considered.
- Design and construct mineral exploration and development operations so as to disturb the smallest footprint practical on the landscape while meeting all safety requirements. Where feasible, consider mowing of parking and storage areas on portions of oil and gas well drilling locations rather than stripping the topsoil and vegetation from the entire location, and the use of two-track trails to conduct exploration activities. Minimize traffic by limiting public vehicular access in new development areas, use remote monitoring of production facilities, encourage car-pooling and the use of buses, and encourage operator-enforced speed limits to reduce dust, noise, and potential collisions with Greater Sage-Grouse so as to reduce habitat impacts. Consider using stakeless geophysical exploration activities to reduce vehicle traffic in sagebrush habitat.
- Plan and construct mining and mineral development activities, to the degree possible given State water rights, to minimize disturbances that would result in alterations to springs and riparian habitat. Greater Sage-Grouse can be impacted by the loss of surface water. Alternative water sources should be developed to replace natural sources that have been negatively affected or destroyed during these development activities. Water storage impoundments should be designed to avoid or minimize loss or degradation of Greater Sage-Grouse habitat. Water storage impoundments should be monitored and treated to prevent mosquito breeding (and the associated spread of WNV). Evaporation, reserve, work over, and production pits should also be designed with adequate fencing/netting or other protective features to reduce mortality of Greater Sage-Grouse due to drowning or entrapment.
- Carefully consider impacts to Greater Sage-Grouse and their habitats when reviewing requests for exceptions, waivers, or modifications to lease stipulations or evaluating requests for waivers of COAs.

- Evaluate land exchanges, acquisitions and disposals to determine if important Greater Sage-Grouse habitat would be impacted or whether the BLM would be acquiring important Greater Sage-Grouse habitat.
- Evaluate proposed agricultural leases, range improvements, special recreation or land use permits, and habitat improvement projects to determine if Greater Sage-Grouse and their habitats would be impacted.
- Conduct fire management activities to minimize overall wildfire size and frequency in sagebrush plant communities where Greater Sage-Grouse habitat objectives will not be met if a fire occurs. Wildfire suppression in sagebrush habitat with an understory of invasive, annual species is crucial. Prioritization of suppression actions should take into account the value and rarity of sagebrush habitat and Greater Sage-Grouse. Retain unburned areas, including interior islands and patches, of sagebrush unless there are compelling safety, private property, resource protection, or control objectives at risk. Burnout operations in areas where there are no threats to human life, private property or other important resources identified in land management plans should be minimized in crucial Greater Sage-Grouse habitats as identified in land and fire management plans.
- Annually update Fire Management Plans to incorporate new sagebrush habitat information as well as fire suppression priorities in sagebrush habitats. Objectives for the management of sagebrush ecosystems should be incorporated into Fire Management Plans and provided to initial attack personnel at the beginning of each fire season.
- Provide Fire Management Plans to the Incident Management Team. The Field Office should provide READs to assist the Incident Commander or Incident Management Teams in developing timely fire suppression priorities in crucial Greater Sage-Grouse habitat.
- Evaluate impacts on Greater Sage-Grouse habitat in areas where wildland fire use for resource benefits may be implemented. Also consider the interval since last fire, fire size and past plant community response to burning during this process.
- Establish fuels treatment projects at strategic locations to minimize size of wildfires and limit further loss of sagebrush. Fuels treatment may include the use of green-strips (strips of fire resistant vegetation) to help reduce the spread of wildfires into sagebrush communities.
- Use prescriptive livestock grazing, where appropriate, to reduce annual grass production and the spread of wildfire into sagebrush communities. Timing of grazing and effects on residual native plants need to be carefully evaluated.
- Consider removal of conifers (e.g., cutting, burning, chaining, etc.) where they have encroached upon Greater Sage-Grouse habitat. Areas of dense conifers (pinyon pine, juniper, ponderosa pine, Douglas fir) may require cutting or chaining to reestablish sagebrush plant communities (prescribed fire may not be feasible given the lack of understory and high woody fuel loads). Sites selected for cutting or chaining should have conifers that have established after the early to mid-1800s. Sites should also have evidence of past sagebrush plant communities as evidenced by residual native plants or soils that support a rangeland not a woodland ecological site. Cutting and chaining may occur as a single treatment or a preparatory treatment for prescribed burning. Post-treatment seeding will probably be required in areas where residual, herbaceous vegetation is inadequate to recover once the conifer competition is removed.
- Steps such as recontouring, respreading topsoil, revegetating all disturbed areas not needed for well or mine production, including cuts, fills, borrow ditches, and well pads up to the production facilities are suggested. Additionally, allowing room for the setup of work over rigs, and allowing future setup and parking on the top of new vegetation will minimize the need for future disturbances. The use of native species of shrubs, forbs, and grasses in seed mixes appropriate for each ecological site will also enhance habitat value or Greater Sage-Grouse.

- Evaluate (e.g., monitor) burned areas for up to three years post-fire and continue management restrictions until the recovering or seeded plant community reflects the desired condition.
- Reclaim unnecessary or redundant roads and facilities by removing surfacing material, reestablishing the original contour, spreading topsoil, and seeding to restore habitat.
- Utilize the ES&R program to apply appropriate post-wildfire treatments (livestock and/or recreation exclusion, reseeding, erosion control structures, etc.) within Greater Sage-Grouse habitat. Use of native species is encouraged dependent on cost, availability and chance for success. Seed mixtures should be designed to reestablish important seasonal habitat components for Greater Sage-Grouse.
- Install anti-perching devices on existing or new powerlines in occupied Greater Sage-Grouse habitat, or habitat identified for restoration, to minimize raptor use of these poles.
- Encourage placement of new utility developments (powerlines, pipelines, etc.) and transportation routes in existing utility or transportation corridors to minimize fragmentation of Greater Sage-Grouse habitat. If corridors do not exist, consider consolidating utility lines, pipelines, and other structures along the same new route (e.g., at one location) that least impacts sagebrush habitat.
- Place new roads where construction activity and use is concentrated and does not impact critical areas such as leks, nesting, early brood-rearing, winter habitat, riparian areas, springs and wetlands.
- Manage existing road use to decrease the level of disturbance during critical periods such as breeding (lek use) by implementing seasonal or daily use schedules, by limiting traffic volume, and/or by posting speed limits.
- Locate new structures associated with recreation (picnic areas, campgrounds, wildlife viewing sites, dispersed recreation sites, kiosks and parking lots) and livestock management facilities (corrals, water pipelines and tanks/troughs, exclosures, etc.) away from crucial breeding, brood-rearing and winter areas; or manage disturbance with seasonal or daily timing restrictions. Construction of recreational-related facilities (kiosks, toilets, signs, etc.) that provide avian perches should be avoided unless they include mitigating features such as perch guards. Manage use at established structures/developments to reduce impacts to Greater Sage-Grouse during critical periods of their life cycle.
- Design and locate the placement of fences for livestock, wildlife, recreation and developed site protection so as not to disturb important Greater Sage-Grouse habitat areas. Impacts of livestock congregation against fences and its effect on Greater Sage-Grouse habitat near leks, nesting, and wintering areas should be considered.
- Design wind energy facilities to reduce habitat fragmentation and mortality to Greater Sage-Grouse. Tubular tower designs to reduce raptor perches and noise reduction to minimize disturbance to nesting birds are encouraged. Design criteria for these projects should include minimizing the facility footprint (including the road network required to service the generators) in Greater Sage-Grouse habitat. BMPs for wind energy are currently being developed in the Wind Energy Programmatic EIS. The BMPs that address the conservation of Greater Sage-Grouse and their habitat are adopted by reference.
- Manage dispersed recreation activities like hiking, mountain biking, and horseback riding to minimize impacts to vegetation and Greater Sage-Grouse in sensitive Greater Sage-Grouse habitat areas. Keeping these users on established trails will minimize impacts to Greater Sage-Grouse habitat and activities.
- Consider seasonal closures to protect priority Greater Sage-Grouse habitat if other alternatives will not achieve desired objectives.
- Reclaim unused roads and facilities by reseeding sagebrush, shrubs, and native grasses and forbs to help improve Greater Sage-Grouse habitat and reduce weed invasion.

- Encourage vegetative restoration along roads, ROWs, on well pads, and at existing facilities where habitat needs for Greater Sage-Grouse are not currently met.
- Require successful seeding of appropriate vegetation on any new disturbance associated with mineral and energy facility developments, livestock management facilities, and recreation facilities.
- Restore small areas dominated by invasive species with desirable vegetation to minimize fragmentation of habitat.
- Where good habitat quality exists, maintain current management practices considering plant composition and soil type.
- Use grazing practices that promote the growth and persistence of native shrubs, grasses and forbs needed by Greater Sage-Grouse for seasonal food and concealment. Vegetation structure (height) should be managed so as to provide adequate cover for Greater Sage-Grouse during the nesting period.
- Change mineral supplement and/or watering locations to move domestic livestock to desired areas. However, any change in location of supplement or watering location should consider potential effects to Greater Sage-Grouse habitat.
- Coordinate with state wildlife agencies where wildlife use detrimentally affects Greater Sage-Grouse habitat quality.
- Construct and maintain water developments at key locations in Greater Sage-Grouse habitat. Install or retrofit water developments with wildlife escape ramps.
- Maintain seeps, springs, wet meadows, and riparian vegetation in a functional and diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas. Consider fencing if vegetation associated with these wet areas cannot be maintained with current livestock or wildlife use and the impacts of the fence are outweighed by the improved habitat quality.
- Maintain sagebrush and understory diversity (relative to site potential) adjacent to crucial seasonal Greater Sage-Grouse habitats unless such removal is necessary to achieve Greater Sage-Grouse habitat management objectives.
- Encourage the use of insecticide baits and natural pathogens instead of broad-spectrum insecticides where insect control is required. Improper use of pesticides to control insect outbreaks can result in a reduction of food resources for Greater Sage-Grouse, particularly nesting females and chicks. While the Animal and Plant Inspection Service is responsible for controlling these insects on public lands, the BLM should recommend avoidance areas as well as the type of treatment. Target pest control toward key problem areas, and schedule applications to be effective in minimum doses. Broadcast spraying should generally be avoided in favor of ground applications to minimize drift into non-target areas. Avoid applying pesticides to Greater Sage-Grouse breeding habitat during the brood-rearing season (mid-May through mid-July) to reduce the loss of food supply to chicks and avoid the chance of secondary poisoning.
- Grazing use should be adjusted during extended drought periods. Consider transitioning back to pre-drought use when drought conditions have ended.
- Reduce the density of conifers that have encroached into but do not yet dominate sagebrush plant communities. Site selection should be based on proximity to occupied habitat, site potential, herbaceous invasive species, or other factors that affect the potential for sagebrush plant communities to be reestablished.
- Where other grazing management options are not achieving, or cannot achieve, the desired objectives, a short-term option may be livestock exclusion.
- Restore lost riparian and wetland plant species diversity and structure by replanting appropriate species near crucial Greater Sage-Grouse habitat.

- Treatments should be designed to improve a deficient condition within the community (e.g., poor cover of herbaceous understory).
- Reintroduction of appropriate fire regimes will help to limit conifer encroachment into the sagebrush plant communities. Prioritization of areas to be burned or mechanically treated should take into account invasive herbaceous species, fire regime, and condition class (measure of departure from historic fire regime). A balance should be achieved between treating areas that have significantly departed from historic fire regime (condition class 3) and areas that are functioning within an appropriate fire regime (condition class 1).
- Seeding may be required in areas where residual perennial vegetation is insufficient to respond following prescribed burning. Minimize seeding with non-native species that may create a continuous perennial grass cover and restrict reestablishment of native vegetation. However, non-native seed may be appropriate on severely degraded sites if native species would not be successful or are not available.
- Evaluate all wildfires in known Greater Sage-Grouse habitat to ensure that the appropriate plant species are reseeded relative to site potential and seasonal Greater Sage-Grouse habitat requirements. Emphasize the use of native species in these seed mixtures and minimize the use of introduced grasses. Make burned Greater Sage-Grouse habitats a high priority for restoration if funds are limited in the ES&R Program. If native plant seed is scarce, assign a priority that this seed be reallocated to ES&R projects in critical Greater Sage-Grouse habitat areas. Seeding of non-native species may be necessary in areas where invasive plants dominate or have the potential to dominate the post-fire plant community.
- BMPs for this species identified in Grazing Influence, Objective Development, and Management in Wyoming's Greater Sage-Grouse Habitat as Grazing Management Recommendations include the following:
 - Avoid any new sources of disturbance such as range improvements on leks sites. Identify the location of leks through consultation with local biologists to provide appropriate emphasis.
 - Maintain the Sagebrush/Bunchgrass Plant Community wherever currently present. Manage for high vigor in all plant communities. Avoid repeatedly using cool-season bunchgrass in the critical growing season and limit utilization to moderate levels to assure that the previous year's standing crop is available for hiding cover.
 - Avoid repeatedly grazing riparian areas in seasons when temperatures are high.
 - Avoid levels of browsing on sagebrush that would limit Greater Sage-Grouse access to their food supply and cover. Additionally, avoid heavy use of herbaceous standing crop as this will adversely affect hiding cover the following spring.
 - Carefully consider changes in management that would increase utilization or change the timing of grazing on bunchgrass community sites.
 - Avoid confining animals on inadequate pasture or supplemental feeding to compensate for a lack of natural forage.
 - Restrict grazing in conjunction with restoration efforts until the site is ready to sustain grazing.

Northeast Wyoming Sage-Grouse Conservation Plan (NWSGLWG 2006)

- **Road Building Maintenance and Usage**
 1. Work cooperatively with all involved permittees, lease holders or field operators, and affected landowners, develop a road use and travel plan for areas within 3 miles (5 kilometers [km]) of sage-grouse leks (Connelly et al. 2000).
 2. Coordinate planning among all companies operating in the same field and strongly encourage everyone involved to follow the same road use plan.

3. Map all existing and proposed roads for areas to be developed, and consolidate activities using existing roads and other facilities where possible.
4. Minimize the number of vehicles per visit, and the number of roads used within the area.
5. Encourage remote monitoring of production sites to minimize road use and reduce harassment of birds during critical seasons (breeding, nesting, brood-rearing, and winter).
6. Allow traffic at most, only every other day, less frequently if possible.
7. Limit traffic on all roads to three, one-hour travel periods per day spaced at least two hours apart.
8. Establish acceptable stopping points and “drive through only” areas.
9. Sign roads as appropriate to prevent off-road travel and to inform all users of the roads of acceptable use times and approved stopping areas.
10. As appropriate, gate and close all newly constructed (project related) roads to public travel.
11. Consider using pipelines to bring product to a central facility to reduce needed number of roads and traffic.
12. Minimize visual/auditory impacts where practicable (e.g., place roads below ridgelines or along topographic features).
13. Place roads outside of riparian areas where possible.
14. If avoidance is not possible, minimize impacts to riparian, wetland, or wet meadow habitats to limit impacts to brood rearing areas. (exploration, drilling, production and operations).
15. Avoid placement of well pads, roads and other well field facilities on mapped winter habitats, or within a 1/8-mile (200 meter) buffer surrounding winter habitat.
16. Encourage road rehabilitation or realignment to minimize impacts to sage-grouse.
17. Select sites for construction that will not disturb suitable nest cover or brood-rearing habitats within 3 miles (5 km) of occupied leks, or within identified nesting and brood-rearing habitats outside the 3-mile (5 km) perimeter (Connelly et al. 2000).
18. Utilize minimum construction and maintenance standards appropriate for the operation.
19. Establish acceptable times for road construction and maintenance that will minimize disturbance during critical seasonal use periods.
20. Reclaim roads that are only needed periodically, and allow operators to drive over reclaimed roads when needed.

● **Powerline Construction and Maintenance**

1. Working cooperatively with all involved permittees, lease holders or field operators to develop a master powerline plan for all areas within 3 miles (5 km) (Connelly et al. 2000) of sage-grouse leks and on other identified sage-grouse habitats.
2. Where feasible, bury new powerlines.
3. Map all existing and proposed powerlines for the area, consolidating new powerlines into existing disturbance corridors.
4. Coordinate planning and powerline needs among companies operating in the same field.
5. Include powerline access roads in the road use and travel plan to include power companies in appropriate use times.
6. Select sites for construction that will not disturb suitable nest cover and brood-rearing habitats within 3 miles (Connelly et al. 2000) of a lek.
7. Select sites for construction that will not disturb wintering habitat.
8. Locate any above-ground powerlines off of ridges and out of riparian areas (1,000 feet (300 meters) riparian buffer where feasible).
9. Direct powerline construction (above or underground) to areas of existing disturbance corridors (i.e., existing roads, railroads, powerlines, etc.).
10. Recommend the lowest voltage powerline needed for the project while considering future needs.

11. Reduce existing above ground powerlines by burying them as opportunities (such as rebuilds) arise.
 - a. If burying powerlines cannot be accomplished, install perch guards to prevent raptor use.
 - b. Recommend onsite power generation to minimize overhead power lines.
 - c. Visibility markers should be included on above ground lines in high avian use areas such as across drainages, water bodies, prairie dog colonies, etc.

- **General Mineral Development**

1. Evaluate and address the needs of sage-grouse when placing well sites, mines, pits and infrastructure. Develop a plan for roads, pipelines, etc. to minimize impacts to sage-grouse.
2. Consider developing travel management plans that would allow seasonal closure of roads for all but permitted uses (i.e., recreation and hunting) and encourage the reclamation of unnecessary or redundant roads.
3. Where mineral development occurs in sage-grouse habitat, tailor reclamation to restore, replace or augment needed habitat types.
4. Where necessary to build or maintain fences, evaluate whether increased visibility, alternate location, or different fence design will reduce hazards to flying grouse.
5. Avoid construction of overhead lines and other perch sites in occupied sage-grouse habitat. Where these structures must be built, or presently exist, bury the lines, locate along existing utility corridors or modify the structures to prevent perching raptors, where possible.
6. Reduce noise from industrial development or traffic, especially in breeding and brood rearing habitats.
7. Manage water production to enhance or maintain sage-grouse habitat.
8. Avoid surface and sub-surface water depletion that impacts sage-grouse habitats.
9. Consider an exception or waiver of seasonal stipulations if technologies that significantly reduce surface disturbance are used.
10. Control dust from roads and other surface disturbances within the population's seasonal habitats.
11. Continue research efforts to determine the effects of mineral development on sage-grouse populations.
12. Consider offsite mitigation as an alternative mitigation for mineral development impacts on known sage-grouse habitat. Work with mineral entities to develop and implement acceptable offsite mitigative measures for enhancing sage-grouse or habitat, as needed, to offset impacts of surface-disturbing activities.

- **Oil and Gas Development and Sand and Gravel Mining**

1. As a general rule, do not drill or permit new or expand existing sand and gravel activities within 3 miles (5 km) (Connelly et al. 2000) of active leks between March 1st and July 15th. As seasonal habitat mapping efforts are completed, re-direct efforts towards protecting nesting habitat. (Dates and distances of agency proposed action will be used.)
2. Avoid surface disturbance or occupancy on or within 0.25 mile of known active lek sites. (Distances of agency proposed action will be used.)
3. Evaluate well spacing and location requirements under Wyoming Oil and Gas Conservation Commission jurisdiction in light of sage-grouse habitat needs and consider spacing exceptions that protect habitat. The limitations of obtaining spacing exceptions must be recognized.
4. To minimize disturbance during the breeding season, avoid human activity within 0.25 mile of occupied sage-grouse leks. (Dates and distances of agency proposed action will be used.)
5. Where technically and economically feasible, use directional drilling or multiple wells from the same pad.

6. Where facilities are developed within sage-grouse habitat, minimize potential use by predators (i.e., raptor proof power poles, eliminate crawlspaces under buildings).
7. Encourage the development of new technologies that would reduce total surface disturbance within occupied sage-grouse habitat (i.e., directional drilling, multiple wells from the same well pad and reinjection of produced water).
- **Vegetation Management**
 1. Develop priorities and implement habitat enhancements in areas currently occupied by sage-grouse.
 2. Develop priorities and implement habitat enhancements in historical or potential sage-grouse habitats.
 3. Develop and implement wildfire suppression guidelines that address sage-grouse habitat health and management.
 4. Remove juniper and other conifers where they have invaded sagebrush sites important to sage-grouse.
 5. Ensure vegetation treatments and post-treatment management actions are appropriate to the soil, climate, and landform of the area.
 6. Recognize that fire provides a natural diversity component in sagebrush habitats; manage fire on a landscape and patch scale at a local level.
 - a. Use prescribed fire to maintain, enhance or promote sagebrush ecosystem health by mimicking natural fire frequencies.
 - b. Where sage-grouse are present or desired, fire management objectives should recognize that fire generally burns the better sage-grouse nesting and severe winter habitat.
 - c. Evaluate all wildfires greater than 40 acres in occupied sage-grouse habitat to determine if rehabilitation of the burned area is needed with emphasis placed on habitats that would be susceptible to invasion by annual grasses.
 7. When rehabilitation is necessary, the first priority is protection of the soil resource. Use appropriate mixtures of sagebrush, native grasses, and forbs that permit burned areas to recover to a sagebrush-perennial grass habitat.
 8. Grazing management following sagebrush treatments or manipulations should be designed to benefit long-term sagebrush diversity and ecosystem health. Grazing management strategies should be designed to permit reestablishment of native sagebrush, grasses, and forbs that benefit sage-grouse.
 9. Experiments in habitat manipulation should be relatively small in comparison to a specific sage-grouse population.
 10. Determine threshold levels of habitat alteration that can occur without negatively impacting specific sage-grouse populations. As a general rule, treat no more than 20 percent of any seasonal habitat type until results are evaluated.
 11. Treat sagebrush in patches rather than contiguous blocks.
 12. Protect patches of sagebrush within burned areas from disturbance and manipulation.
 13. Consider all alternatives when designing sagebrush treatments.
 14. Additional treatments in adjacent areas should be deferred until the previously treated area again provides suitable sage-grouse habitat.
 15. Avoid removing sagebrush adjacent to sage-grouse foraging areas along riparian zones, meadows, lake beds and farmland unless such removal is necessary to achieve habitat management goals.
 16. Use mechanical or other appropriate treatments such as herbicides in areas with relatively high shrub cover (>30%) and a poor herbaceous component in order to improve brood-rearing habitats.

17. Implement effective monitoring plans to determine the effectiveness of vegetation treatments.
 18. Develop and maintain cumulative records for all vegetation treatments to determine and evaluate site specific and cumulative impacts to sage-grouse habitats and identify recommended management practices for successful vegetation treatments.
- **Invasive Plants**
 1. Identify invasive plants of concern in sage-grouse habitats.
 2. Map areas where invasive plants of concern already exist.
 3. Implement strategies to assist in prevention of the spread of noxious weeds or invasive plants detrimental to sage-grouse.
 4. Prioritize and aggressively treat invasive plants in identified areas of concern.
 5. Employ appropriate site preparation techniques and timely reseedling with approved seed mixes of any disturbed areas to prevent encroachment of invasive plants.
 6. Maintain cumulative records for invasive plants treatment and prevention programs to evaluate site specific and cumulative impacts to sage-grouse habitats.
 - **Land Use**
 1. Encourage assimilation of sage-grouse information into plans as they are developed. Develop and distribute appropriate literature.
 2. Limit free-roaming dogs and cats.
 3. Maintain appropriate stocking rates of livestock.
 4. Encourage cluster development, road consolidation and common facilities that would have a reduced impact on sage-grouse.
 5. Where necessary to build or maintain fences, evaluate whether increased visibility, alternate location, or different fence design will reduce hazards to flying grouse.
 6. Maintain healthy sagebrush communities.
 7. Plan development to allow for sage-grouse movement.
 8. Where possible protect habitat through conservation (i.e., land exchanges, conservation easements, leases or Conservation Reservation Program type programs).
 9. Locate and manage facilities to eliminate predator impacts to sage-grouse.
 10. Provide education on the effects of development on sage-grouse habitat and populations. Facilitate conservation districts and extension agents' ability to educate the public about sage-grouse.
 11. Consider developing travel management plans that would allow seasonal closure and reclamation of roads.
 12. Reduce noise from industrial development or traffic especially in breeding and brood rearing habitats.
 13. Avoid construction of overhead lines and other perch sites in occupied sage-grouse habitat. Where these structures must be built, or presently exist, bury the lines, locate along existing utility corridors or modify the structures in key areas (priority habitat).
 14. Control dust from roads and other surface disturbances.
 - **Parasites and Diseases**
 1. Investigate and record deaths that could be attributed to parasites or disease.
 2. Develop and implement strategies to deal with disease outbreaks where appropriate.
 3. Implement pond design standards to minimize mosquito breeding habitat.
 - a. Overbuild the size of ponds to accommodate a greater volume of water than is discharged. This will result in non-vegetated and muddy shorelines that breeding mosquitoes avoid.

- b. Build steep shorelines to reduce shallow water and aquatic vegetation around the perimeter of impoundments. Construction of steep shorelines also will increase wave action that deters mosquito production.
- c. Maintain the water level below that of rooted vegetation for a muddy shoreline that is unfavorable habitat for mosquito larvae. Rooted vegetation includes both aquatic and upland vegetative types. Always avoid flooding terrestrial vegetation in flat terrain or low lying areas.
- d. Construct dams or impoundments that restrict down slope seepage or overflow. Seepage and overflow results in down-grade accumulation of vegetated shallow water areas that support breeding mosquitoes.
- e. Line the channel where discharge water flows into the pond with crushed rock, or use a horizontal pipe to discharge inflow directly into existing open water, thus precluding shallow surface inflow and accumulation of sediment that promotes aquatic vegetation.
- f. Line the overflow spillway with crushed rock, and construct the spillway with steep sides to preclude the accumulation of shallow water and vegetation.
- g. Fence pond sites to restrict access by livestock and other wild ungulates that trample and disturb shorelines, enrich sediments with manure and create hoof print pockets of water that are attractive to breeding mosquitoes.

- **Predation**

Predation recommended management practices on public lands would only be implemented in coordination with U.S. Department of Agriculture (USDA) Wildlife Services.

1. Predator control may be warranted to maintain or enhance local sage-grouse populations when there is a demonstrated need such as a population is trending downward over a 3-year period; populations of "newcomer" predators are artificially high in sage-grouse habitat; specific sage-grouse populations need short-term help.
2. Develop and distribute educational materials regarding human practices that may allow establishment/expansion of predator populations. Examples of these activities include landfills and other garbage/waste disposal that may provide artificial food sources for a variety of predators, and buildings/structures that provide nesting/roosting habitat for ravens/raptors.
3. Avoid construction of overhead lines and other perch sites in occupied sage-grouse habitat. Where these structures must be built, or presently exist, bury the lines, locate along existing utility corridors or modify the structures in key areas.
4. Predator control to enhance sage-grouse survival should be targeted only predators identified as impacting that sage-grouse population.
5. Better quantify and qualify the role of predation on sage-grouse in Wyoming.
6. Discourage the establishment, and bring into balance artificially high populations of "newcomer" predators in sage-grouse habitat.
7. Monitor the effectiveness of any predator control efforts that are implemented.

- **Livestock Grazing Management**

1. In interactions between wildlife professionals, livestock producers and other interested parties, employ tolerance and understanding, and respect other perspectives. Focus on areas of mutual interest.
2. Evaluate effects of different grazing treatments on sage-grouse productivity, survival, and habitat use.
3. Actively educate stakeholders about grazing strategies that can be used to improve or maintain sage-grouse habitats. Cooperate to create and distribute a Wyoming guide to enhancing sage-grouse habitat.

4. In general, avoid yearlong and spring-to-fall continuous grazing schemes in sage-grouse habitat. Yearlong and spring-to-fall grazing may be a tool if it is not continued each year.
5. Where appropriate, implement livestock grazing systems that provide for areas and times of rest or deferment.
6. Where practicable, avoid heavy utilization of grazed pastures to compensate for rested pastures (a year of rest cannot compensate for a year of excessive use).
7. Design grazing systems that provide sage-grouse habitat in riparian areas and around water sources.
8. During periods of forage drought, utilize grazing schemes that reduce impacts to sage-grouse (e.g., adjust intensity, timing and/or duration of grazing).
9. Investigate the possibility of developing forage banks for use during periods of drought to alleviate inappropriate use by grazing animals on sage-grouse habitat.
10. Reduce disturbance to sage-grouse habitat from livestock management activities (e.g., salting or mineral placement, turnout or gathering, bed ground/camp locations, etc.)
11. Develop and implement management plans for grazing that take into consideration the seasonal sage-grouse habitat needs. These management plans could include a variety of grazing systems designed to reach habitat goals, including short-duration, rest rotation, etc.
12. Look for ways to minimize negative impacts and enhance sage-grouse habitat when establishing livestock range improvement projects (e.g., water overflow for sage-grouse from water developments, placement of fences, facilities that provide raptor perch sites, construction of roads, salt grounds).
13. Avoid human activity near leks during the breeding season between the hours of 8 p.m. to 8 a.m.
14. Except for livestock guard dogs, avoid allowing dogs to run unchecked in sage-grouse habitats.
15. Experiment with types of grazing to improve sage-grouse habitat accompanied by monitoring to determine effects on sage-grouse.
16. Use techniques such as increased visibility, alternate location, or different design to build and maintain fences that are not hazards to flying grouse.
17. During the breeding season (March 1st through May 15th), use sheep bedding grounds at least 0.5 mile from leks. Should herding practices regain popularity, herders should attempt to avoid disturbing occupied leks with their sheep bands, once they leave the bed ground and begin their daily movements.
18. During the breeding season (March 1st through May 15th), reduce physical disturbance to breeding sage-grouse by placing salt or mineral supplements beyond 0.25 mile of lek locations.
19. In suitable nesting habitats within 3 miles of leks, design grazing systems to manage for residual herbaceous vegetation to provide cover for nesting sage-grouse hens. Options to promote herbaceous cover include:
 - a. When circumstances allow, shift early-season livestock use to pastures with minimal, or no, potential for nesting (e.g., pastures lacking sagebrush, exotic grass seedings, annual grasslands, etc.).
 - b. When pastures with potential nesting habitat are grazed early in the season, use an appropriate stocking rate when herbaceous plants are not rapidly growing (generally prior to late-April). Options for monitoring grazing can be found in the Wyoming Rangeland Monitoring Guide.
20. Manage stocking rates and rotations to maintain the health and productivity of rangelands for livestock and sage-grouse. Incorporate one of the monitoring programs from the

Wyoming Rangeland Monitoring Guide to ensure proper grazing utilization and plant recovery.

21. If your goal is to increase production of grasses and forbs, manage for increased soil water intake by promoting residual vegetation and mulch through implementation of light grazing intensities.
22. In pastures with riparian habitats (assuming riparian vegetation is actively growing), manage livestock grazing to allow herbaceous vegetation recovery.
23. Supplemental winter-feeding of livestock in occupied sage-grouse winter habitats should be avoided for both sheep and cattle operations to prevent over-utilization of sagebrush resources by sheep and trampling damage by cattle.
24. Utilization of sagebrush plants should not exceed 20 percent by livestock and big game.
25. Placement of new fences and structures should include consideration of their impact on sage-grouse. In general, avoid constructing fences within 0.5 mile of leks. Avoid locating fences in swales and on ridge tops. Minimize fence height and maximize bottom wire height to the extent possible. In areas with documented collisions make fences as visible as possible, (e.g., wire markers, use white-topped steel fence posts, use wooden stays and/or reduce spacing between fence posts, etc.).
26. Where feasible, place new, taller structures such as corrals, loading facilities, water storage tanks, windmills, etc. at least 0.5 mile from leks to reduce opportunities for perching raptors.
27. New spring developments in sage-grouse habitat should be designed to maintain or enhance the free-flowing characteristics of springs and wet meadows with the use of float valves on troughs or other features where feasible. Spring and wet meadows should be protected from over utilization and trampling by livestock.
28. Equip new and existing livestock troughs and open water storage tanks with ramps to facilitate the use of, and escape from, troughs by sage-grouse and other wildlife.

- **Weather**

1. Where drought has been documented for two consecutive years, consider implementation of Recommended Management Practices in year three that may include:
 - a. Drought management of livestock and wildlife grazing.
 - b. Protection of critical sage-grouse habitats from wildfire and prescribed fire.
 - c. Reduced bag limits during sage-grouse hunting seasons. (not within BLM management authority)
 - d. Predator management programs to enhance nesting and early-brood-rearing success of impacted populations. (would only be implemented in coordination with USDA Wildlife Services when a need has been determined.)
 - e. Water hauling and protection of water sources from evaporation.
 - f. Installation of guzzlers, snow fences and fencing of water source overflows.
 - g. Insure wildlife escape ramps are in place on existing water sources.
 - h. Implement other appropriate management options developed by local sage-grouse working groups.

- **Coal Exploration, Mining, and Reclamation**

1. Evaluate and address the needs of sage-grouse when siting mines, and mining related infrastructure. Impacts to sage-grouse should be minimized where practicable.
2. Tailor reclamation to replace or augment sage-grouse habitat to the extent practicable in instances where such habitat is adversely affected.
3. Evaluate fence design, location and visibility to reduce hazards to flying grouse.
4. Manage water production to enhance or maintain sage-grouse habitat.
5. Control dust from roads.

6. Control mosquito larvae, to the extent practicable and feasible, in mine-related surface water impoundments.
 7. Install wildlife escape ramps in mine reclamation-related livestock watering facilities (tanks).
 8. Continue sage-grouse and sage-grouse habitat-related research and monitoring efforts.
 9. Remove only that amount of topsoil necessary to support continued mining operations on an annual basis or otherwise manage topsoil removal operations to minimize the impact on sage-grouse.
 10. Consider alternative mitigation measures for mining impacts on known sage-grouse habitat. This may include, but not be limited to, implementing offsite mitigative measures for enhancing sage-grouse habitat to offset the temporary impacts of coal mine surface-disturbing activities.
 11. When feasible and practicable, new or expanded exploration within two miles of active leks should occur prior to March 15th or after July 15th. Following initiation of mining (i.e., topsoil removal) this recommendation will not be applicable.
 12. When feasible and practicable, plan to avoid new surface occupancy or disturbance activities on or within 0.25 mile (400 meters) of the perimeter of known active lek sites from March 1 to May 15. Following initiation of mining (i.e., topsoil removal) this recommendation will not be applicable. (Active coal mines are located outside of priority habitat.)
 13. Continue the effort to establish Wyoming big sagebrush to meet shrub density requirements.
- **Other Solid Mineral Mining Operations**
 1. When feasible, new or expanded exploration and/or mining activities within 3 miles (5 km) (Connelly et al. 2000) of active leks should be avoided between March 1st and July 15th. Following initiation of mining (i.e., topsoil stripping) this recommendation would not be applied. As seasonal habitat mapping efforts are completed, re-direct efforts towards protecting nesting habitat.
 2. When feasible, plan to avoid new surface occupancy or disturbance activities within 3 miles (5 km) (Connelly et al. 2000) of the perimeter of known active lek sites from March 1 to May 15.
 3. Where sage-grouse are present or desired, avoid human activity adjacent to leks during the breeding season between the hours of 8 p.m. and 8 a.m.
 - **Pesticides**
 1. Determine the extent of pesticide use within sage-grouse habitats.
 2. Examine what, if any, effects each pesticide use may have on sage-grouse populations.
 3. Where possible, adjust management instead of applying pesticides.
 4. Make use of current laboratory analysis procedures where sage-grouse mortality is observed. Report where pesticides have caused mortality in sage-grouse.
 5. Determine which pesticides and application strategies are least harmful to sage-grouse.
 6. Research effects of pesticides on sage-grouse in Wyoming with a specific goal of testing impacts of actual rangeland applications.
 7. Work with county Weed and Pest Districts to identify low-toxicity alternatives to pesticides classified as a medium to very high risk to game birds.
 8. Assist in providing Wyoming retail dealers, Weed and Pest Districts, and county extension agents with information intended for users regarding product toxicity levels to sage-grouse, and alternatives that are effective while less toxic.
 9. Encourage simple, standardized record-keeping formats, and allow access to pesticide use information.
 10. Address grasshopper issues using Reduced Agent Area Treatments approach.

11. Avoid broadcast spraying during the nesting season, March 1 to July 15, within three miles of a sage-grouse lek site.

- **Recreation**

1. Develop travel management plans and enforce existing plans.
2. Restrict off-road-vehicle use in occupied sage-grouse habitats.
3. Avoid recreational activities in sage-grouse nesting habitat during the nesting season.
4. Restrict permitted organized recreational activities between March 1 and July 15 within 3 miles (5 km) (Connelly et al. 2000) of a lek site.
5. Recreational facilities shall be located at least 3 miles (5 km) (Connelly et al. 2000) from lek sites and in areas that are not in crucial sage-grouse habitat.
6. In coordination with the WGFD, establish and maintain a small number of lek viewing sites and minimize viewing impacts on these sites. Viewing sage-grouse on leks (and censusing leks) should be conducted so that disturbance to birds is minimized or preferably eliminated.
7. Do not provide all lek locations to individuals simply interested in viewing birds.
8. Develop and provide information related to recreation and its impacts on sage-grouse habitat.
9. Discourage dispersed camping within important riparian habitats occupied by sage-grouse during late summer.
10. Avoid construction of overhead lines and other perch sites in occupied sage-grouse habitat. Where these structures must be built, or presently exist, bury the lines, locate along existing utility corridors or modify the structures in key areas.
11. Control dust from roads and other surface disturbances.
12. Inform the public that dog training on sage-grouse outside the hunting season is wildlife harassment and therefore illegal.

Northeast Wyoming Sage-Grouse Working Group: Recommendations for Development Within Connectivity Corridors (NWSGLWG 2010)

1. Encourage the suspension of federal and state leases in the connectivity corridors where mutually agreed to by the leasing agency and the operator. These suspensions should be allowed until additional information clarifies their continued need. Where suspensions cannot be accommodated, or at the option of the operator, limit disturbance to no more than 5 percent (up to 32 acres) per 640 acres of suitable Greater Sage-Grouse habitat within connectivity corridors.
2. Carefully plan developments to avoid or minimize fragmentation of sagebrush habitats in connectivity corridors. The Northeast Wyoming Sage-Grouse Working Group expects industry, BLM and WGFD to work closely together to minimize the overall acreages disturbed with efficient road and well pad designs to avoid excessive engineering and size of pads. BLM should especially be judicious in its application of Gold Book Standards within connectivity corridors using minimum standards whenever possible.
3. The Northeast Wyoming Sage-Grouse Working Group recognizes that reducing human disturbance during the breeding season is beneficial for sage-grouse within important habitats in connectivity corridors. The Northeast Wyoming Sage-Grouse Working Group recommends that a Controlled Surface Use buffer of 0.6 mile around leks or their documented perimeters and a March 15 – June 30 Timing Limitation Stipulation (TLS) be required within nesting habitat within 4 miles of leks. These stipulations will be followed regardless of surface or mineral ownership.

4. Utility providers will work closely with State and Federal agencies to ensure that new distribution powerlines are sited with consideration for sage-grouse habitat within connectivity corridors. Eliminate or minimize the use of overhead powerlines after power is delivered (“dropped”) to the development by the utility company. Electrical, gas and water lines should be constructed outside of sage-grouse habitat. Within sage-grouse habitat, consolidate these utility lines within a common corridor. Utility providers will work closely with WGFD, landowners and land management agencies to ensure that source lines are sited with consideration for sage-grouse habitat. Energy companies will be encouraged in the COAs in their plans of development to request overhead powerlines be immediately retired after they are no longer needed for development of minerals. Alternatives to overhead power will be investigated if the landowner requests the powerline to remain for developing water wells for livestock or wildlife.
5. Water reservoirs for Coalbed Natural Gas produced water or other uses may provide habitat for mosquitoes, which spread WNV, promote habitat for newcomer predators (e.g., red fox, raccoon and striped skunk) and occupy acreage that would otherwise be suitable for sage-grouse. Water management will minimize reservoir use. The Northeast Wyoming Sage-Grouse Working Group encourages treatment and discharge into perennial streams, reinjection or other nonsurface discharge options within connectivity corridors.
6. With an effort led by the Governor’s office or other agencies, develop a comprehensive larvicide program to manage mosquitoes for all waters within the connectivity corridor. This will include pre and post treatment monitoring to document presence of the primary WNV vector (*Culex tarsalis*) and determine efficacy of the treatment program.
7. Energy operators should use telemetry systems to remotely monitor system performance and safety issues. Non-emergency visits will observe timing restrictions during the TLS window, avoiding sunrise/sunset time periods when grouse are most active and obey conservative speed limits. Minimize noise levels and locations of compressors and generators within connectivity areas.
8. Require the use of site specific and beneficial seed mixtures for sage-grouse on interim and final reclamation. Reference ESDs from NRCS or other professional service. Allow for spring seeding exceptions from TLS to ensure that forb species are planted during optimum precipitation periods (e.g., spring). Promote the inclusion of sagebrush seeds in final reclamation efforts.
9. The Northeast Wyoming Sage-Grouse Working Group encourages landowners within connectivity corridors to consider participation in USDA/NRCS conservation programs for sage-grouse and other wildlife. These efforts should be further supported by industry, Conservation Districts, and State and Federal agencies wherever possible by promoting participation, sponsoring education opportunities and cost sharing programs.
10. All stakeholders need to be vigilant in identifying invasive weed establishment, treating them appropriately and preventing further spread by routine washing of vehicles and equipment.
11. The WGFD will coordinate monitoring in connectivity corridors including:
 - lek counts and surveys;
 - perform genetic analyses using DNA from collected feathers, blood samples, etc.;
 - monitor a radio-marked sample of sage-grouse in this area for seasonal habitat use and assess the role that WNV may have in annual mortality rates.
12. Coordinate response to range fires in sagebrush habitats with respective counties and other appropriate agencies. Sagebrush habitats should receive a priority response.

Appendix E. Livestock Grazing Allotments

E.1. Livestock Grazing Allotments within the Buffalo Planning Area

Table E.1. Current Livestock Grazing Allotment Information

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
12182	4mile Creek/RC	C	369		41
02378	76 Creek	C	200		33
02314	Adon	C	40		6
22115	Allemandll	C	1,520		184
02246	Anderson Draw	C	178		21
12173	Antelope Basin	C	449		47
02366	Antelope Draw	C	40		6
02493	Armstrong Prong	C	223		51
02433	Arpan Butte	C	1,259		137
00698	Ash Draw	C	240		47
02323	Bader Gulch	C	83		20
02377	Badger Creek	C	40		8
02437	Badger Tract	C	40		7
22204	Baldwin Creek	C	640		47
22009	Bales Ranch Inc	C	80		11
02328	Banner	C	120		24
22011	Barbe Dorie J	C	120		13
32013	Barlow	C	89		13
02442	Barnum Mountain Rd.	C	2,735		277
02414	Barnum Mtn Road	C	40		8
22224	Barnum Mtn Spring	C	80		13
12236	Bates Creek	C	80		12
02475	Bayer Creek	C	120		34
12191	Bear Gulch	M	3,837		612
12168	Beartrap	C	483		76
12072	Beartrap Creek	I	2,171		249
22111	Beaver Creek	C	440		54
12157	Beaver Creek Slope	I	8,098		546
12041	Bed Springs Draw	C	358		23
02478	Beebee	C	320		211
22127	Bekebrede Draw	C	80		20
12209	Belle Fourche Tr	C	800		159
02288	Belus	C	120		30
22017	Belus Ranch	C	292		51
32019	Betz Alvin F.	C	185		21
02262	Billy Creek	C	280		44
12228	Billy Creek Camp	C	80		6
02324	Billy Creek School	C	40		10
22021	Bishop	M	8,632		1,483

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
12048	Bitter Creek	C	1,025		122
22022	Bittercreek	C	80		16
22028	Black Draw	C	2,581		300
12230	Black Stump Draw	C	200		50
42013	Blue Creek	M	2,221		223
12189	Bode Gulch	C	560		59
22210	Bone Pile Creek	C	241		45
02254	Box Elder Draw	C	71		8
32005	Bridge Draw	M	2,720		274
12219	Bright Spring Draw	C	240		61
02243	Brower Draw	C	310		30
12035	Brown Kennedy Ranch	M	2,122		501
12192	Bugher Draw	C	1510		123
12213	Bull Camp	M	2,475		252
02474	Bull Camp Canyon	C	315		24
22212	Bull Creek	C	2,713		250
32018	Bull Creek	C	278		40
12161	Burnt Hollow	I	13,790	AMP IMPLEMENTED	2,400
12046	Butcher	C	640		119
12047	Butcher Ranch	C	240		61
12208	Caballo Draw	C	680		113
02258	Cabin Canyon	C	2,366		356
02299	Cabin Creek	M	3,139		309
12049	Camblin	C	690		130
02289	Campbell Draw	C	413		56
22201	Carpenter Draw	C	760		81
02265	Carr	C	400		43
12053	Carson Dan	C	80		16
12052	Carson, O. And R.J.	C	240		37
02450	Carter Draw	C	220		30
12165	Carter Draw	C	880		45
12054	Cash	C	80		14
12177	Castle Rock	M	5,256		610
02376	Cat Creek	I	5,696		552
12175	Cates Draw	C	1,689		173
12057	Chabot, August, Et Al	C	280		19
02384	Chabot, August, Et Al	C	147		14
02468	Chalk Hills	C	203		29
12211	Charlie Draw	C	1,482		306
02290	Chicken Creek Divide	C	40		7
32020	Clark, Glen L	C	1,247		131
02398	Claypit, Trough Draw	C	1,120		132
02093	Clear Creek	C	396		39

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
12065	Clear Creek Grazing	C	908		92
12149	Coal Creek	C	117		18
12069	Cook	C	40		6
02248	Coon Track Creek	C	121		18
22027	Cordero Allotment	C	480		78
12024	Corral Creek	C	36		5
00754	Cotton	C	40		4
02424	Cottonwood (Knudson)	C	923		106
02261	Cottonwood Creek	C	120		26
22130	Cottonwood Creek E	C	80		12
12143	Cottonwood Creek I	C	160		47
02427	Cottonwood Draw	C	400		72
12179	Cottonwood Draw	C	1,020		105
02357	County Line	C	1,122		153
22132	Coutant Creek	C	320		39
12186	Cow Creek	C	2,706		251
22125	Cow's Face	C	360		24
12059	Craney Draw	M	0		0
12094	Crazy Woman Creek	C	760		80
12218	Crenshaw Hill	C	719		87
12090	Cromack Draw	C	427		93
02426	Crooked Creek	I	20,367	AMP IMPLEMENTED	2,694
22206	Cross H Creek	C	313		49
12184	Croton	M	1,028		174
02352	Cutler Draw	C	161		27
02332	Dabney	C	80		11
12074	Daly	C	120		22
12075	Daly Livestock Co.	C	6,138		1,107
02397	Davis Draw	M	788		81
12105	Davis Draw Common	M	970		156
02400	Davis Draw/Johnson Allotment	M	1,394		149
02322	Dead Horse	C	85		8
12176	Dead Horse Creek	I	9,119		993
22113	Dead Horse Creek Oilfield	C	1,261		216
12062	Deadman Draw	C	1,890		186
02396	Dean Graves	C	720		94
02267	Deep Creek	C	160		41
22102	Deer Creek	M	10,958		1,245
32004	Deer Creek I	C	80		10
12096	Deer Gulch	M	5,566		1,135

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
02270	Dixie Reece	C	263		30
02402	Donlin	C	501		134
12039	Drainage Draw	C	80		11
02412	Dry Creek	C	372		42
22229	Dry Creek Basin	C	79		14
12080	Dry Creek Ranch Inc.	M	4,948		1,074
02285	Dry Creek Res.	C	40		4
02250	Dry Fork	C	3,314		488
02341	Dry Fork P.R.	C	1,406		235
02407	Dry Muddy Creek	C	80		18
12144	Dry Trail Creek	C	2,086		389
02344	Dry Vee	M	4,442	AMP PROPOSED	911
02374	Duck Creek	C	41		12
22026	Duck Creek 2	C	217		60
02453	Dugout Creek	I	9,341		1,217
22124	Dull Knife	I	9,173		553
12031	Dull Knife Pass	M	5,047		603
02317	Dutch Creek	C	80		14
12200	E.K. Mountain	C	156		26
12037	East Fork	C	680		128
22225	East Spring Draw	M	5,683		550
12232	Echeta	C	320		37
02388	Eighty-Five Divide	C	1,319		328
12100	Eighty-Five Divide	M	1,679		384
12034	Elk Creek Road	C	40		8
12086	Elliot Curtis	C	114		24
12089	Elsom Brothers	C	1,760		133
12067	Encres Draw	C	40		7
22215	Erickson Draw	C	840		96
12139	Falxa	I	14,759	AMP IMPLEMENTED	1,546
12097	Fauber George	C	120		7
12162	Fence Creek	I	4,820	AMP IMPLEMENTED	655
14811	Figure 8	C	494		42
12099	Fitch Draw	M	1,840		250
32006	Flats	C	2,947		254
12078	Flying E	I	16,603		1,672
12066	Flying U Ranch	M	4,236		826
12045	Forest Tract	C	320		16
12151	Fort Creek	M	19,376		2,235
42001	Fortification Creek	C	894		102
22107	Fortin Draw	C	40		10
22109	Foster, Ralph T.	C	880		147
12076	Four Corners	M	2,109		422
22126	Four Horse	C	1,175		215
02242	Four Horse Creek	C	320		84
12050	Fourmile	M	4,879		433

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
02293	Fourmile 94	C	156		15
02379	Fourmile Ranch	I	7,595		623
12070	Fowler Draw	C	151		18
12088	Freeman Camp	C	800		32
02391	Freeman Draw	M	2,710		445
12079	Gammon Draw	C	37		9
22112	Garber Victor Et Al	C	280		62
02306	Gardner Lake	C	40		13
02476	Gardner Mt. (South)	M	1,622	AMP IMPLEMENTED	193
02336	Gates-Yonkee	C	560		86
22120	Gibbs Brothers	C	95		12
12085	Goble Draw	C	478		48
12226	Gold Mine Road	C	494		63
22121	Gordon	M	6,674		761
02335	Gordon Creek	I	2,118		285
02428	Gosney Airstrip	C	40		2
02395	Gosney, Elmer	C	278		61
12193	Government Draw	M	3,590		380
02421	Grandma's Bend	C	84		14
02360	Gray Cabin Draw	C	2,230		270
12174	Green Draw	C	160		29
32003	Green Hill	C	40		5
02469	Grub Draw	I	10,120		1,019
22129	Hamm Don Robert	C	362		77
12154	Hampshire	C	1,144		129
12134	Harlan James S.	C	441		24
12136	Harper George Mary	C	120		30
14812	Harper Reservoir	C	23		2
12147	Hat Ranch	M	6,573		493
32002	Hay Creek	C	80		26
02440	Healy	C	280		35
12153	Hepp Charles	M	2,404		228
12231	Hiligh	C	40		8
02443	Hill Prong	C	80		13
22114	Hines	C	120		24
12180	Hoblitt	C	140		23
12169	Hoe Ranch	I	15,279		1,676
02393	Hole In The Wall	I	9,000		738
22116	Holler Draw	C	482		62
02410	Homestead Draw 4150'	C	80		11
10342	Hope	I	3,423	AMP IMPLEMENTED	555
12240	Horse Creek	M	1,110		231
02434	Horse Creek	C	2,071		427
02423	Horse Creek/ Pipeline	C	40		8
02327	Horseshoe Ranch	C	880		24

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
02461	HQ and Taylor Spring	C	912		101
02415	Indian Creek	M	2,587		301
02274	Ivy Creek	C	83		8
12061	Jackplane	C	2,664		266
02394	Jeep Trail	C	200		20
02320	Jeffers Draw	C	39		6
12158	Jiggs Reservoir	C	117		28
02257	Jim Crow Creek	C	597		113
02460	Johnson Creek	C	354		31
02401	Johnson Draw	C	2,288		232
02382	Jones Draw	C	40		6
02447	K Ranch	C	1,361		187
12148	Kaycee L And L	C	761		43
02251	Keathley Draw	C	385		39
12178	Kendrick	M	5,351		874
02277	Keyes Draw	C	79		9
22202	Kingsbury/Wild Horse	C	160		32
12038	Kline Draw	C	400		43
12056	Kurtley Draw	C	1,277		135
02364	Lanabaugh No. 4 Draw	C	40		10
02301	Larey Draw	C	2,320		385
02347	Lariat	C	200		20
22108	Larrechea	C	280		48
12190	Lawrence Charles	C	2,838		285
12188	Lawrence Land Co. Inc.	C	165		19
12023	Lawver	M	4,646		815
12194	Legerski Ranch	C	359		72
02325	Linch	C	1,441		173
12197	Linch	C	80		15
02305	Linn Draw	C	1,440		236
12198	Little Bighorn Ranch	C	40		8
12233	Little Cedar Draw	C	200		28
32007	Little Poison Creek	C	2,244		218
02358	Little Powder River	M	3,711		750
02279	Little Rawhide	C	40		10
02310	Little Willow	I	6,080	AMP IMPLEMENTED	823
02307	Little Youngs Creek	C	169		34
22123	Lone Tree	C	40		7
02343	Long Draw	C	719		99
02466	Lower Willow Glen	C	80		11
02355	Lx Bar	C	1,230		126
02368	Mark Gordon	C	1,282		132
02445	Marton	C	41		7

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
02309	Mary Straatsma Est.	C	40		6
22221	Maycock Draw	C	719		72
02406	Mayer	C	98		12
02346	Mayor	I	3,157		384
12032	Mayoworth S. Of Sdw	C	240		20
02370	Meadow Creek	M	2,355		248
02303	Meadow Draw	C	160		16
12227	Michelena	M	3,405	AMP PROPOSED	348
22055	Mickelberry Creek	C	160		16
12030	Middleberry Draw	C	1,778		178
14952	Mitchell Breaks	M	2,268	AMP IMPLEMENTED	391
02429	Mitchell Draw	M	4,306		419
12140	Montgomery	C	1,861		204
00749	Moore Reservoir	C	40		8
12235	Moore, James R.	C	3,971		782
02408	Moriarty, Jack L.	C	40		8
02435	Morris Draw	C	1,272		144
22029	Mosier Gulch	M	160		41
02373	Mountain	I	8,390	AMP IMPLEMENTED	778
02446	Mountain	C	1,846		223
02449	Mountain (Elm)	C	241		35
02338	Mountain East	C	260		26
02367	Mud Spring Creek	C	80		16
22223	Muddy Creek	C	40		18
22128	Mumma Draw	C	240		54
02354	Murray Draw	C	40		8
02362	N. Fork 9 Mile Creek	C	283		40
02431	N. Gray Cabin Draw	C	723		87
32014	N. Windmill	I	2,074	AMP IMPLEMENTED	276
02418	N. Fork Powder R.	C	212		34
02340	N. Leiter	C	117		40
02444	N. Scotch	C	201		105
02092	N. Cottonwood Cr.	C	79		23
02348	Napier	M	3,242		529
12095	Neil Butte	C	40		6
12238	Niedringhaus Lambert	C	440		24
02425	Ninemile	C	40		5
12081	Nipple Butte	C	1,928		389
02239	Norfolk John	M	1,840		299
22119	North Mitten	C	103		21

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
02363	North Ridge	C	335		57
02295	North Trabling	M	560		78
02436	North West - Iberlin	C	320		32
22008	Number Two Draw	C	1,078		170
02457	OK Creek	C	2,302		216
02390	Olmstead	I	832	AMP IMPLEMENTED	179
02058	Olsen Draw	C	4,892		592
02249	Osborn	C	280		39
02287	Padlock Ranch Co.	C	440		88
12068	Pass Reservoir	C	1,225		118
02405	Peterson Draw	C	2,736		335
12156	Petrified Tree	M	1,867		218
12159	Phinney Draw	C	878		91
02413	Pine Ridge	C	720		76
12166	Pine Ridge	C	240		49
02454	Pine Ridge	C	320		27
02256	Pinette Draw	C	200		48
12229	Piney Creek	C	40		7
02252	Ploesser	C	385		38
02472	Plosser	C	415		47
02441	Plum Creek Draw	C	390		84
32012	Pointed Butte	C	40		11
12195	Poison Creek	M	1,315		148
02419	Poker Creek	I	3,697	AMP IMPLEMENTED	837
02404	Pollard Draw	C	798		79
02430	Powder River	I	4,526	AMP IMPLEMENTED	944
02260	Powder River Ranch	I	17,085		1,779
02422	Prairie Creek	C	38		13
02350	Prong	C	534		92
12164	Prong Spotted Horse	C	2,129		271
22226	Pugsley Hill	C	40		6
12138	Pumpkin Creek	I	13,325		1,454
12172	Quinn, John, Bonnie	C	40		7
02264	Rafter L.	C	1,514		238
02266	Ramsbottom	M	7,189		430
02319	Rattlesnake Creek	C	40		12
12098	Rattlesnake Springs	C	432		46
12040	RBL	C	360		43
12171	Read Draw	C	40		4
02269	Reclusa	C	160		42
12051	Red Canyon	C	2,264		270
02365	Red Draw	M	2,115		128

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
12033	Red Fork	I	10,000	AMP IMPLEMENTED	917
02409	Red Fork Mtn Camp	C	203		7
02253	Red Hills	C	759		127
02416	Red Wall	C	459	AMP IMPLEMENTED	78
02271	Reece Ernest	M	2,715		414
02330	Reel	C	40		6
02275	Remington Creek	M	2,676	AMP IMPLEMENTED	290
02385	Reno	C	160		16
02268	Reno Draw	C	558		63
22205	Robinson Draw	C	69		9
12155	Robinson Place	C	630		68
02329	Rochelle Hills	C	80		12
12087	Rock Ridge	C	1,360		93
02321	Rocky Butte	C	2,075		367
12118	Rosie Draw	C	200		29
02491	Rossnecker Draw	C	42		6
02278	Rourke & Offutt	C	477		125
02263	Rozet	C	40		8
02465	Ryan	C	160		46
02259	S. Wyodak	C	120		32
02386	S. Fork Otter Creek	C	120		17
02452	S. Gillette Forty	C	40		10
22203	S. Leiter	C	1,457		146
02372	S.F. Crazy Woman	C	80		14
02281	S.F. Three Bar	C	215		43
22110	Sahara Draw	C	120		20
02411	Salt Creek	M	4,249		551
02272	Sand Rock/Hoe Creek	C	74		11
00743	Sawmill	C	240		12
12185	Schiermiester	C	800		114
22122	School Sec Dr/Mdlfrk	C	160		27
12073	School Section Draw	C	478		43
22214	Schoonover Ranch	I	12,482	AMP IMPLEMENTED	1,528
12137	Scotch	C	200		10
02353	Scott Draw	C	306		32
02286	Scott Marion	C	560		124
12083	Scotty Draw	C	4,500		624
02276	Se Of Buffalo Creek	C	1,140		152
02369	Senff Ditch	C	80		13
02463	SF Holler Draw	C	280		26
02375	S. Fork Arkansas Creek	C	200		36
02292	Simpson, John H.	C	1,156		198

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
02471	Sioux Battle	C	241		26
02459	Sippie Mine	C	520		53
02291	Skidmore Estate	C	26		9
02371	Slope	I	3,960	AMP IMPLEMENTED	1,044
02399	Slope/Mountain, Allotment	C	2,032		256
02297	Smith	C	322		34
02300	Smith	C	120		23
32010	Smith Creek	C	160		10
02383	Smith Cut	C	3,235		615
02294	Soldier Creek Ranch	C	1,343		229
02495	Sony Draw	M	5,101		513
02498	South Carpenter Draw	C	240		2
02451	South Fork	I	7,466		726
02389	South Fork Powder R.	M	4,890		380
02280	South Middle Butte	C	639		67
12183	South Middle Prong	C	640		73
02467	South Sussex Stkrst	C	27		14
00744	South Tabletop	C	120		15
02296	South Trabing	M	1,039		111
02351	South Twin Creek	C	200		33
22220	Spellman	C	1,278		163
02477	Spotted Horse Creek	C	961		105
02241	Spring Creek	C	1,231		287
22025	Squaw Butte	C	40		11
02298	Squaw Creek	M	2,566		289
02255	Stateline	C	71		18
12131	Steel Creek	C	200		20
02308	Stephenson, Marie	C	80		20
02387	Stone Draw	C	80		20
12160	Stotts Draw	C	1,934		193
02312	Stuart, James R.	C	80		16
02403	Stubbs Draw	C	493	AMP IMPLEMENTED	69
02313	Suel Anna Trustee	C	200		40
12167	Sussex Cutoff	I	1,318		105
12133	Sussex Oil Company	C	920		46
02420	Sussex Stockrest	I	305		50
02316	Swartz, Edward H.	M	2,480		621
02438	T.W.	I	1,840	AMP IMPLEMENTED	184
12141	Tabletop	C	80		8

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
12145	Tarver Trust	C	689		128
02458	Td Southwest	C	120		20
02333	Thom Brothers	C	31		4
02349	Three Mile Creek	C	441		90
12101	Threemile Creek Reservoir	C	80		18
02337	Throne John And Earl	C	120		24
02432	Timar East	C	1,122		116
12199	Timber Draw	C	74		10
02494	Tipperary	C	360		38
22213	Tongue River	I	1,767	AMP IMPLEMENTED	476
02339	Trail Creek	M	7,244		2,624
02417	Trail Side	C	40		14
12043	Trough Draw	C	760		34
00697	Truman Draw	M	2,032		347
02282	Ttt	M	14,155		1,563
02456	Tuttle Draw	C	320		92
02470	Tuttle Draw/Deep Crk	C	554		154
12187	Twenty Mile Creek	I	6,100		808
12142	Tyree Place	C	40		8
02448	Upper Cabin Creek	C	240		43
02273	Upper Fort Creek	C	920		205
12152	Upper Grub	C	1,640		164
12207	Upper Kaufman Draw	M	1920		262
12163	Ute Creek	C	117		17
02284	V Bar F	M	2,797		364
02345	Vanderhoff	C	360		26
02311	Vanhouten	M	1,057		107
12077	W. Sussex (Hickey)	I	3,320		483
02381	Wagensen Don Et Al	C	80		20
22106	Wagonhammer	M	3,881	AMP IMPLEMENTED	1,352
02492	Walker Draw	C	440		48
12146	Wall (East)	C	1,840		247
22104	Walsh	C	340		34
02304	Washout Dr.	M	1,859		315
02318	Water Gap Draw	M	9,043		1,127
02356	Watt Ranch	C	46		6
12181	West Bowman Hill	C	2,311		522
02490	West Coutant Creek	C	80		14
02462	West Fork	C	240		26
12091	West Timber Creek	C	240		32

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Type Management	Permitted Use (AUMs)
02170	West Timber Draw	C	960		100
12063	Weston SW	M	4,435		829
02326	White Rock	C	440		58
02247	White Tail Creek	C	200		62
12237	Whitetail Creek	M	3,391		751
22222	Whitetail Pines	M	1,493		299
02455	Whitmeyer	C	120		21
02302	Whitmeyer Creek	C	40		6
12082	Wild Horse Creek	C	120		24
32015	Wild Horse Creek	C	80		8
02283	Wildcat	C	80		16
10069	Willow Creek	I	26,822		4,412
12036	Willow Creek	C	2,715		462
02331	Winter Draw	C	40		6
12216	Wolf Mountain	C	515		57
02380	Wormwood Ranch	I	20,699	AMP IMPLEMENTED	2,497
12042	Wyarno	C	120		24
02334	Wythom Road	C	120		20
12150	Yellowhammer	M	1,776		206
Source: BLM 2009a AMP Allotment Management Plan AUM Animal Unit Month C Custodial I Improve M Maintain					

E.2. Standards and Guidelines Status

Table E.2. Summary of Standards and Guidelines Evaluations

Allotment Name	Allotment Number	Year Completed	Progress	Standard ^{1, 2}					
				1	2	3	4	5	6
Bear Gulch	12191	2006		Y	Y	Y	Y	U	U
Beartrap Creek	12072	2000		Y	Y	Y	Y	U	U
Beaver Creek Slope	12157	2002		Y	Y	Y	Y	U	U
Bishop	22021	2001		Y	Y	Y	Y	U	U
Bridge Draw	32005	2006		Y	Y	Y	Y	U	U
Bull Camp	12213	2005		Y	Y	Y	Y	U	U
Butcher	12046	2007		Y	Y	Y	Y	U	U
Cabin Creek	02299	2003		Y	Y	Y	Y	U	U
Castle Rock	12177	2007		Y	Y	Y	Y	U	U

Allotment Name	Allotment Number	Year Completed	Progress	Standard ^{1, 2}					
				1	2	3	4	5	6
Castle Rock	12177	2007		Y	Y	Y	Y	U	U
Cat Creek	02376	2002		Y	Y	Y	Y	U	U
Clear Creek	02093	2008		Y	Y	Y	Y	U	U
Crooked Creek	02426	1999		Y	Y	Y	Y	U	U
Croton	12184	2006		Y	Y	Y	Y	U	U
Daly	12074	2007		Y	Y	Y	Y	U	U
Daly Livestock Co.	12075	2007		Y	Y	Y	Y	U	U
Davis Draw	02397	2005		Y	Y	Y	Y	U	U
Davis Draw Common	12105	2005	Y	N	Y	N	Y	U	U
Davis Draw/Johnson Allotment	02400	2005		Y	Y	Y	Y	U	U
Dead Horse Creek	12176	1999		Y	Y	Y	Y	U	U
Deer Creek	22102	2000		Y	Y	Y	Y	U	U
Deer Gulch	12096	2002		Y	Y	Y	Y	U	U
Donlin	02402	2001		Y	Y	Y	Y	U	U
Dry Creek Ranch Inc.	12080	2005		Y	Y	Y	Y	U	U
Dugout Creek	02453	1999		Y	Y	Y	Y	U	U
Dull Knife	22124	2002		Y	Y	Y	Y	U	U
Dull Knife Pass	12031	2005		Y	Y	Y	Y	U	U
Eagle Creek	02344	1998		Y	Y	Y	Y	U	U
East Spring Draw	22225	2006		Y	Y	Y	Y	U	U
Eighty-Five Divide	12100	2005		Y	Y	Y	Y	U	U
Elsom Brothers	12089	2001		Y	Y	Y	Y	U	U
Falxa	12139	1999		Y	Y	Y	Y	U	U
Fence Creek	12162	1999		Y	Y	Y	Y	U	U
Fitch Draw	12099	1999		Y	Y	Y	Y	U	U
Flying E	12078	1998		Y	Y	Y	Y	U	U

Allotment Name	Allotment Number	Year Completed	Progress	Standard ^{1, 2}					
				1	2	3	4	5	6
Flying U Ranch	12066	2006		Y	Y	Y	Y	U	U
Fort Creek	12151	2002		Y	Y	Y	Y	U	U
Four Corners	12076	2005		Y	Y	Y	Y	U	U
Fourmile	12050	2006		Y	Y	Y	Y	U	U
Fourmile Ranch	02379	2002		Y	Y	Y	Y	U	U
Gardner Mt. (South)	02476	1999		Y	Y	Y	Y	U	U
Gordon	22121	2002		Y	Y	Y	Y	U	U
Gordon Creek	02335	1999		Y	Y	Y	Y	U	U
Gov-ernment Draw	12193	2008		Y	Y	Y	Y	U	U
Grub Draw	02469	2001		Y	Y	Y	Y	U	U
Hat Ranch	12147	2004		Y	Y	Y	Y	U	U
Hepp Charles	12153	2005		Y	Y	Y	Y	U	U
Hoe Ranch	12169	2000		Y	Y	Y	Y	U	U
Hole In The Wall	02393	2002	Y	Y	N	N	Y	U	U
Hope	10342	1999		Y	Y	Y	Y	U	U
Horse Creek	02434	2007		Y	Y	Y	Y	U	U
Indian Creek	02415	2006		Y	Y	Y	Y	U	U
Jackplane	12061	2008		Y	Y	Y	Y	U	U
Johnson Draw	02401	2008		Y	Y	Y	Y	U	U
Kendrick	12178	2006		Y	Y	Y	Y	U	U
Lawver	12023	2007		Y	Y	Y	Y	U	U
Little Powder River	02358	2001		Y	Y	Y	Y	U	U
Little Willow	02310	2002		Y	Y	Y	Y	U	U
M. Gordon	02368	2008		Y	Y	Y	Y	U	U
Mayor	02346	2001		Y	Y	Y	Y	U	U
Meadow Creek	02370	2006		Y	Y	Y	Y	U	U
Michelena	12227	2004		Y	Y	Y	Y	U	U
Mitchell Draw	02429	2006		Y	Y	Y	Y	U	U
Morris Draw	02435	2008		Y	Y	Y	Y	U	U
Mosier Gulch	22029	2006		Y	Y	Y	Y	U	U

Allotment Name	Allotment Number	Year Completed	Progress	Standard ^{1, 2}					
				1	2	3	4	5	6
Mountain	02373	1999		Y	Y	Y	Y	U	U
N	32014	1998		Y	Y	Y	Y	U	U
Windmill									
Napier	02348	2006		Y	Y	Y	Y	U	U
North Trabling	02295	2004		Y	Y	Y	Y	U	U
Olmstead	02390	1998		Y	Y	Y	Y	U	U
Olsen Draw	02058	2007		Y	Y	Y	Y	U	U
Petrified Tree	12156	2004		Y	Y	Y	Y	U	U
Plosser	02472	2008		Y	Y	Y	Y	U	U
Poison Creek	12195	2005		Y	Y	Y	Y	U	U
Poker Creek	02419	1999		Y	Y	Y	Y	U	U
Powder River	02430	1998		Y	Y	Y	Y	U	U
Powder River Ranch	02260	2003		Y	Y	Y	Y	U	U
Pumpkin Creek	12138	2001		Y	Y	Y	Y	U	U
Red Draw	02365	2006		Y	Y	Y	Y	U	U
Red Fork	12033	1999		Y	Y	Y	Y	U	U
Reece Ernest	02271	2006		Y	Y	Y	Y	U	U
Remington Creek	02275	2008		Y	Y	Y	Y	U	U
Rock Ridge	12087	2006		Y	Y	Y	Y	U	U
Salt Creek	02411	2005		Y	Y	Y	Y	U	U
Schiermister	12185	2008		Y	Y	Y	Y	U	U
Schoono-ver Ranch	22214	1998		Y	Y	Y	Y	U	U
Sioux Battle	02471	2003	Y	Y	Y	N	Y	U	U
Slope	02371	1999		Y	Y	Y	Y	U	U
Sony Draw	02495	2006		Y	Y	Y	Y	U	U
South Fork	02451	2003		Y	Y	Y	Y	U	U
South Fork Powder R.	02389	2000		Y	Y	Y	Y	U	U
South Trabling	02296	2004		Y	Y	Y	Y	U	U
Squaw Creek	02298	2005		Y	Y	Y	Y	U	U
Stubbs Draw	02403	1999		Y	Y	Y	Y	U	U

Allotment Name	Allotment Number	Year Completed	Progress	Standard ^{1, 2}					
				1	2	3	4	5	6
Sussex Cutoff	12167	2000		Y	Y	Y	Y	U	U
Sussex Stockrest	02420	2000		Y	Y	Y	Y	U	U
Swartz, Edward H.	02316	2007		Y	Y	Y	Y	U	U
T.W.	02438	1998		Y	Y	Y	Y	U	U
Timar East	02432	2004		Y	Y	Y	Y	U	U
Trail Creek	02339	2006		Y	Y	Y	Y	U	U
Trough Draw	12043	2008		Y	Y	Y	Y	U	U
Ttt	02282	2000		Y	Y	Y	Y	U	U
Twenty Mile Creek	12187	2000		Y	Y	Y	Y	U	U
Upper Grub	12152	2005		Y	Y	Y	Y	U	U
Upper Kaufman Draw	12207	2006		Y	Y	Y	Y	U	U
V Bar F	02284	2006		Y	Y	Y	Y	U	U
Van-houten	02311	2003		Y	Y	Y	Y	U	U
W. Sussex (Hickey)	12077	2001		Y	Y	Y	Y	U	U
Wag-onhammer	22106	1998		Y	Y	Y	Y	U	U
Washout Dr.	02304	2005		Y	Y	Y	Y	U	U
Water Gap Draw	02318	2005		Y	Y	Y	Y	U	U
Whitetail Creek	12237	2001		Y	Y	Y	Y	U	U
Whitetail Pines	22222	2002		Y	Y	Y	Y	U	U
Willow Creek	10069	2004		Y	Y	Y	Y	U	U
Worm-wood Ranch	02380	1998		Y	Y	Y	Y	U	U

Allotment Name	Allotment Number	Year Completed	Progress	Standard ^{1, 2}					
				1	2	3	4	5	6
Yel-lowham-mer	12150	2004		Y	Y	Y	Y	U	U
Source(s): BLM 1998 - 2008									
¹ Codes in Progress and Standard columns are as follows: Y Yes meets standard N No does not meet standard U Unknown									
² Standards 5 and 6 are dependent upon determinations made by the Wyoming Department of Environmental Quality (DEQ). Standard 5 is Unknown if allotment specific data is not available. Wyoming DEQ has not identified air quality impairments within the Buffalo Field Office resulting in Standard 6 being met.									

E.3. Livestock Grazing Allotments Within Greater Sage-Grouse Habitat

Table E.3. Grazing Allotments within 4.0 Miles of Occupied Greater Sage-Grouse Leks

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
12182	4mile Creek/RC	C	369		41	
02378	76 Creek	C	200		33	X
02314	Adon	C	40		6	
22115	Allemand	C	1,520		184	X
02246	Anderson Draw	C	178		21	
12173	Antelope Basin	C	449		47	X
02366	Antelope Draw	C	40		6	X
02493	Armstrong Prong	C	223		51	X
02433	Arpan Butte	C	1,259		137	X
00698	Ash Draw	C	240		47	X
02323	Bader Gulch	C	83		20	
02377	Badger Creek	C	40		8	X
02437	Badger Tract	C	40		7	X
22204	Baldwin Creek	C	640		47	
22009	Bales Ranch Inc	C	80		11	X
02328	Banner	C	120		24	
22011	Barbe Dorie J	C	120		13	X
32013	Barlow	C	89		13	X
02442	Barnum Mountain Road	C	2,735		277	

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
02414	Barnum Mtn. Road	C	40		8	
22224	Barnum Mtn. Spring	C	80		13	
12236	Bates Creek	C	80		12	
02475	Bayer Creek	C	120		34	
12191	Bear Gulch	M	3,837		612	
12168	Beartrap	C	483		76	
12072	Beartrap Creek	C	2,171		249	
22111	Beaver Creek	C	440		54	
12157	Beaver Creek Slope	I	8,098		546	
12041	Bed Spring Draw	C	358		23	X
02478	Beebee	C	320		211	
22127	Bekebrede Draw	C	80		20	X
12209	Belle Fourche Tr.	C	800		159	X
02288	Belus	C	120		30	
22017	Belus Ranch	C	292		51	X
32019	Betz Alvin F	C	185		21	X
02262	Billy Creek	C	280		44	
12228	Billy Creek Camp	C	80		6	
02324	Billy Creek School	C	40		10	
22021	Bishop	C	8,632		1,483	X
12048	Bitter Creek	C	1,025		122	
22022	Bittercreek	C	80		16	
22028	Black Draw	C	2,581		300	
12230	Black Stump Draw	C	200		50	
42013	Blue Creek	C	2,221		223	
12189	Bode Gulch	C	560		59	
22210	Bone Pile Creek	C	241		45	X
02254	Box Elder Draw	C	71		8	X
32005	Bridge Draw	C	2,720		274	X
12219	Bright Spring Draw	C	240		61	X
02243	Brower Draw	C	310		30	X
12035	Brown Kennedy Ranch	M	2,122		501	X
12192	Bugher Draw	C	1,510		123	X
12213	Bull Camp	M	2,475		252	

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
02474	Bull Camp Canyon	C	315		24	
22212	Bull Creek	C	2,713		250	
32018	Bull Creek	C	278		40	
12161	Burnt Hollow	I	13,790		2,400	X
12046	Butcher	C	640		119	X
12047	Butcher Ranch	C	240		61	X
12208	Caballo Draw	C	680		113	X
02258	Cabin Canyon	C	2,366		356	X
02299	Cabin Creek	M	3,139		309	X
12049	Camblin	C	690		130	X
02289	Campbell Draw	C	413		56	X
22201	Carpenter Draw	C	760		81	X
02265	Carr	C	400		43	X
12053	Carson, Dan	C	80		16	X
12052	Carson, O. and R.J.	C	240		37	X
02450	Carter Draw	C	220		30	X
12165	Carter Draw	C	880		45	X
12054	Cash	C	80		14	X
12177	Castle Rock	M	5,256		610	X
02376	Cat Creek	I	5,696		552	X
12175	Cates Draw	C	1,689		173	X
12057	Chabot August Et Al	C	280		19	X
02384	Chabot August Et Al	C	147		14	
02468	Chalk Hills	C	203		29	X
12211	Charlie Draw	C	1,482		306	X
02290	Chicken Creek Divide	C	40		7	X
32020	Clark, Glen L.	C	1,247		131	X
02398	Claypit	C	1,120		132	X
02093	Clear Creek	C	396		39	X
12065	Clear Creek Grazing	C	908		92	X
12149	Coal Creek	C	117		18	X
12069	Cook	C	40		6	X
02248	Coon Track Creek	C	121		18	X
22027	Codero Allotment	C	480		78	X
12024	Corral Creek	C	36		5	X
00754	Cotton	C	40		4	X
02424	Cottonwood (Knudson)	C	923		106	X

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
022661	Cottonwood Creek	C	120		26	X
22130	Cottonwood Creek E	C	80		12	X
12143	Cottonwood Creek I	C	160		47	X
02427	Cottonwood Draw	C	400		72	X
12179	Cottonwood Draw	C	1,020		105	X
02357	County Line	C	1,122		153	X
22132	Coutant Creek	C	320		39	X
12186	Cow Creek	C	2,706		251	X
22125	Cow's Face	C	360		24	
12094	Crazy Woman Creek	C	760		80	X
12218	Crenshaw Hill	C	719		87	X
12090	Cromack Draw	C	427		93	X
02426	Crooked Creek	I	20,367	AMP Implemented	2694	X
22206	Cross H Creek	C	313		49	X
12184	Croton	M	1,028		174	X
02352	Cutler Draw	C	161		27	
02332	Dabney	C	80		11	X
12074	Daly	C	120		22	
12075	Daly Livestock Co.	C	6,138		1107	X
02397	Davis Draw	M	788		81	X
12105	Davis Draw common	M	970		156	X
02400	Davis Draw/Johnson	M	1,394		149	X
02322	Dead Horse	C	85		8	
12176	Dead Horse Creek	I	9,119		993	X
22113	Dead Horse Creek Oilfield	C	1,261		216	X
12062	Deadman Draw	C	1,890		186	
02396	Dean Graves	C	720		94	
02267	Deep Creek	C	160		41	X
22102	Deer Creek	M	10,958		1245	X
32004	Deer Creek I	C	80		10	X
12096	Deer Gulch	M	5,566		1135	X
02270	Dixie Reese	C	263		30	X
02402	Donlin	C	501		134	
12039	Drainage Draw	C	80		11	X
02412	Dry Creek	C	372		42	

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
22229	Dry Creek Basin	C	79		14	X
12080	Dry Creek Ranch	C	4,948		1074	X
02285	Dry Creek Res	C	40		4	X
02250	Dry Fork	C	3,314		488	X
02341	Dry Fork P.R.	C	1,406		235	X
02407	Dry Muddy Creek	C	80		18	
12144	Dry Trail Creek	C	2,086		389	X
02344	Dry Vee	M	4,442	AMP PROPOSED	911	X
02374	Duck Creek	C	41		12	X
22036	Duck Creek 2	C	217		60	
02453	Dugout Creek	I	9,341		1217	
22124	Dull Knife	I	9,173		553	
12031	Dull Knife Pass	M	5,047		603	X
02317	Dutch Dreek	C	80		14	
12200	E.K. Mountain	C	156		26	X
12037	East Fork	C	680		128	X
22225	East Spring Draw	M	5,683		550	X
12232	Echeta	C	320		37	X
02388	Eightyfive Divide	C	1,319		328	X
12100	Eighty-five Divide	M	1,679		384	X
12034	Elk Creek Road	C	40		8	X
12086	Elliot Curtis	C	114		24	
12089	Elsom Brothers	C	1,760		133	
12067	Encres Draw	C	40		7	X
22215	Erickson Draw	C	840		96	X
12139	Falxa	I	14,759	AMP Implemented	1,546	X
12097	Fauber George	C	120		7	
12162	Fence Creek	I	4,820	AMP Implemented	655	X
14811	Figure 8	C	494		42	X
12099	Fitch Draw	M	1,840		250	X
32006	Flats	C	2947		254	X
12078	Flying E	I	16,603		1,672	X
12066	Flying U Ranch	M	4,236		826	
12045	Forest Tract	C	320		16	
12151	Fort Creek	M	19,376		2,235	X
42001	Fortification Creek	C	894		102	
22107	Fortin Draw	C	40		10	X

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
22109	Foster, Ralph	C	880		147	X
12076	Four Corners	M	2,109		422	X
22126	Four Horse	C	1,175		215	X
02242	Four Horse Creek	C	320		84	X
12050	Fourmile	M	4,879		433	X
02293	Fourmile 94	C	156		15	
02379	Fourmile Ranch	I	7,595		623	X
12070	Fowler Draw	C	151		18	X
12088	Freeman Camp	C	800		32	
02391	Freeman Draw	M	2,710		445	
12079	Gammon Draw	C	37		9	
22112	Garber Victor Et Al	C	280		62	
02306	Gardner Lake	C	40		13	X
02476	Gardner Mt. (South)	M	1,622	AMP Implemented	193	X
02336	Gates-Yonkee	C	560		86	X
22120	Gibbs Brothers	C	95		12	
12085	Goble Draw	C	478		48	X
12226	Gold Mine Road	C	494		63	
22121	Gordon	M	6,674		761	X
02335	Gordon Creek	I	2,118		285	
02428	Gosney Airstrip	C	40		2	X
02395	Gosney, Elmer	C	278		61	X
12193	Government Draw	M	3,590		380	X
02421	Grandma's Bend	C	84		14	X
02360	Gray Cabin Draw	C	2,230		270	X
12174	Green Draw	C	160		29	X
32003	Green Hill	C	40		5	X
02469	Grub Draw	I	10,120		1019	X
22129	Hamm Don Robert	C	362		77	X
12154	Hampshire	C	1,144		129	X
12134	Harlan James S	C	441		24	
14812	Harper Reservoir	C	23		2	X
12147	Hat Ranch	M	6,573		493	X
32002	Hay Creek	C	80		26	X
02440	Healy	C	280		35	X
12153	Hepp Charles	M	2,404		228	X
12231	Hilight	C	40		8	

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
02443	Hill Prong	C	80		13	X
2213	Hines	C	120		24	X
12180	Hoblitt	C	140		23	X
12169	Hoe Ranch	I	15,279		1676	X
02393	Hole In The Wall	I	9,000		738	X
22116	Holler Draw	C	482		62	X
02410	Homestead Draw 4150'	C	80		11	X
10342	Hope	I	3,423	AMP Implemented	555	X
12240	Horse Creek	M	1,110		231	X
02434	Horse Creek	C	2,071		427	X
02434	Horse Creek/ Pipeline	C	40		8	X
02327	Horseshoe Ranch	C	880		24	
02461	HQ and Taylor Spring	C	912		101	X
02415	Indian Creek	M	2,587		301	X
02274	Ivy Creek	C	83		8	X
12061	Jackplane	C	2,664		266	X
02394	Jeep Trail	C	200		20	X
02320	Jeffers Draw	C	39		6	X
12158	Jiggs Reservoir	C	117		28	X
02257	Jim Crow Creek	C	597		113	X
02460	Johnson Creek	C	354		31	
02401	Johnson Draw	C	2,288		232	
02382	Jones Draw	C	40		6	
02447	K Ranch	C	1,361		187	
12148	Kaycee L and L	C	761		43	
02251	Keathley Draw	C	385		39	X
12178	Kendrick	M	5,351		874	X
02277	Keyes Draw	C	79		9	X
22202	Kingsbury/ Wild Horse	C	160		32	X
12038	Kline Draw	C	400		43	X
12056	Kurtley Draw	C	1,277		135	
02364	Lanabaugh No. 4 Draw	C	40		10	
02301	Larey Draw	C	2,310		385	X
02347	Lariat	C	200		20	
22108	Larrechea	C	280		48	X
12190	Lawrence Charles	C	2838		285	X

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
12188	Lawrence Land Co. Inc	C	165		19	X
12023	Lawver	M	4646		815	X
12194	Legerski Ranch	C	359		72	
02325	Linch	C	1441		173	X
12197	Linch	C	80		15	
02305	Linn Draw	C	1440		236	X
12198	Little Bighorn Ranch	C	40		8	
12233	Little Cedar Draw	C	200		28	X
32007	Little Poison Creek	C	2244		218	
02358	Little Powder River	M	3711		750	X
02279	Little Rawhide	C	40		10	X
02310	Little Willow	I	6080	AMP Implemented	823	X
02307	Little Youngs Creek	C	169		34	X
22123	Lone Tree	C	40		7	X
02343	Long Draw	C	719		99	X
02466	Lower Willow Glen	C	80		11	
02355	LX Bar	C	1,230		126	X
02368	Mark Gordon	C	1,282		132	X
02445	Marton	C	41		7	
02309	Mary Straatsma Est.	C	40		6	X
22221	Maycock Draw	I	719		72	X
02406	Mayer	C	98		12	X
02346	Mayor	C	3,157		384	
12032	Mayoworth S. of SDW	C	240		20	X
02370	Meadow Creek	M	2,355		248	X
02303	Meadow Draw	C	160		16	
12227	Michelena	M	3,405	AMP Proposed	348	X
22055	Mickelberry Creek	C	160		16	
12030	Middleberry Draw	C	1,778		178	
14952	Mitchell Breaks	M	2,268	AMP Implemented	391	
02429	Mitchell Draw	M	4,306		419	X
12140	Montgomery	C	1,861		204	X
00749	Moore Reservoir	C	40		8	X

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
12235	Moore, James R	C	3,971		782	X
02408	Moriarty, Jack L.	C	40		8	X
02435	Morris Draw	C	1,272		144	X
22029	Mosier Gulch	M	160		41	
02373	Mountain	I	8,390	AMP Implemented	778	X
02446	Mountain	C	1,846		223	
02449	Mountain (Elm)	C	241		35	
02338	Mountain East	C	260		26	
02367	Mud Spring Creek	C	80		16	
22223	Muddy Creek	C	40		18	
22128	Mumma Draw	C	240		54	X
02354	Murray Draw	C	40		8	X
02362	N Fork 9 Mile Creek	C	283		40	
02431	N Gray Cabin Creek	C	723		87	X
32014	N Windmill	I	2,074	AMP Implemented	276	X
02418	N. Fork Powder R.	C	212		34	
02340	N. Leiter	C	117		40	X
02444	N. Scotch	C	201		83	
02092	N. Cottonwood Cr.	C	79		23	X
02348	Napier	M	3,242		529	X
12095	Neil Butte	C	40		6	X
12238	Niedringhaus Lambert	C	440		24	
02425	Ninemile	C	40		5	X
12081	Nipple Butte	C	1,928		389	X
02239	Norfolk John	M	1,840		299	
22119	North Mitten	C	103		21	X
02363	North Ridge	C	335		57	
02295	North Trabing	M	560		78	
02436	North-West Iberlin	C	320		32	X
22008	Number Two Draw	C	1,078		170	X
02457	OK Creek	C	2,302	AMP Implemented	216	X
02390	Olmstead	I	832		179	X
02058	Olsen Draw	C	4,862		592	X
02249	Osborn	C	280		39	X

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
02287	Padlock Ranch Co.	C	440		88	X
12068	Pass Reservoir	C	1,225		118	X
02405	Peterson Draw	C	2,736		335	X
12156	Petrified Tree	M	1,867		218	X
12159	Phinney Draw	C	878		91	X
02413	Pine Ridge	C	720		76	X
12166	Pine Ridge	C	240		49	
02454	Pine Ridge	C	320		27	X
02256	Pinette Draw	C	200		48	X
12229	Piney Creek	C	40		7	X
02252	Ploesser	C	385		38	X
02472	Plosser	C	415		47	X
02441	Plum Creek Draw	C	390		84	X
32012	Pointed Butte	C	40		11	X
12195	Poison Creek	M	1,315		148	
02419	Poker Creek	I	3,697	AMP Implemented	837	X
02404	Pollard Draw	C	798		79	
02430	Powder River	I	4,526	AMP Implemented	944	X
02260	Powder River Ranch	I	17,085		1,779	X
02422	Prairie Creek	C	38		13	X
02350	Prong	C	534		92	X
12164	Prong Spotted Horse	C	2,129		271	X
2226	Pugsley Hill	C	40		6	X
12138	Pumpkin Creek	I	13,325		1,454	X
12172	Quinn, John, Bonnie	C	40		7	X
02264	Rafter L	C	1,514		238	X
02266	Ramsbottom	M	7,189		430	X
02319	Rattlesnake Creek	C	40		12	X
12098	Rattlesnake Spring	C	432		46	X
12040	RBL	C	360		43	X
12171	Read Draw	C	40		4	
02269	Reclusa	C	160		42	
12051	Red Canyon	C	2,264		270	X
02365	Red Draw	M	2,115		128	
12033	Red Fork	I	10,000	AMP Implemented	917	X
02409	Red Fork Mtn Camp	C	203		7	
02253	Red Hills	C	759		127	X

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
02416	Red Wall	C	459	AMP Implemented	78	X
02271	Reece Ernest	M	2,715		414	X
02330	Reel	C	40		6	X
02275	Remington Creek	M	2,676	AMP Implemented	290	X
02385	Reno	C	160		16	
02268	Reno Draw	C	558		63	X
22205	Robinson Draw	C	69		9	
12155	Robinson Place	C	630		68	X
02329	Rochelle Hills	C	80		12	
12087	Rock Ridge	C	1,360		93	
02321	Rocky Butte	C	2,075		367	X
12118	Rosie Draw	C	200		29	
02491	Rossnecker Draw	C	42		6	X
02278	Rourke & Offutt	C	477		125	X
02263	Rozet	C	40		8	X
02465	Ryan	C	160		46	X
02259	S. Wyodak	C	120		32	X
02386	S. Fork Otter Creek	C	120		17	
22203	S. Leiter	C	1,457		146	X
02372	S.F. Crazy Woman	C	80		14	
02281	S.F. Three Bar	C	215		43	X
22110	Sahara Draw	C	120		20	
02411	Salt Creek	M	4,249		551	X
02272	Sand Rock/Hoe Creek	C	74		11	
00743	Sawmill	C	240		12	
12185	Schiermiester	C	800		114	X
22122	School Sec Dr/Mdlfrk	C	160		27	X
12073	School Section Draw	C	478		43	X
22214	Schoonover Ranch	I	12,482	AMP Implemented	1,528	X
12137	Scotch	C	200		10	
02353	Scott Draw	C	306		32	X
02286	Scott Marion	C	560		124	X
12083	Scotty Draw	C	4,500		624	X
02276	Se of Buffalo Creek	C	1140		152	X
02369	Senff Ditch	C	80		13	X
02463	SF Holler Draw	C	280		26	X

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
02375	S. Fork Arkansas Creek	C	200		36	
02292	Simpson, John H	C	1,156		198	X
02471	Sioux Battle	C	241		26	
02459	Sippie Mine	C	250		53	X
02291	Skidmore Estate	C	26		9	
02371	Slope	I	3,960	AMP Implemented	1,044	X
02399	Slope/ Mountain	C	2,032		256	
02297	Smith	C	322		34	
02300	Smith	C	120		23	X
32010	Smith Creek	C	160		10	X
02383	Smith Cut	C	3,235		615	X
02294	Soldier Creek Ranch	C	1,343		229	
02495	Sony Draw	M	5,101		513	X
02498	South Carpenter Draw	C	240		2	X
02451	South Fork	I	7,433		726	X
02389	South Fork Powder R.	M	4,890		380	X
02280	South Middle Butte	C	639		67	X
12183	South Middle Prong	C	640		73	X
02467	South Sussex Stkrst	C	27		14	
00744	South Tabletop	C	120		15	
02296	South Trabing	M	1,039		111	X
02351	South Twin Creek	C	200		33	X
22220	Spellman	C	1,278		163	X
02477	Spotted Horse Creek	C	961		105	X
02241	Spring Creek	C	1,231		287	X
22025	Squaw Butte	C	40		11	X
02298	Squaw Creek	M	2,566		289	X
02255	Stateline	C	71		18	X
12131	Steel Creek	C	200		20	
02308	Stephenson, Marie	C	80		20	
02387	Stone Draw	C	80		20	X
12160	Stotts Draw	C	1,934		193	

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
02312	Stuart, James R.	C	80		16	X
02403	Stubbs Draw	C	493	AMP Implemented	69	
02313	Suel Anna Trustee	C	200		40	
12167	Sussex Cutoff	I	1,318		105	
12133	Sussex Oil Company	C	920		46	
02420	Sussex Stockrest	I	305		50	
02316	Swartz, Edward H.	M	2,480		621	X
02438	T.W.	I	1,840	AMP Implemented	184	X
12141	Tabletop	C	80		8	
12145	Tarver Trust	C	689		128	X
02458	TD Southwest	C	120		20	X
02333	Thom Brothers	C	31		4	
02349	Three Mile Creek	C	441		90	X
12101	Threemile Creek Reservoir	C	80		18	
02337	Throne John and Earl	C	120		24	X
02432	Timar East	C	1,122		116	X
12199	Timber Draw	C	74		10	X
02494	Tipperary	C	360		38	X
22213	Tongue River	I	1,767	AMP Implemented	476	X
02339	Trail Creek	M	7,244		2,624	X
02417	Trail Side	C	40		14	
12043	Trough Draw	C	760		34	X
00697	Truman Draw	M	2,032		347	X
02282	TTT	M	14,155		1,563	X
02456	Tuttle Draw	C	320		92	X
02470	Tuttle Draw/ Deep Crk	C	554		154	X
12187	Twenty Mile Creek	I	6,100		808	X
12142	Tyree Place	C	40		8	
02448	Upper Cabin Creek	C	240		43	X
02273	Upper Fort Creek	C	920		205	X
12152	Upper Grub	C	1,340		164	X

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
12207	Upper Kaufman Draw	M	1,920		262	X
12163	Ute Creek	C	117		17	
02284	V Bar F	M	2,797		364	X
02345	Vanderhoff	C	360		26	
02311	Vanhouten	M	1,057		107	X
12077	W. Sussex (Hickey)	I	3,320		483	
02381	Wagensen Don et al	C	80		20	X
22106	Wagonhammer	M	3,881	AMP Implemented	1,352	X
02492	Walker Draw	C	440		48	X
12146	Wall (East)	C	1840		247	
22104	Walsh	C	340		34	
02304	Washout Dr.	M	1,859		315	X
02318	Water Gap Draw	M	9,043		1,127	X
02356	Watt ranch	C	46		6	
12181	West Bowman Hill	C	2,311		522	X
02490	West Coutant Creek	C	80		14	
02462	West Fork	C	240		26	X
12091	West Timber Creek	C	240		32	X
02170	West Timber Draw	C	960		100	X
12063	Weston SW	M	4,435		829	X
02326	White Rock	C	440		58	X
02247	White Tail Creek	C	200		62	X
12237	Whitetail Creek	M	3,391		751	X
22222	Whitetail Pines	M	1,493		299	X
02455	Whitmeyer	C	120		21	
02302	Whitmeyer Creek	C	40		6	
12082	Wild Horse Creek	C	120		24	
32015	Wild Horse Creek	C	80		8	X
02283	Wildcat	C	80		16	X
10069	Willow Creek	I	26,822		4,412	X
12036	Willow Creek	C	2,715		462	X
02331	Winter Draw	C	40		6	
12216	Wolf Mountain	C	515		57	

Allotment Number	Allotment Name	Management Category	Total Federal Acres	Management Type	Permitted Use (AUMs)	All or a portion of the Federal acres are within 4.0 Miles of a Greater Sage-Grouse Lek
02380	Wormwood Ranch	I	20,699	AMP Implemented	2,497	X
12042	Wyarno	C	120		24	
02334	Wythom Road	C	120		20	X
12150	Yellowhammer	M	1,776		206	X
AMP Allotment Management Plan AUM Animal Unit Month C Custodial I Improve M Maintain						

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Appendix F. Maps

Maps referenced in the Proposed RMP and Final EIS are included in hardcopy at the end of Volume 3.

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Appendix G. Surface Disturbance and Reasonable Foreseeable Actions

This appendix includes tables that provide information on surface disturbance and reasonable foreseeable actions within the planning area. Table G.1, “RFA-1A Reasonable Foreseeable Development Assumptions: Oil and Gas” (p. 1938) and Table G.2, “RFA-1B Reasonable Foreseeable Development Assumptions: Other Resource Uses” (p. 1942) provide foreseeable development project assumptions by resource. Table G.3, “RFA-2 Summary of Projected Acres of Surface Disturbance by Resource” (p. 1946) provides projected acres of surface disturbance by resource; the projected surface disturbances in Table G.3, “RFA-2 Summary of Projected Acres of Surface Disturbance by Resource” (p. 1946) are based on the project assumptions in Table G.1, “RFA-1A Reasonable Foreseeable Development Assumptions: Oil and Gas” (p. 1938) and Table G.2, “RFA-1B Reasonable Foreseeable Development Assumptions: Other Resource Uses” (p. 1942).

The well count projections in Table G.1, “RFA-1A Reasonable Foreseeable Development Assumptions: Oil and Gas” (p. 1938) are derived from the Reasonable Foreseeable Development Scenario (RFD) for Oil and Gas prepared by the BLM Wyoming State Office Reservoir Management Group. The RFD projects future development potential and activity based on a technical analysis of the oil and gas resource known to occur and potentially occurring within the planning area, published industry reports, and input from local oil and gas operators and other federal and state agencies. The difference in projected well counts between each alternative is a result of proposed management action and constraints, mitigation measures, and Best Management Practices that may affect the level of oil and gas development under each alternative. Additional information regarding the assumptions used to develop projections for oil and gas activity can be found in the RFD Scenario for Oil and Gas which is available on the Buffalo Resource Management Plan (RMP) revision website.

The BLM developed the assumptions and projections in Table G.2, “RFA-1B Reasonable Foreseeable Development Assumptions: Other Resource Uses” (p. 1942) based on BLM Interdisciplinary Team knowledge, historical and existing activity for all programs, and current project proposals. The difference in assumptions between alternatives is based on the proposed management actions and associated restrictions and stipulations under each alternative.

Table G.1. RFA-1A Reasonable Foreseeable Development Assumptions: Oil and Gas

Type of Development	Alternative A	Alternative B	Alternative C	Alternative D
Mineral Resources – CBNG				
Federal CBNG Well Projections				
Existing Productive Federal CBNG Wells				
Number of Existing Federal CBNG Wells	9,211	9,211	9,211	9,211
Projected Number of Abandoned Existing Federal CBNG Wells	9,211	9,211	9,211	9,211
Remaining Number of Existing Productive Federal CBNG Wells	0	0	0	0
Projected New Federal CBNG Wells				
Number of Projected New Federal CBNG Wells	903	101	5,280	2,721
Projected Number of Abandoned New Federal CBNG Wells	314	35	1,836	946
Projected Productive New Federal CBNG Wells	589	66	3,444	1,775
Projected Total Productive Federal CBNG Wells				
Remaining Number of Existing Productive Federal CBNG Wells	0	0	0	0
Projected Productive New Federal CBNG Wells	589	66	3,444	1,775
Total Number Productive Federal CBNG Wells	589	66	3,444	1,775
Non-federal CBNG Well Projections (State and Fee Minerals)				
Existing Productive Non-federal CBNG Wells				
Number of Existing Non-federal CBNG Wells	16,853	16,853	16,853	16,853
Projected Number of Abandoned Non-federal CBNG Wells	16,853	16,853	16,853	16,853
Remaining Number of Existing Productive Non-federal CBNG Wells	0	0	0	0

Type of Development	Alternative A	Alternative B	Alternative C	Alternative D
Projected New Non-federal CBNG Wells				
Number of Projected New Non-federal CBNG Wells	4,987	4,987	4,987	4,987
Projected Number of Abandoned New Non-federal CBNG Wells	1,734	1,734	1,734	1,734
Projected Productive New Non-federal CBNG Wells	3,253	3,253	3,253	3,253
Projected Total Productive Non-federal CBNG Wells				
Remaining Number of Existing Productive Non-federal CBNG Wells	0	0	0	0
Projected Productive New Non-federal CBNG Wells	3,253	3,253	3,253	3,253
Total Number Productive Non-federal CBNG Wells	3,253	3,253	3,253	3,253
Cumulative CBNG Productive Wells				
Total Number Productive Federal CBNG Wells	589	66	3,444	1,775
Total Number Productive Non-federal CBNG Wells	3,253	3,253	3,253	3,253
Total Productive CBNG Wells	3,842	3,319	6,697	5,028
Mineral Resources – Conventional Oil and Gas				
Federal Conventional Well Projections				
Existing Productive Federal Conventional Wells				
Number of Existing Federal Conventional Wells	2,189	2,189	2,189	2,189
Projected Number of Abandoned Existing Federal Conventional Wells	882	882	882	882
Remaining Number of Existing Productive Federal Conventional Wells	1,307	1,307	1,307	1,307
Projected New Federal Conventional Wells				
Number of Projected New Federal Conventional Wells	1,828	7	1,990	1,773
Projected Number of Abandoned New Federal Conventional Wells	92	1	100	88

Type of Development	Alternative A	Alternative B	Alternative C	Alternative D
Projected Productive New Federal Conventional Wells	1,736	6	1,890	1,685
Projected Total Productive Federal Conventional Wells				
Remaining Number of Existing Productive Federal Conventional Wells	1,307	1,307	1,307	1,307
Projected Productive New Federal Conventional Wells	1,736	6	1,890	1685
Total Number Productive Federal Conventional Wells	3,043	1,313	3,197	2,992
Non-federal Conventional Well Projections (State and Fee Minerals)				
Existing Productive Non-federal Conventional Wells				
Number of Existing Non-federal Conventional Wells	1,944	1,944	1,944	1,944
Projected Number of Abandoned Non-federal Conventional Wells	727	727	727	727
Remaining Number of Existing Productive Non-federal Conventional Wells	1,217	1,217	1,217	1,217
Projected New Non-federal Conventional Wells				
Number of Projected New Non-federal Conventional Wells	1,875	1,875	1,875	1,875
Projected Number of Abandoned New Non-federal Conventional Wells	94	94	94	94
Projected Productive New Non-federal Conventional Wells	1,781	1,781	1,781	1,781
Projected Total Productive Non-federal Conventional Wells				
Remaining Number of Existing Productive Non-federal Conventional Wells	1,217	1,217	1,217	1,217
Projected Productive New Non-federal Conventional Wells	1,781	1781	1781	1781

Type of Development	Alternative A	Alternative B	Alternative C	Alternative D
Total Number Productive Non-federal Conventional Wells	2,998	2,998	2,998	2,998
Cumulative Conventional Productive Conventional Wells				
Total Number Productive Federal Conventional Wells	3,043	1,313	3,197	2,992
Total Number Productive Non-federal Conventional Wells	2,998	2,998	2,998	2,998
Total Productive Conventional Wells	6,041	4,311	6,195	5,990
Cumulative Productive Wells				
Total Number Productive CBNG Federal Wells	589	66	3,444	1,775
Total Number Productive Conventional Federal Wells	3,043	1,313	3,197	2,992
Total Number Productive Federal Wells	3,632	1,379	6,641	4,767
Total Number Productive CBNG Non-federal Wells	3,253	3,253	3,253	3,253
Total Number Productive Conventional Non-federal Wells	2,998	2,998	2,998	2,998
Total Number Productive Non-federal Wells	6,251	6,251	6,251	6,251
Total Productive Wells	9,883	7,630	12,892	11,018
CBNG Coalbed Natural Gas RFA Reasonable Foreseeable Action				

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Appendix G Surface Disturbance and Reasonable
Foreseeable Actions

Table G.2. RFA-1B Reasonable Foreseeable Development Assumptions: Other Resource Uses

Type of Development	Alternative A	Alternative B	Alternative C	Alternative D
PHYSICAL RESOURCES				
Cave and Karst				
Gating of Specific Caves	No Previous	2	0	0
Cave Inventory	No Previous	Entire field office	None	Entire field office
Interpretive Signs	No Previous	5	0	3
Cave Registers	No Previous	5	0	3
Cave Management Plans	No Previous	All caves	Specific caves	All caves
MINERAL RESOURCES				
Mineral Resources - Locatable				
Exploration for Locatable Minerals (numbers of Notices and acres disturbed)	4 Notices/2 acres	2 Notices/1 acre	11 Notices/5.25 acres	9 Notices/4.5 acres
Development of Locatable Minerals (numbers of POOs and acres disturbed)	4 POOs/554 acres	4 POOs/277 acres	11 POOs/1,455 acres	9 POOs/1,252 acres
Mineral Resources – Leasable Coal				
Exploration for Coal (number of licenses and acreage disturbed)	65 licenses/700 acres	60 licenses/600 acres	65 licenses/700 acres	65 licenses/700 acres
Development of Coal (number of leases and net acreage disturbed by mining, i.e., new disturbance – new reclamation)	28 new leases (106,400 acres) to existing mine operators.	28 new leases (106,400 acres) to existing mine operators.	28 new leases (106,400 acres) to existing mine operators.	28 new leases (106,400 acres) to existing mine operators.
Development of Coal by Non-conventional Means (in place conversion) – number of authorizations and new acreage disturbed	No authorization policy	0/0	20 authorizations/0	No authorization policy
Mineral Resources – Leasable Geothermal				
Geothermal Development (number of leases and acres)	0/0	0/0	0/0	0/0
Mineral Resources – Other Leasable Minerals				
Development of Other Leasable Minerals (number of leases and acres)	0/0	0/0	0/0	0/0
Mineral Resources - Salable				

Type of Development	Alternative A	Alternative B	Alternative C	Alternative D
Exploration for Salable Minerals (numbers of exploration sites and acres disturbed)	4 exploration sites/2 acres	1 exploration site/0.43 acre	16 exploration sites/ 7.89 acres	9 exploration sites/ 4.5 acres
Development of Salable Minerals (numbers of disposal operations and acres disturbed)	61 operations/ 530 acres	27 operations/ 114 acres	240 operations/ 2,090 acres	137 operations/ 1,193 acres
FIRE AND FUELS MANAGEMENT				
Prescribed Fire (acreage)	14,000	3,500	42,000	14,000
Mechanical Fuels Management (acreage)	0	0	0	0
BIOLOGICAL RESOURCES				
Forests, Woodlands, and Forest Products				
Forest Products Sales (acreage)	200 to 300 acres annually or 4,000 to 6,000 acres for lifetime of plan or 20 years	10 to 50 acres annually or 200 to 1,000 acres for lifetime of plan or 20 years	800 to 1,200 acres annually or 16,000 to 24,000 acres for lifetime of plan or 20 years	800 to 1000 acres annually or 16,000-20,000 acres for the lifetime of the plan
Invasive Species (treatment acres based on disturbance for other resources)				
Range Improvement Projects (acreage)	8	34	17	24
Prescribed Fire (acreage)	420	2,800	12,600	420
BLM Road Maintenance (miles/acreage)	0.5 mile/4 acres	2 miles/12 acres	1 mile/7 acres	1 mile/7 acres
Forests and Woodlands (acreage)	120	100	1,200	1,000
Not Associated with any Surface Disturbance (acreage)	8,000	15,000	10,000	12,000
Federal Oil and Gas Well Activities (acreage)	Short term: 16,473 Long term: 4,250	Short term: 9,423 Long term: 3,212	Short term: 15,343 Long term: 5,412	Short term: 16,473 Long term: 4,250
Renewable Energy Projects (acreage)	2,020	4,040	16,080	6,060
Rights-of-way (miles/acreage)	274 miles/1,990 acres	150 miles/1,094 acres	406 miles/2,953 acres	274 miles/1,990 acres
Fish and Wildlife Resources				
Wildlife Habitat Restoration and Enhancement: Mountain Mahogany (acreage)	0	8,714	0	8,714
Wildlife Habitat Restoration and Enhancement: Greater Sage-Grouse (acreage)	0	156,420	0	77,560

Type of Development	Alternative A	Alternative B	Alternative C	Alternative D
Watershed Restoration and Enhancement (acreage)	0	0	0	0
Stream Restoration, Structure Removal, and Other Fisheries Enhancements (number of sites and acreage)	80 structures in <1 mile of stream. (one site)/2 acres	20 sites/20 acres	0/0	20 sites/20 acres
HERITAGE AND VISUAL RESOURCES				
Paleontological				
Fossil Collection (acreage)	0	0	0	0
LAND RESOURCES				
Renewable Energy				
Wind-Energy Testing – MET Towers (number of sites and acreage)	200 sites/200 acres	50 sites/50 acres	200 sites/200 acres	80 sites/240 acres
Wind-Energy Development (number of sites and acreage)	20 sites/ up to 20,000 acres	5 sites/5,000 acres	20 sites/ up to 40,000 acres	30 sites/up to 75,000 acres
Rights-of-Way				
Communication Site Development (number of sites/acreage)	56 sites/28 acres	28 sites/5 acres	84 sites/38 acres	56 sites/28 acres
Powerline Development (number of sites and miles/acreage)	740 rights-of-way/ 1,000 miles/ 3,600 acres	500 rights-of-way/ 425 miles/ 1,546 acres	1,500 rights-of-way/ 1,200 miles/ 4,400 acres	740 rights-of-way/ 1,000 miles/ 3,600 acres
Pipeline Development – Total Number of Projects	1,400	400	2,000	1,400
Road Development (number of sites and miles/acres)	1,100 rights-of-way/ 1,725 miles/ 6,275 acres	550 rights-of-way/ 575 miles/ 2,090 acres	1,650 rights-of-way/ 2,300 miles/ 8,364 acres	1,100 rights-of-way/ 1,725 miles/ 6,275 acres
Compressor Stations (number of sites/acreage)	52 sites/200 acres	26 sites/38 acres	78 sites/114 acres	52 sites/76 acres
Travel and Transportation Management				
Road Maintenance (miles/acreage)	16.5 miles (Bar C, Billy Creek, Muir, Petrified Tree, and Weston West)/120 acres	16.5 miles (Bar C, Billy Creek, Muir, Petrified Tree, and Weston West)/120 acres	~ 20 miles (Bar C, Billy Creek, Muir, Petrified Tree, and Weston West and new developed routes)/145 acres	20 miles/145 acres
BLM Nonmotorized Trail Creation (miles/acreage)	9 miles/65 acres	2 miles/14 acres	7 miles (Burnt Hollow/Mosier Ext/Etc. Trails)/51 acres	7 miles/50 acres
BLM Public Access Road Creation (miles)	0 miles	1 mile	5 Miles (Middle Fork/other access roads)	5 miles
Recreation				

Type of Development	Alternative A	Alternative B	Alternative C	Alternative D
Campsites (number of sites/acreage)	0/0	0/0	10/20	8/16
Interpretive Sites (number of sites/acreage)	1/2	0/0	5/2.5	5/2.5
Other Facilities (number of sites/acreage)	3/3	0/0	3/3	3/3
Livestock Grazing Management				
Reservoir/Pit Development (number of sites/acreage)	0/0	0/0	0/0	0/0
Well Development (number of sites/acreage)	4/<1	4/<1	4/<1	6/<1
Spring Development (number of sites/acreage)	40/4	40/4	40/4	42/4
Fence Development (number of sites/miles)	100/100	150/150	150/150	200/200
Reservoir Conversion from CBNG Development/water disposal to Range Improvement (acreage)	150	150	150	150
BLM Bureau of Land Management CBNG Coalbed natural gas POO Plan of Operations RFA Reasonable Foreseeable Action				

Table G.3. RFA-2 Summary of Projected Acres of Surface Disturbance by Resource

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
MINERAL RESOURCES				
Mineral Resources – Locatable Exploration				
Acres Disturbed from BLM Actions	2	1	5.25	4
Acres Reclaimed from BLM Actions	2	1	5.25	4
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Disturbed from Non-BLM Actions	200	600	300	450
Acres Reclaimed from Non-BLM Actions	200	600	300	450
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Mineral Resources – Locatable Development				
Acres Disturbed from BLM Actions	554	277	1,455	1,252
Acres Reclaimed from BLM Actions	144	72	378	329
Acres Long-Term Disturbance from BLM Actions	410	205	1,077	923
Acres Disturbed from Non-BLM Actions	7,789	23,368	11,684	17,525
Acres Reclaimed from Non-BLM Actions	2,025	6,076	3,038	4,556
Acres Long-Term Disturbance from Non-BLM Actions	5,764	17,292	8,646	12,969
Mineral Resources - Leasable Coal (It is assumed that the only solid leasable will be coal – all other solid leasable minerals activity is projected to be possible, but insignificant compared to coal activity over the planning horizon.)				
Acres Disturbed from BLM Actions	195,700	186,600	195,700	195,700
Acres Reclaimed from BLM Actions	120,700	120,600	120,700	120,700
Acres Long-Term Disturbance from BLM Actions (long-term mining facilities) ¹	75,000	66,000	75,000	75,000

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres Disturbed from Non-BLM Actions	10,000	10,000	10,000	10,000
Acres Reclaimed from Non-BLM Actions	6,000	6,000	6,000	6,000
Acres Long-Term Disturbance from Non-BLM Actions (long-term mining facilities) ²	4,000	4,000	4,000	4,000
Mineral Resources – Leasable Geothermal				
Acres Disturbed from BLM Actions	0	0	0	0
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Disturbed from Non-BLM Actions	0	0	0	0
Acres Reclaimed from Non-BLM Actions	0	0	0	0
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Mineral Resources – Leasable Oil and Gas (Coalbed Natural Gas only)				
Acres Disturbed from BLM Actions	2,258	253	13,200	6,803
Acres Reclaimed from BLM Actions	903	101	5,280	2,721
Acres Long-Term Disturbance from BLM Actions	1,355	152	7,920	4,082
Acres Disturbed from Non-BLM Actions	12,468	12,468	12,468	12,468
Acres Reclaimed from Non-BLM Actions	4,987	4,987	4,987	4,987
Acres Long-Term Disturbance from Non-BLM Actions	7,481	7,481	7,481	7,481
Mineral Resources – Leasable Oil and Gas (Conventional only)				
Acres Disturbed from BLM Actions	8,317	33	9,055	8,066
Acres Reclaimed from BLM Actions	5,575	22	6,070	5,406

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres Long-Term Disturbance from BLM Actions	2,742	11	2,985	2,660
Acres Disturbed from Non-BLM Actions	8,531	8,531	8,531	8,531
Acres Reclaimed from Non-BLM Actions	5,719	5,719	5,719	5,719
Acres Long-Term Disturbance from Non-BLM Actions	2,812	2,812	2,812	2,812
Mineral Resources – Salable Exploration				
Acres Disturbed from BLM Actions	2	0.43	7.89	4.5
Acres Reclaimed from BLM Actions	2	0.43	7.89	4.5
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Disturbed from Non-BLM Actions	200	600	300	450
Acres Reclaimed at Non-BLM Actions	200	600	300	450
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Mineral Resources – Salable Development				
Acres Disturbed from BLM Actions	530	114	2,090	1,193
Acres Reclaimed from BLM Actions	99	21	392	224
Acres Long-Term Disturbance from BLM Actions	431	93	1,698	969
Acres Disturbed from Non-BLM Actions	4,568	13,704	6,852	10,728
Acres Reclaimed at Non-BLM Actions	1,188	3,564	1,782	3,123
Acres Long-Term Disturbance from Non-BLM Actions	3,380	10,140	5,070	7,605
FIRE AND FUELS MANAGEMENT				
Prescribed Fire				
Acres Treated from BLM Actions	14,000	3,500	42,000	14,000

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres Reclaimed from BLM Actions	14,000	3,500	42,000	14,000
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Treated from Non-BLM Actions	2,000	2,000	2,000	2,000
Acres Reclaimed from Non-BLM Actions	2,000	2,000	2,000	2,000
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Wildfire – Active Rehabilitation (fire lines, etc.)				
Acres Treated from BLM Actions	27,596	27,596	27,596	27,596
Acres Reclaimed from BLM Actions	27,596	27,596	27,596	27,596
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Treated from Non-BLM Actions	139,042	139,042	139,042	139,042
Acres Reclaimed from Non-BLM Actions	139,042	139,042	139,042	139,042
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Mechanical Fuels Treatment				
Acres Treated from BLM Actions	0	0	0	0
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Treated from Non-BLM Actions	3,200	3,200	3,200	3,200
Acres Reclaimed from Non-BLM Actions	3,200	3,200	3,200	3,200
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
BIOLOGICAL RESOURCES				
Forests, Woodlands, and Forest Products				

Appendix G Surface Disturbance and Reasonable
Foreseeable Actions

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres Treated from BLM Actions	200 to 300 acres annually or 4,000 to 6,000 acres for lifetime of plan	10 to 50 acres annually or 200 to 1,000 acres for lifetime of plan	800 to 1,200 acres annually or 16,000 to 24,000 acres for lifetime of plan	800 to 1,000 acres annually or 16,000-20,000 acres for the lifetime of the plan
Acres Reclaimed from BLM Actions	200 to 300 acres annually or 4,000 to 6,000 total acres	10 to 50 acres annually or 200 to 1,000 total acres	800 to 1,200 acres annually or 16,000 to 24,000 total acres	800 to 1,000 acres annually or 16,000-20,000 acres for the lifetime of the plan
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Treated from Non-BLM Actions	4,055	2,832	80,910	10,000
Acres Reclaimed from Non-BLM Actions	4,055	2,832	80,910	10,000
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Invasive Species				
Acres Treated Disturbance from BLM Actions	8,000	15,000	10,000	12,000
Acres Reclaimed from BLM Actions	7,000	13,000	8,500	10,500
Acres Long-Term Disturbance from BLM Actions	1,000	2,000	1,500	1,500
Acres Treated from Non-BLM Actions	40,000	70,000	55,000	63,000
Acres Reclaimed from Non-BLM Actions	38,000	66,000	52,000	59,500
Acres Long-Term Disturbance from Non-BLM Actions	2,000	4,000	3,000	3,500
Fish and Wildlife Resources				
Wildlife Habitat Enhancements Activities				
Acres Treated from BLM Actions	0	165,134	0	86,274
Acres Reclaimed from BLM Actions	0	165,134	0	86,274
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Treated from Non-BLM Actions	1,414,888	1,414,888	1,414,888	1,414,888
Acres Reclaimed from Non-BLM Actions	1,414,888	1,414,888	1,414,888	1,414,888

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Fisheries, Watershed, and Stream Enhancement Activities				
Miles/Acres Treated from BLM Actions	1.5/20	10/12	0	1.5/20
Acres Reclaimed from BLM Actions	20	12	0	20
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Miles/Acres Treated from Non-BLM Actions	12/145	81/980	0	12/145
Acres Reclaimed from Non-BLM Actions	145	980	0	145
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
HERITAGE AND VISUAL RESOURCES				
Paleontological				
Acres Disturbed from BLM Actions	100	200	100	100
Acres Reclaimed from BLM Actions	100	200	100	100
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Disturbed from Non-BLM Actions	900	1,800	900	900
Acres Reclaimed from Non-BLM Actions	900	1,800	900	900
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
LAND RESOURCES				
Renewable Energy - Wind-Energy Development				
Acres Disturbed from BLM Actions	20,000	5,000	40,000	240 acres MET Towers (3 year disturbance) and 75,000 acres wind towers and infrastructure
Acres Reclaimed from BLM Actions	17,500	4,500	22,500	240 acres MET Towers and 50,000 acres for buried power and staging

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres of Long-Term Disturbance from BLM Actions	2,500	500	17,500	25,000
Acres Disturbed from Non-BLM Actions	161,818	40,455	323,636	161,818
Acres Reclaimed from Non-BLM Actions	141,591	36,409	182,046	141,591
Acres of Long-Term Disturbance from Non-BLM Actions	20,227	4,046	141,590	20,227
Rights-of-Way (ROW)				
Pipelines (Mineral and Water)				
Acres Disturbed from BLM Actions	14,000	5,750	20,000	14,000
Acres Reclaimed from BLM Actions	14,000	5,750	20,000	14,000
Acres of Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Disturbed from Non-BLM Actions	113,272	46,522	161,818	113,272
Acres Reclaimed from Non-BLM Actions	113,272	46,522	161,818	113,272
Acres of Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Roads				
Miles/Acres Disturbed from BLM Actions	1,725/18,550	575/9,275	2,300/27,825	1,035/18,550
Miles/Acres Reclaimed from BLM Actions	500/7,049	125/2,690	800/12,800	250/5,750
Miles/Acres of Long-Term Disturbance from BLM Actions	1,225/11,501	450/6,585	1,500/15,025	785/12,800
Acres Disturbed from Non-BLM Actions	150,086	75,043	225,130	150,086
Acres Reclaimed from Non-BLM Actions	57,033	21,765	103,564	46,523

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres of Long-Term Disturbance from Non-BLM Actions	93,054	53,279	121,566	103,564
Powerlines				
Miles/Acres Disturbed from BLM Actions	1,000/4,916	425/2,458	1,200/7,374	1,000/4,916
Miles/Acres Reclaimed from BLM Actions	100/491	42.5/245	120/737	100/491
Miles/Acres of Long-Term Disturbance from BLM Actions	900/4,425	382.5/2,213	1,080/6,637	900/4,425
Acres Disturbed from Non-BLM Actions	39,775	19,887	59,662	39,775
Acres Reclaimed from Non-BLM Actions	3,973	1,982	5,963	3,973
Acres of Long-Term Disturbance from Non-BLM Actions	35,802	17,905	53,699	35,802
Communication Sites				
Acres Disturbed from BLM Actions	56	28	84	56
Acres Reclaimed from BLM Actions	0	0	0	20
Acres of Long-Term Disturbance from BLM Actions	56	28	84	36
Acres Disturbed from Non-BLM Actions	453	227	680	453
Acres Reclaimed from Non-BLM Actions	0	0	0	162
Acres of Long-Term Disturbance from Non-BLM Actions	453	227	680	291
Compressor Sites				
Acres Disturbed from BLM Actions	200	100	300	200
Acres Reclaimed from BLM Actions	0	0	0	40

Appendix G Surface Disturbance and Reasonable
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Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres of Long-Term Disturbance from BLM Actions	200	100	300	160
Acres Disturbed from Non-BLM Actions	1,618	809	2,427	1,618
Acres Reclaimed from Non-BLM Actions	0	0	0	324
Acres of Long-Term Disturbance from Non-BLM Actions	1,618	809	2,427	1,295
Other Facilities				
Acres Disturbed from BLM Actions	1,040	400	1,500	1,040
Acres Reclaimed from BLM Actions	620	200	750	620
Acres of Long-Term Disturbance from BLM Actions	420	200	750	420
Acres Disturbed from Non-BLM Actions	8,415	3,236	12,136	8,415
Acres Reclaimed from Non-BLM Actions	5,016	1,618	6,068	5,016
Acres of Long-Term Disturbance from Non-BLM Actions	3,398	1,618	6,068	3,398
Travel and Transportation Management				
Nonmotorized Trails				
Miles/Acres Disturbed from BLM Actions	9/65	2/15	7/51	9/65
Miles/Acres Reclaimed from BLM Actions	0/0	0/0	0/0	0/0
Miles/Acres Long-Term Disturbance from BLM Actions	9/65	2/15	7/51	9/65
BLM Public Access Road Creation				
Miles/Acres Disturbed from BLM Actions	0/0	1/7	5/36	2/15
Miles/Acres Reclaimed from BLM Actions	0/0	0/0	0/0	0/0

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Miles/Acres Long-Term Disturbance from BLM Actions	0/0	1/7	5/36	2/15
BLM Public Access Road Reclamation³				
Miles/Acres Disturbed from BLM Actions	0/0	0/0	0/0	0/0
Miles/Acres Reclaimed from BLM Actions	0/0	5/36	2/15	5/36
Miles/Acres Long-Term Disturbance from BLM Actions	0/0	0/0	0/0	0/0
Recreation				
Recreational Site Development				
Acres Disturbed from BLM Actions	5	5	20	20
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	5	5	20	20
Livestock Grazing Management				
Spring Development				
Acres Disturbed from BLM Actions	4	4	4	4
Acres Reclaimed from BLM Actions	2	2	2	2
Acres Long-Term Disturbance from BLM Actions	2	2	2	2
Acres Disturbed from Non-BLM Actions	1	1	1	1
Acres Reclaimed from Non-BLM Actions	0.5	0.5	0.5	0.5
Acres Long-Term Disturbance from Non-BLM Actions	0.5	0.5	0.5	0.5
Pipeline Development				
Acres Disturbed from BLM Actions	40	40	40	40
Acres Reclaimed from BLM Actions	35	35	35	35

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Foreseeable Actions

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres Long-Term Disturbance from BLM Actions	5	5	5	5
Acres Disturbed from Non-BLM Actions	20	20	20	20
Acres Reclaimed from Non-BLM Actions	18	18	18	18
Acres Long-Term Disturbance from Non-BLM Actions	2	2	2	2
Reservoir/Pit Development				
Acres Disturbed from BLM Actions	0	0	0	0
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Disturbed from Non-BLM Actions	0	0	0	0
Acres Reclaimed from Non-BLM Actions	0	0	0	0
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Fence Development				
Miles/Acres Disturbed from BLM Actions	80/70	120/100	120/100	150/38
Miles/Acres Reclaimed from BLM Actions	57/50	84/70	84/70	140/35
Miles/Acres Long-Term Disturbance from BLM Actions	23/20	36/30	36/30	10/3
Miles/Acres Disturbed from Non-BLM Actions	20/15	30/25	30/25	50/13
Miles/Acres Reclaimed from Non-BLM Actions	13/10	24/20	24/20	45/11
Miles/Acres Long-Term Disturbance from Non-BLM Actions	7/5	6/5	6/5	5/2
Well Development				
Acres Disturbed from BLM Actions	<1	<1	<1	<1

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	<1	<1	<1	<1
Acres Disturbed from Non-BLM Actions	<1	<1	<1	<1
Acres Reclaimed from Non-BLM Actions	0	0	0	0
Acres Long-Term Disturbance from Non-BLM Actions	<1	<1	<1	<1
Reservoir Maintenance Development				
Acres Disturbed from BLM Actions	0	0	0	0
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Disturbed from Non-BLM Actions	0	0	0	0
Acres Reclaimed from Non-BLM Actions	0	0	0	0
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
CUMULATIVE DISTURBANCE⁴				
Total Acres Disturbed from BLM Actions	322,026	422,903	422,544	486,957
Total Acres Reclaimed from BLM Actions	221,888	344,752	291,923	358,871
Total Acres Long-Term Disturbance from BLM Actions	100,138	78,152	130,621	128,086
Total Acres Disturbed from Non-BLM Actions	2,123,460	1,890,239	2,531,611	2,168,799
Total Acres Reclaimed from Non-BLM Actions	1,943,463	1,766,623	2,174,564	1,965,851
Total Acres Long-Term Disturbance from Non-BLM Actions	179,998	123,617	357,048	202,949

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Cumulative Long-Term Acres of Disturbance	280,135	201,768	487,669	331,035
<p>¹Of the 75,000 acres of long-term disturbance from BLM actions for alternatives A, C, and D, 45,500 acres are part of the active mine. Of the 66,000 acres of long-term disturbance from BLM actions for Alternative B, 36,500 acres are part of the active mine. The remaining long-term disturbance acreage for all alternatives includes buildings and processing areas.</p> <p>²Of the 4,000 acres of long-term disturbance from non-BLM actions for all alternatives, 2,500 acres are part of the active mine. The remaining long-term disturbance acreage for all alternatives includes buildings and processing areas.</p> <p>³Represents the projected reclamation of existing roads in the planning area. As such, there is no long-term disturbance anticipated from this action. The projected acres reclaimed from this action are not included in the cumulative disturbance acreages.</p> <p>⁴Numbers may not add up due to rounding.</p> <p>BLM Bureau of Land Management RFA Reasonable Foreseeable Action</p>				

Appendix H. Fluid Mineral Lease Notices; Lease Stipulations; and the Process for Exceptions, Modifications, and Waivers

H.1. Lease Notices

A lease notice provides more detailed information concerning limitations that already exist in law, lease terms, regulations, or operational orders. A Lease Notice also addresses special items the lessee should consider when planning operations, but does not impose new or additional restrictions (Uniform Format for Oil and Gas Lease Stipulations, March 1989. Rocky Mountain Regional Coordinating Committee). “An information [lease] notice has no legal consequences, except to give notice of existing requirements, and may be attached to a lease by the authorized officer at the time of lease issuance to convey certain operational, procedural or administrative requirements relative to lease management within the terms and conditions of the standard lease form. Information [lease] notices shall not be a basis for denial of lease operations.” (43 Code of Federal Regulations [CFR] 3101.1-3). There are four standard lease notices that are attached to every lease issued by the Bureau of Land Management (BLM) within Wyoming (three numbered, and one unnumbered lease notice).

LEASE NOTICE NO. 1

Under Regulation 43 CFR 3101.1-2 and terms of the lease (BLM Form 3100-11), the authorized officer may require reasonable measures to minimize adverse impacts to other resource values, land uses, and users not addressed in lease stipulations at the time operations are proposed. Such reasonable measures may include, but are not limited to, modification of siting or design of facilities, timing of operations, and specification of interim and final reclamation measures, which may require relocating proposed operations up to 200 meters, but not off the leasehold, and prohibiting surface disturbance activities for up to 60 days.

The lands within this lease may include areas not specifically addressed by lease stipulations that may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or other resources. Possible special areas are identified below. Any surface use or occupancy within such special areas will be strictly controlled or, if absolutely necessary, prohibited. Appropriate modifications to imposed restrictions will be made for the maintenance and operation of producing wells.

1. Slopes in excess of 25 percent.
2. Within 500 feet of surface water and/or riparian areas.
3. Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur.
4. Within 500 feet of Interstate highways and 200 feet of other existing rights-of-way (i.e., U.S. and State highways, roads, railroads, pipelines, powerlines).
5. Within 0.25 mile of occupied dwellings.
6. Material sites.

GUIDANCE:

The intent of this notice is to inform interested parties (potential lessees, permittees, operators) that when one or more of the above conditions exist, surface-disturbing activities will be prohibited

*Appendix H Fluid Mineral Lease Notices; Lease Stipulations; and the Process for Exceptions, Modifications, and Waivers
Lease Notices*

unless or until the permittee or the designated representative and the surface management agency (SMA) arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development and become a condition for approval when authorizing the action.

Specific threshold criteria (e.g., 500 feet from water) have been established based upon the best information available. However, geographical areas and time periods of concern must be delineated at the field level (i.e., "surface water and/or riparian areas" may include both intermittent and ephemeral water sources or may be limited to perennial surface water).

The referenced oil and gas leases on these lands are hereby made subject to the stipulation that the exploration or drilling activities will not interfere materially with the use of the area as a materials site/free use permit. At the time operations on the above lands are commenced, notification will be made to the appropriate agency. The name of the appropriate agency may be obtained from the proper BLM Field Office.

THIS NOTICE APPLIES TO ALL PARCELS.

LEASE NOTICE NO. 2

BACKGROUND:

The BLM, by including National Historic Trails within its National Landscape Conservation System, has recognized these trails as national treasures. Our responsibility is to review our strategy for management, protection, and preservation of these trails. The National Historic Trails in Wyoming, which include the Oregon, California, Mormon Pioneer, and Pony Express Trails, as well as the Nez Perce Trail, were designated by Congress through the National Trails System Act (P.L. 90-543; 16 United States Code [U.S.C.] 1241-1251) as amended through P.L. 106-509 dated November 13, 2000. Protection of the National Historic Trails is normally considered under the National Historic Preservation Act (NHPA) (P.L. 89-665; 16 U.S.C. 470 et seq.) as amended through 1992 and the National Trails System Act. Additionally, Executive Order 13195, "Trails for America in the 21st Century," signed January 18, 2001, states in Section 1: "Federal agencies will...protect, connect, promote, and assist trails of all types throughout the United States. This will be accomplished by: (b) Protecting the trail corridors associated with national scenic trails and the high priority potential sites and segments of national historic trails to the degrees necessary to ensure that the values for which each trail was established remain intact." Therefore, the BLM will be considering all impacts and intrusions to the National Historic Trails, their associated historic landscapes, and all associated features, such as trail traces, grave sites, historic encampments, inscriptions, natural features frequently commented on by emigrants in journals, letters and diaries, or any other feature contributing to the historic significance of the trails. Additional National Historic Trails will likely be designated amending the National Trails System Act. When these amendments occur, this notice will apply to those newly designated National Historic Trails as well.

STRATEGY:

The BLM will proceed in this objective by conducting a viewshed analysis on either side of the designated centerline of the National Historic Trails in Wyoming, except, at this time, for the Nez Perce Trail, for the purpose of identifying and evaluating potential impacts to the trails, their associated historic landscapes, and their associated historic features. Subject to the viewshed analysis and archeological inventory, reasonable mitigation measures may be applied. These may include, but are not limited to, modification of siting or design of facilities to camouflage or otherwise hide the proposed operations within the viewshed. Additionally, specification of interim and final reclamation measures may require relocating the proposed operations within

the leasehold. Surface-disturbing activities will be analyzed in accordance with the National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190; 42 U.S.C. 4321-4347) as amended through P.L. 94-52, July 3, 1975 and P.L. 94-83, August 9, 1975, and the NHPA, supra, to determine if any design, siting, timing, or reclamation requirements are necessary. This strategy is necessary until the BLM determines that, based on the results of the completed viewshed analysis and archeological inventory, the existing land use plans (RMPs) have to be amended.

The use of this lease notice is a predecisional action, necessary until final decisions regarding surface-disturbing restrictions are made. Final decisions regarding surface-disturbing restrictions will take place with full public disclosure and public involvement over the next several years if BLM determines that it is necessary to amend existing land use plans.

GUIDANCE:

The intent of this notice is to inform interested parties (potential lessees, permittees, operators) that when any oil and gas lease contains remnants of National Historic Trails, or is located within the viewshed of a National Historic Trails' designated centerline, surface-disturbing activities will require the lessee, permittee, operator or, their designated representative, and the SMA to arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development and become a condition for approval when authorizing the action.

THIS NOTICE APPLIES TO ALL PARCELS.

LEASE NOTICE NO. 3

Greater Sage-Grouse Habitat: The lease may in part, or in total, contain important Greater Sage-Grouse habitats as identified by the BLM, either currently or prospectively. The operator may be required to implement specific measures to reduce impacts of oil and gas operations on the Greater Sage-Grouse populations and habitat quality. Such measures shall be developed during the Application for Permit to Drill (APD) onsite and environmental review process and will be consistent with the lease rights granted.

THIS NOTICE APPLIES TO ALL PARCELS.

UNNUMBERED LEASE NOTICE

ATTACHMENT TO EACH LEASE

Provisions of the Mineral Leasing Act (MLA) of 1920, as amended by the Federal Coal Leasing Amendments Act of 1976, affect an entity's qualifications to obtain an oil and gas lease. Section 2(a)(2)(A) of the MLA, 30 U.S.C. 201 (a)(2)(A), requires that any entity that holds and has held a Federal coal lease for 10 years beginning on or after August 4, 1976, and who is not producing coal in commercial quantities from each such lease, cannot qualify for the issuance of any other lease granted under the MLA. Compliance by coal lessees with Section 2(a)(2)(A) is explained in 43 CFR 3472.

In accordance with the terms of this oil and gas lease, with respect to compliance by the initial lessee with qualifications concerning Federal coal lease holdings, all assignees and transferees are hereby notified that this oil and gas lease is subject to cancellation if: (1) the initial lessee as assignor or as transferor has falsely certified compliance with Section 2(a)(2)(A), or (2) because of a denial or disapproval by a State Office of a pending coal action, i.e., arms-length assignment, relinquishment, or logical mining unit, the initial lessee as assignor or as transferor is no longer in compliance with Section 2(a)(2)(A). The assignee, sublessee or transferee does not qualify as

*Appendix H Fluid Mineral Lease Notices; Lease
Stipulations; and the Process for Exceptions,
Modifications, and Waivers
Lease Notices*

a bona fide purchaser and, thus, has no rights to bona fide purchaser protection in the event of cancellation of this lease due to noncompliance with Section 2(a)(2)(A).

Information regarding assignor, sublessor or transferor compliance with Section 2(a)(2)(A) is contained in the lease case file as well as in other BLM records available through the State Office issuing this lease.

H.2. Lease Stipulations

The Resource Management Plan (RMP) determines which areas of the planning area are open to fluid mineral leasing, including the constraints or conditions open areas are subject to, and which areas are closed to fluid mineral leasing. The Proposed RMP (Alternative D) proposes to close the following areas to mineral leasing: Wilderness Study Areas, recommended Wild and Scenic Rivers, and certain Special Recreation Management Areas (Burnt Hollow, Dry Creek Petrified Tree, Middle Fork Powder River, Mosier Gulch, and Hole-in-the-Wall).

In areas open to leasing the BLM may impose lease stipulations. A lease stipulation is a condition of lease issuance that provides a level of protection for other resource values or land uses by restricting lease operations during certain times or locations or to avoid unacceptable impacts, to an extent greater than standard lease terms or regulations. These resource values and land uses generally include wildlife, soil, water, recreation, visual, and cultural resources. A stipulation is an enforceable term of the lease contract, supersedes any inconsistent provisions of the standard lease form, and is attached to and made a part of the lease. Lease stipulations further implement the BLM's regulatory authority to protect resources or resource values. Lease stipulations are developed through the land use planning process. "The authorized officer may require stipulations as conditions of lease issuance. Stipulations shall become part of the lease and shall supersede inconsistent provisions of the standard lease form. Any party submitting a bid... shall be deemed to have agreed to stipulations applicable to the specific parcel..." (43 CFR 3101.1-3).

Exceptions, waivers, and modifications provide an effective means of applying "Adaptive Management" techniques to oil and gas leases and associated permitting activities to meet changing circumstances. The criteria for approval of exceptions, waivers, and modifications should be supported by NEPA analysis, either through the land use planning process or site-specific environmental review.

This appendix identifies fluid mineral lease stipulations and addresses the procedure for providing exceptions, modifications, and waivers of lease stipulations. Procedures for changing Conditions of Approval (COAs) placed on surface disturbance and disruptive activity authorizations to protect resource values are the same.

Definitions

The three types of surface stipulations the BLM applies are: (1) no surface occupancy (NSO), (2) timing limitation stipulation (TLS), and (3) controlled surface use (CSU).

- **NSO:** Use or occupancy of the land surface for fluid mineral exploration or development is prohibited in order to protect identified resource values. The minerals under NSO lands may potentially be developed by directionally or horizontally drilling from nearby lands that do not have the NSO limitation.

- **TLS:** Prohibits surface use during a specified time period to protect identified resource values. (Seasonal Restriction).
- **CSU:** Use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operational constraints that may modify lease rights.

Surface use rights are described in more detail at 43 CFR 3101.1-2.

An applicant may request an exception, modification, or waiver of a stipulation or restriction included in a lease or applied as a COA.

- **Exception:** A one-time exemption to a lease stipulation or COA determined on a case-by-case basis.
- **Modification:** A change to the provisions of a lease stipulation, either temporarily or for the term of the lease.
- **Waiver:** A permanent exemption to a lease stipulation.

Standard Stipulations

The following three stipulations are applied to all BLM-administered fluid mineral leases within Wyoming.

LEASE STIPULATION NO. 1: CULTURAL RESOURCES

This lease may be found to contain historic properties and/or resources protected under the NHPA, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders. The BLM will not approve any ground-disturbing activities that may affect any such properties or resources until it completes its obligations (e.g., State Historic Preservation Officer [SHPO]) and tribal consultation) under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated.

LEASE STIPULATION NO. 2: ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat. The BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. The BLM will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. § 1531 *et seq.*, including completion of any required procedure for conference or consultation.

LEASE STIPULATION NO. 3 MULTIPLE MINERAL DEVELOPMENT

Operations will not be approved which, in the opinion of the authorized officer, would unreasonably interfere with the orderly development and/or production from a valid existing mineral lease issued prior to this one for the same lands.

Buffalo Planning Area Stipulations

*Appendix H Fluid Mineral Lease Notices; Lease Stipulations; and the Process for Exceptions, Modifications, and Waivers
Standard Stipulations*

The following table lists the fluid mineral lease stipulations and exception, modification, and waiver criteria for those stipulations included under the BLM's Proposed RMP (Alternative D). Table H.1, "Lease Stipulations and Exception, Modification, and Waiver Criteria" (p. 1965) describes the stipulation (NSO, TLS, and CSU), identifies the applicable management action to which the stipulation applies, discloses the approximate acreage to which the stipulation applies, and the criteria for considering exceptions, modifications, and waivers.

Table H.1. Lease Stipulations and Exception, Modification, and Waiver Criteria

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Soil-1004	CSU	Soil: severe erosion hazard	669,739	<p>Surface disturbance is restricted on soils with a severe erosion hazard rating.</p> <p>Controlled Surface Use (CSU) (1): (a) Prior to surface disturbance on soils with a severe erosion hazard rating a site-specific construction, stabilization, and reclamation plan (Plan) must be submitted to the Bureau of Land Management (BLM) by the applicant as a component of the Application for Permit to Drill (APD) (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate). (b) The Plan must demonstrate to the BLM authorized officer's satisfaction how the operator will meet the following performance standards:</p> <ul style="list-style-type: none"> • The disturbed area will be stabilized with no evidence of accelerated erosion features. • The disturbed area shall be managed to ensure soil characteristics approximate an appropriate reference site with regard to erosional features to maintain soil productivity and sustainability. • Sufficient viable topsoil is maintained for ensuring successful final reclamation. At locations where interim reclamation will be completed, this will be accomplished by respreading all salvaged topsoil over the areas of interim reclamation. • The original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation. <p>On the lands described below: CSU (2) as mapped by the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) Order 3 soil survey and/or as determined by a BLM evaluation of the area. For the purpose of: CSU (3) ensuring successful reclamation and erosion control on soils with a severe erosion hazard rating in order to meet the standards outlined in, Chapter 6 the BLM's Oil and Gas Gold Book, as revised, and the 2015 Buffalo Field Office (BFO) Resource Management Plan (RMP) Record of Decision (ROD).</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action will not result in a failure to meet the performance standards above or a BLM evaluation determines that the affected soils do not meet the severe erosion hazard rating criteria.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a NRCS soil survey or BLM evaluation. The stipulation and performance standards identified above may be modified based on monitoring results.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
				Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include soils with severe erosion hazard. This determination shall be based upon NRCS mapping and/or BLM evaluation of the area.
Soil-1006	CSU	Soil: slopes greater than 25% and less than 50%	170,590 acres	<p>Surface disturbance is restricted on slopes greater than 25% and less than 50%.</p> <p>CSU (1): (a) Prior to surface disturbance on slopes greater than 25% and less than 50% a site-specific construction, stabilization, and reclamation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The Plan must include designs approved and stamped by a licensed engineer. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate). (b) The Plan must demonstrate to the BLM authorized officer's satisfaction how the operator will meet the following performance standards:</p> <ul style="list-style-type: none"> • Slope stability is maintained preventing slope failure or mass wasting. • The disturbed area will be stabilized with no evidence of accelerated erosion features. • The disturbed area shall be managed to ensure soil characteristics approximate an appropriate reference site with regard to erosional features to maintain soil productivity and sustainability. • Sufficient viable topsoil is maintained for ensuring successful final reclamation. At locations where interim reclamation will be completed, this will be accomplished by respreading all salvaged topsoil over the areas of interim reclamation. • The original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation. <p>On the lands described below: CSU (2) as mapped by the U.S. Geological Survey (USGS) 1:24,000 scale topographic maps, USGS Digital Elevation Models, and/or as determined by a BLM evaluation of the area. For the purpose of: CSU (3) ensuring successful reclamation and erosion control on slopes greater than 25% and less than 50% in order to meet the standards outlined in Chapter 6 of the BLM's Oil and Gas Gold Book, as revised, and the 2015 BFO RMP ROD.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action will not result in a failure to meet the performance standards above, or a BLM evaluation determines that the disturbed area is not located on slopes greater than 25% but less than 50%.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation of the area. The stipulation and performance standards identified above may be modified based on monitoring results.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
				Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include slopes greater than 25% but less than 50%. This determination shall be based upon USGS mapping and/or BLM evaluation of the area.
Soil-1006	NSO	Soil: slopes greater than 50%	45,570	<p>No surface occupancy (NSO) or use is allowed on slopes greater than 50%.</p> <p>On the lands described below: NSO (1) as mapped by the USGS 1:24,000 scale topographic maps, USGS Digital Elevation Models, and/or as determined by a BLM evaluation of the area.</p> <p>For the purpose of: NSO (2) preventing mass slope failure and accelerated erosion.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action will not result in a mass slope failure or accelerated erosion, or if the action is located entirely within an existing surface disturbance.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation of the area. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include slopes greater than 50%. This determination shall be based upon USGS mapping and/or BLM evaluation of the area.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Soil-1010	CSU	Soil: limited reclamation potential areas	685,950 acres	<p>Surface disturbance is prohibited or restricted on limited reclamation potential areas such as areas possessing sensitive geologic formations, extremely limiting soil conditions, biological soil crusts, badlands, rock outcrops, and slopes susceptible to mass failure.</p> <p>CSU (1): (a) CSU (1): (a) Prior to surface disturbance on limited reclamation potential areas a site-specific construction, stabilization, and reclamation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The Plan must include designs approved and stamped by a licensed engineer. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(b) The Plan must demonstrate to the BLM authorized officer's satisfaction how the operator will meet the following performance standards:</p> <ul style="list-style-type: none"> • The disturbed area will be stabilized with no evidence of accelerated erosion features. • The disturbed area shall be managed to ensure soil characteristics approximate an appropriate reference site with regard to erosional features to maintain soil productivity and sustainability. • Slope stability is maintained preventing slope failure and erosion. • Sufficient viable topsoil is maintained for ensuring successful final reclamation. At locations where interim reclamation will be completed, this will be accomplished by respreading all salvaged topsoil over the areas of interim reclamation. • The original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation. <p>On the lands described below: CSU (2) as mapped by the NRCS SSURGO Order 3 soil survey and as determined by a BLM evaluation of the area. For the purpose of: CSU (3) ensuring successful reclamation and erosion control on limited reclamation potential areas in order to meet the standards outlined in, Chapter 6 of the BLM's Oil and Gas Gold Book, as revised, and the 2015 BFO RMP ROD.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action will not result in a failure to meet the performance standards above or a BLM evaluation determines that the area does not meet the limited reclamation criteria.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a NRCS soil survey and BLM evaluation. The stipulation and performance standards identified above may be modified based on monitoring results.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
				Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include limited reclamation potential areas. This determination shall be based upon NRCS mapping and BLM evaluation.

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Water-1014	CSU	Water: surface waters	95,172 acres	<p>Surface disturbance is restricted within 500 feet of springs, non-Coalbed Natural Gas (CBNG) reservoirs, water wells, and perennial streams.</p> <p>CSU (1): (a) CSU (1): (a) Prior to surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams a site-specific construction, stabilization, and reclamation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(b) The Plan must demonstrate to the BLM authorized officer's satisfaction how the operator will meet the following performance standards:</p> <ul style="list-style-type: none"> • storm water and surface runoff will be controlled to minimize erosion (rilling, gullyng, piping, mass wasting) and offsite siltation during construction, use/operations, and reclamation. • offsite areas will be protected from accelerated soil erosion. • the original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation. <p>CSU (2) as mapped by the USGS National Hydrologic Inventory and/or as determined by a BLM evaluation of the area.</p> <p>For the purpose of:</p> <p>CSU (3) ensuring protection of surface waters and associated riparian habitats by meeting the standards outlined in, Chapter 6 of the BLM's Oil and Gas Gold Book, as revised, and the 2015 BFO RMP ROD.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action will not result in a failure to meet the performance standards above.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a USGS National Hydrologic Inventory and/or BLM evaluation, in coordination with the Wyoming DEQ and/or Wyoming State Engineer's Office (WSEO). The stipulation and performance standards identified above may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams. This determination shall be based upon USGS National Hydrologic Inventory and/or BLM evaluation, in coordination with the Wyoming DEQ and/or BFO.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Cave-1004	CSU	Cave and Karst: significant caves	212,626 acres	<p>Surface disturbance is restricted near the entrances to significant caves.</p> <p>CSU (1): (a) Prior to surface disturbance or disruptive activities near an entrance to a significant cave a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(b) The Plan must demonstrate to the BLM authorized officer's satisfaction that the action will not destroy, disturb, deface, mar, alter, remove, or harm any significant cave or alter the free movement of any animal or plant life into or out of any significant cave.</p> <p>On the lands described below: CSU (2) as mapped by the BLM. For the purpose of: CSU (3) protecting significant cave resources (any material or substance occurring naturally in caves, such as animal life, plant life, paleontological deposits, sediments, minerals, speleogens, and speleothems).</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the significant cave resource(s) will be protected.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon on local evaluation. The stipulation and standards identified above may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative of the operator subject to confirmation from BLM.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain significant caves. This determination shall be based upon USGS or BLM data and field evaluation of the area.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Coal-2002 O&G-2007	CSU	Coal: areas identified as highly likely to be considered in a Coal (LBA)	304,967 acres	<p>Surface use or occupancy is restricted within areas identified as highly likely to be considered in a Coal Lease by Application (LBA).</p> <p>CSU (1): Surface use or occupancy shall not be allowed by oil and gas lessee(s), operating rights holder(s), and/or oil and gas operator(s) on this federal oil and gas lease to conduct any oil and gas operation, including drilling for, removing, or disposing of oil and/or gas contained in federal coal lease(s) unless a plan for mitigation of anticipated impacts is developed between the oil and gas and the coal lessees, and the Plan is approved by the BLM authorized officer; On the lands described below:</p> <p>CSU (2) areas identified as highly likely to be considered in a Coal LBA as mapped by the U.S. Office of Surface Mining, Wyoming Department of Environmental Quality (DEQ), USGS, and/or BLM. For the purpose of:</p> <p>CSU (3) protecting the first in time valid existing rights of the coal lessee, the BLM authorized officer reserves the right to alter or modify any oil and gas operations on the lands described in this lease ensuring: a.) the orderly development of the coal resource by surface and/or underground mining methods; b.) coal mine worker safety; and/or c.) coal production rates or recovery of the coal resource. The oil and gas lessee(s), operating rights holder(s), and/or oil and gas operator(s) of this federal oil and gas lease shall not hold the United States as lessor, coal lessee(s), sub-lessee(s), and/or coal operator(s) liable for any damage or loss of the oil and gas resource, including the venting of CBNG, caused by coal exploration or mining operations conducted on federal coal lease.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action will not interfere with coal operations.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain areas identified as highly likely to be considered in a coal LBA. This determination shall be based upon U.S. Office of Surface Mining, Wyoming DEQ, USGS, and/or BLM data.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Riparian-4009	CSU	Riparian and Wetlands	144,045 acres	<p>Surface disturbance is restricted within 500 feet of riparian systems, wetlands, and aquatic habitats.</p> <p>CSU (1): (a) Prior to surface disturbance within 500 feet of riparian systems, wetlands, and aquatic habitats a site-specific construction, stabilization, and reclamation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate). (b) The Plan must demonstrate to the BLM authorized officer's satisfaction how the operator will meet the following performance standards:</p> <ul style="list-style-type: none"> • storm water and surface runoff will be controlled to minimize erosion (rilling, gully, piping, mass wasting) and offsite siltation during construction, use/operations, and reclamation. • offsite areas will be protected from accelerated soil erosion. • the original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation. <p>CSU (2) as mapped by the USGS National Hydrologic Inventory and/or as determined by a BLM evaluation of the area.</p> <p>For the purpose of:</p> <p>CSU (3) ensuring protection of surface waters and associated riparian habitats by meeting the standards outlined in, Chapter 6 of the BLM's Oil and Gas Gold Book, as revised, and the 2015 BFO RMP ROD.</p> <p>CSU (3) On the lands described below:</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action will not result in a failure to meet the performance standards above.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a USGS National Hydrologic Inventory and/or BLM evaluation. The stipulation and performance standards identified above may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 500 feet of riparian systems, wetlands, and aquatic habitats. This determination shall be based upon USGS National Hydrologic Inventory and/or BLM field evaluation.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Fish-4013	CSU	Fish: occupied habitat	261,870 acres	<p>Surface disturbance is restricted within 0.25 mile of naturally occurring water bodies containing native or desirable non-native fish species.</p> <p>CSU (1): (a) Prior to surface disturbance within 0.25 mile of naturally occurring water bodies containing native or desirable non-native fish species a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(b) The Plan must demonstrate to the authorized officer's satisfaction that there will not be a local decline in fish abundance or range as a result of the lease operations. Examples of a few of the items to consider are as follows:</p> <ul style="list-style-type: none"> • Spill prevention measures to ensure hydrocarbons and other potentially toxic substances used for lease activities are prevented from entering the watercourse. • Sediment control measures to ensure increased sediment contributions are avoided. <p>On the lands described below: CSU (2) as mapped by the Wyoming Game and Fish Department (WGFD) and/or BLM. For the purpose of: CSU (3) protecting native and desirable non-native fish populations and habitat.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action will not result in a local decline in native or desirable non-native fish abundance or range.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a WGFD or BLM evaluation, in coordination with the WGFD. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 0.25 mile of naturally occurring water bodies containing native and desirable non-native fish species. This determination shall be based upon WGFD mapping and BLM onsite evaluation of the area.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
WL-4015	NSO	Wildlife: Big game habitat management areas	14,216 acres	<p>NSO or use is allowed within WGFD Big Game Habitat Management Areas (Ed O. Taylor, Kerns, Bud Love, and Amsden Creek).</p> <p>On the lands described below: NSO (1) as mapped by the WGFD.</p> <p>For the purpose of: NSO (2) ensuring the function and suitability of WGFD Big Game Habitat Management Areas.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not impair the function or suitability of WGFD Big Game Habitat Management Areas.</p> <p>Modification: The BLM-authorized officer may modify the area subject to the stipulation based upon a WGFD and BLM evaluation, in coordination with the WGFD. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within a WGFD big game habitat management area. This determination shall be based upon a BLM evaluation, in coordination with the WGFD.</p>
WL-4017	TLS	Wildlife: big game crucial winter range	81,437 acres	<p>Surface-disturbing and disruptive activities are prohibited or restricted from (1) November 15 to April 30 within big-game crucial winter range, or from May 1 to June 15 within elk calving areas (WGFD 2009a).</p> <p>On the lands described below: TLS (2) as mapped by the WGFD and evaluated by the BLM.</p> <p>For the purpose of: TLS (3) ensuring the function and suitability of crucial big game winter ranges.</p> <p>Exception: The BLM authorized officer may grant an exception if the operator demonstrates that the crucial habitat is not occupied during the period of concern, subject to confirmation by the WGFD and BLM; or it is determined that the action will not impair the function or suitability of the crucial habitat.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the WGFD, to determine that the big game crucial winter range is not present or boundaries of the subject winter range areas have been refined. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within big game crucial winter range or an elk calving area. This determination shall be based upon a BLM evaluation of the area, in coordination with the WGFD.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
WL-4017	TLS	Wildlife: elk calving areas	37,549 acres	<p>Surface-disturbing and disruptive activities are prohibited or restricted from (1) May 1 to June 15 within elk calving areas (WGFD 2009a). On the lands described below: TLS (2) as mapped by the WGFD and evaluated by the BLM. For the purpose of: TLS (3) ensuring the function and suitability of elk calving areas.</p> <p>Exception: The BLM authorized officer may grant an exception if the operator demonstrates that the crucial elk calving habitat is not occupied during the period of concern, subject to confirmation by the WGFD and BLM; or it is determined that the action will not impair the function or suitability of the crucial habitat.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the WGFD, to determine that the elk calving habitat is not present or boundaries of the subject calving areas have been refined. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within an elk calving area. This determination shall be based upon a BLM evaluation of the area, in coordination with the WGFD.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
WL-4017	CSU	Wildlife: big game crucial winter ranges	81,437 acres	<p>Surface disturbance is prohibited or restricted within WGFD designated big game crucial winter range.</p> <p>CSU (1): (a) Prior to surface disturbance within WGFD designated big game crucial winter range, a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate). (b) The Plan must demonstrate to the authorized officer's satisfaction that the function and suitability of crucial big game winter ranges will not be impaired On the lands described below:</p> <p>CSU (2) as mapped by the WGFD.</p> <p>For the purpose of:</p> <p>CSU (3) ensuring the function and suitability of crucial big game winter range.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not impair the function or suitability of the crucial habitat.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the WGFD. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within big game crucial winter range. This determination shall be based upon a BLM evaluation of the area, in coordination with the WGFD.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
WL-4017	CSU	Wildlife: elk calving areas	37,549 acres	<p>Surface disturbance is prohibited or restricted within WGFD designated elk calving areas.</p> <p>CSU (1): (a) Prior to surface disturbance within WGFD designated elk calving areas a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate). (b) The Plan must demonstrate to the authorized officer's satisfaction that the function and suitability of elk calving area will not be impaired.</p> <p>On the lands described below: CSU (2) as mapped by the WGFD. For the purpose of: CSU (3) ensuring the function and suitability of elk calving areas.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not impair the function or suitability of the elk calving area.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the WGFD. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within an elk calving area. This determination shall be based upon a BLM evaluation of the area, in coordination with the WGFD.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
WL-4018 WL-4021	CSU	Wildlife: crucial elk ranges	173,512 acres	<p>Surface disturbance is prohibited or restricted within WGFD designated elk crucial winter range and calving areas.</p> <p>CSU (1): (a) Fluid mineral production and byproducts shall be piped out of and (b) permanent above ground facilities will be located outside of WGFD designated elk crucial winter range and calving areas unless a mitigation plan (Plan) submitted by the applicant and approved by the BLM as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(c) The Plan must demonstrate to the authorized officer's satisfaction that the function and suitability of elk crucial winter range and elk calving areas will not be impaired.</p> <p>On the lands described below:</p> <p>CSU (2) as mapped by the WGFD.</p> <p>For the purpose of:</p> <p>CSU (3) ensuring the function and suitability of elk crucial winter range and elk calving areas.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not impair the function or suitability of the crucial habitat.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the WGFD. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within elk crucial winter range or a calving area. This determination shall be based upon a BLM evaluation, in coordination with the WGFD.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
WL-4023	CSU	Wildlife: Fortification Creek Planning Area	79,362 acres	<p>Surface occupancy or use is subject to the following special operating constraints.</p> <p>CSU (1) Surface-disturbing and disruptive activities shall only be approved with adequate mitigation to ensure compliance with the Fortification Creek RMP Amendment (BLM 2011c) performance standards. Prior to surface disturbance within the Fortification Creek Planning Area a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate). On the lands described below:</p> <p>CSU (2) within the Fortification Creek Planning Area (Map 76)</p> <p>For the purpose of:</p> <p>CSU (3) protecting the viability of the Fortification elk herd and facilitating ecosystem reconstruction in the stabilization of disturbed areas.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, is sited in a location, or otherwise designed, such that the Fortification Creek Resource Management Planning Area objectives (performance standards) are not applicable (i.e., outside the elk yearlong range).</p> <p>Modification: The authorized officer may modify the area subject to the stipulation or the CSU criteria if an environmental record of review finds that a portion of the CSU area is nonessential, it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site, or the modification will meet the goals identified in the Fortification Creek Resource Management Planning Area.</p> <p>Waiver: This stipulation may be waived over the entire lease if the authorized officer determines that the described lands are not within the Fortification elk herd yearlong range or do not contain areas of limited reclamation potential (including slopes greater than 25%) and therefore the Fortification Creek Resource Management Planning Area objectives (performance standards) are not applicable. This determination shall be based upon BLM evaluation of the area. The determination may be coordinated with other agencies such as the WGFD or NRCS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
WL-4026	CSU	Wildlife: sharp-tailed grouse leks	3,601 acres	<p>Surface disturbance is prohibited or restricted within 0.25 mile of the perimeter of occupied sharp-tailed grouse leks.</p> <p>CSU (1): (a) Prior to surface disturbance within 0.25 mile of the perimeter of occupied sharp-tailed grouse leks a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(b) The Plan must demonstrate to the authorized officer's satisfaction that the function and suitability of sharp-tailed grouse breeding habitat will not be impaired (result in physical injury; a decrease in productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or lek abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior).</p> <p>On the lands described below:</p> <p>CSU (2) as mapped by the WGFD.</p> <p>For the purpose of:</p> <p>CSU (3) ensuring the function and suitability of sharp-tailed grouse breeding habitat.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not impair the function and suitability of sharp-tailed grouse breeding habitat. The determination may include consultation with the WGFD.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the WGFD. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 0.25 mile of an occupied sharp-tailed grouse lek. This determination shall be based upon a BLM evaluation, in coordination with the WGFD.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
WL-4026	TLS	Wildlife: sharp-tailed grouse nesting	191,257 acres	<p>Surface-disturbing and disruptive activities are prohibited or restricted from April 1 to July 15 (WGFD 2009a) within 2 miles of the perimeter of occupied sharp-tailed grouse leks. On the lands described below: TLS (2) as mapped by the WGFD and evaluated by the BLM. For the purpose of: TLS (3) ensuring the function and suitability of sharp-tailed grouse nesting habitat.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action will not affect reproductive displays, nest attendance, egg or chick survival, or early brood-rearing success. Actions designed to enhance the long-term utility or availability of suitable sharp-tailed grouse habitat may be exempted from this timing limitation. The determination may include coordination with the WGFD, so that granting an exception would not adversely impact the population being protected.</p> <p>Modification: The BLM authorized officer may modify the size and shape of the TLS area or the TLS criteria if it is determined that the actual habitat suitability for seasonal sharp-tailed grouse activities is greater or less than the stipulated area, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the sharp-tailed grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined, in coordination with the WGFD, that the described lands are incapable of serving the long-term requirements of sharp-tailed grouse breeding, nesting, and early brood-rearing habitat.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
WL-4028	CSU	Wildlife: non-special status species raptor nests	1,195,815 acres	<p>Surface disturbance is restricted within U.S. Fish and Wildlife Service (USFWS) Wyoming Ecological Service's recommended spatial biological buffers (Appendix K (p. 2161)) or http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) of active non-special status species raptor nests.</p> <p>CSU (1) (a) Prior to surface disturbance within USFWS recommended spatial buffers of raptor nests a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(b) The Plan must demonstrate to the authorized officer's satisfaction that nesting raptors will not be disturbed. Nesting raptors will not be agitated or bothered to a degree that causes or is likely to cause:</p> <ul style="list-style-type: none"> • physical injury, • a decrease in productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or • nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. <p>On the lands described below: CSU (2) as mapped on the BFO Geographic Information System (GIS) database or determined by the BLM from field evaluation, in coordination with the WGFD and/or USFWS. For the purpose of: CSU (3) ensuring raptor productivity.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to meet the performance standards above. The determination may include coordination with the WGFD or USFWS.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. Spatial buffers may be modified based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site. The stipulation and performance standards identified above may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include consultation with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include spatial buffer zones for nesting raptors. This determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include consultation with the WGFD or USFWS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
WL-4030	TLS	Wildlife: non-special status species raptor nesting		<p>Surface-disturbing and disruptive activities are prohibited or restricted within (1) the USFWS Wyoming Ecological Service's recommended spatial buffers and dates of active non-special status species raptor nests. (Appendix K (p. 2161) or http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html).</p> <p>On the lands described below: TLS (2) as mapped on the BFO GIS database or determined by, BLM from field evaluation, in coordination with the WGFD and/or USFWS. For the purpose of: TLS (3) ensuring raptor nest productivity.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action will not disturb (likely to cause physical injury; a decrease in productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior) nesting raptors. The determination may include consultation with the WGFD or USFWS.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. Spatial buffers may be modified based on auditory and visual impacts, as well as the topography and other ecological characteristics surrounding the nest site. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. The confirmation may include consultation with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include spatial buffers for raptor nests. This determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS Plant-4008	NSO	SS Plants: populations		<p>NSO or use is allowed within special status species plant populations.</p> <p>On the lands described below:</p> <p>NSO (1) as mapped on the BFO GIS database, or determined by BLM from field evaluation, in coordination with the Wyoming Natural Disturbance Density and/or USFWS.</p> <p>For the purpose of:</p> <p>NSO (2) protecting special status species plant populations.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not adversely affect special status species plant populations.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the USFWS. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain a special status species plant population. This determination shall be based upon a BLM evaluation, in coordination with the USFWS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS Plant-4008	CSU	SS Plants: habitat	243,929 acres	<p>Surface disturbance is prohibited or restricted within special status plant species habitat.</p> <p>CSU (1) (a) Prior to surface disturbance within special status plant species habitat flowering season survey(s) must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(b) The Plan must demonstrate to the authorized officer's satisfaction that special status plant species will not be harmed and that the habitat on which they depend will be conserved. On the lands described below:</p> <p>CSU (2) as mapped or determined by the USFWS, Wyoming Natural Diversity Database, the BFO GIS database, or from field evaluation.</p> <p>For the purpose of:</p> <p>CSU (3) conserving special status plant species and the habitat on which they depend.</p> <p>Exception: The BLM authorized officer may grant an exception if flowering season survey(s) determine that a special status species plant population is not present or it is determined that the action is sited in a location so that the action will not harm special status plant species.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation and performance standards identified above may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if flowering season survey(s) determine that the entire lease area does not include populations or habitat of special status species plants. This determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS Plant-4008	CSU	SS Plants: Ute ladies'-tresses orchid populations	0 acres	<p>Surface disturbance is prohibited or restricted within 0.25 mile of Ute ladies'-tresses orchid populations. CSU (1) (a) Prior to surface disturbance within Ute ladies'-tresses orchid habitat flowering season survey(s) must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(b) The Plan must demonstrate to the authorized officer's satisfaction that Ute ladies'-tresses orchids will not be harmed and that the habitat on which they depend will be conserved. On the lands described below:</p> <p>CSU (2) as mapped or determined by the USFWS, Wyoming Natural Diversity Database, the BFO GIS database, or from field evaluation.</p> <p>For the purpose of:</p> <p>CSU (3) conserving Ute ladies'-tresses orchids and the habitat on which they depend.</p> <p>Exception: The BLM authorized officer may grant an exception if flowering season survey(s) determine that a Ute ladies'-tresses orchid population is not present or it is determined that the action is sited in a location so that the action will not harm special status plant species.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation and performance standards identified above may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if flowering season survey(s) determine that the entire lease area does not include populations or habitat of Ute ladies'-tresses orchid. This determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS Fish-4008	NSO	SS Fish: occupied habitat	4,846 acres	<p>NSO or use is allowed within 0.25 mile of any waters containing special status fish species.</p> <p>On the lands described below; NSO (1) as mapped on the BFO GIS database or from field evaluation, in consultation with the WGFD.</p> <p>For the purpose of: NSO (2) protecting special status fish populations and habitat.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a local decline in special status species fish abundance or range.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in consultation with the WGFD. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 0.25 mile of any waters containing special status fish species. This determination shall be based upon WGFD mapping and field evaluation of the area.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4007	CSU	SS Wildlife: special status wildlife habitat	2,325,854	<p>Surface disturbance is restricted within special status species wildlife habitat.</p> <p>CSU (1) (a) Prior to surface disturbance within special status species wildlife habitat an occupancy survey must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(b) The Plan must demonstrate to the authorized officer's satisfaction that special status wildlife species will not be harmed (any act which actually kills or injures wildlife including habitat modification or degradation that substantially impairs essential behavioral patterns) and that the habitat on which they depend will be conserved.</p> <p>On the lands described below:</p> <p>CSU (2) as mapped or determined by the USFWS, WGFD, Wyoming Natural Diversity Database, or BLM from field evaluation.</p> <p>For the purpose of:</p> <p>CSU (3) conserving special status species wildlife and the habitat on which they depend (BLM 2008d - 6840 manual).</p> <p>Exception: The BLM authorized officer may grant an exception if an occupancy survey determines that special status wildlife species are not present or it is determined that the action is sited in a location so that the action will not harm special status wildlife species. Confirmation may include coordination with the WGFD and/or USFWS.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation and performance standards identified above may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD and/or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include special status species wildlife habitat. This determination shall be based upon field studies of the area by a qualified representative subject to confirmation from BLM. Confirmation may include coordination with the WGFD and/or USFWS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4009	CSU	SS Wildlife: prairie dog colonies and dependent species	58,902 acres	<p>Surface disturbance is prohibited or restricted within active prairie dog colonies on BLM-administered surface.</p> <p>CSU (1) (a) Prior to surface disturbance within active prairie dog colonies on BLM-administered surface a special status species occupancy survey must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(b) The Plan must demonstrate to the authorized officer's satisfaction that activities with active prairie dog colonies on BLM surface would not adversely impact suitable habitat for special status species dependent upon prairie dog colonies. On the lands described below:</p> <p>CSU (2) as mapped or determined on the BFO GIS database or from field evaluation, in coordination with the USFWS and WGFD.</p> <p>For the purpose of:</p> <p>CSU (3) conserving special status species wildlife and the prairie dog colonies on which they depend.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that special status wildlife species are not present or it is determined that the action is sited in a location so that the action will not harm special status wildlife species. This determination shall be based upon evaluation by a qualified representative, subject to confirmation from BLM. Confirmation may include coordination with the WGFD and/or USFWS.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation and performance standards identified above may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD and/or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not occupied by prairie dog dependent special status wildlife species. This determination shall be based upon field studies of the area by a qualified representative subject to confirmation from BLM. Confirmation may include coordination with the WGFD and/or USFWS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4024	NSO	SS Wildlife: Greater Sage-Grouse Core Population Areas and Connectivity Corridors	Core Population Areas: 30,754 acres Connectivity Corridors: 7,359 acres	<p>Stipulation: Occupied Greater Sage-Grouse leks inside designated Core Population Areas and Connectivity Corridors. This area encompasses occupied Greater Sage-Grouse leks inside designated Core Population Areas and Connectivity Corridors. NSO or use is allowed within a six-tenths (0.6) mile radius of the perimeter of occupied Greater Sage-Grouse leks inside designated Core Population Areas and Connectivity Corridors, as mapped on the BFO GIS database.</p> <p>Purpose: To protect occupied Greater Sage-Grouse leks and associated seasonal habitat, life-history, or behavioral needs of Greater Sage-Grouse in proximity to leks, from habitat fragmentation and loss and Greater Sage-Grouse populations from disturbance inside designated Core Population Areas and Connectivity Corridors.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, would not impair the function or utility of the site for the current or subsequent seasonal habitat, life-history, or behavioral needs of Greater Sage-Grouse. The BLM can and does grant exceptions if the BLM, in coordination with the WGFD, determines that granting an exception would not adversely impact the population being protected. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Modification: The authorized officer may modify the area subject to the stipulation or the NSO criteria if an environmental record of review finds that a portion of the NSO area is nonessential, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the Greater Sage-Grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Waiver: This stipulation may be waived over the entire lease if, in coordination with the WGFD, it is determined that the site is no longer considered in the land use plan to be within a Greater Sage-Grouse designated Core Population Area or Connectivity Corridor or Greater Sage-Grouse are no longer a BLM sensitive or special status species and are not listed by the USFWS as Threatened or Endangered under the Endangered Species Act (ESA). Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4024	CSU	SS Wildlife: Greater Sage-Grouse Core Population Areas and Connectivity Corridors	Core Population Areas: 30,754 acres Connectivity Corridors: 7,359 acres	<p>Stipulation: Greater Sage-Grouse Core Population Areas and Connectivity Corridors (Priority Habitat). This area encompasses BLM-administered surface within Greater Sage-Grouse Core Population Areas and Connectivity Corridors (Priority Habitat). All applicable surface disturbances (existing or future, and not limited to fluid mineral disturbances) must be restored, as described in the BFO RMP, to the approval of the BLM authorized officer.</p> <p>Purpose: To restore functional Greater Sage-Grouse habitat to support core Greater Sage-Grouse populations.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, would not impair the function or utility of the site for the current or subsequent needs of Greater Sage-Grouse. The BLM can and does grant exceptions if the BLM, in coordination with the WGFD, determines that granting an exception would not adversely impact the population being protected. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Modification: The authorized officer may modify the area subject to the stipulation or surface occupancy criteria if an environmental record of review finds that a portion of the CSU area is nonessential, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the needs of the Greater Sage-Grouse. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Waiver: This stipulation may be waived over the entire lease if, in coordination with the WGFD, it is determined that the site is no longer considered in the land use plan to be within a Greater Sage-Grouse Core Population Area or Connectivity Corridor or Greater Sage-Grouse are no longer a BLM sensitive or special status species and are not listed by the USFWS as Threatened or Endangered under the ESA. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4024	TLS	SS Wildlife: Greater Sage-Grouse Core Population Areas and Connectivity Corridors	Core Population Areas: 30,754 acres Connectivity Corridors: 7,359 acres	<p>Stipulation: Occupied Greater Sage-Grouse leks in designated Core Population Areas or Connectivity Corridors. This area encompasses occupied Greater Sage-Grouse leks in designated Core Population Areas or Connectivity Corridors. No disruptive activity is allowed during 6:00 p.m. – 8:00 a.m., March 1 – May 15, within a six tenths (0.6) mile radius of the perimeter of occupied Greater Sage-Grouse leks in designated Core Population Areas or Connectivity Corridors.</p> <p>Purpose: To seasonally protect occupied Greater Sage-Grouse leks from disruptive activity in designated Core Population Areas or Connectivity Corridors.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, will not affect reproductive displays, nest attendance, egg or chick survival, or early brood-rearing success. Actions designed to enhance the long-term utility or availability of suitable Greater Sage-Grouse habitat may be exempted from this timing limitation. The BLM can and does grant exceptions to seasonal restrictions if the BLM, in coordination with the WGFD, determines that granting an exception would not adversely impact the population being protected. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Modification: The authorized officer may modify the size and shape of the TLS area or the TLS criteria if an environmental record of review indicates the actual habitat suitability for seasonal Greater Sage-Grouse activities is greater or less than the stipulated area, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the Greater Sage-Grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Waiver: This stipulation may be waived over the entire lease if, in coordination with the WGFD, it is determined that the described lands are no longer considered in the land use plan to be within a Greater Sage-Grouse designated Core Population Area or Connectivity Corridor or are incapable of serving the long-term requirements of Greater Sage-Grouse breeding habitat and that these ranges no longer warrant consideration as components of Greater Sage-Grouse breeding habitat. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Appendix H Fluid Mineral Lease Notices; Lease Stipulations; and the Process for Exceptions, Modifications, and Waivers
Buffalo Planning Area Stipulations

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4024	TLS	SS Wildlife: Greater Sage-Grouse Core Population Areas and Connectivity Corridors	Core Population Areas: 30,754 acres Connectivity Corridors: 7,359 acres	<p>Stipulation: Occupied Greater Sage-Grouse leks in designated Core Population Areas or Connectivity Corridors. This area encompasses occupied Greater Sage-Grouse leks in designated Core Population Areas or Connectivity Corridors. Noise levels may not exceed 10 A-weighted decibels above ambient noise during 6:00 p.m. – 8:00 a.m., March 1 – May 15, within a six tenths (0.6) mile radius of the perimeter of occupied Greater Sage-Grouse leks in designated Core Population Areas or Connectivity Corridors.</p> <p>Purpose: To seasonally protect occupied Greater Sage-Grouse leks from disruptive activity in designated Core Population Areas or Connectivity Corridors.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, will not affect reproductive displays, nest attendance, egg or chick survival, or early brood-rearing success. Actions designed to enhance the long-term utility or availability of suitable Greater Sage-Grouse habitat may be exempted from this timing limitation. The BLM can and does grant exceptions to seasonal restrictions if the BLM, in coordination with the WGFD, determines that granting an exception would not adversely impact the population being protected. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Modification: The authorized officer may modify the size and shape of the TLS area or the TLS criteria if an environmental record of review indicates the actual habitat suitability for seasonal Greater Sage-Grouse activities is greater or less than the stipulated area, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the Greater Sage-Grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Waiver: This stipulation may be waived over the entire lease if, in coordination with the WGFD, it is determined that the described lands are no longer considered in the land use plan to be within a Greater Sage-Grouse designated Core Population Area or Connectivity Corridor or are incapable of serving the long-term requirements of Greater Sage-Grouse breeding habitat and that these ranges no longer warrant consideration as components of Greater Sage-Grouse breeding habitat. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4024	TLS	SS Wildlife: Greater Sage-Grouse winter concentration areas that support nesting in Core Population Areas (Priority Habitat Area and general habitat)	Not mapped	<p>Stipulation: Greater Sage-Grouse winter concentration areas. This area encompasses Greater Sage-Grouse winter concentration areas. No surface use is allowed during December 1 – March 14, within Greater Sage-grouse Winter concentration areas in designated core population areas, and outside designated core population areas when supporting wintering Greater Sage-Grouse that attend leks within designated core population areas.</p> <p>Purpose: To seasonally protect Greater Sage-Grouse winter concentration areas from disruptive activities.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, will not impair the function and suitability of the winter concentration area, or it is determined that the winter concentration area is not occupied by concentrated populations of Greater Sage-Grouse during the period of concern. Actions designed to enhance the long-term utility or availability of suitable Greater Sage-Grouse habitat may be exempted from this timing limitation. The BLM can and does grant exceptions to seasonal restrictions if the BLM, in coordination with the WGFD, determines that granting an exception would not adversely impact the population being protected. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Modification: The authorized officer may modify the size and shape of the TLS area or the TLS criteria if an environmental record of review indicates the actual habitat suitability for seasonal Greater Sage-Grouse activities is greater or less than the stipulated area, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the Greater Sage-Grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Waiver: This stipulation may be waived over the entire lease if, in coordination with the WGFD, it is determined that the described lands are incapable of serving the long-term requirements of Greater Sage-Grouse winter habitat and that these ranges no longer warrant consideration as components of Greater Sage-Grouse winter habitat. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4024	CSU	SS Wildlife: Greater Sage-Grouse Core Population Areas	519,444 acres	<p>Stipulation: Greater Sage-Grouse designated Core Population Areas. This area encompasses Greater Sage-Grouse designated Core Population Areas. Surface occupancy or use will be restricted to no more than an average of one disturbance location per 640 acres using the Density and Disturbance Calculation Tool (DDCT), and the cumulative value of all applicable surface disturbances, existing or future, must not exceed 5 percent of the DDCT area.</p> <p>This lease does not guarantee the lessee the right to occupy the surface of the lease for the purpose of producing oil and natural gas within Greater Sage-Grouse designated Core Population Areas. The surface occupancy restriction criteria identified in this stipulation may preclude surface occupancy and may be beyond the ability of the lessee to meet due to existing surface disturbance on Federal, State, or private lands within designated Core Population Areas or surface disturbance created by other land users. The BLM may require the lessee or operator to enter into a unit agreement or drilling easement to facilitate the equitable development of this and surrounding leases.</p> <p>Purpose: To protect Greater Sage-Grouse designated Core Population Areas from habitat fragmentation and loss.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, would not impair the function or utility of the site for the current or subsequent seasonal habitat, life-history, or behavioral needs of Greater Sage-Grouse. An exception to the stated limits may be granted when offsite mitigation is determined to provide an overall beneficial effect to Greater Sage-Grouse habitat and populations. The BLM can and does grant exceptions if the BLM, in coordination with the WGFD, determines that granting an exception would not adversely impact the population being protected. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Modification: The authorized officer may modify the area subject to the stipulation or surface occupancy criteria if an environmental record of review finds that a portion of the CSU area is nonessential, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the Greater Sage-Grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
				Waiver: This stipulation may be waived over the entire lease if, in coordination with the WGFD, it is determined that the site is no longer considered in the land use plan to be within a Greater Sage-Grouse designated Core Population Area or Greater Sage-Grouse are no longer a BLM sensitive or special status species and are not listed by the USFWS as Threatened or Endangered under the ESA. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4024	TLS	SS Wildlife: Greater Sage-Grouse Core Population Area nesting habitat	440,114 acres	<p>Stipulation: Greater Sage-Grouse breeding, nesting, and early brood-rearing habitats inside designated Core Population Areas. This area encompasses Greater Sage-Grouse breeding, nesting, and early brood-rearing habitats inside designated Core Population Areas. No surface use is allowed during March 15 – June 30, inside designated Core Population Areas.</p> <p>Purpose: To seasonally protect Greater Sage-Grouse breeding, nesting, and early brood-rearing habitats from disruptive activities inside designated Core Population Areas.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, will not affect reproductive displays, nest attendance, egg or chick survival, or early brood-rearing success. Actions designed to enhance the long-term utility or availability of suitable Greater Sage-Grouse habitat may be exempted from this timing limitation. The BLM can and does grant exceptions to seasonal restrictions if the BLM, in coordination with the WGFD, determines that granting an exception would not adversely impact the population being protected. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Modification: The authorized officer may modify the size and shape of the TLS area or the TLS criteria if an environmental record of review indicates the actual habitat suitability for seasonal Greater Sage-Grouse activities is greater or less than the stipulated area, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the Greater Sage-Grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Waiver: This stipulation may be waived over the entire lease if, in coordination with the WGFD, it is determined that the described lands are no longer considered in the land use plan to be within a Greater Sage-Grouse designated Core Population Area or are incapable of serving the long-term requirements of Greater Sage-Grouse breeding, nesting, or early brood-rearing habitat and that these ranges no longer warrant consideration as components of Greater Sage-Grouse breeding, nesting, or early brood-rearing habitat. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4024	CSU	SS Wildlife: Greater Sage-Grouse Connectivity Corridors	150,006 acres	<p>Stipulation: Greater Sage-Grouse Connectivity Corridors. This area encompasses Greater Sage-Grouse Connectivity Corridors. The cumulative value of all applicable surface disturbances must not exceed an average of 5 percent of the sagebrush habitat mapped on the BFO GIS database per 640 acres, using the DDCT.</p> <p>This lease does not guarantee the lessee the right to occupy the surface of the lease for the purpose of producing oil and natural gas within Greater Sage-Grouse designated Connectivity Corridors. The surface occupancy restriction criteria identified in this stipulation may preclude surface occupancy and may be beyond the ability of the lessee to meet due to existing surface disturbance on Federal, State, or private lands within designated Connectivity Corridors or surface disturbance created by other land users. The BLM may require the lessee or operator to enter into a unit agreement or drilling easement to facilitate the equitable development of this and surrounding leases.</p> <p>Purpose: To protect Greater Sage-Grouse Connectivity Corridors from habitat fragmentation and loss.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, would not impair the function or utility of the site for the current or subsequent seasonal habitat, life-history, or behavioral needs of Greater Sage-Grouse. An exception to the stated limits may be granted when offsite mitigation is determined to provide an overall beneficial effect to Greater Sage-Grouse habitat and populations. The BLM can and does grant exceptions if the BLM, in coordination with the WGFD, determines that granting an exception would not adversely impact the population being protected. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Modification: The authorized officer may modify the area subject to the stipulation or surface occupancy criteria if an environmental record of review finds that a portion of the CSU area is nonessential, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the Greater Sage-Grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
				Waiver: This stipulation may be waived over the entire lease if, in coordination with the WGFD, it is determined that the site is no longer considered in the land use plan to be a Greater Sage-Grouse Connectivity Corridor or Greater Sage-Grouse are no longer a BLM sensitive or special status species and are not listed by the USFWS as Threatened or Endangered under the ESA. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)
SS WL-4024	TLS	SS Wildlife: Greater Sage-Grouse Connectivity Corridor nesting habitat	131,849 acres	<p>Stipulation: Greater Sage-Grouse breeding, nesting, and early brood-rearing habitat within Connectivity Corridors. This area encompasses Greater Sage-Grouse breeding, nesting, and early brood-rearing habitat within Connectivity Corridors. No surface use is allowed during March 15 – June 30, inside Connectivity Corridors, within four miles of an occupied lek (independent of habitat suitability).</p> <p>Purpose: To seasonally protect Greater Sage-Grouse breeding, nesting, and early brood-rearing habitats inside Connectivity Corridors from disruptive activities, within four miles of an occupied lek.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, will not affect reproductive displays, nest attendance, egg or chick survival, or early brood-rearing success. Actions designed to enhance the long-term utility or availability of suitable Greater Sage-Grouse habitat may be exempted from this timing limitation. The BLM can and does grant exceptions to seasonal restrictions if the BLM, in coordination with the WGFD, determines that granting an exception would not adversely impact the population being protected. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Modification: The authorized officer may modify the size and shape of the TLS area or the TLS criteria if an environmental record of review indicates the actual habitat suitability for seasonal Greater Sage-Grouse activities is greater or less than the stipulated area, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the Greater Sage-Grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
				<p>Waiver: This stipulation may be waived over the entire lease if, in coordination with the WGFD, it is determined that the described lands are no longer considered in the land use plan to be within a Greater Sage-Grouse designated Connectivity Corridor or are incapable of serving the long-term requirements of Greater Sage-Grouse breeding, nesting, or early brood-rearing habitat and that these ranges no longer warrant consideration as components of Greater Sage-Grouse breeding, nesting, or early brood-rearing habitat. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4024	NSO	SS Wildlife: general Greater Sage-Grouse breeding habitat	16,103 acres	<p>Stipulation: Occupied Greater Sage-Grouse leks outside designated Core Population Areas and Connectivity Corridors. This area encompasses occupied Greater Sage-Grouse leks outside designated Core Population Areas and Connectivity Corridors. NSO or use is allowed within a one-quarter (0.25) mile radius of the perimeter of occupied Greater Sage-Grouse leks outside designated Core Population Areas and Connectivity Corridors, as mapped on the BFO GIS database.</p> <p>Purpose: To protect occupied Greater Sage-Grouse leks and associated seasonal habitat, life-history, or behavioral needs of Greater Sage-Grouse in proximity to leks, from habitat fragmentation and loss and Greater Sage-Grouse populations from disturbance outside designated Core Population Areas and Connectivity Corridors.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, would not impair the function or utility of the site for the current or subsequent seasonal habitat, life-history, or behavioral needs of Greater Sage-Grouse. The BLM can and does grant exceptions if the BLM, in coordination with the WGFD, determines that granting an exception would not adversely impact the population being protected. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Modification: The authorized officer may modify the area subject to the stipulation or the NSO criteria if an environmental record of review finds that a portion of the NSO area is nonessential, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the Greater Sage-Grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Waiver: This stipulation may be waived over the entire lease if Greater Sage-Grouse are no longer a BLM sensitive or special status species and are not listed by the USFWS as Threatened or Endangered under the ESA. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4024	TLS	SS Wildlife: general Greater Sage-Grouse nesting and early brood-rearing habitat	779,834 acres	<p>Stipulation: Greater Sage-Grouse breeding, nesting and early brood-rearing habitat outside designated Core Population Areas and Connectivity Corridors. This area encompasses Greater Sage-Grouse breeding, nesting and early brood-rearing habitat outside designated Core Population Areas and Connectivity Corridors. No surface use is allowed during March 15 – June 30, in Greater Sage-Grouse breeding, nesting and early brood-rearing habitats outside designated Core Population Areas and Connectivity Corridors, within two miles of an occupied lek.</p> <p>Purpose: To seasonally protect Greater Sage-Grouse nesting and early brood-rearing habitats from disruptive activities outside designated Core Population Areas and Connectivity Corridors, within two miles of an occupied lek.</p> <p>Exception: The authorized officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, will not affect reproductive displays, nest attendance, egg or chick survival, or early brood-rearing success. Actions designed to enhance the long-term utility or availability of suitable Greater Sage-Grouse habitat may be exempted from this timing limitation. The BLM can and does grant exceptions to seasonal restrictions if the BLM, in coordination with the WGFD, determines that granting an exception would not adversely impact the population being protected. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p> <p>Modification: The authorized officer may modify the size and shape of the TLS area or the TLS criteria if an environmental record of review indicates the actual habitat suitability for seasonal Greater Sage-Grouse activities is greater or less than the stipulated area, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the Greater Sage-Grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
				<p>Waiver: This stipulation may be waived over the entire lease if, in coordination with the WGFD, it is determined that the described lands are incapable of serving the long-term requirements of Greater Sage-Grouse breeding, nesting, or early brood-rearing habitat and that these ranges no longer warrant consideration as components of Greater Sage-Grouse breeding, nesting, or early brood-rearing habitat. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manuals 1624 and 3101.)</p>
SS WL-4026	NSO	SS Wildlife: bald eagle nesting habitat	7,710 acres	<p>NSO or use is allowed within 0.5 mile of bald eagle nests.</p> <p>On the lands described below: NSO (1) as mapped on the BFO GIS database or determined by field evaluation, in coordination with the WGFD and/or USFWS.</p> <p>For the purpose of: NSO (2) ensuring productivity of bald eagles.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not disturb (as defined by the Bald and Golden Eagle Protection Act) nesting bald eagles. Bald eagles will not be agitated or bothered to a degree that causes or is likely to cause:</p> <ul style="list-style-type: none"> • physical injury, or • a decrease in productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or • nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 0.5 mile of a bald eagle nest. Confirmation may include coordination with the WGFD or USFWS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4026	TLS	SS Wildlife: bald eagle nesting	36,597 acres	<p>Surface-disturbing and disruptive activities are prohibited or restricted from February 1 to August 15 within 1.0 mile of active bald eagle nests.</p> <p>On the lands described below: TLS (2) as mapped on the BFO GIS database or determined by field evaluation, in coordination with the WGFD and/or USFWS.</p> <p>For the purpose of: TLS (3) ensuring productivity of bald eagles.</p> <p>Exception: The BLM authorized officer may grant an exception if a staff review determines that the action will not disturb nesting bald eagles. This determination shall be based upon field study by a qualified representative, subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 1.0 mile of a bald eagle nest. Confirmation may include coordination with the WGFD or USFWS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4028	NSO	SS Wildlife: bald and golden eagle winter roosts	58,902 acres	<p>NSO or use is allowed within 0.5 miles from the edge of consistently used bald or golden eagle winter roosts and the following consistently used riparian corridors: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. On the lands described below: NSO (2) as mapped on the BFO GIS database or determined by field evaluation, in coordination with the WGFD and/or USFWS.. For the purpose of: NSO (3) protecting wintering bald and golden eagles.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not harm roosting eagles.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 0.5 mile of a consistently used eagle roost or riparian corridor.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4028	CSU	SS Wildlife: bald and golden eagle winter roosting habitat	58,902 acres	<p>Surface disturbance is restricted within 1.0 mile from the edge of consistently used bald or golden eagle winter roosts and the following consistently used riparian corridors: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River.</p> <p>CSU (1): (a) Prior to surface disturbance within 1.0 mile of consistently used bald and golden eagle winter roosts and riparian corridors a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate). (b) The Plan must demonstrate to the authorized officer's satisfaction that wintering eagles will not be disturbed (as defined by the Bald and Golden Eagle Protection Act). Bald or golden eagles will not be agitated or bothered to a degree that causes or is likely to cause:</p> <ul style="list-style-type: none"> • physical injury, or • a decrease in productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior. <p>On the lands described below: CSU (2) as mapped on the BFO GIS database or determined by field evaluation, in coordination with the WGFD and/or USFWS..</p> <p>For the purpose of: CSU (3) protecting bald and golden eagle winter roosting habitat.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to meet the performance standards above.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation and performance standards identified above may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 1.0 mile of a consistently used eagle winter roost or riparian corridor.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4028	TLS	SS Wildlife: bald and golden eagle winter roosting habitat	58,902 acres	<p>Surface-disturbing and disruptive activities are prohibited or restricted from (1) November 1 to April 1 within 1.0 mile from the edge of consistently used eagle winter roosts and the following consistently used riparian corridors: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. On the lands described below:</p> <p>TLS (2) as mapped on the BFO GIS database or determined by field evaluation, in coordination with the WGFD and/or USFWS.</p> <p>For the purpose of:</p> <p>TLS (3) protecting roosting eagles.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designated so that the action will not harm roosting eagles.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 1.0 mile of a consistently used bald or golden eagle winter roost or riparian corridor.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4031	TLS	SS Wildlife: special status raptor nesting	701,847 acres	<p>Surface-disturbing and disruptive activities are prohibited or restricted (1) within USFWS recommended spatial buffers and dates (Appendix K (p. 2161) or http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html) of active raptor nests of special status species.</p> <p>On the lands described below:</p> <p>TLS (2) as mapped on the BFO GIS database or determined by field evaluation, in coordination with the WGFD and/or USFWS..</p> <p>For the purpose of:</p> <p>TLS (3) ensuring productivity of nesting special status raptors.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action will not disturb nesting special status raptors.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within the USFWS recommended spatial buffer of a sensitive species raptor nest. This determination shall be based upon field studies of the area by a qualified representative and reviewed by BLM. The determination may include coordination with the WGFD or USFWS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4032	NSO	SS Wildlife: special status raptor nests	701,847 acres	<p>NSO or use is allowed within a species specific spatial buffer of special status species raptor nests using USFWS Wyoming Ecological Service's recommendations (Appendix K (p. 2161) or http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html).</p> <p>On the lands described below: NSO (1) as mapped on the BFO GIS database or determined by field evaluation, in coordination with the WGFD and/or USFWS.</p> <p>For the purpose of: NSO (2) protecting nest sites of special status raptors.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, or sited in a location, or a site-specific evaluation determines that nesting special status raptors will not be disturbed (agitated or bothered to a degree that causes or is likely to cause: physical injury; or a decrease in productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.) The determination may include coordination with the WGFD or USFWS.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within the USFWS recommended spatial buffer of a sensitive species raptor nest. This determination shall be based upon field studies of the area by a qualified representative and reviewed by BLM. The determination may include coordination with the WGFD or USFWS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4034	CSU	SS Wildlife: amphibian habitat	1,217,959 acres	<p>Surface disturbance is restricted within 1,640 feet (500 meters) of perennial water, vernal pools, playas, and wetlands.</p> <p>CSU (1) (a) Prior to surface disturbance within 1,640 feet (500 meters) of perennial water, vernal pools, playas, and wetlands appropriate surveys must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator may not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan or approved it with conditions.</p> <p>(b) The Plan must demonstrate to the authorized officer's satisfaction that special status amphibian species will not be disturbed to a degree that causes or is likely to cause:</p> <ul style="list-style-type: none"> • physical injury, • a decrease in productivity, by substantially interfering with normal breeding, sheltering, or hibernation behavior, or • site abandonment, by substantially interfering with normal breeding, sheltering, or hibernation behavior. <p>On the lands described below:</p> <p>CSU (2) as mapped on the BFO GIS database or determined by field evaluation, in coordination with the WGFD and/or USFWS.</p> <p>For the purpose of:</p> <p>CSU (3) ensuring production of special status amphibian species breeding, sheltering, and hibernation habitat.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the proposed action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to meet the performance standards above. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation and performance standards identified above may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include special status species amphibian habitat. This determination shall be based upon field studies of the area by a qualified representative and reviewed by BLM. The determination may include coordination with the WGFD or USFWS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4034	CSU	SS Wildlife: reptile habitat	1,217,959 acres outcrops not mapped	<p>Surface disturbance is restricted within 1,640 feet (500 meters) of south facing rock outcrops, perennial water, vernal pools, playas, and wetlands.</p> <p>CSU (1) (a) Prior to surface disturbance within 1,640 feet (500 meters) of south facing rock outcrops, perennial water, vernal pools, playas, and wetlands appropriate surveys must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator may not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan or approved it with conditions.</p> <p>(b) The Plan must demonstrate to the authorized officer's satisfaction that special status reptile species will not be disturbed to a degree that causes or is likely to cause:</p> <ul style="list-style-type: none"> • physical injury, • a decrease in productivity, by substantially interfering with normal breeding, basking, sheltering, or hibernation behavior, or • site abandonment, by substantially interfering with normal breeding, basking, sheltering, or hibernation behavior. <p>On the lands described below:</p> <p>CSU (2) as mapped on the BFO GIS data-base or determined by field evaluation, in coordination with the WGFD and/or USFWS.</p> <p>For the purpose of:</p> <p>CSU (3) ensuring production of special status reptile species breeding, basking, sheltering, and hibernation habitat.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the proposed action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to meet the performance standards above. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation and performance standards identified above may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include special status species reptile habitat. This determination shall be based upon field studies of the area by a qualified representative and reviewed by BLM. The determination may include coordination with the WGFD or USFWS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
SS WL-4034	CSU	SS Wildlife: bat habitat	115,196 acres	<p>Surface disturbance is restricted within 1,640 feet (500 meters) of cave entrances, mature forest, and rock outcrops. CSU (1) (a) Prior to surface disturbance within 1,640 feet (500 meters) of cave entrances, mature forest, and rock outcrops appropriate surveys must be conducted and a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator may not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan or approved it with conditions. (b) The Plan must demonstrate to the authorized officer's satisfaction that special status bat species will not be disturbed to a degree that causes or is likely to cause:</p> <ul style="list-style-type: none"> • physical injury, • a decrease in productivity, by substantially interfering with normal breeding, nursery, roosting, or hibernation behavior, or • site abandonment, by substantially interfering with normal breeding, nursery, roosting, or hibernation behavior. <p>On the lands described below: CSU (2) as mapped on the BFO GIS database or determined by field evaluation, in coordination with the WGFD and/or USFWS. For the purpose of: CSU (3) ensuring production of special status bat species breeding, nursery, roosting, and hibernation habitat.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the proposed action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to meet the performance standards above. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation and performance standards identified above may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the WGFD or USFWS.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include special status species bat habitat. This determination shall be based upon field studies of the area by a qualified representative and reviewed by BLM. The determination may include coordination with the WGFD or USFWS.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Cultural-5006	NSO	Cultural: historic properties	15,382 acres	<p>NSO or use (NSO) (1) is allowed within the following historic properties: Pumpkin Buttes, Cantonment Reno, Dull Knife Battle, Crazy Woman Battle, contributing and unevaluated segments of the Bozeman Trail, all rock art sites, all rock shelter sites, all Native American burials.</p> <p>On the lands described below: NSO (2) as mapped on the BFO GIS database.</p> <p>For the purpose of: NSO (3) protecting historic properties.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so it will not be placed within the actual boundaries of or will not disturb the site within the defined NSO area.</p> <p>Modification: The BLM authorized officer may modify the stipulation in consultation with State Historic Preservation Office (SHPO), applicable tribes, and other interested parties, if the site is no longer considered eligible under National Register of Historic Places (NRHP) or if, in consultation with SHPO, applicable Indian tribes, and other interested parties it is determined that the identified property's sacred, spiritual, and/or traditional values have been downgraded and/or the tribes have reduced the previous avoidance distance around the site.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined in consultation with SHPO, applicable Indian tribes, and other interested parties, that the identified site is no longer considered sacred, spiritual, and/or traditional.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Cultural-5006	CSU	Cultural: historic property setting	613,601 acres	<p>Surface disturbance is restricted within three miles of the following historic properties: Pumpkin Buttes, Cantonment Reno, Dull Knife Battle, Crazy Woman Battle, contributing and unevaluated segments of the Bozeman Trail, all rock art sites, all rock shelter sites, all Native American burials. CSU (1) (a) Prior to surface disturbance within three miles of the identified historic properties a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator may not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan or approved it with conditions after consultation with SHPO, applicable Indian tribes, and other interested parties. (b) The Plan must demonstrate to the authorized officer's satisfaction that there will be no adverse effects to NRHP eligible or listed historic properties (i.e., the infrastructure will either not be visible or will result in a weak contrast rating). On the lands described below: CSU (2) as mapped on the BFO GIS database. CSU (3) ensuring the setting of historic properties.</p> <p>Exception: The BLM authorized officer may grant an exception if, after consultation SHPO, applicable Indian tribes, and other interested parties, it is determined that the proposed action will result in a no adverse effect determination to the sacred, spiritual, and/or traditional nature of the property(s) (i.e., will not result in a more than a weak contrast rating).</p> <p>Modification: The BLM authorized officer if, in consultation with SHPO, applicable Indian tribes, and other interested parties, the site is no longer considered eligible under NRHP or if, in consultation with Indian tribes and/or SHPO, it is determined that the identified property's sacred, spiritual, and/or traditional values have been downgraded and/or the tribes have reduced the previous avoidance distance around the site.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined, in consultation with SHPO, applicable Indian tribes, and other interested parties, that the identified site is no longer considered sacred, spiritual, and/or traditional.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Cultural-5011	NSO	Cultural: traditional cultural properties	15,382 acres	<p>NSO or use is allowed on lands containing traditional cultural properties.</p> <p>NSO (1) On the lands described below: NSO (2) as mapped on the BFO GIS database.</p> <p>For the purpose of: NSO (3) protecting traditional cultural properties.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so it will not be placed within the actual boundaries of or will not disturb the site within the defined NSO area.</p> <p>Modification: The BLM authorized officer if, in consultation with SHPO, applicable tribes, and other interested parties, the site is no longer considered eligible under NRHP or if, in consultation with SHPO, applicable Indian tribes, and other interested parties it is determined that the identified property's sacred, spiritual, and/or traditional values have been downgraded and/or the tribes have reduced the previous avoidance distance around the site.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined, in consultation with SHPO, applicable Indian tribes, and other interested parties, that the identified site is no longer considered sacred, spiritual, and/or traditional.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Cultural-5011	CSU	Cultural: traditional cultural property setting	613,601 acres	<p>Surface disturbance is restricted within three miles of traditional cultural properties.</p> <p>CSU (1) (a) Prior to surface disturbance within three miles of traditional cultural properties a mitigation plan (Plan) must be submitted by the applicant. The Plan must be approved or approved with conditions by the BLM authorized officer prior to surface-disturbing activities after consultation with SHPO, applicable Indian tribes, and other interested parties.</p> <p>(b) The Plan must demonstrate there will be no adverse effects to NRHP eligible or listed historic properties (i.e., proposed infrastructure is either not visible or will result in a weak contrast rating) On the lands described below:</p> <p>CSU (2) as mapped on the BFO GIS database.</p> <p>For the purpose of:</p> <p>CSU (3) ensuring the setting of traditional cultural properties.</p> <p>Exception: The BLM authorized officer may grant an exception, after consultation SHPO, applicable Indian tribes, and other interested parties, it is determined that the proposed action will result in a no adverse effect determination to the sacred, spiritual, and/or traditional nature of the property(s).</p> <p>Modification: The BLM authorized officer may modify the stipulation, if in consultation with SHPO, applicable Indian tribes, and other interested parties, the site is no longer considered eligible under NRHP or if, in consultation with Indian tribes and/or SHPO, it is determined that the identified property's sacred, spiritual, and/or traditional values have been downgraded and/or the tribes have reduced the previous avoidance distance around the site.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined, in consultation with SHPO, applicable Indian tribes, and other interested parties, that the identified site is no longer considered sacred, spiritual, and/or traditional.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Paleo-5007	NSO	Paleontology: high quality or important resources	860 acres	<p>NSO or use is allowed on lands containing paleontological resources of high quality or importance.</p> <p>On the lands described below: NSO (1) as mapped on the BFO GIS database.</p> <p>For the purpose of: NSO (2) protecting paleontological resources of high quality or importance.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will protect paleontological resources of high quality or importance.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain paleontological resources of high quality or importance.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
VRM-5005	CSU	Visual: Class II and Special Emphasis Areas	112,329 acres	<p>Surface disturbance is restricted within Visual Resource Management (VRM) Class II areas.</p> <p>CSU (1) Prior to surface disturbance within VRM Class II areas, a site-specific plan must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the plan (with conditions, as appropriate). The plan must demonstrate to the BLM authorized officer's satisfaction how the operator will meet the following performance standards:</p> <ul style="list-style-type: none"> • A visual contrast rating must demonstrate that VRM Class II objectives will be met. • Where required by the BLM authorized officer, a visual simulation must be prepared and must demonstrate that VRM Class II objectives will be met through practices such as siting of permanent facilities. • Where present and feasible, existing surface disturbances shall be utilized; new surface disturbances shall be minimized to the extent practicable. • All permanent above-ground facilities (such as production tanks or other production facilities) not having specific coloration requirements for safety must be painted or designed using a BLM-approved color. <p>On the lands described below: CSU (2) as mapped on the BFO GIS database. For the purpose of: CSU (3) protecting Class II VRM Areas.</p> <p>Exception: The BLM authorized officer may grant an exception if it is demonstrated through a BLM-approved visual simulation and contrast rating worksheet that the project or identified mitigation will meet or exceed VRM Class II objectives. This restriction does not apply to temporary structures such as drilling rigs.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation if it is demonstrated that VRM Class II objectives have been modified through appropriate RMP planning procedures, or if a portion of the lease is not located within a VRM Class II area.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire leasehold is no longer managed for VRM Class II objectives based on planning, or if the entire leasehold is not located within a Class II area.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
Rec-6019	CSU	Recreation: Special Recreation Management Areas	9,504 acres	<p>Surface disturbance is restricted within the Special Recreation Management Areas (SRMA) available for leasing (Weston Hills).</p> <p>CSU (1) (a) Prior to surface disturbance within SRMAs available for leasing a mitigation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate).</p> <p>(b) The Plan must demonstrate to the authorized officer's satisfaction that the proposed action is consistent with the prescribed management for the SRMA.</p> <p>On the lands described below:</p> <p>CSU (2) as mapped or determined by BLM.</p> <p>For the purpose of:</p> <p>CSU (3) ensuring the recreational opportunities and setting of the SRMA.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will meet the management objectives, the recreational opportunities, and setting of the SRMA.</p> <p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the area is no longer located within a SRMA.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within a SRMA.</p>
ACEC-7003	NSO	ACEC: Pumpkin Buttes	1,731 acres	<p>NSO or use is allowed within the Pumpkin Buttes Area of Critical Environmental Concern.</p> <p>On the lands described below:</p> <p>NSO (2) as mapped or determined by BLM.</p> <p>For the purpose of:</p> <p>NSO (3) protecting the relevant and important values.</p> <p>Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. The Plan may be subject to consultation with Wyoming SHPO, applicable tribes, and other interested parties.</p>

Management Action	Stipulation Type	Protected Resource	Acreage Affected	Stipulation Description
				<p>Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the Pumpkin Buttes ACEC.</p> <p>Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values, subject to consultation with Wyoming SHPO, applicable tribes, and other interested parties.</p>

H.3. Processing Exceptions, Modifications, and Waivers

An exception, waiver, or modification must be based on one of two criteria. According to 43 CFR 3101.1-4, “A stipulation included in an oil and gas lease shall be subject to modification or waiver only if the authorized officer determines that the factors leading to its inclusion in the lease have changed sufficiently to make the protection provided by the stipulation no longer justified or if the proposed operations would not cause unacceptable impacts.” Waiver, exceptions, or modifications must be supported by appropriate environmental analysis and documentation.

The person requesting the exception, modification, or waiver is responsible to submit a written request including information that might assist the authorized official in making a decision. The authorized officer will review the information submitted in support of the request along with other pertinent information. Requests must be submitted to the BLM field office (Buffalo) in which the lease is located. Modification and waiver requests will be forwarded to the BLM-Wyoming Deputy State Director for Minerals and Lands along with the Buffalo Field Office (BFO)’s recommendation. Requests shall be subject to at least a 30 day public review if the authorized officer determines that a stipulation involves an issue of major concern to the public (43 CFR 3101.1-4).

The request is considered a unique action and is analyzed and documented individually for RMP and NEPA compliance. Processing may include coordination or consultation with the Wyoming Game and Fish Department (WGFD), U.S. Fish and Wildlife Service (USFWS), SHPO, or other agencies. For example, requests will not be granted for stipulations designed to protect Threatened and Endangered species, unless the BLM consults with the USFWS and reinitiates consultation, if necessary. Consultation with other agencies require additional time and resources to process.

The request must include the lease number and effective date, the stipulation(s) the request is for, the change in circumstances that lead the lessee or operator to believe the request is appropriate, and the name and/or number of any applicable authorization(s) (i.e., APD, sundry, right-of-way). A map is strongly recommended. The following information must be addressed, when applicable, in the written request:

1. **WHY** the public land user wants the request. For example with a timing limitation exception request, include the reason(s) why an action could not be completed within the original stipulation period, any evidence of why the action would not adversely affect the resource or species being protected, or any other information (additional mitigation measures or alternatives) that would help the BLM (and WGFD or USFWS) in reviewing the request.

Appendix H Fluid Mineral Lease Notices; Lease Stipulations; and the Process for Exceptions, Modifications, and Waivers

2. **WHO** is filing the request. This must include the company name, the name of the contact person, and the address, telephone number, e-mail address (if available), and fax number of the contact person.
3. **WHAT** is being requested. For example with a timing limitation request, include a detailed description of the activity including types of equipment or vehicles required and the number of trips expected.
4. **WHERE** the activity would take place. This must include the legal description of the activity and a map clearly depicting these areas. Proponent prepared Geographic Information System layers meeting BLM requirements can expedite the processing.
5. **WHEN** the activity would occur and it's duration. This must include the start date, end date, and time of day/night when activities would occur.

Requests must be made in writing and hard copy delivered to the Buffalo Field Manager at the physical address of the office. When time is of the essence, the process may be initiated by fax or electronic delivery of a scanned copy but the original must be received by the BFO within three working days. No exception, waiver, or modification will be issued until the hard copy request is received.

An exception request must be initiated near the time of the proposed activity. As a general rule, the request should be made within two weeks of conducting the proposed activity. The unpredictability of weather, animal movement and condition, and so on precludes analysis of requests related to wildlife far in advance of the time periods in question. The BLM uses a set of criteria when considering an exception request. Professional judgment plays a key part in the BLM's decisions on whether to grant exceptions. There is no clear-cut formula.

The following example describes some of the factors considered by the BLM when determining whether a request for a big game winter range timing limitation exception should be granted.

Factors Considered

1. Resource Concern
 - Animal presence or absence
 - Additional or new resource concerns
 - Potential for increased wildlife accidents or poaching
2. Animal Conditions
 - Physical condition of individual animals (e.g., fat reserves)
 - Local animal population condition (animal density)
 - Potential for additive mortality
 - Likelihood of introduction or increased incidence of disease
 - Likelihood of decreased recruitment/natality
3. Climate/Weather
 - Snow conditions (depth, crusting, longevity)
 - Current and historic local precipitation patterns
 - Current and historical seasonal weather patterns
 - Recent and current wind-chill factors (indication of animals energy use)
 - Duration of condition

- Short- and long-range forecasts
4. Habitat Condition and Availability
 - Water and forage condition (availability, quality, and quantity)
 - Competition (interspecific, intraspecific)
 - Animal use of available forage
 - Suitable and ample forage immediately available and accessible
 5. Spatial Considerations
 - Migration/travel corridors
 - Winter range, foraging, calving or breeding
 - Topography (plains vs. mountains)
 - Topographic/geographic limitations (barriers)
 - Presence of thermal cover (e.g., protection from wind)
 - Proportion of range impacted
 - Juxtaposition and density of other activities/disturbances in the vicinity
 - Cumulative impacts
 6. Timing
 - When proposed activity would occur in the stipulation period
 - Kind and duration of potentially disruptive activity
 - Likelihood of animals habituating to the proposed activity

A determination will be fully documented in the case file with an appropriate level of environmental review after asking not one, but a series of questions, such as:

- Would the BLM remain in compliance with laws and regulations?
- Is the proposal in conformance with the objectives of the RMP?
- What would be the level of harm to the protected resource, both locally and regionally?
- What would be the economic or public safety concerns if an active operation near completion was shut in to comply with a seasonal closure? (For example: economic, multi-stage fracturing not completed; safety, casing and cementing of fresh water zones not completed.)
- Are the impacts temporary, rather than long term?
- Is the resource being protected rare, or is it relatively common? Is it a special status species?
- Based on existing knowledge of a species and its use of an area, would impacts be confined to single or a small number of individuals, or would there be impacts on local or regional populations?
- Would impacts be allowed under existing law and policy?
- Is offsite mitigation an appropriate option? (For example, where individual or cumulative impacts cannot be effectively mitigated on site?)
- Can the impacts be reduced to an acceptable level through intensive use of environmental Best Management Practices?

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Appendix I. Biological Assessment

Note: This appendix was added following the release of the Buffalo Draft Resource Management Plan and Environmental Impact Statement.

I.1. Introduction

Endangered Species Act (ESA) Section 7 requires that federal agencies (such as the Bureau of Land Management [BLM]) consult with the United States (U.S.) Fish and Wildlife Service (USFWS) and address the potential effects of their proposed actions on plant and animal species listed or proposed for listing in accordance with the ESA. The BLM sent a scoping letter in November of 2008 to the USFWS requesting comments concerning Section 7 consultation for the Buffalo Resource Management Plan (RMP). The BLM Buffalo Field Office (BFO) has received several letters containing the Service's comments on (1) Threatened, Endangered, Proposed, and Candidate species updates, (2) migratory birds, and (3) wetlands and riparian areas. The latest of these letters, received on July 26, 2011, provided the most current list of species likely to occur in the BFO, for evaluating BLM Section 7 responsibilities. Two species, the Ute ladies'-tresses orchid, a Threatened plant, and Greater Sage-Grouse, a Candidate species for Threatened status, were included. On October 2, 2013, the USFWS proposed the northern long-eared bat (*Myotis septentrionalis*) for listing as endangered under the ESA (78 Federal Register [FR] 61045); the bat was added to the species list for Campbell County by Wyoming Ecological Services.

The BLM has prepared a Biological Assessment (BA) to evaluate the potential effects of the BLM proposed action (RMP Revision) on ESA-listed species and designated critical habitats occurring or affected by activities within the planning area. The action agency, in this case the BLM, has documented the determination of potential effects within the BA (50 Code of Federal Regulations [CFR] Part 402). If the BA determines that the proposed action may affect a listed species or modify its critical habitat, the BLM must enter into consultation with the USFWS. The BLM and USFWS discuss the proposed action, proposed conservation measures, and any other relevant issues. Depending on the level of effect to the species or its critical habitat, the USFWS prepares a concurrence letter (informal consultation) or a Biological Opinion (BO) (formal consultation). The consultation process with the USFWS ensures that BLM actions minimize impacts to listed species and designated critical habitats.

Federal action agencies may address rare, sensitive, Candidate, or Proposed species within the BA. Inclusion of non-ESA-listed species for the purpose of conference with the FWS can facilitate future consultations should one of these species become listed. Northern long-eared bat is included within the BA for this reason. Conservation measures identified in the BA are BLM management commitments regardless of whether consultation occurs or not.

The Buffalo Proposed RMP Revision analyzes the proposed plan to revise the existing Land Use Plan for the Buffalo, Wyoming, planning area. The BLM administers public lands in the planning area according to the Buffalo RMP (BLM 1985). The process for the development, approval, maintenance, and amendment or revision of an RMP and associated Environmental Impact Statement (EIS) is initiated under the authority of Section 202(f) of the Federal Land Policy and Management Act (FLPMA) of 1976 and Section 202(c) of the National Environmental Policy Act (NEPA). The process is guided by BLM planning regulations in Title 43 of the CFR, part 1600 (43 CFR 1600) and the Council on Environmental Quality (CEQ) regulations in 40 CFR

1500. The purpose, or goal, of the Land Use Plan is to ensure lands administered by the BLM are managed in accordance with the FLPMA and the principles of multiple use and sustained yield.

The existing plan has been updated and amended since the BLM adopted it. The Buffalo RMP Revision is scheduled for completion in 2014. When complete, the Buffalo RMP Revision will replace the existing RMP, updates, and amendments. Revising an existing land use plan is a major federal action for the BLM. NEPA, as amended, requires federal agencies to prepare an EIS for major federal actions. The RMP and EIS analyze the impacts of four alternative RMPs for the planning area, including the No Action Alternative, the Proposed RMP, and two other action alternatives. This BA analyzes the effects of the Proposed RMP on listed species, the Ute ladies'-tresses orchid, and proposed species, the northern long-eared bat.

The purpose of the Buffalo RMP is to provide a comprehensive and environmentally adequate framework for managing and allocating uses of the BLM-administered public lands and resources in the planning area. The planning area covers approximately 7.3 million acres of federal, state, and private lands in three Wyoming counties (Campbell, Johnson, and Sheridan). Of the total area, 782,102 acres are BLM surface and 4.8 million acres are federal mineral estate.

The objectives of the Buffalo RMP are to provide specific management direction to prevent or address potential conflicts among energy resources development, recreational activities, livestock grazing management, important wildlife habitats, and other important land and resource uses in the planning area, and to determine the appropriate levels and timing of these activities. Section 6.0, Analysis of Proposed Management Actions and Effects, in this BA identifies and analyzes the effects of the proposed management actions for each major functional activity (e.g., air quality, cultural resources, livestock grazing management, etc.) and additional conservation measures applicable to each major functional activity.

Proposed RMP

The Proposed RMP generally increases conservation of physical, biological, and heritage and visual resources compared to current management, including the designation of seven Special Recreation Management Areas (SRMAs) and two Areas of Critical Environmental Concern (ACECs). The Proposed RMP also emphasizes moderate constraints on resource uses through reclamation and mitigation requirements to reduce impacts to resource values.

Resource Uses and Support

Under the Proposed RMP, 4,720,586 acres are available for locatable mineral entry, while 82,691 acres are recommended for withdrawal. Existing withdrawals and segregations not carried forward are allowed to expire. In addition, approximately 72,276 acres of federal mineral estate are closed to oil and gas leasing in the planning area. The remaining federal mineral estate in the planning area is open to oil and gas leasing subject to the following constraints: 135,909 acres are subject to the standard lease terms, 104,927 acres are subject to minor constraints, 2,516,826 acres are subject to moderate constraints, and 556,592 acres are subject to major constraints. The Proposed RMP makes 2,725,060 acres available for mineral materials sales and closes 623,061 acres to mineral materials sales.

Land resource program actions under the Proposed RMP identify 120,722 acres of BLM-administered surface in the planning area as available for disposal. Under the Proposed RMP, the BLM administers 321,149 acres as right-of-way (ROW) avoidance/mitigation areas and 79,777 acres as ROW exclusion areas. Under the Proposed RMP, 55,516 acres are open to

renewable energy development. Travel management designations under the Proposed RMP include 37,389 acres closed to motorized vehicle use and 661,726 acres limited to designated roads and trails.

The Proposed RMP designates recreation management areas, including SRMAs and extensive recreation management areas (ERMAs). Other resource uses, such as minerals development, are typically allowed in these areas if adverse impacts can be mitigated. A surface occupancy prohibition may be applied to developed recreation sites, regional trails, local trail systems, and interpretive sites with exceptional recreation value. Under the Proposed RMP, the BLM designates seven SRMAs – Burnt Hollow (17,280 acres), Dry Creek Petrified Tree (2,567 acres), Middle Fork Canyon (10,083 acres), Mosier Gulch (1,026 acres), Welch Ranch (1,748 acres), Weston Hills (9,504 acres), and Hole-In-The-Wall (11,952 acres). Under the Proposed RMP, the BLM closes 16,960 acres in the planning area to livestock grazing. However, grazing may be used in closed areas as a tool to maintain or improve resource conditions. To reduce user conflict, new resource uses are mitigated to minimize or avoid conflict with livestock grazing.

Special Designations

No ACECs currently exist within the planning area. The Proposed RMP includes two new ACECs. The two proposed ACECs are Pumpkin Buttes and Welch Ranch. The Proposed RMP evaluates Hazelton Road, Slip Road, Trabing/Sussex Road, Powder River Road, Rome Hill Road, and Tipperary/Thompson Road as Back Country or Scenic Byways. The BLM manages the Middle Fork Powder River as a Wild and Scenic River (WSR). The Proposed RMP retains the previous decision that closes three Wilderness Study Areas (WSAs) to motorized vehicle use and manages them to preserve wilderness characteristics.

Physical, Biological, and Heritage Resources

Under the Proposed RMP, management emphasizes moderate constraints on resource uses and mitigation of impacts to conserve physical resources. Reclamation practices include beginning interim and final reclamation at the earliest feasible times, and in disturbed areas, reestablishing healthy native or desired plant communities based on predisturbance/desired plant species composition. The BLM requires site-specific stabilization and reclamation plans, stipulations, or measures before it will authorize surface-disturbing activities. Under the Proposed RMP, the BLM assesses erosion and soil stability during rangeland health evaluations, and allows the surface discharge of produced water from new activities where compatible with other resource objectives.

Management of biological resources under the Proposed RMP emphasizes protection of these resources through avoidance and mitigation of surface-disturbing activities and moderate resource constraints. For example, surface-disturbing activities are to avoid riparian/wetland areas by 500 feet. The BLM allows aerial application of pesticides on a case-by-case basis. Vegetation resources are managed for a full range of diverse native species, composition, densities, and age classes across the landscape. For fish species, the BLM avoids surface-disturbing activities within 0.25 mile of any naturally occurring water bodies containing native or desirable non-native fish species unless fish resources objectives can be met. Seasonal wildlife restrictions under the Proposed RMP include a mix of controlled surface use (CSU), timing limitation stipulations (TLS), and no surface occupancy (NSO) stipulations for fluid mineral leasing; corresponding restrictions are placed on all surface-disturbing activity authorizations.

The Proposed RMP generally protects special status species. Greater Sage-Grouse are managed in accordance with Wyoming's Core Population Area strategy as defined in Wyoming Executive Order 2011-5 and BLM Wyoming IM-2012-019. Greater Sage-Grouse constraints on resource

uses are greater in Core Population Areas and Connectivity Corridors (Priority Habitat) than outside them. For example, the BLM applies an NSO stipulation to prohibit surface-disturbing activities within 0.6 mile of Greater Sage-Grouse leks in Core Population Areas and Connectivity Corridors and within 0.25 mile of Greater Sage-Grouse leks outside Core Population Areas and Connectivity Corridors (general habitat). The BLM also applies a goal of consolidating development to maintain Greater Sage-Grouse habitat and includes provisions for Greater Sage-Grouse habitat restoration on qualifying public lands. To protect raptor nesting habitat, the BLM applies USFWS Wyoming Ecological Service's species-specific protective buffers around active raptor nests. The BLM manages energy projects and grazing to protect special status plant populations.

Under the Proposed RMP, the BLM protects historically important cultural sites up to 3 miles, using best management practices (BMPs) to avoid or mitigate adverse impacts from mineral development or other surface-disturbing activities. The BLM attaches standard Paleontological Resources Protection Stipulations to authorizations for surface-disturbing activities on Potential Fossil Yield Classification (PFYC) 4 or 5 formations and requires an on-the-ground survey before it will approve surface-disturbing activities or land-disposal actions. The BLM would monitor surface-disturbing activities for PFYC 3, 4, and 5 formations on a case-by-case basis. The BLM allows surface-disturbing activities within 100 feet of a paleontological locality if the impacts can be adequately mitigated.

Under the Proposed RMP, the BLM manages the following visual resource management (VRM) class allocations for BLM surface in the planning area: 112,329 acres of VRM Class II, 379,429 acres of VRM Class III, and 260,238 acres of VRM Class IV.

I.2. Consultation and Biological Assessment Objectives

Under provisions of the ESA, as amended (16 United States Code [U.S.C.] 1531 et seq.), federal agencies are directed to conserve Threatened and Endangered species and the habitats in which these species are found. Federal agencies also are required to ensure actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of Endangered and Threatened species or their critical habitats. The ESA requires action agencies, such as the BLM, to consult or conference with the USFWS and/or the National Marine Fisheries Service when there is discretionary federal involvement or control over the action. Formal consultation becomes necessary when the action agency requests consultation after determining the Proposed RMP is likely to adversely affect listed species or critical habitats, or the aforementioned federal agencies do not concur with the action agency's finding (USFWS and U.S. National Marine Fisheries Service 1998). Under the 1994 Memorandum of Understanding (MOU) and the 2000 Memorandum of Agreement among the BLM, the U.S. Department of Agriculture (USDA) U.S. Forest Service (USFS), the USFWS, and the National Marine Fisheries Service, all four agencies agreed to promote the conservation of Candidate and Proposed species and streamline the Section 7 consultation and coordination process.

This programmatic BA provides documentation for the Proposed RMP to meet federal requirements and agreements among the federal agencies identified above. It addresses federally listed Threatened, Endangered, and Proposed species and is prepared under 1973 ESA Section 7 regulations, in accordance with USFWS and National Marine Fisheries Service 1998 procedures, and in accordance with the 1994 MOU and 2000 Memorandum of Agreement. As appropriate, the BLM will perform site-specific evaluations for activities authorized under the Proposed RMP. The BLM will consult or conference with the USFWS for activities authorized under the Proposed

RMP that may affect Threatened, Endangered, or Proposed species. In addition, in compliance with BLM Manual 6840, the BLM will address potential effects to special status species.

Objectives of this BA include the following:

- Summarize the biology, distribution, and habitats of species listed or proposed as Threatened or Endangered occurring in the planning area.
- Assess the past, current, and future effects (direct and indirect) of the proposed RMP actions to the species.
- Assess the cumulative effects of state and private actions on the subject species.
- Make an effect determination for each species based on the actions identified in the RMP.
- Document conservation measures to foster the welfare of the subject species.
- Predict the expected future status of the subject species based on the effects analysis.

The outcome of this BA will determine the need for, and type of, consultation and/or conferencing with the USFWS. In addition, during implementation of specific actions identified in the RMP, potential effects to federally listed species will be evaluated again, and any necessary consultation with the USFWS will be initiated, as appropriate.

Emergency consultation may be necessary when emergency actions (i.e., wildland fires, disasters, casualties, national defense or security emergencies, including response activities taken to prevent imminent loss of human life or property) may affect listed species and/or critical habitats, and the federal action agency does not have the time for the normal ESA- or NEPA-required administrative work prior to action. Emergency consultations will consider the action agency's critical mission, while ensuring that anticipated actions will not violate ESA section 7(a)(2) or 7(d).

I.3. Overview of the Planning Area

This RMP planning effort will address lands within the Buffalo planning area in north-central Wyoming. The planning area covers 782,102 acres of public surface land (RMP Map 1) and 4.8 million acres of federal mineral estate (RMP Map 2) in three counties (Table I.1, "BLM Surface and Federal Mineral Estate within the Buffalo Planning Area" (p. 2029)). BLM surface in the planning area is in scattered tracts intermingled with state and private lands. The southern Big Horn Mountains, the Powder River Breaks, the Rochelle Hills, and some areas in northeast Campbell County contain larger blocks of BLM surface.

Table I.1. BLM Surface and Federal Mineral Estate within the Buffalo Planning Area

County	BLM Surface Estate (acres)	Federal Mineral Estate (acres)
Campbell	223,994	2,418,761
Johnson	504,325	1,682,668
Sheridan	53,724	701,848
Total	782,102	4,803,277

Source: BLM Land Tenure database.

The planning area is part of the Missouri Plateau of the Great Plains. This region is characterized by rolling hills that have been greatly dissected by tributaries of the Missouri River system. The Big Horn Mountains, which are part of the Rocky Mountains, lie along the western-most portion

of the planning area. On the east, the planning area is bounded by the Black Hills. On the south, the planning area is bounded by the Casper Arch, the Laramie Mountains, and the Hartville Uplift.

The planning area consists of a dissected, rolling upland plain, with low to moderate relief, broken by buttes, mesas, hills, and ridges. Extensive areas of open high hills in the northern portion of the planning area indicate rough, broken terrain where moderate to deep erosion has occurred. Erosion-resistant clinker, produced by the natural burning of coalbeds, caps many hills and ridges in the planning area with a characteristic broken, red brick or scoria-like rock. Elevations in the planning area range from 3,350 to 9,250 feet above mean sea level.

The planning area is drained toward the north and east by the Tongue, Powder, Little Powder, Belle Fourche, and Cheyenne Rivers, which all flow into the Missouri River system. The planning area forms a low divide among these smaller drainage systems. The major river valleys have wide flat forms and broad floodplains. Tributaries in the planning area are incised and drain areas of isolated, flat-topped, clinker-covered buttes and mesas, 100 to 500 feet above the valley floor. Flow in the planning area is generally toward the northeast. Perennial streams generally originate in the mountainous areas because of substantial annual precipitation and geologic conditions that foster discharge of groundwater.

Surface water quality in the planning area is generally adequate to support designated uses. Surface waters in the planning area are typically alkaline, with moderate to high levels of hardness. These waters vary from a calcium bicarbonate type in the mountain streams, to a sodium sulfate type in the lowlands. Surface water quality in the planning area is affected by depletions and return flows from irrigation. Surface water in the planning area is withdrawn to support agricultural, domestic, and stock water uses. Irrigation accounts for about 98% of surface water withdrawals in the planning area.

The groundwater resources of the planning area that are at or near the land surface are contained in unconsolidated Quaternary alluvial or basin fill deposits or in semi-consolidated lower Tertiary sandstones and coalbeds that are the uppermost aquifers in the Northern Great Plains aquifer system. Clinker, which also can make up an aquifer, has formed some of the lower Tertiary sediments. The Lower Tertiary Aquifer System consists of the Wasatch aquifers, the Fort Union aquifers contained in the Tongue River member of the Fort Union Formation, the Lebo confining layer, and the Tullock aquifer.

The planning area contains some of the largest accumulations of low-sulfur sub bituminous coal in the world. Thick coal deposits occur at or near the surface along the eastern boundary of the planning area, along a north-south trend situated west of both Gillette and Wright, and in the northwestern portion of the planning area near Sheridan. Important coal seams within the Wasatch Formation, from oldest to youngest, include the School, Badger, Felix, and Lake DeSmet. Additionally, there are several world-class deposits currently being mined in Wyoming from 13 mines along the north-south trend known as the Gillette Coal Field. These mines are producing coal from seams within the Fort Union Formation. Over the years numerous names, both official and unofficial, have developed for these seams. The most recently revised coal stratigraphy in the Fort Union Formation, from oldest to youngest, includes the Lower Wyodak, Upper Wyodak, and Smith Seams (Flores et al. 2010). Although these are the currently accepted names for these coals, industry continues to use the following naming convention: Big George (Lower Wyodak equivalent), Canyon (Lower Wyodak equivalent), Anderson (Upper Wyodak equivalent), and Roland (Smith equivalent).

The planning area is characterized as a mosaic of vegetation types that includes prairie grasslands, shrublands, riparian areas, and forested areas. Twelve vegetation types were identified in the planning area. They are mixed-grass prairie, wet meadow, herbaceous riparian, sagebrush shrubland, other shrubland, shrubby riparian coniferous forest, aspen, forested riparian, agriculture, urban/disturbed, barren, and water. Those broad categories often represent several vegetation types that were similar in terms of dominant species and ecological importance.

All of the vegetation types present in the planning area provide habitats for some species of wildlife. When they are undisturbed, the major vegetation types in the planning area provide high-quality habitats for many species of wildlife. Because these habitats tend to occur in a mosaic across the landscape, many species of wildlife can be expected to use more than one habitat. Primary wildlife species and guilds of concern in the planning area include pronghorn, mule deer, white-tailed deer, elk, moose, Greater Sage-Grouse, sharp-tailed grouse, reptiles, amphibians, bats, and various raptors and other migratory birds. Perennial streams in the planning area support a diverse fish fauna of game and non-game species.

Not surprisingly, the planning area supports a variety of special status species that are of concern to other management agencies. These species of plants and animals include one listed as Threatened (Ute ladies'-tresses orchid), one Proposed for listing as Endangered (northern long-eared bat), and one Candidate for listing as Threatened (Greater Sage-Grouse). They also include species that the BLM or the Wyoming Game and Fish Department (WGFD) consider rare or sensitive.

Land ownership in the planning area consists primarily of private lands intermingled with federal (approximately 11% BLM) and state lands. Mineral ownership in the planning area consists primarily of federal mineral estates (approximately 60%). Rangeland livestock grazing and oil and gas development are the dominant land use for both public and private lands in the planning area.

The planning area encompasses all or portions of Campbell, Johnson, and Sheridan Counties in Wyoming. It also includes five incorporated municipalities: Gillette, Wright, Sheridan, Kaycee, and Buffalo. Gillette is the county seat and the largest incorporated city in Campbell County. Wright is in southern Campbell County. Sheridan is the county seat of Sheridan County. Buffalo is the largest incorporated city and county seat of Johnson County. Kaycee is in southern Johnson County.

Gillette and Sheridan are the hubs for the transportation network in the planning area. Interstate highways in the planning area include Interstate (I)-25 and I-90. The major north-south transportation corridors include State Route 59 in Campbell County, and I-25/I-90 in Johnson and Sheridan Counties. The principal east-west highway is I-90 through Campbell and Johnson Counties. I-90 turns north at Buffalo continuing to Sheridan, and into Montana. U.S. Highways in the planning area are U.S. Routes 14 and 16 running east-west, and 87 running north-south paralleling I-25 and I-90. The primary state highways that traverse the planning area are Routes 59 and 387. Secondary state highways that traverse the planning area include Routes 50, 51, 192, 196, 338, and 450. Numerous county roads also provide local access to public and private lands in the planning area. The coalbed natural gas (CBNG) boom of 2000-2008 created a "spider-web" of roads throughout the vast majority of the planning area.

Oil and gas pumping units and associated well pads, pipelines, powerlines, and access roads are evident throughout the planning area. The landscape that has resulted from oil and gas development in the planning area is rural and/or industrial.

Most of the areas with significant scenic values occur in the western part of the planning area. The South Big Horns area is located in the southwestern quarter of Johnson County, primarily within the Middle Fork Powder River sub-watershed. The area provides sensitive and unique resource values, including scenery. Management emphasis areas within the South Big Horns Area include the Middle Fork Recreation Area, the Red Wall/Hole-in-the-Wall Area, Outlaw Cave, the Dull Knife Battlefield site, and the Gardner Mountain and North Fork WSAs. The Powder River Breaks in eastern Johnson County, Fortification Creek, and the Weston Hills Recreation Area in the eastern part of the planning area also provide scenic settings for a variety of dispersed recreational activities. The Burnt Hollow Management Area is a recently acquired parcel totaling nearly 18,000 acres of BLM-administered surface in northern Campbell County. The varied topography and diversity of vegetative communities is unique and provides habitat for numerous wildlife species.

Three scenic byways exist in the western part of the planning area. They provide access to the Big Horn Mountains. The Bighorn Scenic Byway is on U.S. Route 14 west of Ranchester. The Cloud Peak Skyway is on U.S. Route 16 west of Buffalo. The Medicine Wheel Passage Scenic Byway is on U.S. Route 14A from Burgess Junction to Lovell.

Recreational use of the planning area is limited because more than 75% of the land surface is privately owned. Developed recreational areas, such as campgrounds, are generally limited to private lands in or near larger communities in the planning area, and to state and federal lands located in the western part of the planning area. However, opportunities for dispersed recreation can be found on federal and state lands throughout the planning area. A few developed recreational sites or facilities exist within BLM-administered lands in the planning area. Communities in the planning area provide a variety of municipal and private recreational facilities, including golf courses, rodeo grounds, parks, and swimming pools.

Major sources of noise are towns; industrial facilities; major roadways, such as I-90; railroad corridors; oil and gas compressor stations; wellhead compressors; generators; and high winds. Noise in rural areas away from industrial facilities and transportation corridors is lower than noise levels close to industrial facilities and transportation corridors. The most substantial noise from CBNG operations results from operation of compressor stations that use multiple engines to move natural gas through high-pressure transmission pipelines.

I.4. Current Status and Habitat Requirements

The USFWS Ecological Service office in Cheyenne, Wyoming, provided a list of Threatened, Endangered, Proposed, and Candidate species that may occur in the planning area. The USFWS letter dated August 26, 2010, contained four species, including blowout penstemon, Greater Sage-Grouse, mountain plover, and Ute ladies'-tresses orchid (USFWS 2010). Black-footed ferret was not identified in the 2010 letter. On May 12, 2011, the USFWS withdrew the proposal to list the mountain plover as Threatened. On June 30, 2011, the BLM BFO requested that blowout penstemon be removed from the field office list as suitable habitat is not present. The USFWS responded to this request with concurrence and removed the blowout penstemon from the BFO list of Threatened and Endangered species for consideration. The remaining two species, included in the USFWS concurrence letter, received by the BLM BFO on July 26, 2011, were Greater Sage-Grouse and Ute ladies'-tresses orchid (Table I.2, "Federally Listed Species in the Buffalo Planning Area" (p. 2033)). No critical habitat is designated for either of these two species within the Buffalo planning area. Greater Sage-Grouse are not included in this BA as it is not presently required to consult or conference on Candidate species. Recently (October 2013), the northern

long-eared bat was proposed for listing as Endangered under the ESA by the USFWS. The species range includes portions of northeast Wyoming; the species has been included in the BA.

Although the black-footed ferret is listed as Endangered in the BFO, it is not being fully analyzed in this BA. On March 6, 2013, the USFWS issued a letter acknowledging 'block clearance' for the State of Wyoming. That letter provided acknowledgement that the likelihood of identifying wild ferrets in Wyoming, outside of those resulting from reintroductions, was distinctly minimal (USFWS 2013b). WY BLM has committed to assist in recovery efforts for the ferret as appropriate (Memorandum of Understanding between WGFD and USFWS, signed November 8, 2013). The BLM manages less than 11% of the surface in the planning area, in primarily small scattered parcels. The WGFD has not proposed reintroduction within the planning area and the BFO does not manage sufficient habitat in the planning area to support a reintroduction. Therefore, management actions implemented in the RMP are anticipated to have no effect on the black-footed ferret.

Table I.2. Federally Listed Species in the Buffalo Planning Area

Common Name	Scientific Name	Status ¹	Expected Occurrence
Ute ladies'-tresses orchid	<i>Spiranthes diluvialis</i>	Threatened	Seasonally moist soils and wet meadows of drainages below 7,000 feet above mean sea level.
Northern long-eared bat	<i>Myotis septentrionalis</i>	Proposed	Conifer and deciduous forests, caves and mines in north-eastern Campbell County.
Source: USFWS 2010			
¹ Status refers to federal status in accordance with the Endangered Species Act.			

Ute Ladies'-Tresses Orchid

Status

On January 17, 1992, the USFWS listed the Ute ladies'-tresses orchid (*Spiranthes diluvialis*) as Threatened in the lower 48 states under the ESA. The Wyoming BLM completed the *Final Statewide Programmatic Biological Assessment Ute Ladies'-Tresses Orchid* in 2007 (BLM 2007). Consideration of effects and conservation measures identified in the statewide assessment are included in this BA. Unless otherwise referenced, the species information in this report came from the statewide BA (BLM 2007).

The Natural Heritage rank is G2 and S1, meaning that the species is imperiled because of rarity on the global level (known from 6 to 20 locations) and critically imperiled because of extreme rarity on the state level (known from 5 or fewer occurrences). The Wyoming Natural Diversity Database (WYNDD) lists the Ute ladies'-tresses orchid as sparse and a High Conservation Priority.

Nine populations of the Ute ladies'-tresses orchid occur in Wyoming within Goshen, Laramie, Converse, and Niobrara counties. Three populations are on BLM-administered surface (Casper Field Office). The populations that are not on BLM-administered surface do not have any federal mineral estate under them.

All BLM Field Office management areas have been inventoried for presence of Ute ladies'-tresses orchid. Ute ladies'-tresses orchid has been found on non-federal surface lands in the Newcastle and Rawlins Field Office areas in addition to the Casper Field Office populations. As further

surveys are conducted, previous and current factors affecting areas with Ute ladies'-tresses orchid will be addressed on a case-by-case basis.

Life History

Ute ladies'-tresses orchid is a perennial plant with stems 8 to 19 inches tall, arising from tuberous-thickened roots. Basal leaves are linear, up to 0.4 inches wide and 11 inches long. Leaves are small in size and number higher up the stem. The species is characterized by a flowering stalk 1.2 to 5.9 inches long with numerous small, ivory white flowers arranged in a helix at the top of the stem. The lip petal is oval to lance-shaped, narrowed at the middle, and has wavy margins. Sepals are separate or fused only at the base and often spread at their tips. In general, Ute ladies'-tresses orchid blooms from late July to early September; however, it does not necessarily flower every year. The peak of flowering occurs in Wyoming around August 10, but it depends on temperature and moisture. It reproduces by seed only.

Habitat Requirements

Ute ladies'-tresses orchid is a species that occurs primarily in seasonally moist peat, sand, silt, or gravel soils near wet meadows, springs, lakes, ponds, or perennial streams. Ute ladies'-tresses orchid establishes in open grass- and forb-dominated riparian areas that are not particularly dense or overgrown. Ute ladies'-tresses orchid seems generally intolerant of shade, although a few populations in eastern Utah and Colorado occur in riparian woodlands. Most populations occur as small, scattered groups occupying relatively small areas within the riparian system. Populations occur in mesic or wet meadows near riparian edges, gravel bars, and old oxbows along perennial streams at elevations ranging from 4,000 to 7,000 feet. Most sites are sub-irrigated and seasonally flooded, remaining moist into the summer.

Ute ladies'-tresses orchid is well-adapted to periodic disturbances from stream movement and grazing. It is known to establish in heavily disturbed sites, such as revegetated gravel pits, heavily grazed riparian edges, and along well-traveled foot trails on old berms.

Regional and Local Distribution

Populations of Ute ladies'-tresses orchid occur in southeastern Wyoming, western Nebraska, north central Colorado, northeastern and southern Utah, east central Idaho, southwestern Montana, and central Washington. Ute ladies'-tresses orchid is currently known from nine sites in eastern Wyoming, including a small population along a tributary to Antelope Creek (a tributary to the Cheyenne River); a population along North Wind Creek, a tributary to Antelope Creek; a population along Stinking Water Creek, a tributary of Sand Creek, which is a tributary to Antelope Creek (all three of these populations are on BLM-administered lands in northwest Converse County (Casper Field Office)); one population along Bear Creek in southwestern Goshen County (Casper Field Office) and a second population along Bear Creek in north-central Laramie County (Rawlins Field Office) (both of these populations are on state lands); a large population along the Niobrara River near McMaster's Reservoir in southeastern Niobrara County (Newcastle Field Office) on private land; and two populations along Sprager Creek in Laramie County (Rawlins Field Office) on private lands. Another population occurs on private lands in the Horse Creek watershed in Laramie County (Rawlins Field Office). These populations were all discovered between 1993 and 2005. They are monitored on a limited basis and appear to be stable. Mowing occurs on at least four of the sites and grazing occurs on all of the sites and appears to have only minor impacts on the populations. In fact, the combination of mowing and grazing appears to benefit Ute ladies'-tresses orchid on the private parcels. The Wyoming Natural Diversity Database (WYNDD) predicts that within the planning area the Ute ladies'-tresses orchid would

most likely occur in southwestern Campbell County (Figure I.1, “Wyoming Natural Diversity Database Predicted Ute Ladies-Tresses Orchid Distribution in Wyoming.” (p. 2035)).

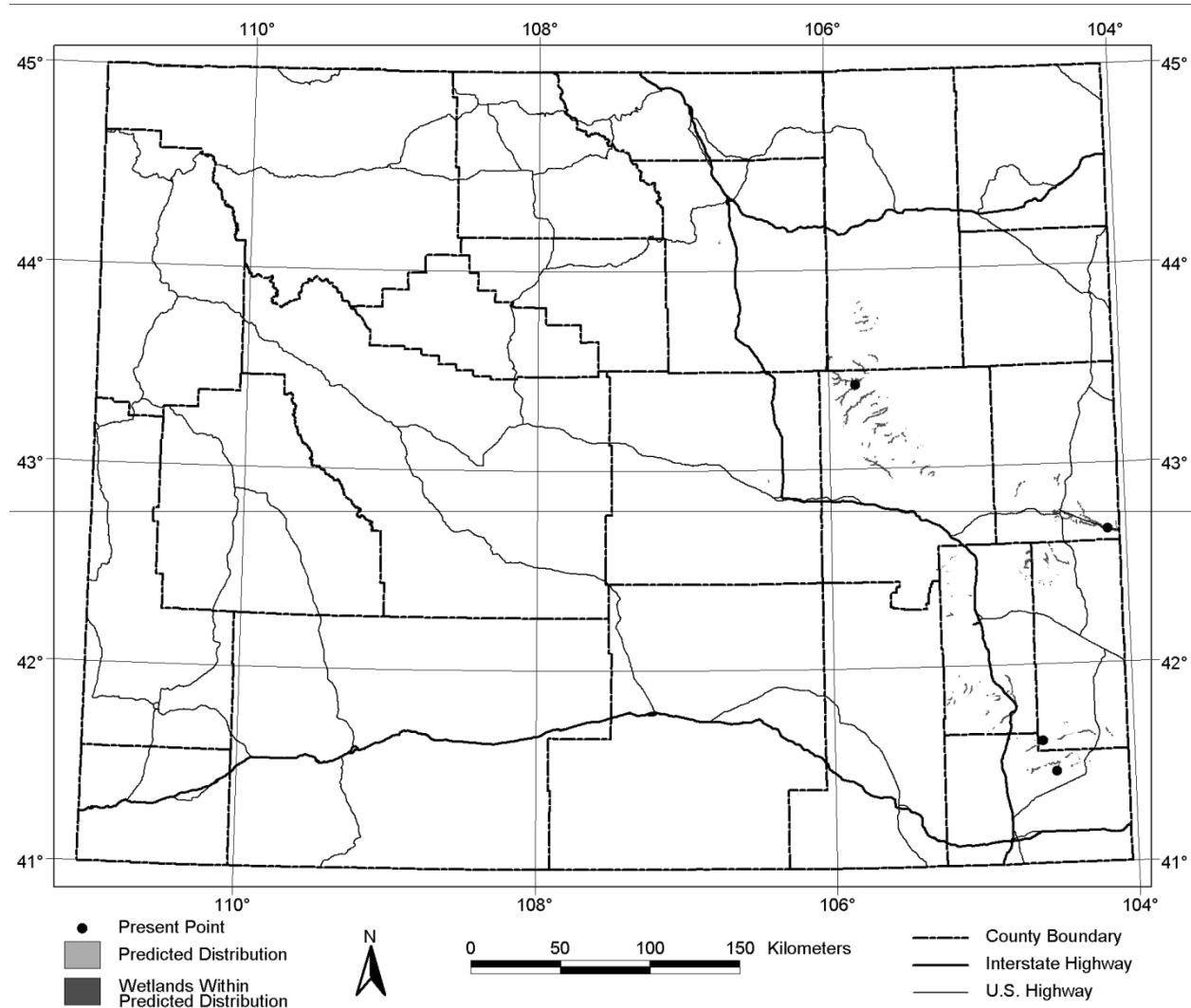


Figure I.1. Wyoming Natural Diversity Database Predicted Ute Ladies-Tresses Orchid Distribution in Wyoming.

Because it may not flower or emerge every year, there may be unknown populations. The total number of individuals from known populations in the state is estimated to be approximately 3,000 to 4,000 plants in a total area of about 50 acres, although the population numbers may fluctuate from year to year. Populations range in size from small patches of 12 to 35 individuals to the largest population of 1,000 to 2,000 plants.

Threats

Ute ladies'-tresses orchids, in general, are not common. They are rare in their distribution. This makes it difficult to assess the stability of any given population. Furthermore, the naturally occurring low population numbers make the species susceptible to localized extinction caused by natural or man-made disasters. Historical accounts typically help realize the population trends, but populations in Wyoming were not discovered until 1993. Although no trend data are available, populations in Wyoming are considered stable. Continued presence/absence

surveys and population studies will provide data necessary to quantify statewide trends in distribution and populations.

Changes in large ungulate populations may have affected the distribution of Ute ladies'-tresses orchid. This species likely evolved according to the seasonal presence of large herbivores such as American bison, elk, deer, and bighorn sheep. Changes in these species' distribution could have adversely affected Ute ladies'-tresses orchid populations by removing them during late winter and early spring. Additionally, cattle grazing may alter both plant communities and stream ecology. Depending when a site is grazed, there is also the possibility of removing flowering or fruiting stalks. With cattle introduction, there is the risk of noxious weed invasion. Canada thistle, reed canary grass, and leafy spurge pose threats because they compete vigorously with Ute ladies'-tresses orchid.

Herbicides applied to control noxious weeds and fertilizers from agricultural fields possibly affect Ute ladies'-tresses orchid. Both direct applications to nearby agricultural fields and runoff from sites upstream have potentially harmful effects on Ute ladies'-tresses orchid. Pesticides applied to nearby sites could affect bumblebee populations, which are the Ute ladies'-tresses orchid primary pollinators.

Development in or near wetlands has had an effect on the distribution of Ute ladies'-tresses orchid. Water diversion, channelization, and irrigation have all affected the species. All of these factors decrease the input of water into riparian systems or completely destroy habitat, thus eliminating potential habitat for this species. Conversely, some irrigated plots have proven to create habitat for Ute ladies'-tresses orchid.

Northern Long-eared Bat

Status

On October 2, 2013, the USFWS proposed the northern long-eared bat (*Myotis septentrionalis*) for listing as Endangered under the ESA (USFWS 2013a). Unless otherwise referenced, the species information in this BA came from the Proposed Rule in the FR notice (USFWS 2013a). It was determined that the northern long-eared bat is in danger of extinction, predominantly due to the threat of white-nose syndrome (WNS). However, other threats (the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; other natural or manmade factors affecting its continued existence) when combined with WNS heighten the level of risk to the species.

NatureServe gives this species a global conservation rank G2/G3, meaning that the species is imperiled, with a high to moderate risk of extinction or elimination due to restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors (NatureServe 2013).

Most BLM field offices have not inventoried for presence of northern long-eared bat. Surveys conducted by the USFS in 2006 positively identified the presence of the species near Spring Creek in northern Campbell County; no other observations have been reported in the Buffalo planning area (Schubert 2013). As further surveys are conducted, previous and current factors affecting areas with northern long-eared bat will be addressed on a case-by-case basis.

Life History

A medium-sized bat species, the northern long-eared bat adult body weight averages 5 to 8 g,

with females tending to be slightly larger than males. Fur is medium to dark brown on its back, dark brown, but not black, ears and wing membranes, and tawny to pale-brown fur on the ventral side. The northern long-eared bat is distinguished from other *Myotis* species by its long ears (average 17 mm (0.7 in)) that, when laid forward, extend beyond the nose but less than 5 mm (0.2 in) beyond the muzzle. The tragus is long, pointed, and symmetrical. Within its range, the northern long-eared bat can be confused with the little brown bat (*Myotis lucifugus*) or the western long-eared myotis (*Myotis evotis*).

Northern long-eared bats hibernate during the winter months to conserve energy from increased thermoregulatory demands and reduced food resources. In general, northern long-eared bats arrive at hibernacula in August or September, enter hibernation in October and November, and leave the hibernacula in March or April. In the Black Hills northern long-eared bats typically enter hibernacula by October 1 and depart before May 15 (Reeves pers. comm.). Northern long-eared bats have shown a high degree of philopatry (using the same site multiple years) for a hibernaculum, although they may not return to the same hibernaculum in successive seasons. Typically, northern long-eared bats are not abundant and compose a small proportion of the total number of bats hibernating in a hibernaculum. Although usually found in small numbers, the species typically inhabits the same hibernacula with large numbers of other bat species, and occasionally are found in clusters with these other bat species. Other species that commonly occupy the same habitat include: little brown bat, big brown bat, eastern small-footed bat, tri-colored bat, and Indiana bat. Northern long-eared bats exhibit significant weight loss during hibernation. The northern long-eared bat is not considered a long-distance migratory species; short migratory movements between summer roost and winter hibernacula have been documented. Movements from hibernacula to summer colonies may be further. Several studies show a strong homing ability of northern long-eared bats in terms of return rates to a specific hibernaculum, although bats may not return to the same hibernaculum in successive winters.

Breeding occurs from late July in northern regions to early October in southern regions and commences when males begin to swarm hibernacula and initiate copulation activity. Hibernating females store sperm until spring, exhibiting a delayed fertilization strategy. Ovulation takes place at the time of emergence from the hibernaculum, followed by fertilization of a single egg, resulting in a single embryo; gestation is approximately 60 days. Maternity colonies, consisting of females and young, are generally small, numbering from about 30 to 60 individuals. Adult females give birth to a single pup typically in late May or early June, but may occur as late as July. Juveniles typically start flying at 21 days. Adult longevity is estimated to be up to 18.5 years.

The northern long-eared bat has a diverse diet including moths, flies, leafhoppers, caddisflies, and beetles, with diet composition differing geographically and seasonally. Foraging techniques include hawking (catching insects in flight) and gleaning in conjunction with passive acoustic cues. Emerging at dusk, most hunting occurs above the understory, but under the canopy on forested hillsides and ridges, rather than along riparian areas. This coincides with data indicating that mature forests are an important habitat type for foraging.

Habitat Requirements

Northern long-eared bats forage primarily in coniferous or deciduous forests. They are short-distance migrants, the distance between summer habitat and the hibernaculum typically being 56 kilometers (35 miles) (Hester and Grenier 2005) to 89 kilometers (55 miles) (USFWS 2014) or less. Northern long-eared bats predominantly overwinter in hibernacula that include caves and abandoned mines. Hibernacula used by northern long-eared bats are typically large, with large passages and entrances, relatively constant, cooler temperatures, and with high

humidity and no air currents. They are typically found roosting in small crevices or cracks in cave or mine walls or ceilings, often with only the nose and ears visible, thus are easily overlooked during surveys. To a lesser extent, northern long-eared bats have been found overwintering in other types of habitat including abandoned railroad tunnels, more frequently in the northeast portion of the range.

During the summer, northern long-eared bats typically roost singly or in colonies underneath bark or in cavities or crevices of both live trees and snags. Males and non-reproductive females' summer roost sites may also include cooler locations, including caves and mines. Northern long-eared bats have also been observed roosting in colonies in human made structures, such as buildings, barns, park pavilions, sheds, cabins, under eaves of buildings, behind window shutters, and in bat houses. Northern long-eared bats most likely are not dependent on a certain species of trees for roosts throughout their range; rather, certain tree species will form suitable cavities or retain bark and the bats will use them opportunistically. Structural complexity of habitat or available roosting resources may be more important factors. The species appears to favor areas with greater canopy cover, and often roosts below the canopy, but higher on slopes. Northern long-eared bats switch roosts often, typically every 2-3 days. Bats switch roosts for a variety of reasons, including, temperature, precipitation, predation, parasitism, and ephemeral roost sites.

Regional and Local Distribution

The northern long-eared bat ranges across much of the eastern and north central U.S., and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia. In the U.S., the species' range reaches from Maine west to Montana, south to eastern Kansas, eastern Oklahoma, Arkansas, and east to the Florida panhandle. Throughout the majority of the species' range it is patchily distributed, and historically was less common in the southern and western portions of the range than in the northern portion of the range. Although they are typically found in low numbers in inconspicuous roosts, most records of northern long-eared bats are from winter hibernacula surveys. Wyoming has no known hibernacula (likely due to lack of survey effort, suitability of habitat, and extent of range) (Hester and Grenier 2005).

The U.S. portion of the northern long-eared bat's range can be described in four parts: the eastern population, Midwestern population, the southern population, and the western population. Historically, the northern long-eared bat was most abundant in the eastern portion of its range. The northern long-eared bat is generally less common in the western portion of its range; it is considered common in only small portions of the western range (e.g., Black Hills) and uncommon or rare in the western extremes of the range (e.g., Wyoming, Kansas, Nebraska). The northern long-eared bat is considered abundant in the Black Hills having been observed hibernating and during the summer.

There are no limestone, dolomite or other karst formations suitable for caves within the Buffalo planning area east of the Big Horn Mountains. There are also no known abandoned mine shafts with hibernacula potential. The closest potential hibernacula habitat is the western extent of the Black Hills in Crook County, within ten miles of the Campbell County line.

During acoustic and mist net surveys conducted throughout Wyoming in the summers of 2008-2011, 27 separate observations of northern long-eared bats were recorded in Weston and Crook counties and breeding was confirmed by the WGFD (USFWS 2013a; WGFD 2011). To date, the BLM only knows of one survey where northern long-eared bats were captured by mist nets and acoustic monitors in the Buffalo planning area. In July 2006, the USFS conducted surveys near Spring Creek in northern Campbell County on USFS lands. Several calls were

recorded, and one individual was captured (Schubert 2013). Though additional surveys are planned, BLM is not aware of any extensive survey efforts in Campbell County that may be used to differentiate occupied versus unoccupied habitats. However, suitable habitats are known to be extremely limited in the planning area, with forested habitats comprising approximately 4% of the Campbell County land base. Even more limited is the overlap of forested habitats with either BLM administered surface or minerals, comprising around 75,000 acres, or 2.4% of the total land base in the county. Forested habitat in Campbell county rarely occurs as large, contiguous stands, but more often as small stands restricted to steep slopes and ridges. WYNDD predicts that within the planning area the northern long-eared bat would occur only in northeastern Campbell County (Figure I.2, “Wyoming Natural Diversity Database Predicted Northern-Long Eared Bat Distribution in Wyoming.” (p. 2039)).

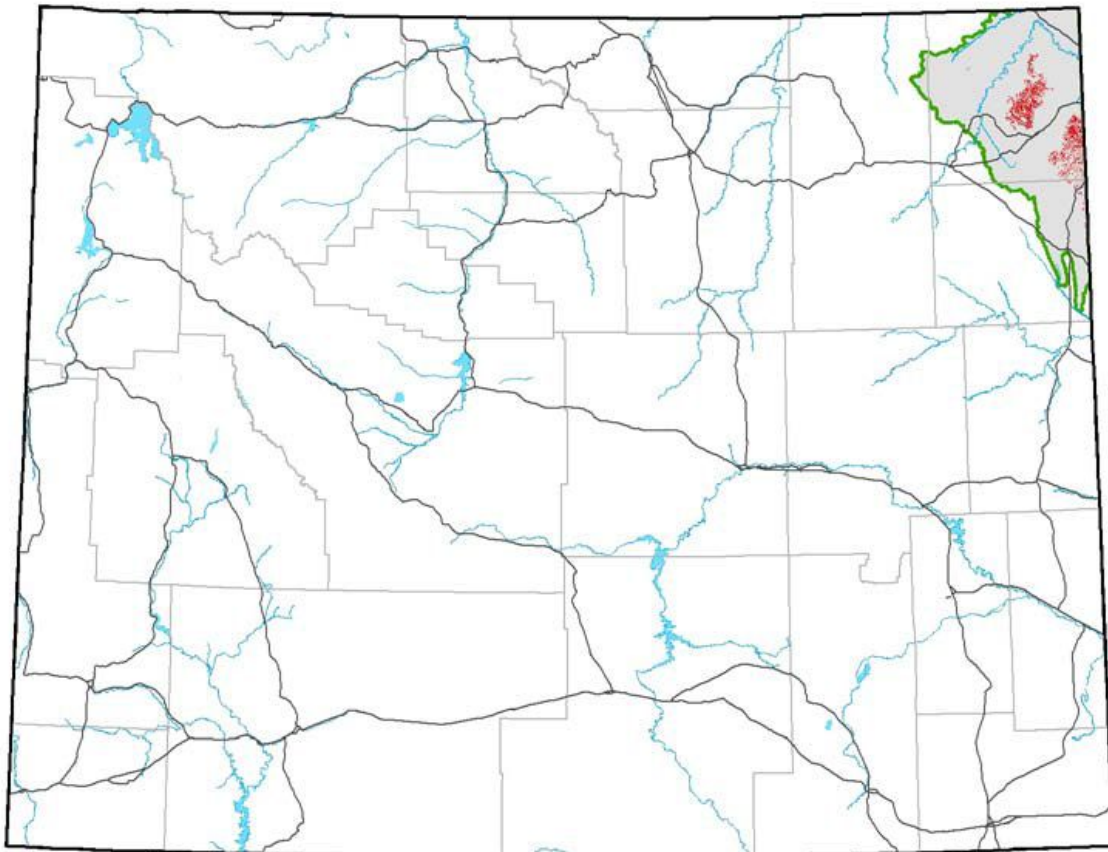


Figure I.2. Wyoming Natural Diversity Database Predicted Northern-Long Eared Bat Distribution in Wyoming.

Threats

It was determined that the northern long-eared bat is in danger of extinction, predominantly due to the threat of WNS. WNS is a disease caused by the cold-loving fungus, *Psuedogymnoascus* (*Geomyces*) *destructans*. First observed in New York in 2006, WNS has spread rapidly across the Northeast and into the Midwest and Southeast. Throughout the range of WNS, up to 99 percent of infected bats die from the disease. Although there is uncertainty about the spread of WNS, experts agree that the fungus will likely spread throughout the United States (USFWS 2013b).

The northern long-eared bat is also threatened by the loss and degradation of summer habitat caused by human development, and by collision with or barotrauma (injury to the lungs due to a change in air pressure) caused by wind turbines. Mine closures and vandalism of winter roosts and hibernacula also pose threats to this species (USFWS 2013b). These additional threats (the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; other natural or manmade factors affecting its continued existence) when combined with WNS heighten the level of risk to the species (USFWS 2013a).

I.5. Methods and Context of the Analysis

The Proposed RMP was reviewed to identify foreseeable actions with the potential to affect listed and proposed species in the planning area. The BLM, the USFWS, the WYND, the WGFD, and private consultants have performed ground surveys and inventories as part of other planning documents or projects. Moreover, species recovery plans, action plans, critical habitat designation documents, and conservation plans were reviewed for further information on habitats, occurrences, life histories, and conservation measures.

Activity Description

For brevity purposes, descriptions of the individual resource programs/activities are not presented in the BA. BLM Wyoming's Ute ladies'-tresses orchid programmatic BA (BLM 2007p) provides summary descriptions of BLM's resource programs. Additional detail, specific to the Buffalo planning area is presented within the Proposed RMP. Goals, objectives and management actions for each resource activity are identified in the detailed alternative description tables (Section 2.9). The BA reiterates those management actions expected to have a direct conservation benefit for Threatened, Endangered, and Proposed species. The Affected Environment section (Chapter 3) describes the regional context, current conditions within the planning area (including past effects) and trends for each resource activity. The Environmental Consequences section (Chapter 4) analyzes the direct, indirect, and cumulative effects of the various resource activities upon the specific resource activity. The impacts common to all describes the general effects of each resource activity while Alternative D (proposed alternative) describes the additional effects (effects in addition to the common to all alternative effects) of the proposed alternative. Several of the appendices also provide helpful resource program information: Appendix E lists the livestock allotments including federal acreage and permitted AUMs, Appendix G identifies the forecasted level of development for each resource activity, Appendix N describes the air quality management program (technical data is provided in Appendix M), Appendix R describes the travel management program, Appendix S describes management for the proposed ACECs, Appendix T describes management for the proposed Special Recreation Management Areas, Appendix V describes the fluid mineral management process, and Appendix W describes water management.

Effects Analysis

This BA analyzes the effects of a proposed *federal action*, the Proposed RMP. A *federal action* is defined as anything authorized, funded, or carried out by the federal agency. *Direct impacts* are effects on the species or its habitats caused by an action and occur at the same time and place as the action. *Indirect impacts* are effects on the species or its habitat caused by an action occurring later in time or farther removed in distance than direct impacts, but which are still reasonably

foreseeable. The analysis of all impacts includes the effects of interrelated and interdependent actions.

For the purposes of effects analysis under the ESA, *cumulative effects* are defined as impacts of future state, tribal, and private actions reasonably certain to occur. Future federal actions will be subject to the consultation requirements established in ESA Section 7 and, therefore, are *not* considered cumulative to the proposed action.

Factors considered when analyzing effects of federal actions include proximity of the action to the species or habitat of concern, geographic distribution of the action disturbance, timing of the action, nature of the action effect, action disturbance frequency, duration of the affecting action, action disturbance intensity, and action disturbance severity.

The BA process is focused primarily on *adverse impacts* to the species of concern. Although impacts to the subject species may be beneficial, the effects determination of the assessment is based on and controlled by the likelihood of adversely affecting the species. In other words, for a BA, the impacts analysis is not an averaging process.

Effects Determinations

Determinations for each resource program (i.e., air quality, cultural resources, livestock grazing management, etc.) are based on the impacts of the management actions (proposed protections) and conservation measures committed to by the BLM. BMPs are typically voluntary measures; therefore, they are speculative and not typically considered in the effects determination. However, the BLM is committed to implementing BMPs identified in the BLM National Greater Sage-Grouse Land Use Planning Strategy (BLM Instruction Memorandum [IM] 2012-044) and the BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA as required design features (RDFs). The BLM will require application of all appropriate RDFs, warranted by site-specific analysis, in order to avoid, minimize, rectify, reduce, or compensate for impacts. RDFs not included in project proposals and determined appropriate from the site-specific analysis will be required as Conditions of Approval (COAs). RDFs are listed as conservation measures as BLM is committed to their implementation.

Threatened and Endangered Species Determinations - Determination categories for this BA for federally listed Threatened and Endangered species are defined below.

No effect (NE) – The appropriate conclusion when the BLM determines its proposed action will not affect listed species or critical habitats. The principle factors for this determination are that “suitable habitat” or the species does not exist in the analysis area, or the very nature of the action will not have any effect on an individual or its habitat. In this situation, no further contact with the USFWS is required.

May affect, not likely to adversely affect (NLAA-b, -i, -d) – The appropriate conclusion when effects on a listed species or its critical habitats are expected to be completely beneficial (-b), or insignificant (-i), or discountable (-d). Beneficial effects have contemporaneous beneficial effects without adverse effects to the species or its critical habitat. (For example, there cannot be “balancing,” where the benefits of the action would outweigh the adverse effects.) Insignificant effects relate to the size of the impact and should not reach the scale where take occurs. Discountable effects are extremely unlikely to occur. Based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects, or expect discountable

effects (USFWS and U.S. National Marine Fisheries Service 1998). This level of effect requires informal Section 7 consultation with the USFWS and their concurrence with the determination.

May affect, is likely to adversely affect (LAA) – The appropriate conclusion if any adverse effect to the listed species or its critical habitats may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. In the event the overall effect of the proposed action is beneficial to the listed species, but also is likely to cause some adverse effects to even just one individual plant or animal, then the proper effect determination for the proposed action “is likely to adversely affect” the listed species. An “is likely to adversely affect” determination requires formal Section 7 consultation with the USFWS.

There is no designated critical habitat in the Buffalo planning area.

Proposed Species - The ESA Section 7 consultation process is not required for Proposed species, unless it has been determined that actions taken are likely to jeopardize the continued existence of the species. However, because the northern long-eared bat has been identified as a Proposed species, it may eventually become listed, and there are advantages to addressing Proposed species as though they were listed. Early technical coordination with the USFWS can yield some collaborative management advantages and is in line with BLM Manual 6840. For these reasons, the northern long-eared bat is included in this BA and will be analyzed as appropriate. Determination categories used in this BA for federal Proposed species are defined below. For the purposes of requesting technical assistance from the USFWS for the proposed action, the following language for Proposed species effects determinations will apply:

No Effect (NE) – The appropriate conclusion when the BLM determines its proposed action will not impact Proposed species or their essential habitat. This is based on the fact that the species’ habitat is not present and/or no impacts would be expected to occur. If this determination is reached, no coordination with the USFWS regarding the proposed species would be necessary.

May affect, not likely to adversely affect (NLAA) – The appropriate conclusion when the BLM identifies situations in which the proposed action may have an impact on individuals but any impacts are likely to be wholly beneficial, so unlikely as to be considered totally discountable, or so small or minor as to be considered completely insignificant. Where this determination is made, the BLM will not likely pursue formal conference with the USFWS because there is no potential for NLAA to rise to the level of jeopardy of the continued existence of the Proposed species at either local or range-wide scales. If this conclusion is reached, BLM determinations will be coordinated with the USFWS as appropriate.

May impact, likely to adversely affect (LAA) – The appropriate conclusion when the BLM identifies situations in which the proposed action is likely to have an adverse impact on individuals or populations of the Proposed species. Determinations of jeopardy will be the subject of formal conference request with the USFWS.

BLM staff reviewed proposed management actions associated with the Proposed RMP and potential impacts to individual species to identify potential impact to the species if the actions were to occur within suitable habitat for the species.

This BA describes, in detail, potential actions that may affect listed or proposed species. Other potential actions that have been determined to have no effect on a species are not discussed in

detail. Programs that do not have actions located within the habitat of a listed species have been identified as having no effect on that species.

Coordination and Conservation Measures

Consistent with Section 7 of the ESA, the BLM considered conservation measures for the management of Threatened, Endangered and Proposed species. The adopted conservation measures for Utes Ladies'-tresses Orchid and Northern Long-eared Bat will be incorporated into the approved RMP. Conservation measures serve several purposes, including presenting ways the BLM can assist species conservation in furtherance of statutory responsibilities; minimizing or avoiding the adverse impacts of a proposed action on Threatened, Endangered or Proposed species; and identifying and recommending studies aimed at improving the understanding of a species' biology or ecology.

Management is addressed in four primary ways, as follows:

- Through conservation measures, reasonable and prudent measures, and BMPs identified as part of a species listing package, measures recommended in the BO from the USFWS in response to a BA, and through species protection measures determined through collaborative interagency and multidiscipline efforts.
- The BLM Wyoming Field Offices incorporate the *Wyoming BLM Mitigation Guidelines for Surface-Disturbing and Disruptive Activities*. These guidelines state that before performing activities in known or suspected habitats, the lessee or permittee is required to perform inventories or studies in accordance with BLM and/or USFWS guidelines to verify the presence or absence of federally-listed Threatened and Endangered species. If the presence of one or more of these species is verified, the operation plans of a proposed action will be modified to include the protection of the species and its habitat, as necessary. Possible protective measures include seasonal or activity limitations, or other surface management and occupancy constraints.
- The BLM incorporates *Wyoming Standards for Healthy Rangelands* (BLM 1997). As stated, the "standards apply to all resource uses on public lands," while the "guidelines apply specifically to livestock grazing management practices on BLM-administered public lands" [surface]. The development and application of these standards and guidelines are intended to achieve the following four fundamentals of rangeland health: (1) proper functioning of air and watersheds; (2) proper cycling of air, water, soil nutrients, and energy; (3) attainment of state water quality standards; and (4) sustained maintenance and management of the native fauna and flora of the area, including federally listed Threatened and Endangered species. These fundamental goals are achieved through inventory of natural resources, appropriate management actions aimed at these resources, monitoring and evaluation of the effectiveness of these management actions, and land management adjustments as necessary.
- *BLM Manual 6840: Special Status Species Management* directs Field Office managers to implement special status species programs within their area of jurisdiction by: (1) implementing conservation strategies for BLM special status species as contained in approved recovery plans, cooperative agreements, and other instruments the BLM has cooperatively participated in the development of; (2) conducting and maintaining current inventories of BLM special status species on BLM-administered lands; (3) ensuring that all actions undertaken comply with the ESA, its implementing regulations, and other directives associated with ESA-listed

and proposed species; (4) ensuring that the results of formal Section 7 consultations, including mandatory terms and conditions in incidental take statement that are consistent with 50 CFR 402 regulations, are implemented and documented in the administrative record; (5) coordinating field office activities with federal, state, and local groups to ensure the most effective program for BLM special status species; (6) ensuring that land use and implementation plans fully address appropriate conservation of BLM special status species; and (7) monitoring populations of BLM special status species to determine whether management objectives are being met. Records of monitoring activities are to be maintained and used to evaluate progress relative to such objectives. Monitoring shall be conducted consistent with the principles of adaptive management as defined in the U.S. Department of the Interior (DOI) policy, as appropriate.

The conservation measures are intended to minimize adverse impacts likely to result from implementation of the management actions in the Proposed RMP. Conservation measures presented take two forms, as follows: the proposed management actions within the Proposed RMP (Proposed Protections) and additional conservation measures from BLM policies, conservation strategies, BAs and similar sources that would reduce impacts to listed or proposed species. Program appropriate BMPs that would further protect the species and its habitats are also included to be applied to individual projects, as warranted. If new populations of the species are discovered, these measures would apply until such time that further investigation and subsequent consultation with the USFWS results in more appropriate management prescriptions.

Conservation measures have been written in a format that will allow for either their direct use as stipulations or operating standards and/or in addition to specific or specialized mitigation following the submission of a detailed development plan or other project proposal and an environmental analysis. These operating standards are given as acceptable methods for mitigating anticipated effects and achieving the desired plan outcomes but are not prescribed as the only method for achieving the outcomes.

Those resource activities or programs currently without a standardized set of permit or operation stipulations can use the conservation measures as stipulations or as COAs, or as a baseline for developing specific stipulations for a given activity or program.

Conservation Measures Common to All Species

The following general conservation measures will be applied under all resource programs and are not repeated in this BA under each management program. The Statewide Programmatic BAs and BOs, including all reasonable and prudent measures and terms and conditions, will be implemented for the Buffalo planning area. Conservation measures are identified with the appropriate resource.

- Surface-disturbing activities are subject to the *Wyoming BLM Mitigation Guidelines for Surface-Disturbing and Disruptive Activities*, the *Wyoming BLM Reclamation Policy* issued under IM WY-2012-032, and similar guidance and policy as updated over time (BLM 2012a). The *Wyoming BLM Mitigation Guidelines for Surface-Disturbing Activities* requires any lessee or permittee to perform inventories or studies in accordance with BLM and USFWS guidelines to verify the presence or absence of Threatened or Endangered species before any activities can begin onsite. In the event the presence of one or more of these species is verified, the operation plans of a proposed action will be modified to include the protection of the species and its habitat, as necessary. Possible protective measures may include seasonal or activity limitations or other surface management and occupancy constraints.

- The BLM may pursue a withdrawal from appropriation under the mining laws for special status species habitat on a case-by-case basis.
- The BLM will modify projects that may affect special status species to protect these species and will consult with the USFWS in such cases, as required by the ESA.
- The BLM will consult with stakeholders in modifying projects that may affect special status species.
- The BLM will assist authorized agencies in the restoration, reintroduction, augmentation, or reestablishment of Threatened, Endangered, and other special status species populations and/or habitats.
- Motorized vehicle use is limited to designated roads and trails in essential and recovery habitat for Threatened or Endangered species.
- All types of forest management will apply appropriate mitigation, that riparian/wetland areas will be managed to meet Proper Functioning Condition (PFC) and the *Wyoming Standards for Healthy Rangelands*, and the BLM will work cooperatively to control outbreaks of grasshoppers and Mormon crickets.
- Areas harvested for timber are to be regenerated by natural or artificial means consistent with BLM policy, and vegetative communities are managed in accordance with the *Wyoming Standards for Healthy Rangelands*.
- Grazing management will consider Threatened and Endangered species and their habitats. Grazing management practices will incorporate the kinds and amounts of use that will restore, maintain, or enhance habitats to assist in the recovery of federally Threatened and Endangered species or the conservation of federally listed species of concern and other state-designated special status species. Grazing management practices will maintain existing habitats or facilitate vegetation change toward desired habitats by considering the hydrology, physical attributes, and potential for the watershed and the ecological site (BLM 1997).
- Management prescriptions for invasive species include developing and maintaining an invasive species and pest management plan, and coordinating with appropriate stakeholders to manage for the reduction of cheatgrass and other invasive species.
- Fish and wildlife management includes actions to appropriately mitigate the effects of surface-disturbing activities. Management actions include maintaining or improving important wildlife habitats through vegetative manipulations, habitat improvement projects, livestock grazing strategies, and the application of applicable guidance.
- The BLM will continue to use and update existing Habitat Management Plans (HMPs) (including the South Big Horns HMP, Wetlands HMP, and Middle Fork Powder River HMP) as necessary to include management objectives and prescriptions for wildlife.
- The BLM will participate with the development of species specific recovery plans in coordination with the USFWS and other agencies. Populations and habitats on BLM-administered lands will be monitored to determine if recovery objectives are being met.

- In the event a dead or injured Threatened or Endangered species is discovered during project activities the BLM would notify the USFWS Ecological Field Office (307-772-2374) or Law Enforcement Office (307-261-6365) within 24 hours of the discovery.
- BLM-administered public lands that contain identified habitat for Threatened and Endangered Species will not be exchanged or sold, unless it benefits the species.

I.6. Analysis of Proposed Management Actions and Effects

The following program analyses follow a linear process that starts with the resource activity description and runs through to a listing of effect determinations. For purposes of this BA, this section is divided into a discussion of each major functional resource activity occurring on the public lands in the planning area. For each major activity, conservation strategies are divided into two categories, as follows: proposed protections identified for the Agency Proposed Alternative and Conservation Measures. The proposed protections identified in the Proposed RMP are those protections for the specific resource that will benefit Threatened, Endangered, or Proposed species. The conservation measures include additional management actions within the Proposed RMP (additional to those for the resource being discussed), policy measures, and other conservation measures that could further protect Threatened, Endangered or Proposed species. This information provides the basis for the impacts analysis and effect determinations presented by species and their respective habitats, and the potential direct, indirect, and cumulative effects of the activity.

Note: measures may be paraphrased within this section. For the complete wording of the Proposed RMP's Management Actions see the *Detailed Alternative Descriptions* (Section 2.7) of the proposed RMP. The complete wording of conservation measures from other sources is identified in Section 10 of this BA. The complete text, not the paraphrased wording presented here, was used in the impact analysis and effects determinations.

Proposed RMP Management Actions Applicable to all Resource Activities

The analysis for each resource program begins by listing the conservation measures applicable to that resource activity. Since many conservation measures will be applied to all resource programs they are listed within this section and are not repeated within the individual resource program analyses to reduce redundancy. The complete list of conservation measures is also included in Section 10.

Ute Ladies'-Tresses Orchid

- Implement actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate BMPs and reasonable and prudent measures within BOs for Threatened and/or Endangered plant species. (SS Plants-4001)
- Allow treatments within habitat for special status plant species and within known populations that are proven to benefit the species. (SS Plants-4002)
- Allow the following within habitat for special status plant species, though not within known populations: surface-disturbing activities that could adversely impact special status plant species, mineral exploration and development activities, motor vehicle use, including uses related to fire suppression and geophysical exploration activities (surveying, etc.), use of

explosives and blasting, and placement of water developments, salt and mineral supplements. (SS Plants-4003)

- Require predisturbance flowering season surveys for special status plant species prior to approving any project or activity that may impact the habitat for these species as modeled and surveyed by WYNDD and BLM. A mitigation and monitoring plan is to be developed within occupied habitat. (SS Plants-4004)
- Prohibit new surface-disturbing activities within 0.25 mile of any waters containing special status fish species unless it benefits the species. Exceptions must demonstrate the proposed impacts cannot be avoided and the proposal is the least environmentally damaging alternative. (SS Fish-4007)
- Utilize current research, management and conservation plans, and similar related documents to guide special status species habitat management. (SS WL-4001)
- Implement actions set forth in recovery plans, conservation measures, terms and conditions, protection measures, and appropriate BMPs and reasonable and prudent measures within BOs for Threatened and/or Endangered wildlife species, including those specific to this RMP and any future statewide programmatic BOs. (SS WL-4002)
- Maintain (size and quality) or enhance current habitat utilized by special status species. Enlarge/restore habitat on site specific basis. (SS WL-4003)
- Maintain or enhance the integrity of identified special status wildlife species migration corridors. Manage identified special status wildlife species travel corridors consistent with other resource values. (SS WL-4004)
- Manage surface-disturbing and disruptive activities to mitigate impacts on special status wildlife species and their habitats. (SS WL-4006)
- Apply a CSU stipulation to mineral leases containing special status species habitat. Surveys required for clearance. (SS WL-4007)
- Restore Greater Sage-Grouse brood-rearing habitats in riparian/wetland areas. Maintain seeps, springs, wet meadows, and riparian vegetation in a functional and diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas. (SS WL-4012)

Northern Long-Eared Bat

- Manage human activity in caves with significant resources by developing and implementing a Cave Management Plan for the planning area, with potential cave specific components. (Cave-1003)
- Require a site-specific buffer from significant cave entrances for surface-disturbing activities. (Cave-1005)
- Utilize current research, management and conservation plans, and similar related documents to guide special status species habitat management. (SS WL-4001)
- Implement actions set forth in recovery plans, conservation measures, terms and conditions, protection measures, and appropriate BMPs and reasonable and prudent measures within BOs

for Threatened and/or Endangered wildlife species, including those specific to this RMP and any future statewide programmatic BOs. (SS WL-4002)

- Maintain (size and quality) or enhance current habitat utilized by special status species. Enlarge/restore habitat on site specific basis. (SS WL-4003)
- Maintain or enhance the integrity of identified special status wildlife species migration corridors. Manage identified special status wildlife species travel corridors consistent with other resource values. (SS WL-4004)
- Manage surface-disturbing and disruptive activities to mitigate impacts on special status wildlife species and their habitats. (SS WL-4006)
- Apply a CSU stipulation to fluid mineral leases containing special status species habitat. Surveys required for clearance. (SS WL-4007)
- Require surveys for special status amphibian, reptile, and bat species prior to approving any project or activity that may impact the habitat for these species. Habitat includes: caves, mature forest, perennial waters, vernal pools, playas, wetlands, and south-facing rock outcrops. Allow surface-disturbing and disruptive activities within 1,640 feet (500 meters) of caves, mature forest, perennial waters, vernal pools, playas, wetlands, and south facing rock outcrops when special status amphibian, reptile, and bat species populations and habitat can be conserved. (SS WL-4033)

Conservation Measures Applicable to all Resource Activities

BLM Wyoming Statewide Programmatic BA for Ute Ladies'-Tresses Orchid Conservation Measures

- The *Wyoming BLM Standard Mitigation Guidelines for Surface Disturbing Activities* requires any lessee or permittee to conduct inventories or studies in accordance with the BLM and USFWS guidelines to verify the presence or absence of threatened or endangered species before any activities can begin on site. In the event the presence of one or more of these species is verified, the operation plans of a proposed action will be modified to include the protection of the species and its habitat, as necessary. Possible protective measures may include seasonal or activity limitations, or other surface management and occupancy constraints.
 - Surface disturbance will be prohibited within 500 feet of surface water and/or riparian areas. Exception, waiver, or modification of this limitation may be approved in writing, including documented supporting analysis, by the authorized officer. (Wyoming BLM Mitigation Guidelines for Surface-disturbing and Disruptive Activities). **Note:** this conservation measure was revised from the programmatic BA by adding the second sentence to clarify that exception, waiver, or modifications from the prohibition are possible.
 - NSO will be allowed within special management areas (e.g., known threatened or endangered species habitat) (Wyoming BLM Mitigation Guidelines for Surface-disturbing and Disruptive Activities).
 - Portions of the authorized use area are known or suspected to be essential habitat for threatened or endangered species. Prior to conducting any onsite activities, the lessee/permittee will be required to conduct inventories or studies in accordance with BLM

and USFWS guidelines to verify the presence or absence of this species. In the event that an occurrence is identified, the lessee/permittee will be required to modify operational plans to include the protection requirements of this species and its habitat (e.g., seasonal use restrictions, occupancy limitations, facility design modifications) (Wyoming BLM Mitigation Guidelines for Surface-disturbing and Disruptive Activities).

- Within the potential of the ecological site (soil type, landform, climate, and geology), the BLM will ensure that the soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff.
- The BLM will maintain biological diversity of plant and animal species; support the WGFD strategic plan population objective levels to the extent practical and to the extent consistent with BLM multiple use management requirements; maintain, and where possible, improve forage production and quality of rangelands, fisheries, and wildlife habitat; and to the extent possible, provide habitat for threatened and endangered and special status plant and animal species on all public lands in compliance with the ESA and approved recovery plans.
- If revegetation projects are conducted within 0.25 miles of known habitat for the orchid, only native species will be selected. This conservation measure will keep non-native species from competing with the orchid.
- All proposed projects will be designed and locations selected to minimize disturbances to known Ute ladies'-tresses orchid populations, and if the avoidance of adverse effects is not possible, the BLM will re-initiate consultation with the Service. Projects will not be authorized closer than 0.25 miles from any known Ute ladies'-tresses populations without concurrence of the USFWS and the BLM authorized officer. No ground disturbing construction activities will be authorized within 0.25 miles of any known Ute ladies'-tresses orchid populations during the essential growing season time period (from July to September, the growing, flowering and fruiting stages) to reduce impacts to the species.

BLM Wyoming Statewide Programmatic BA for Ute Ladies'-Tresses Orchid Best Management Practices

- When project proposals are received, the BLM will initiate coordination with the USFWS at the earliest possible date so that both agencies can advise on project design. This should minimize the need to redesign projects at a later date to include orchid conservation measures, determined as appropriate by the USFWS.
- The BLM will coordinate with the USFWS, the Natural Resources Conservation Service (NRCS), and private landowners to ensure adequate protection for the Ute ladies'-tresses orchid and its habitat when new activities are proposed, and to work proactively to enhance the survival of the plant.
- In the event that a new population of the orchid is found, the USFWS Wyoming Field Office (307-772-2374) will be notified within 48 hours of discovery.
- For the protection of the Ute ladies'-tresses orchid and its potential habitat, surface-disturbing activities should be avoided in the following areas when they occur outside the protective 0.25-mile buffer from populations of the Ute ladies'-tresses orchid: (a) identified 100-year flood plains, (b) areas within 500 feet from perennial waters, springs, wells, and wetlands, and (c) areas within 100 feet of the inner gorge of ephemeral channels.

*Appendix I Biological Assessment
Conservation Measures Applicable to all
Resource Activities*

BLM National Sage-Grouse Habitat Conservation Strategy's Suggested Management Practices (BLM 2004)

- Steps such as recontouring, resspreading topsoil, revegetating all disturbed areas not needed are suggested. The use of native species of shrubs, forbs, and grasses in seed mixes appropriate for each ecological site will also enhance habitat value for Greater Sage-Grouse.
- Reclaim unnecessary or redundant roads and facilities by removing surfacing material, reestablishing the original contour, spreading topsoil, and seeding to restore habitat.
- Encourage vegetative restoration along roads, ROWs, on well pads, and at existing facilities where habitat needs for Greater Sage-Grouse are not currently met.
- Require successful seeding of appropriate vegetation on any new disturbance associated with mineral and energy facility developments, livestock management facilities, and recreation facilities.

Northern Long-Eared Bat Interim Conference and Planning Guidance (USFWS 2014)

Measures that BLM is willing to fully commit to have been re-worded to reflect the BLM's commitment; and the measures have been re-ordered placing the committed conservation measures above the discretionary best management practices. Best Management Practices are discretionary measures as they cannot always be required due to valid and existing rights or other concerns. BLM will recommend all proposal appropriate BMPs to proponents, and include them in project level environmental analyses.

Hibernacula, Spring Staging and Fall Swarming Habitat (Oct. 1- May 14):

Conservation Measures

- BLM will take actions to protect Northern Long-Eared Bat hibernacula. Where a known Northern Long-Eared Bat hibernaculum is experiencing threats, BLM will work with the USFWS and other partners to provide the necessary protections (e.g., limit human disturbance, install bat-friendly gates, ensure the use of "clean" clothing and gear).
- BLM will participate in actions to manage and reduce the impacts of WNS on Northern Long-Eared Bats. A national plan was prepared by the USFWS and other state and federal agencies that details actions needed to investigate and manage WNS.
- BLM will avoid disturbing/injuring hibernating bats by:
 - Not entering Northern Long-Eared Bat hibernacula during the hibernation season, unless coordinated with the Service for survey, research, or other management purposes.
 - Complying with all cave and mine closures, advisories, and regulations.
- BLM will avoid destruction/alteration (e.g., fill, cause collapse of) of caves/mines that may support hibernating bats by:
 - Prohibiting woody vegetation or spoil (e.g., soil, rock, etc.) disposal within 100 feet of known hibernacula entrances and associated sinkholes, fissures, or other karst features.
 - When blasting within 0.5 mile of known or presumed known or presumed occupied hibernacula entrances and passages, BLM will coordinate with the USFWS to ensure that the

blasting will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula.

- Avoiding modifying cave or mine entrances that support hibernating bats. If there are safety concerns or concerns about bats (e.g., disturbance, vandalism) at a site, only "bat friendly" cave/mine gates will be installed.
- BLM will avoid/minimize alterations of clean drinking water and foraging areas by:
 - Protecting potential recharge areas of cave streams and other karst features that are hydrologically connected to known or assumed hibernacula.
 - Setting back equipment servicing and maintenance areas at least 300 feet away from streambeds, sinkholes, fissures, or areas draining into sinkholes, fissures, or other karst or mine features.
 - Following available standards on spill prevention, containment, and control.
 - Restricting use of herbicides for vegetation management near known or assumed Northern Long-Eared Bat hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands).
 - Implementing strict adherence to sediment and erosion control measures and reclamation standards.
- BLM will minimize the spread of WNS. If a cave or mine that could harbor hibernating bats must be entered, and it does not have a cave and mine closure policy, BLM follow approved WNS decontamination protocols. Under no circumstances will clothing, footwear, or equipment that was used in a WNS-affected state or region be used.
- BLM will avoid disturbing/killing/injuring Northern Long-Eared Bats by not clearing occupied spring staging and fall swarming habitat near known Northern Long-Eared Bat hibernacula during the staging and swarming seasons. Surveys will be conducted to determine occupancy prior to any tree clearing activities.

Best Management Practices

- Activities involving continuing (i.e., longer than 24 hours) noise disturbances greater than 75 decibels measured on the A scale (e.g., loud machinery) would be avoided within a one-mile radius of known Northern Long-Eared Bat hibernacula.
- Avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming by not clearing suitable spring staging and fall swarming habitat within 5.0 miles of known Northern Long-Eared Bat hibernacula during the staging and swarming seasons.
- Maintain spring staging/fall swarming forested habitat within 5.0 miles of known Northern Long-Eared Bat hibernacula.
 - Retain snags, dead/dying trees, and trees with exfoliating (loose) bark ≥ 3 -inch diameter at breast height in areas \leq one mile from water.
 - Minimize impacts to all forest patches.

- Maintain forest patches and forested connections (e.g., hedgerows, riparian corridors) between patches.
- Maintain natural vegetation between forest patches/connections and developed areas.

Summer Habitat (May 15 - Sep 30):

Conservation Measures

- BLM will determine where Northern Long-Eared Bats occur in the summer.
 - Coordinate with partners to gather and evaluate Northern Long-Eared Bat location information.
 - Review both positive and negative data (e.g., acoustic transect surveys).
- BLM will take actions to protect Northern Long-Eared Bats and their habitat within known Northern Long-Eared Bat home ranges.
- BLM will avoid killing or injuring Northern Long-Eared Bats during tree clearing activities by not clearing occupied maternity colony summer habitat during the summer maternity season. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
- BLM will minimize other direct effects to Northern Long-Eared Bats by not clearing occupied summer habitat during the time of year when females are pregnant or the pups are incapable of flight. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
- BLM will avoid/minimize altering clean drinking water and foraging areas by:
 - Implementing sediment and erosion control measures and reclamation standards.
 - Siting equipment servicing and maintenance areas at least 300 feet away from waterbodies (e.g., wetlands, streams). Following available standards on spill prevention, containment, and control.
- BLM will maintain summer maternity habitat by:
 - Retaining known roost trees, which includes live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
 - Clearly demarcating trees to be protected vs. cut to help ensure that contractors do not accidentally remove more trees than anticipated.

Best Management Practices

- Determine where Northern Long-Eared Bats occur in the summer by performing baseline bat surveys.
- BLM will minimize direct effects by avoiding construction activities after sunset in known or suitable summer habitat to avoid harassment of foraging Northern Long-Eared Bats.
- BLM will avoid/minimize altering clean drinking water and foraging areas by:

- Minimizing use of herbicides and pesticides. If necessary, spot treatment is preferred over aerial application.
- Minimize use of chemicals in/around storm water detention basins.
- Minimize potential lighting impacts (e.g., reduce the number of lights, use motion sensors, use shields/full cut-off lens, angle lights downward and away from forest).
- Contaminants, including but not limited to oils and solvents, would be controlled so the quality, quantity, and timing of prey resources are not affected.
- Avoiding filling, channelizing, or degrading streams, wetlands, and other watering areas where possible.
- BLM will maintain summer maternity habitat by:
 - Retaining and avoiding potential roost trees, which includes live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Not removing trees surrounding potential roosts to maintain the microclimate.
 - Where possible and not a safety hazard, leaving dead or dying trees standing.
 - Avoiding reducing the suitability of forest patches with known Northern Long-Eared Bat use.
 - Maintaining or improving forest patches.
 - Avoiding/minimizing tree clearing that fragments large forested areas or tree lined corridors. For example, routing linear features along the edge of a woodlot instead of through the middle of it; using horizontal directional drilling for pipeline crossings of wooded stream corridors and upland tree lines.

A Conservation Plan for Bats in Wyoming (Hester and Grenier 2005)

Measures that BLM is willing to fully commit to have been re-worded to reflect the BLM's commitment; and the measures have been re-ordered placing the committed conservation measures above the recommended best management practices.

Conservation Measures

- BLM, in cooperation with the State of Wyoming and/or the Service, will implement inventory and monitoring to determine population status and habitat requirements, as additional information is necessary to guide management actions.
- BLM will manage BLM administered lands where *Myotis septentrionalis* occurs in such a way that provides adequate roosting and foraging habitat to maintain stable populations (that is, secure roosting sites; diverse, native foraging habitat; and uncontaminated water sources).
- BLM will evaluate and where appropriate require BMPs for natural caves and abandoned mines in areas where *Myotis septentrionalis* roosts.

Best Management Practices

- Retain all large-diameter snags, particularly those greater than 21 centimeters (8 inches) diameter at breast height (Schmidt 2003), as potential roost sites for *Myotis septentrionalis* and other snag-dependent species. Provide large-diameter snags in early states of decay,

particularly snags with large amounts of exfoliating bark (Lacki and Schwierjohann 2001). Retain mature and decadent trees for future snag production, particularly where existing snags are few. Because the northern myotis switches tree roosts frequently and may need several suitable roosts over the course of a summer (Foster and Kurta 1999; Caceres and Barclay 2000), retain all snags in areas where bats are known to roost.

- Implement BMPs for natural caves and abandoned mines in areas where *Myotis septentrionalis* roosts.
- Avoid or minimize pesticide use in areas where the *Myotis septentrionalis* is known to occur to avoid direct poisoning and to maintain a food source for this species and other insectivores. Where possible, allow insect outbreaks to proceed naturally.

Bureau of Land Management White-nose Syndrome Interim Response Strategy (Washington Office Instruction Memorandum No. 2010-181 [BLM 2010d])

- BLM will coordinate and conduct outreach with appropriate internal and external stakeholders to prevent or contain the spread of WNS.
- BLM will identify caves and abandoned mine features with important bat resources (refer to all three attachments for more detail).
- BLM will follow the Containment and Decontamination Procedures for Bureau of Land Management Administered Lands to Minimize the Spread of White-Nose Syndrome in Caves and Abandoned Mines August 5, 2010 outlined in WO IM No. 2010-181.
- BLM will participate in interagency groups to develop state WNS response plans.
- BLM will recommend locations to test for the presence of WNS at a subset of the sites that have been identified as having important bat resources and support WNS research efforts where practicable and feasible within budgetary constraints.

A Strategic Plan for White-nose Syndrome in Wyoming (Abel and Grenier 2011)

- BLM will coordinate with the State of Wyoming and the Service to implement Wyoming's strategic plan for WNS prevention, and continue to work with the WGFD and other stakeholders in minimizing the risk of WNS spread into Wyoming.

Air Quality

Proposed Management Actions for Air Quality

The Proposed RMP includes the following air quality management actions that may benefit Threatened and Endangered species:

- Manage prescribed burns to comply with Wyoming Department of Environmental Quality Air Quality Division smoke-management rules and regulations. (AQ-1001)
- Implement mitigation measures within BLM's authority (BMPs – for example, dust suppression) to reduce emissions from current levels in the planning area and work cooperatively to encourage industry and other permittees to adopt measures to reduce emissions. (AQ-1003)

- Work cooperatively with stakeholders to reduce cumulative dust emissions (i.e., Campbell County Dust Coalition) and address other air quality concerns. (AQ-1005)
- Require quantitative Air Quality modeling of proposed activities in consultation with stakeholders in order to determine the potential impacts of proposed emission sources and potential mitigation strategies for projects expected to approach or exceed ambient air quality standards. (AQ-1006)

Conservation Measures Specific to Air Quality

No conservation measures specific to Air Quality Management are identified.

Impact Analysis and Effects Determination

A summary of the air quality resources within the planning area can be found in the Buffalo RMP Revision in Section 3.1.1, the *Air Quality* section of Chapter 3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Currently no air quality monitoring stations exist in Ute ladies'-tresses orchid potential habitats within the Buffalo planning area. Typically air quality monitoring stations are not located in riparian habitat. No air quality monitoring stations are anticipated to be constructed near Ute ladies'-tresses orchid potential habitat. Implementing air quality management actions will result in *no effect (NE)* to the Ute ladies'-tresses orchid. This determination is based on the absence of air quality monitoring stations in riparian habitat, the lack of plans to construct an air quality monitoring station near Ute ladies'-tresses orchid potential habitats, and the current absence of this species in the planning area.

Northern Long-Eared Bat – Limited suitable northern long-eared bat habitat is present in the planning area. Currently no air quality monitoring stations exist within potential habitat in the planning area. It would be unlikely that monitoring stations would be constructed in forested habitats due to the lack of visibility and chance that the density of trees would make measurements inaccurate. If a monitoring station were constructed in suitable habitat, trees may be removed; however, conservation measures would be implemented to ensure that habitat removal and surface disturbance does not occur when bats are present. Habitat loss would be minimal. The construction and maintenance of air quality monitoring stations near forested habitats would be analyzed on a site-specific basis and the BLM would apply appropriate conservation measures such as clearance surveys, avoidance, and timing restrictions for construction activities and habitat removal; the actions associated with air quality management are relatively small in scope and of short duration. Implementing air quality management actions *may affect, not likely to adversely affect (NLAA-i)* the species. This determination is based on insignificant impacts due to management actions that are relatively small in scope and of short duration that are not likely to occur in suitable habitat, as well as management actions and conservation measures for special status species which minimize and mitigate adverse impacts.

Cumulative Effects – Cumulative effects resulting from air quality activities in the planning area include future state, tribal, local, or private actions reasonably certain to occur in the planning area, and are anticipated to be greater. Air quality monitoring stations may be constructed on state, tribal local, or private lands in the planning area. The nature of the impacts are likely to be the same on all land ownerships.

Soil

Proposed Management Actions for Soil

The Proposed RMP includes the following soil management actions that may benefit Threatened, Endangered, and Proposed species:

- Evaluate the effects of a proposed surface-disturbing activity to the soil resource using NRCS Soil Survey data and/or onsite investigation. Apply mitigation measures if necessary, relocate the activity to a more suitable soil type, or deny the authorization. (Soil-1001)
- Authorized surface-disturbing activities will include plans for reclamation; site-specific reclamation actions should reflect the complexity of the project, environmental concerns, and the reclamation potential of the site. (Soil-1002)
- Allow surface-disturbing activities on soils without a severe erosion hazard. Activities on highly erosive soils would be allowed with approved site-specific construction, stabilization, and reclamation plans to conserve the soil resource and meet reclamation and resource objectives. (Soil-1003)
- Apply a CSU stipulation on soils with a severe erosion hazard with approved site-specific construction, stabilization, and reclamation plans. (Soil-1004)
- Allow surface-disturbing activities on slopes less than 25%. Activities on slopes 25% and greater would be allowed with approved site-specific construction, stabilization, and reclamation plans to conserve the soil resource and meet reclamation and resource objectives. (Soil-1005)
- Apply a CSU stipulation on all slopes 25% and greater with approved site-specific construction, stabilization, and reclamation plans. (Soil-1006)
- Allow surface-disturbing activities on soils with poor reclamation suitability recognizing that reclamation may be challenging and that construction, stabilization, and reclamation plans are required to conserve the soil resource. (Soil-1007)
- Apply a lease notice on soils with poor reclamation suitability identifying that reclamation may be challenging and that construction, stabilization, and reclamation plans are required to conserve the soil resource. (Soil-1008)
- Avoid surface-disturbing activities on limited reclamation potential areas such as badlands, rock outcrops, biologic crusts, and slopes susceptible to mass movement. Activities may be allowed in limited cases with an approved site-specific construction, stabilization, and reclamation plans to conserve the soil resource and meet reclamation and resource objectives. (Soil-1009)
- Apply a CSU stipulation on limited reclamation potential areas such as badlands, rock outcrops, biologic crusts, and slopes susceptible to mass movement with approved site-specific construction, stabilization, and reclamation plans. (Soil-1010)

Conservation Measures Specific to Soil

The following Conservation Measure, identified in BA Section 9, may benefit listed or proposed species and is specific to soil management:

- Within the potential of the ecological site (soil type, landform, climate, and geology), the BLM will ensure that the soils are stable and allow for water infiltration to provide for optimal

plant growth and minimal surface runoff. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)

- BLM will avoid woody vegetation and spoil (e.g., soil, rock, etc.) disposal within 100 feet of known Northern Long-Eared Bat hibernacula entrances and associated sinkholes, fissures, or other karst features. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- Avoid/minimize altering clean drinking water and foraging areas. Implement strict adherence to sediment and erosion control measures and reclamation standards. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the soil resources within the planning area can be found in the Buffalo RMP Revision in Section 3.1.3, the *Soils* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Activities associated with soil resources are not expected to impact the Ute ladies'-tresses orchid in an adverse way and may even lead to beneficial impacts. Soil mapping or sampling actions, including soil testing, may result in minimal impacts to Ute ladies'-tresses orchid potential habitat due to the short duration of time spent sampling and the reclamation of the disturbance. Management actions that improve habitats through revegetation, reseeding, and other rehabilitation actions may benefit the Ute ladies'-tresses orchid habitat. Reductions in sedimentation and erosion within the drainages and waterways also will benefit the Ute ladies'-tresses orchid habitat. Construction of sediment control and watershed stabilization projects may benefit Ute ladies'-tresses orchid habitat. Soil-damaging actions are prohibited on moist soils where the Ute ladies'-tresses orchid typically is found. Implementing soil management actions *may affect, not likely to adversely affect*, the Ute ladies'-tresses orchid due to *beneficial effects (NLAA-b)*. This determination is based on the localized, infrequent occurrence and relatively small scale of these actions, benefits to potential habitat, existing conservation measures in place to protect this species, and the current absence of the species from the planning area and scattered nature of Ute ladies'-tresses orchid populations.

Northern Long-Eared Bat – Limited suitable habitat is present in the planning area. Actions to alleviate and/or avoid soil erosion are not expected to adversely impact the northern long-eared bat. Soil resource program actions associated with soil sampling are localized in nature and of short duration, and will not impact habitat. Soil mapping or sampling actions, including soil testing, will not result in the removal of trees, and would not occur during sensitive periods. Management actions that improve and restore habitats, such as revegetation and prevention of erosion and sedimentation, would benefit the species by protecting habitat function. Surface disturbance is typically restricted on slopes in excess of 25% slopes, without site-specific stabilization and reclamation plans. Suitable forested habitat in northern Campbell County occurs on ridges and break topography with steep slopes. The likelihood of surface disturbance occurring in these areas is minimal. Implementing soil-management actions *may affect, not likely to adversely affect (NLAA-d)* the northern long-eared bat. This determination is based on the probability that actions would not occur in suitable habitat and that special status species actions and conservation measures would restrict disruptive activities during sensitive time periods.

Cumulative Effects – Cumulative effects include future state, tribal local, or private actions reasonably certain to occur in the planning area. Actions that disturb or compact soil, disrupt soil stability, or reduce soil productivity could adversely impact listed or proposed species on

non-federal lands. Actions that stabilize soils or increase soil productivity may benefit these species. As these types of actions occur on non-federal lands, the adverse or beneficial impacts may influence the habitats of listed or proposed species.

Water

Proposed Management Actions for Water

The Proposed RMP includes the following water management actions that may benefit Threatened and Endangered species:

- Provide an alternative or “off-source” water supply (e.g., piping water to troughs, tanks, or ponds) in locations where BLM-authorized uses are fenced out of water sources. (Water-1001)
- Install flow-control devices on new and existing BLM-authorized water wells and spring developments and evaluate the need for additional flow-control devices on a project specific basis. (Water-1002)
- Manage surface-disturbing activities to prevent degradation of water quality for all waters. (Water-1004)
- Minimize impacts to groundwater quality and quantity during BLM-authorized actions. (Water-1005)
- Manage water resources to meet the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming*, achieve Proper Functioning Condition, and meet Wyoming water quality standards. Take appropriate actions to improve the biological, chemical, and geomorphic conditions of streams adversely impacted by BLM authorized actions and permitted activities. (Water-1006)
- Design and manage land use and surface-disturbing activities to reduce channel and bank erosion and the associated loss of riparian habitats. (Water-1007)
- Allow for on-channel reservoirs affecting natural streamflow regimes in consideration of other resource values. (Water-1008)
- Maintain existing water supply sources where possible; otherwise, supply new water sources to meet demand and need, consistent with other resources. (Water-1010)
- Allow abandoned oil and gas wells to be converted to water supply wells if a beneficial use (livestock, recreation, and wildlife) can be demonstrated. (Water-1011)
- Encourage alternative energy (e.g., solar and wind) to power new water resource developments versus overhead power or petroleum based. (Water-1012)
- Allow surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, or perennial streams where water and other resource objectives (including, but not limited to soil, slope, and vegetation) can be met. (Water-1013)
- Apply a CSU stipulation to any fluid mineral lease within 500 feet of any spring, non-CBNG reservoir, water well, or perennial stream, based on other resource values, including, but not limited to soil, slope, and vegetation. (Water-1014)

- Manage riparian and uplands to restore perennial flows or standing water. (Water-1015)
- Evaluate unneeded reservoirs for removal and reclamation. (Water-1016)

Conservation Measures Specific to Water

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to water management:

- The BLM will manage stream habitats to retain, re-create, or mimic natural hydrology, water quality, and related vegetation dynamics. Projects that may alter natural hydrology or water quality, change the vegetation of the riparian ecosystem, or cause direct ground disturbance will be evaluated and redesigned to ensure that adverse effects to populations of the Ute ladies'-tresses orchid do not occur. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Maintain and restore the dynamics of stream systems, including the movement of streams within their floodplains, which are vital for the life-cycle of the orchid. (BLM Wyoming Programmatic Statewide Ute Ladies'-Tresses Orchid BA)
- Perform monitoring and analysis pertaining to flow timing, flow quantity, and water table characteristics with the goal of ensuring that riparian vegetation, in areas of known and potential habitat for the orchid, is maintained. (BLM Wyoming Programmatic Statewide Ute Ladies'-Tresses Orchid BA)
- Protect potential recharge areas of cave streams and other karst features that are hydrologically connected to known or assumed hibernacula. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- Within known habitat, implement strict adherence to sediment and erosion control measures and reclamation standards. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid/minimize altering clean drinking water and foraging areas by:
 - Implementing sediment and erosion control measures and reclamation standards.
 - Siting equipment servicing and maintenance areas at least 300 feet away from waterbodies (e.g., wetlands, streams). Following available standards on spill prevention, containment, and control. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the water resources within the planning area can be found in the Buffalo RMP Revision in Section 3.1.4, the *Water Resources* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Management actions associated with water resources are infrequent and typically small in scale. Water monitoring activities are not anticipated to impact the orchid. Construction of reservoirs or monitoring stations in suitable habitat could remove habitat; however, these activities would not occur in occupied habitat. Occupancy surveys would be conducted in any suitable habitat prior to project approval to determine the presence of the species. Although not expected to occur, water diversions could significantly reduce riparian habitat for the orchid and if present, possibly cause the loss of a population. Overall, these types

of water management actions may benefit the species and its habitat by maintaining or improving riparian habitat condition. Managing riparian and uplands to restore perennial flows or standing water would also benefit the Ute ladies'-tresses orchid. Implementing water resource management actions *may affect, not likely to adversely affect*, the Ute ladies'-tresses orchid due to *discountable effects (NLAA-d)*. This determination is based on no known populations of Ute ladies'-tresses orchid occurring in the planning area and the incorporation of conservation measures. If water resource management actions are conducted in potential Ute ladies'-tresses orchid habitat, this species could incur beneficial effects of habitat improvement. Secondary beneficial effects may be realized for the Ute ladies'-tresses orchid through habitat maintenance and improvements.

Northern Long-Eared Bat – Limited suitable habitat is present in the planning area. Management actions associated with water resources are infrequent and typically small in scale. Water resource management does not generally occur in northern long-eared bat habitat; however, bats are likely to utilize naturally occurring (streams, springs) or improved (tanks or reservoirs) open water sources near roosting and foraging habitat. Stock tanks on BLM-administered surface lands near suitable habitat would be designed to be easily accessed by bats and equipped with wildlife escape ramps to mitigate risks to bats. Actions taken to improve water quality and promote the proper functioning condition of naturally occurring waters are a benefit to the species. Construction of reservoirs or monitoring stations would not occur within occupied habitat (verified by survey) during sensitive periods for the bat. Suitable habitat is not expected to be lost. Bats would not be foraging while active construction was taking place. Surface disturbance would not be allowed within 500 feet of riparian areas if it would negatively impact the species, thereby protecting foraging and watering areas. The likelihood that water management actions will affect the species is minimal and impacts that may occur from construction such as increased erosion potential will be short-term. Therefore, supporting and encouraging water supply sources near suitable habitat *may affect, not likely to adversely affect (NLAA-i)* the species due to both beneficial and insignificant effects.

Cumulative Effects – Cumulative effects include future state, tribal local, or private actions reasonably certain to occur in the planning area. Protection and enhancement of water resources in the planning area on non-federal lands will improve habitat for listed or proposed species. Surface disturbance and other actions could increase sedimentation of waterways and may potentially impact listed or proposed species.

Cave and Karst Resources

Proposed Management Actions for Cave and Karst Resources

The Proposed RMP does not propose management actions for cave and karst resources that may benefit the Ute ladies'-tresses orchid as cave and karst formations do not overlap orchid habitat. The following management actions may benefit northern long-eared bat:

- Conduct cave inventories and significance determinations. (Cave-1001)
- Inventory and map cave and karst areas. (Cave-1002)
- Manage human activity in caves with significant resources by developing and implementing a Cave Management Plan for the planning area, with potential cave specific components. (Cave-1003)

- Apply a CSU stipulation within cave and karst areas. Mineral resource activities would likely be required to maintain a site-specific buffer around significant cave entrances and passages. (Cave-1004)
- Require a site-specific buffer from significant cave entrances for surface-disturbing activities. (Cave-1005)
- Require forest management to maintain a site-specific buffer from significant cave entrances. (Cave-1006)
- Restrict livestock from entrances to significant caves. (Cave-1007)

Conservation Measures Specific to Cave and Karst Resources

The following are Conservation Measures, identified in BA Section 9, that may benefit Threatened, Endangered, and Proposed species are specific to Cave and Karst Management:

- BLM will take actions to protect Northern Long-Eared Bat hibernacula. Where a known Northern Long-Eared Bat hibernaculum is experiencing threats, BLM work with the USFWS and other partners to provide the necessary protections (e.g., limit human disturbance, install bat-friendly gates, ensure the use of “clean” clothing and gear). (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will participate in actions to manage and reduce the impacts of WNS on Northern Long-Eared Bats. A national plan was prepared by the USFWS and other state and federal agencies that details actions needed to investigate and manage WNS. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid disturbing/injuring hibernating bats by:
 - Not entering Northern Long-Eared Bat hibernacula during the hibernation season, unless coordinated with the Service for survey, research, or other management purposes.
 - Complying with all cave and mine closures, advisories, and regulations. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid destruction/alteration (e.g., fill, cause collapse of) of caves/mines that may support hibernating bats by:
 - Avoiding modifying cave or mine entrances that support hibernating bats. If there are safety concerns or concerns about bats (e.g., disturbance, vandalism) at a site, only “bat friendly” cave/mine gates will be installed. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will minimize the spread of WNS. If a cave or mine that could harbor hibernating bats must be entered, and it does not have a cave and mine closure policy, BLM follow approved WNS decontamination protocols. Under no circumstances will clothing, footwear, or equipment that was used in a WNS-affected state or region be used. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- Activities involving continuing (i.e., longer than 24 hours) noise disturbances greater than 75 decibels measured on the A scale (e.g., loud machinery) would be avoided within a one-mile radius of known Northern Long-Eared Bat hibernacula. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

- Implement BMPs for natural caves and abandoned mines, where possible, in areas where *Myotis septentrionalis* roost. (A Conservation Plan for Bats in Wyoming)
- Coordinate and conduct outreach with appropriate internal and external stakeholders to prevent or contain the spread of WNS. (Washington Office [WO] IM 2010-181)
- Consider restricting access to caves and abandoned mines on BLM-administered lands in the planning area. (WO IM 2010-181)
- Follow the Containment and Decontamination Procedures for Bureau of Land Management Administered Lands to Minimize the Spread of White-Nose Syndrome in Caves and Abandoned Mines August 5, 2010 outlined in WO IM No. 2010-181. (WO IM 2010-181)
- Recommend locations to test for the presence of WNS at a subset of the sites that have been identified as having important bat resources and support WNS research efforts where practicable and feasible within budgetary constraints. (WO IM 2010-181)
- Implement the guidelines described in Wyoming's strategic plan for prevention, and continue to work with the WGFD and other stakeholders in minimizing the risk of WNS spread into Wyoming. (A Strategic Plan for White-nose Syndrome in Wyoming)

Impact Analysis and Effects Determination

A summary of the cave and karst resources within the planning area can be found in the Buffalo RMP Revision in Section 3.1.5, the *Cave and Karst Resources* section of Chapter 3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – There are no direct or indirect effects anticipated for the Ute ladies'-tresses orchid, as this species does not occur on karst formations (RMP Map 7). Implementing management actions associated with cave and karst resources would have *no effect (NE)* on the Ute ladies'-tresses orchid.

Northern Long-Eared Bat – There are no caves in northern Campbell County that could potentially serve as hibernacula for northern long-eared bats (RMP Map 7). Water soluble formations required for cave formation, such as limestone or dolomite, are not present in Campbell County. The only known occurrence of caves on BLM-administered lands in the planning area are in the Big Horn Mountains, which is outside the current known range for the species. Therefore, implementing the actions for cave and karst will have *no effect (NE)* on northern long-eared bat.

Cumulative Effects – Cumulative effects include future state, tribal local, or private actions reasonably certain to occur in the planning area. Recreational use of caves on non-federal lands could occur but is not anticipated to impact either species due to lack of caves and karst within the planning area.

Mineral Resources - Locatable

Proposed Management Actions for Locatable Minerals

The following management actions may benefit Ute ladies'-tresses orchid and northern long-eared bat:

- Implement the MOUs between BLM and Wyoming DEQ, and BLM and the Nuclear Regulatory Commission (NRC), addressing locatable mineral exploration, development, and reclamation activities. (Locatable-2002)
- Recommend withdrawals from mineral entry for areas identified within Alternative D to conserve other resource values. (Locatable-2003)

Conservation Measures Specific to Locatable Mineral Resources

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to locatable mineral resource management:

- Reduce habitat loss associated with mineral exploration and development by consolidating facilities as much as possible. The possibility of burying utility and flow lines beneath or along roads, centralizing tank batteries, and drilling multiple wells from a single location should be considered. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Design and construct mineral exploration and development operations so as to disturb the smallest footprint practical on the landscape while meeting all safety requirements. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Plan and construct mining and mineral development activities, to the degree possible given state water rights, to minimize disturbances that would result in alterations to springs and riparian Greater Sage-Grouse habitat. Alternative water sources may be developed to replace natural sources that have been affected or destroyed during these development activities. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Avoid surface and sub-surface water depletion that impacts sage-grouse habitats. (Northeast Wyoming Sage-Grouse Conservation Plan)
- BLM will avoid destruction/alteration (e.g., fill, cause collapse of) of caves/mines that may support hibernating bats by:
 - Prohibiting woody vegetation or spoil (e.g., soil, rock, etc.) disposal within 100 feet of known hibernacula entrances and associated sinkholes, fissures, or other karst features.
 - When blasting within 0.5 mile of known or presumed known or presumed occupied hibernacula entrances and passages, BLM will coordinate with the USFWS to ensure that the blasting will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula.
 - When drilling or hydraulic fracturing within 0.5 mile of a known or presumed occupied hibernacula entrances and passages, BLM will coordinate with the USFWS to ensure that the drilling will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula.
 - Avoiding modifying cave or mine entrances that support hibernating bats. If there are safety concerns or concerns about bats (e.g., disturbance, vandalism) at a site, only "bat friendly" cave/mine gates will be installed. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid/minimize alterations of clean drinking water and foraging areas by:

- Protecting potential recharge areas of cave streams and other karst features that are hydrologically connected to known or assumed hibernacula.
- Setting back equipment servicing and maintenance areas at least 300 feet away from streambeds, sinkholes, fissures, or areas draining into sinkholes, fissures, or other karst or mine features.
- Following available standards on spill prevention, containment, and control.
- Restricting use of herbicides for vegetation management near known or assumed Northern Long-Eared Bat hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands).
- Implementing strict adherence to sediment and erosion control measures and reclamation standards. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming by not clearing occupied spring staging and fall swarming habitat near known Northern Long-Eared Bat hibernacula during the staging and swarming seasons. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid killing or injuring Northern Long-Eared Bats during tree clearing activities by not clearing occupied maternity colony summer habitat during the summer maternity season. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will minimize other direct effects to Northern Long-Eared Bats by not clearing occupied summer habitat during the time of year when females are pregnant or the pups are incapable of flight. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid/minimize altering clean drinking water and foraging areas by:
 - Implementing sediment and erosion control measures and reclamation standards.
 - Siting equipment servicing and maintenance areas at least 300 feet away from waterbodies (e.g., wetlands, streams). Following available standards on spill prevention, containment, and control. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the locatable mineral resources within the planning area can be found in the Buffalo RMP Revision in Section 3.2.1, the *Locatable Minerals* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – There are no known populations of ULT occurring in the planning area. Locatable minerals include gypsum, bentonite, and uranium. Gypsum development within the planning area is presently not economical, there are no mining operations within the planning area, nor are any reasonably foreseeable. ULT would not typically occur in the clay soils where bentonite is found. The WYNDD potential distribution model identifies southern Campbell County to be the most suitable for ULT within the Buffalo planning area (Heidel

2007). Uranium potential is highest in southern Campbell and Johnson Counties (RMP Map 9). Mining of locatable minerals would entail using heavy equipment such as scrapers or dozers to remove topsoil and could increase erosion potential. Suitable habitat may be removed; however, clearance surveys would ensure that no known population would be destroyed. The potential for direct effects will be minimized by the avoidance of surface-disturbing activities within 500 feet of riparian/wetland areas. Implementation of erosion control measures should minimize impacts to surrounding riparian areas from surface-disturbing activities. Implementation of locatable minerals management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid (*NLAA-d*). This determination is based on the low potential of locatable mineral entry to take place in potential habitats for Ute ladies'-tresses orchid. Projects will be designed and conservation measures implemented to protect Threatened and Endangered species.

Northern Long-Eared Bat – The Proposed RMP would recommend mineral entry withdrawal from the Weston Hills and Burnt Hollow SRMAs (RMP Map 71), which may contain habitat suitable for roosting or foraging northern long-eared bats; other BLM surface lands in northern Campbell County would be open to locatable mineral entry. The potential for locatable mineral mining in suitable habitat for the species is extremely low; high potential occurrence/mining areas for gypsum, bentonite and uranium are all outside the current known distribution of the species, and these are the only areas where development is expected to occur (RMP Map 9). It is extremely unlikely that locatable minerals would be developed outside of the areas shown on the map, but it is not impossible. Gypsum development within the planning area is presently not economical, there are no mining operations within the planning area, nor are any reasonably foreseeable. Changes in mining technologies and costs could increase the value of mineral deposits outside the high potential areas. Mining of locatable minerals would entail using heavy equipment such as scrapers or dozers to remove topsoil and could increase erosion potential, impacting habitat by removing trees or altering riparian habitat. Suitable habitat may be removed. The BLM would work with the proponent to reduce impacts to the bat, but because the bat is not a listed species, the proponent would not be required to include BLM recommendations in their mine plan. At the time of application for a mine permit, the proponent is likely to coordinate with the USFWS for recommendations on any species of concern, which the Wyoming DEQ may require in the plan. Although restricting development within these two SRMA's would conserve habitat, it would be a negligible benefit to the species. Implementation of the management actions *may affect, not likely to adversely affect (NLAA-d)* the species due to discountable effects. This determination is based on the unlikely probability that activities will occur in suitable habitat.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Additional surface disturbance from locatable mineral actions on non-federal lands could adversely impact listed or proposed species by further fragmenting the habitats, increasing road densities, spreading invasive species, and degrading habitats for these species.

Leasable Minerals – Coal

Proposed Management Actions for Leasable Coal

The Proposed RMP does not propose management actions for leasable - coal minerals that benefit Threatened and Endangered species.

Conservation Measures Specific to Leasable - Coal Mineral Resources

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to leasable - coal mineral resource management:

- Where existing leases or ROWs have had some level of development (road, fence, well, etc.) and are no longer in use, reclaim the site by removing these features and restoring the habitat. (BLM IM 2012-044)
- Reduce habitat loss associated with mineral exploration and development by consolidating facilities as much as possible. The possibility of burying utility and flow lines beneath or along roads, centralizing tank batteries, and drilling multiple wells from a single location should be considered. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Design and construct mineral exploration and development operations so as to disturb the smallest footprint practical on the landscape while meeting all safety requirements. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Plan and construct mining and mineral development activities, to the degree possible given state water rights, to minimize disturbances that would result in alterations to springs and riparian Greater Sage-Grouse habitat. Alternative water sources may be developed to replace natural sources that have been affected or destroyed during these development activities. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Avoid surface and sub-surface water depletion that impacts sage-grouse habitats. (Northeast Wyoming Sage-Grouse Conservation Plan)
- BLM will avoid killing or injuring Northern Long-Eared Bats during tree clearing activities by not clearing occupied maternity colony summer habitat during the summer maternity season. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will minimize other direct effects to Northern Long-Eared Bats by not clearing occupied summer habitat during the time of year when females are pregnant or the pups are incapable of flight. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid/minimize altering clean drinking water and foraging areas by:
 - Implementing sediment and erosion control measures and reclamation standards.
 - Siting equipment servicing and maintenance areas at least 300 feet away from waterbodies (e.g., wetlands, streams). Following available standards on spill prevention, containment, and control. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the leasable coal mineral resources within the planning area can be found in the Buffalo RMP Revision in Section 3.2.2, the *Leasable Minerals – Coal* section of Chapter 3. This summary and the above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Coal planning was completed as part of the April 2001 BFO RMP update and is being carried forward in this RMP revision. Coal leasing and development could occur in areas identified as acceptable for further coal leasing consideration (BLM 2001a), namely northern Sheridan and eastern Campbell counties. New lease applications are not foreseen within Sheridan County, which according to WYNDD is also unlikely to provide potential orchid habitat (Heidel 2007). Approximately 28 new coal leases encompassing 106,400 acres of disturbance are

forecasted within Campbell County during the life of the RMP (Appendix G). Several coal mines and a portion of the area acceptable for further coal leasing consideration, southeast of Wright, are located within the Antelope Creek drainage downstream of three known Ute ladies'-tresses orchid populations. The area acceptable for coal leasing is more than 10 miles downstream from the nearest known Ute ladies'-tresses orchid population. The WYNDD potential distribution model indicates that most of the suitable orchid habitat within the planning area is southwest of Wright (Heidel 2007), while the area acceptable for further coal leasing consideration is east and north of Wright (RMP Map 11).

The Campbell County area acceptable for further coal leasing, like the Powder River Basin in general, is semi-arid. Many riparian areas located in the area of interest are intermittent or ephemeral in nature, receiving flow contributions primarily from thunderstorm runoff and to a much lesser extent from spring snowmelt. The main perennial stream in the vicinity of the Wright area coal mines is Antelope Creek (BLM 2010h). Wetlands within the Basin are predominantly associated with ephemeral streams, playas, isolated depressions, reservoirs, and excavated upland areas; including all wetlands identified within six Wright area lease applications (BLM 2010h). As part of the leasing process, the six Wright Area lease applications were surveyed for Ute ladies'-tresses orchid multiple times, over at least three different years. Several of the mines in the area have carried out and recorded many years of Ute ladies'-tresses orchid surveys within their permit areas. It is unlikely that Ute ladies'-tresses orchid populations would remain undetected during multiple surveys over multiple years if Ute ladies'-tresses orchid was present in the area. Based on the WYNDD model, hydrology, and the numerous Ute ladies'-tresses orchid surveys that have been conducted in the area over multiple years, it is unlikely that there is occupied Ute ladies'-tresses orchid habitat within the Campbell County area acceptable for further coal leasing.

If undetected orchid populations were present within a mine area, they would be lost due to surface disturbing activities. Indirect effects to the Ute ladies'-tresses orchid could also occur, including increased human use in the area, potential spread of invasive or noxious species, elevated dust levels, and degradation or loss of the habitat.

In the coal leasing area, all Ute ladies'-tresses orchid survey work is carried out in accordance with USFWS guidelines and recommendations prior to issuing a leasing decision. BLM further consults with the USFWS if there is potential to adversely affect the orchid or any other listed species.

Implementing coal development management actions *may affect, likely to adversely affect (LAA)* the Ute ladies'-tresses orchid. This determination is based on BLM's inability to guarantee that a Ute ladies'-tresses orchid would not be harmed even with the lack of suitable habitat within potential coal development areas, as confirmed by multiple years of survey effort, and therefore the low potential for populations of the orchid to be within the areas identified as acceptable for further coal leasing. BLM will consult with the USFWS if the Ute ladies'-tresses orchid may potentially be affected by a BLM coal leasing action.

Northern Long-Eared Bat – Coal planning was completed as part of the April 2001 BFO RMP update. Coal development could occur in areas identified as acceptable for further coal leasing consideration (BLM 2001a), namely northern Sheridan and Campbell counties (RMP Map 11). No new leasing decisions are being proposed in the RMP revision. Approximately 10% of potential habitat identified by the USFWS could be affected by coal development; however, based on the distribution maps provided by WYNDD for the species, it is unlikely that coal mining will affect any occupied habitat. WYNDD's predicted occurrence for the species only includes a small

portion of forested habitat in northeast Campbell County, and does not overlap the coal leasing area. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, the habitat that would be affected is extremely limited. Areas that are mined will have complete habitat removal using heavy equipment. Suitable habitat present within mine area boundaries could be destroyed by heavy equipment, such as dozers or backhoes. The implementation of conservation measures will serve to avoid adverse impacts to individuals, though suitable habitat may still be lost. In addition, consultation with the USFWS will occur at the leasing stage, and if needed, stipulations applied to the lease. Coordination is also anticipated to occur during permit application with Wyoming DEQ. Implementing coal development management actions *may affect, not likely to adversely affect (NLAA-i)* the northern long-eared bat. This determination is based on the unlikelihood that coal development will occur within occupied habitats and the implementation of conservation measures to mitigate adverse impacts.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Coal mine operations occur on both state and private lands. These mines and associated infrastructure may affect habitats through increased human use in the area, potential spread of invasive or noxious species, elevated dust levels, and degradation or loss of habitat.

Leasable Minerals – Fluids

Proposed Management Actions for Leasable Fluids

The Proposed RMP includes the following management actions for leasable fluids resources that may benefit listed or proposed species:

- Continue to require lessees to conduct operations in a manner that minimizes adverse impacts to other resources and other land uses and users. (O&G-2001)

Conservation Measures Specific to Leasable – Fluid Mineral Resources

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to leasable – fluid mineral resource management:

- Apply a CSU stipulation to mineral leases within habitat for special status plant species. (SS Plants-4008)
- Apply a CSU stipulation to any fluid mineral lease within 500 feet of surface water, riparian or wetlands systems, and aquatic habitats. (Water-1014, Riparian-4009)
- Apply a CSU stipulation to mineral leases containing special status species habitat. Surveys required for clearance. (SS WL-4007)
- NSO will be allowed within special management areas (e.g., known threatened or endangered species habitat). (BLM Wyoming Programmatic Statewide Ute Ladies'-Tresses Orchid BA)
- The BLM will apply a COA on all applications for permit to drill (APDs) oil and gas wells for sites within 0.25 miles of any known populations of the Ute ladies'-tresses orchid. This condition will prohibit all authorized surface disturbance and off-highway vehicle (OHV) travel from sites containing populations of the Ute ladies'-tresses orchid. (BLM Wyoming Programmatic Statewide Ute Ladies'-Tresses Orchid BA)

- For known Ute ladies'-tresses orchid populations, the BLM will place a CSU stipulation prohibiting all surface disturbances on new oil and gas leases, buffering the area within 0.25 miles of known Ute ladies'-tresses orchid populations. (BLM Wyoming Programmatic Statewide Ute Ladies'-Tresses Orchid BA)
- Where existing leases or ROWs have had some level of development (road, fence, well, etc.) and are no longer in use, reclaim the site by removing these features and restoring the habitat. (BLM IM 2012-044)
- Reduce habitat loss associated with mineral exploration and development by consolidating facilities as much as possible. The possibility of burying utility and flow lines beneath or along roads, centralizing tank batteries, and drilling multiple wells from a single location should be considered. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Design and construct mineral exploration and development operations so as to disturb the smallest footprint practical on the landscape while meeting all safety requirements. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Plan and construct mineral development activities, to the degree possible given state water rights, to minimize disturbances that would result in alterations to springs and riparian Greater Sage-Grouse habitat. Alternative water sources may be developed to replace natural sources that have been affected or destroyed during these development activities. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Steps such as recontouring, resspreading topsoil, revegetating all disturbed areas not needed for well production, including cuts, fills, borrow ditches, and well pads up to the production facilities are suggested. Additionally, allowing room for the setup of work over rigs, and allowing future setup and parking on the top of new vegetation will minimize the need for future disturbances. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Avoid surface and sub-surface water depletion that impacts sage-grouse habitats. (Northeast Wyoming Sage-Grouse Conservation Plan)
- BLM will avoid destruction/alteration (e.g., fill, cause collapse of) of caves/mines that may support hibernating bats by:
 - Prohibiting woody vegetation or spoil (e.g., soil, rock, etc.) disposal within 100 feet of known hibernacula entrances and associated sinkholes, fissures, or other karst features.
 - When blasting within 0.5 mile of known or presumed known or presumed occupied hibernacula entrances and passages, BLM will coordinate with the USFWS to ensure that the blasting will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula.
 - When drilling or hydraulic fracturing within 0.5 mile of a known or presumed occupied hibernacula entrances and passages, BLM will coordinate with the USFWS to ensure that the drilling will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula.
 - Avoiding modifying cave or mine entrances that support hibernating bats. If there are safety concerns or concerns about bats (e.g., disturbance, vandalism) at a site, only "bat

friendly" cave/mine gates will be installed. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

- BLM will avoid/minimize alterations of clean drinking water and foraging areas by:
 - Protecting potential recharge areas of cave streams and other karst features that are hydrologically connected to known or assumed hibernacula.
 - Setting back equipment servicing and maintenance areas at least 300 feet away from streambeds, sinkholes, fissures, or areas draining into sinkholes, fissures, or other karst or mine features.
 - Following available standards on spill prevention, containment, and control.
 - Restricting use of herbicides for vegetation management near known or assumed Northern Long-Eared Bat hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands).
 - Implementing strict adherence to sediment and erosion control measures and reclamation standards. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming by not clearing occupied spring staging and fall swarming habitat near known Northern Long-Eared Bat hibernacula during the staging and swarming seasons. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid killing or injuring Northern Long-Eared Bats during tree clearing activities by not clearing occupied maternity colony summer habitat during the summer maternity season. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will minimize other direct effects to Northern Long-Eared Bats by not clearing occupied summer habitat during the time of year when females are pregnant or the pups are incapable of flight. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid/minimize altering clean drinking water and foraging areas by:
 - Implementing sediment and erosion control measures and reclamation standards.
 - Siting equipment servicing and maintenance areas at least 300 feet away from waterbodies (e.g., wetlands, streams). Following available standards on spill prevention, containment, and control. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the leasable - fluid mineral resources within the planning area can be found in the Buffalo RMP Revision in Section 3.2.3, the *Leasable Minerals – Fluids* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – No Ute ladies'-tresses orchid populations are known to occur in the planning area. Oil and gas development in or near wetland/riparian areas may impact

potential habitat for Ute ladies'-tresses orchid through water diversion and channelization, soil erosion, stream bank degradation, and the spread of invasive species. BLM will protect wetlands/riparian areas by restricting or otherwise mitigating fluid mineral activities within 500 feet of springs, non-CBNG reservoirs, water wells, or perennial streams. An NSO restriction on wetland areas greater than 20 acres would also reduce these effects. Implementing oil and gas development management actions *may affect, likely to adversely affect (LAA)* the Ute ladies'-tresses orchid. This determination is based on the possibility that surface discharge of saline or other contaminated waters into a watershed above habitat occupied by the orchid would likely kill individuals or populations of orchids. Surface waters are under the jurisdiction of the State of Wyoming. The BLM is likely to approve discharge points when the project proponent has obtained the necessary State permits and the action is compatible with other resource values. If suitable habitat for the orchid were present at a proposed discharge site, surveys to determine presence of the species would be required prior to approval or the area would be avoided. Water quality is regulated by Wyoming Department of Environmental Quality, so the likelihood that concentrations of salts or contaminants would be so high that mortality would occur is minimal. Because exact locations of future discharge points or oil and gas wells are not known, the extent of effects is largely unknown. The effects are not anticipated to be extensive, since the only drainage that extends into the planning area where the orchid has been documented is Antelope Creek, in southern Campbell County. Although WYNDD's predictive distribution models (Heidel 2007) identify potential habitat in the planning area, a substantial survey effort over several years has not identified any new populations.

Northern Long-Eared Bat – Oil and gas development is the primary land disturbance activity permitted, and fluid minerals will be available for leasing in the majority of the planning area. The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 70% of potential habitat identified by the USFWS overlays federal mineral estate; however, based on the distribution maps provided by WYNDD for the species, the likelihood that oil and gas development will affect any occupied habitat is minimal. WYNDD's predicted occurrence for the species includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, the habitat that would be affected is limited. The fluid mineral potential in most areas containing suitable habitat for the species is low to moderate for CBNG development and is negligible to low for conventional oil development (RMP Maps 23 and 24). Development of fluid minerals through construction of well pads, access roads, pipelines, and power lines may remove or fragment habitat suitable for roosting or foraging. Management actions will require mitigation for special status species including conducting clearance surveys prior to approval of projects, siting projects to avoid suitable habitat, and restricting removal of occupied habitat while bats are present; mitigation for surface-disturbing and disruptive activities will be considered and applied on a site-specific level. Even with siting and timing considerations, alteration of suitable habitat and increased human activities may cause the species to avoid areas near developed sites. Actions related to fluid minerals resources *may affect, not likely to adversely affect (NLAA-d)* the species due to the minimal probability that activities will occur in occupied habitat and the application of conservation measures for special status species.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Oil and gas development on private lands is expected to continue and there are opportunities for this activity on state and private mineral estate, potentially impacting listed or proposed species.

Salable Minerals

Proposed Management Actions for Salable Minerals

The Proposed RMP includes the following management action for salable mineral resources that may benefit listed or proposed species:

- Allow salable mineral exploration and development in accordance with management identified within the Proposed RMP, as consistent with other resource values. This results in 623,061 acres closed to salable mineral exploration and development. (Salable-2002)

Conservation Measures Specific to Salable Mineral Resources

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to salable mineral resource management:

- Allow salable mineral development within designated SRMAs for administrative use only. (Rec-6023)
- The disposal (sale and removal) of salable minerals is a discretionary BLM action and is prohibited within a 0.25 mile buffer area of known populations of Ute ladies'-tresses orchids. (BLM Wyoming Programmatic Statewide Ute Ladies'-Tresses Orchid BA)
- Reduce habitat loss associated with mineral exploration and development by consolidating facilities as much as possible. The possibility of burying utility and flow lines beneath or along roads, centralizing tank batteries, and drilling multiple wells from a single location should be considered. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Design and construct mineral exploration and development operations so as to disturb the smallest footprint practical on the landscape while meeting all safety requirements. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Plan and construct mining and mineral development activities, to the degree possible given state water rights, to minimize disturbances that would result in alterations to springs and riparian Greater Sage-Grouse habitat. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Avoid surface and sub-surface water depletion that impacts sage-grouse habitats. (Northeast Wyoming Sage-Grouse Conservation Plan)
- BLM will avoid destruction/alteration (e.g., fill, cause collapse of) of caves/mines that may support hibernating bats by:
 - Prohibiting woody vegetation or spoil (e.g., soil, rock, etc.) disposal within 100 feet of known hibernacula entrances and associated sinkholes, fissures, or other karst features.
 - When blasting within 0.5 mile of known or presumed occupied hibernacula entrances and passages, BLM will coordinate with the USFWS to ensure that the blasting will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula.
 - Avoiding modifying cave or mine entrances that support hibernating bats. If there are safety concerns or concerns about bats (e.g., disturbance, vandalism) at a site, only "bat friendly" cave/mine gates will be installed. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

- BLM will avoid/minimize alterations of clean drinking water and foraging areas by:
 - Protecting potential recharge areas of cave streams and other karst features that are hydrologically connected to known or assumed hibernacula.
 - Setting back equipment servicing and maintenance areas at least 300 feet away from streambeds, sinkholes, fissures, or areas draining into sinkholes, fissures, or other karst or mine features.
 - Following available standards on spill prevention, containment, and control.
 - Restricting use of herbicides for vegetation management near known or assumed Northern Long-Eared Bat hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands).
 - Implementing strict adherence to sediment and erosion control measures and reclamation standards. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming by not clearing occupied spring staging and fall swarming habitat near known Northern Long-Eared Bat hibernacula during the staging and swarming seasons. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid killing or injuring Northern Long-Eared Bats during tree clearing activities by not clearing occupied maternity colony summer habitat during the summer maternity season. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will minimize other direct effects to Northern Long-Eared Bats by not clearing occupied summer habitat during the time of year when females are pregnant or the pups are incapable of flight. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid/minimize altering clean drinking water and foraging areas by:
 - Implementing sediment and erosion control measures and reclamation standards.
 - Siting equipment servicing and maintenance areas at least 300 feet away from waterbodies (e.g., wetlands, streams). Following available standards on spill prevention, containment, and control. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the salable mineral resources within the planning area can be found in the Buffalo RMP Revision in Section 3.2.5, the *Salable Minerals* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – No known populations of Ute ladies'-tresses orchid occur in the planning area. Areas being mined for sand and gravel or clinker would have topsoil removed by heavy equipment in the pit and for access roads. Activity in the mine pit would include using backhoes and dozers to dig out rock, and using separators and crushers to process it. Haul trucks would be utilized to transport the rock out of the pit. No direct effects to this species are

anticipated. Indirect effects to potential habitat may occur, including spread of invasive species, increased human use in the area, and elevated dust levels from mining and transportation may occur. However, all federal actions and authorizations for potential impacts to special status plant species will be reviewed and avoidance and mitigation measures implemented. Management actions in the RMP for special status plants would require that predisturbance flowering season surveys are conducted prior to approving any project or activity that may impact habitat for the orchid. The sale or removal of salable minerals would not be allowed within 0.25 mile of any known populations of the orchid. Implementing management actions associated with salable minerals *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *discountable effects (NLAA-d)*. This determination is based on the absence of Ute ladies'-tresses orchid in the planning area, the unlikely event of populations of Ute ladies'-tresses orchid being discovered in areas with proposed salable minerals, and the application of conservation measures to eliminate the risk of destroying individuals. Conservation measures for riparian/wetland areas would also help to protect yet-to-be discovered populations.

Northern Long-Eared Bat – The Proposed RMP would open most lands with federally owned minerals to development and exploration of salable minerals, including those lands where suitable habitat may be present for northern long-eared bats. There may be overlap of areas with the potential for sand and gravel or clinker mining within forested habitats. Areas being mined for sand and gravel or clinker would have topsoil removed by heavy equipment in the pit and for access roads. Activity in the mine pit would include using backhoes and dozers to dig out rock, and using separators and crushers to process it. Heavy earth moving equipment and crushers typically produce increased dust and loud noise. Haul trucks would be utilized to transport the rock out of the pit. Forested habitat could be removed and individuals roosting near active pits could be disturbed by increased dust and noise. Management actions for special status species will mitigate impacts to northern long-eared bats by requiring clearance surveys prior to approval of projects, siting projects to avoid suitable habitat, prohibiting removal of occupied habitat while bats are present, and implementing timing limitations on activities that may disturb roosting bats; mitigation for surface-disturbing and disruptive activities will be considered and applied on a site-specific level. Even with timing limitations, alteration of habitats and increased human activity could cause the species to avoid developed sites. Implementing management actions for salable minerals resources *may affect, not likely to adversely affect (NLAA-i)* the species due to the application of conservation measures identified to avoid occupied habitat and mitigate impacts to special status species.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Cumulative effects from salable resource operations along river corridors or adjacent to other potential habitat for federally listed species on non-federal lands could occur, which may impact these federally listed or proposed species.

Fire and Fuels Management – Wildfires (Unplanned Ignitions)

Proposed Management Actions for Wildfires

The Proposed RMP proposes the following protections for fire and fuels management that benefit listed or proposed species:

- A resource advisor appropriate to the potentially affected resource will be consulted, or assigned, to all wildland fires that involve or threaten BLM-administered lands. (Fire-3002)

- Prohibit use of retardant or foam within 300 feet of surface water sources consistent with guidelines described in the *Interagency Standards for Fire and Fire Aviation Operations*. (Fire-3004)
- Implement the BLM Emergency Stabilization and Burned Area Rehabilitation standards located in the DOI Interagency Burned Area Emergency Response Guidebook (620 DM 3) and BLM Burned Area Emergency Stabilization and Rehabilitation (ES&R) Handbook as needed. (Fire-3006)
- Maintain and implement the District Fire Management Plan. (Fire-3007)
- Cooperate with and pursue agreements with other agencies and landowners to conduct landscape treatments to achieve enhanced fuels management and/or restoration of fire-adapted ecosystems. (Fire-3009)
- Rehabilitate firelines constructed by heavy equipment, or on steep slopes, to prevent or control erosion. Rehabilitation includes, but is not limited to, water barring and reseeding. (Fire-3010)
- Response to wildland fires varies from full protection in areas where fire is undesirable to monitoring fire behavior in areas where fire can be used as a management tool. (Fire-3011)
- Prohibit heavy equipment use within the following areas, except when human safety is at risk or if the expected fire effects would cause more resource damage than the use of heavy equipment (Fire-3012):
 - Riparian/wetland habitats
 - Identified Greater Sage-Grouse important habitats: Core Population Area and Connectivity Corridor; mapped high quality nesting, brood-rearing, or winter habitat
 - Areas of highly erosive soils
 - Areas with wilderness characteristics
- Limit heavy equipment usage to existing roads and trails, or immediately adjacent to them, in areas not identified as full protection. (Fire-3013)
- Evaluate all fires and rehabilitate, as needed, for suppression and fire-severity impacts. (Fire-3014)
- Use wildland fire and other vegetation treatments to meet vegetation management goals and objectives. (Fire-3015)

Conservation Measures Specific to Wildfire (Unplanned Ignitions)

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to wildfire (unplanned ignitions) management:

- Allow the use of fire suppression chemicals, including foaming agents and surfactants, within areas of known special status plant populations where consistent with the biology of the plant or where human safety or property are at risk. (SS Plants-4006)
- Design post ES&R management to ensure long term persistence of seeded or pre-burn native plants. This may require temporary or long-term changes in livestock grazing and travel

management, etc., to achieve and maintain the desired condition of ES&R projects to benefit sage-grouse (Eiswerth and Shonkwiler 2006). (BLM IM 2012-044)

- Post fire recovery must include establishing adequately sized exclosures (free of livestock grazing) that can be used to assess recovery. (BLM IM 2012-044)
- Mowing of grass will be used in any fuelbreak fuels reduction project (roadsides or other areas). (BLM IM 2012-044)
- Consider potential changes in climate (Miller et al. 2011) when proposing post-fire seedings using native plants. Consider seed collections from the warmer component within a species' current range for selection of native seed (Kramer and Havens 2009). (BLM IM 2012-044)
- Evaluate (e.g., monitor) burned areas for up to three years post-fire and continue management restrictions until the recovering or seeded plant community reflects the desired condition. (BLM National Sage-Grouse Habitat Conservation Strategy)

Impact Analysis and Effects Determination

A summary of the wildfire (unplanned ignitions) resources within the planning area can be found in the Buffalo RMP Revision in Section 3.3.1, the *Unplanned Fire* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – No known populations of Ute ladies'-tresses orchid occur in the planning area. Actions associated with wildfire suppression could destroy habitats. However, because wildland fires are considered rare events in these habitats, this type of impact is unlikely to occur. Wildfire is not common in Ute ladies'-tresses orchid habitats due to the presence of surface and subsurface water. Wildfire planning is done in advance to determine what kinds of suppression activities will be allowed in a planning unit, where they will be allowed, and what kinds of equipment will be used. Fire plans also identify any special concerns or values that need to be protected, and a resource advisor will be on site to ensure that sensitive resources are avoided when human safety is not at risk. Activities often employ the use of off-road vehicles, hand tools, and heavy equipment such as bulldozers to construct fire lines to contain the fire. Although the likelihood is small, fire suppression activities could affect Ute ladies'-tresses and their habitat. During the filling of water tankers, riparian habitat may be altered or destroyed by tanker truck or human trampling. Plants may be crushed while crews and vehicles access fire lines, however potential loss of habitat or individual plants would probably be extremely limited if the plant were to occur in the area at all. The use of aerial fire retardant is restricted near water resources. If the introduction or spread of noxious weeds occurred, it could adversely affect the orchid and its habitat. Suitable habitat areas typically do not burn frequently because of the presence of nearby surface and subsurface water, and the lack of significant fuel associated with orchid's habitat. Heavy machinery associated with fire suppression and fire prevention could potentially destroy habitat and individuals. Implementing wildfire management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *discountable effects* (NLAA-d). This determination is based on the extremely limited potential for wildland fires to occur in habitat for the species and the same limited probability that fire equipment would be used in the orchid's habitat. If a wildland fire were to occur within any known habitat for the orchid and immediate suppression is required, as many conservation measures as possible will be applied that do not hinder safety or property protection. The USFWS will be contacted and emergency consultation will take place at the earliest possible time if any known habitat for the orchid is affected or impacted.

Northern Long-Eared Bat – The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 18% of potential habitat identified by the USFWS overlays BLM administered surface lands in Campbell County; however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, occupied habitat that may be affected is limited. Activities often employ the use of off-road vehicles, hand tools, and heavy equipment such as bulldozers to construct fire lines to contain the fire. Although the likelihood is small, fire suppression activities could affect northern long-eared bat habitat. BLM is typically the lead agency on fires that start on BLM surface, BLM is rarely the first responder to wildfires and therefore cannot control all initial suppression activities. BLM has agreements in place with the counties to guide initial attack, including resource protection strategies. Wildfire planning is done in advance to determine what kinds of suppression activities will be allowed in a planning unit, where they will be allowed, and what kinds of equipment will be used. Fire plans also identify any special concerns or values that need to be protected, and a resource advisor will be on site to ensure that sensitive resources are avoided when human safety is not at risk. Suppression activities in suitable occupied habitats may impact the northern long-eared bat, especially during the initial attack phase of a fire when extinguishing the fire is likely to be the main objective. The use of heavy equipment and other techniques may remove trees suitable for roosting; if an active roost is removed, bats may be disturbed or killed. Areas containing sensitive resources, such as suitable habitat for the bat, will be targeted for special protection, and reinforced through coordination with assigned resource advisors; important habitat will be identified during annual fire management planning with other stakeholders. Implementing wildfire management actions *may affect, likely to adversely affect (LAA)* the species within the planning area. While the risk to occupied habitat may be minimal, it is still possible that roosts could be removed while active, especially during the initial attack phase. The BLM will consider the Northern Long-Eared Bat and other special status species during planning and implementation of suppression activities in occupied habitat.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Buildup of hazardous fuels on private lands could increase the risk of wildland fire in the planning area, potentially directly and indirectly impacting listed or proposed species and their habitats. Individuals may be displaced or killed and suitable habitats may be altered due to suppression activities. Indirect effects include the potential for wildland fire to improve some habitats for listed or proposed species.

Fire and Fuels Management - Prescribed Fires (Planned Ignitions)

Proposed Management Actions for Prescribed Fires

Refer to the Unplanned Fire (Wildfire) section above for management actions for fire and fuels management that benefit listed or proposed species.

Conservation Measures Specific to Prescribed Fire (Planned Ignitions)

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to prescribed fire (planned ignitions) management:

- Prescribed fire and grazing activities shall be coordinated between biologists, rangeland management specialists, and fire personnel to ensure that no damage occurs to the plant habitat

when being used to maintain the habitat for the species. (BLM Wyoming Programmatic Statewide Ute Ladies'-Tresses Orchid BA)

- During fuels management project design, consider the utility of using livestock to strategically reduce fine fuels (Diamond et al. 2009), and implement grazing management that will accomplish this objective (Davies et al. 2011; Launchbaugh et al. 2007). Consult with ecologists to minimize impacts to native perennial grasses. (BLM IM 2012-044)
- Evaluate (e.g., monitor) burned areas for up to three years post-fire and continue management restrictions until the recovering or seeded plant community reflects the desired condition. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Seeding may be required in areas where residual perennial vegetation is insufficient to respond following prescribed burning. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming. Avoid prescribed burning or other sources of smoke in known or assumed Northern Long-Eared Bat habitat during the swarming/staging or hibernation season, or coordinate with the local USFWS office. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- Avoid killing or injuring Northern Long-Eared Bat during tree clearing activities. Do not clear maternity colony summer habitat during the summer maternity season to avoid direct effects to females (pregnant, lactating, and post-lactating) and juveniles. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- Minimize other direct effects to Northern Long-Eared Bat. During prescribed burns, where the proposed perimeter fire line is constructed by hand, construct it at least two tree-lengths away from any known Northern Long-Eared Bat habitat, or potential roost trees that have been identified. If such trees are adjacent to a fixed part of the fire line such as the road, a trail, or the river, they will have fire line constructed around the bases, so long as their remaining in place does not jeopardize firefighter safety. Whenever possible, conduct prescribed burns outside of the summer maternity season. Burns conducted during the summer maternity season should be low/moderate intensity to minimize direct impacts to Northern Long-Eared Bat. Fire-effects monitoring should be used before, during, and after the burns to ensure that burning conditions and effects are within the desired ranges. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- Maintain summer maternity habitat. Retain and avoid impacting potential roost trees, which includes live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Do not remove trees surrounding potential roosts to maintain the microclimate. Where possible and not a safety hazard, leave dead or dying trees standing. Avoid reducing the suitability of forest patches with known Northern Long-Eared Bat use. Clearly demarcate trees to be protected. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the prescribed fire (planned ignitions) management within the planning area can be found in the Buffalo RMP Revision in Section 3.3.2, the *Planned Fire* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Prescribed fire is not commonly used in Ute ladies'-tresses orchid habitat in the planning area due to the presence of surface and subsurface water and the lack of fuel accumulation in these areas. Actions associated with fuels management could destroy habitats; however, this type of impact is unlikely due to the rare use of prescribed fire in these areas. Management actions in the RMP would require clearance surveys in any suitable habitats prior to the approval of any activity planned in suitable habitat, including prescribed fire. Activities within known populations would not be permitted. Implementing prescribed fire management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *discountable effects (NLAA-d)*. This determination is based on the unlikely event of prescribed fire use in Ute ladies'-tresses orchid habitat.

Northern Long-Eared Bat – The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 18% of potential habitat identified by the USFWS overlays BLM administered surface lands in Campbell County; however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, occupied habitat that may be affected is limited. Prescribed fire in occupied habitats may impact the northern long-eared bat. Reduction of fuels in forested habitats through prescribed fire could limit the severity of wildfires, and in turn protect habitat from loss. Use of prescribed fire to reduce ladder fuels and fuels treatments that open up the canopy of forested areas may improve habitat for the species (USFWS 2014). Increased light penetration may increase some insect taxa and stimulate vegetation growth in the understory (Loeb and Waldrop 2008). Female bats may prefer to roost in stands where the canopy has been opened up (but not clear cut), which may be due to trees located in more open habitat receiving greater solar radiation and therefore speeding development of young bats (USFWS 2013a). Fire treatments that may remove several acres of forested habitat would not be prescribed in occupied habitats. If activities are planned in suitable habitat, clearance surveys and seasonal timing limitations would be implemented, as well as identification of important habitat components to be conserved such as live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Extra precautions to protect important trees would be implemented in areas where understory burns are planned. No potential hibernacula are likely to exist within Campbell County due to the geology, so prescribed burning during spring, fall, and winter are not likely to impact the species, which is only expected to utilize habitat in the planning area for summer roosting. If a hibernaculum were discovered, then conservation measures to protect hibernating bats would be implemented. Implementing prescribed fire management actions *may affect, not likely to adversely affect (NLAA-d)* the species within the planning area, due to the unlikelihood that activities would occur in occupied habitat or remove large areas of trees, application of conservation measures, and the potential improvement and protection of suitable habitat.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Prescribed fire on non-federal lands could reduce hazardous fuel loads and, therefore, the risk of catastrophic wildland fire, as well as improve habitat for listed or proposed species. Such impacts are anticipated to be minimal.

Vegetation - Forests and Woodlands

Proposed Management Actions for Forests and Woodlands

The Proposed RMP proposes the following protections for forest and woodlands that benefit listed or proposed species:

- Design and implement silvicultural treatments to maximize forest health. (Forest-4001)
- Utilize intensive management tactics to manage for desired forest/woodland health (HFRA) and to reduce or circumvent events such as insects, disease, and wildfire. (Fire-4002)
- Manage forests/woodlands to emphasize multiple resource values. (Forest-4004)
- Actively manage woodlands to prevent expansion into other communities consistent with multiple resource values, on a project specific basis. (Forest-4006)

Conservation Measures Specific to Forests and Woodlands

Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and which are specific to forest and woodland resource management are as follows:

- BLM will avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming by:
 - not clearing occupied spring staging and fall swarming habitat near known Northern Long-Eared Bat hibernacula during the staging and swarming seasons. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
 - avoiding planned fire or other sources of smoke in known Northern Long-Eared Bat habitat during the swarming/staging or hibernation season, or coordinate with the USFWS. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid killing or injuring Northern Long-Eared Bats during tree clearing activities by not clearing occupied maternity colony summer habitat during the summer maternity season. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will minimize other direct effects to Northern Long-Eared Bats by not clearing occupied summer habitat during the time of year when females are pregnant or the pups are incapable of flight. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will maintain summer maternity habitat by:
 - Retaining known roost trees, which includes live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
 - Clearly demarcating trees to be protected vs. cut to help ensure that contractors do not accidentally remove more trees than anticipated. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- Avoid timber harvest activities in areas close to known roosting sites of northern myotis (*Myotis septentrionalis*) during the maternity roosting period, and retain all known roost trees (Schmidt 2003). Use patch cuts and selective harvesting to provide regenerating forest and

retain large-diameter snags (Lacki and Schwierjohann 2001). (A Conservation Plan for Bats in Wyoming)

- Retain all large-diameter snags, particularly those greater than 21 centimeters (8 inches) diameter at breast height (Schmidt 2003), as potential roost sites for northern myotis (*Myotis septentrionalis*) and other snag-dependent species. Provide large-diameter snags in early states of decay, particularly snags with large amounts of exfoliating bark (Lacki and Schwierjohann 2001). Retain mature and decadent trees for future snag production, particularly where existing snags are few. Because the northern myotis switches tree roosts frequently and may need several suitable roosts over the course of a summer (Foster and Kurta 1999; Caceres and Barclay 2000), it is necessary to retain all snags in areas where bats are known to roost. (A Conservation Plan for Bats in Wyoming)

Impact Analysis and Effects Determination

A summary of the forest and woodlands resources within the planning area can be found in the Buffalo RMP Revision in Section 3.4.1, the *Vegetation – Forest and Woodlands* section in Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – The Ute ladies'-tresses orchid is associated with riparian areas, which are not typically targeted for forest and woodland management. Potential Ute ladies'-tresses orchid habitats are not expected to experience any effects from forest and woodland management actions. Implementing forest and woodland management actions has *no effect* (NE) on the Ute ladies'-tresses orchid. This determination is based on the absence of forest and woodland management actions occurring in Ute ladies'-tresses orchid potential habitats.

Northern Long-Eared Bat – Forested habitats in Campbell County may provide suitable habitat to the northern long-eared bat in the planning area. The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 18% of potential habitat identified by the USFWS overlays BLM administered surface lands in Campbell County; however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, occupied habitat that may be affected is limited. Managing forests and woodlands to maximize forest health and emphasize multiple resource values, such as healthy wildlife habitat, is a benefit to the species. Management that reduces the threats of wildfire, disease, and insect damage would in turn reduce the threat of habitat loss. The primary mechanism for carrying out forest and woodlands management is expected to be removal of trees through mechanical methods such as cutting. Thinning is expected to be the most common treatment to address forest health issues, and clear cutting is not anticipated to occur. Thinned trees would be laid on the ground where they fall to decay, moved into slash piles that may be burned at a later date, or girdled but not felled to provide potential roost sites, depending on site-specific conditions. Actions that open up the canopy of forested areas may improve habitat for the species (USFWS 2014). Increased light penetration may increase some insect taxa and stimulate vegetation growth in the understory (Loeb and Waldrop 2008). Female bats may prefer to roost in stands where the canopy has been opened up (but not clear cut), which may be due to trees located in more open habitat receiving greater solar radiation and therefore speeding development of young bats (USFWS 2013a). If activities are planned in suitable habitat, clearance surveys to determine occupancy and seasonal

timing limitations on removal of trees in occupied habitat would be implemented, as well as identification of important habitat components to be conserved such as live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Removal of trees during the summer roosting season would not be permitted in occupied habitat. Implementing forest and woodland management actions *may affect, not likely to adversely affect (NLAA-i)* the species within the planning area, but effects are likely to be mostly beneficial due to potential improvement and protection of suitable habitat.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Forest and woodland management on non-federal lands could affect listed or proposed species and potential habitats. Individuals may be displaced or killed and suitable habitats may be lost or altered due to activities. Road building, related to commercial operations, may affect suitable habitats.

Vegetation - Grassland and Shrubland Communities

Proposed Management Actions for Grassland and Shrubland Communities

The Proposed RMP proposes the following protections for grassland and shrubland communities that benefit listed or proposed species:

- Manage vegetative communities in accordance with *Wyoming Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming*. (GS-4001)
- Complete vegetation inventories in coordination with stakeholders. (GS-4002)
- Use an integrated management approach (e.g., mechanical, chemical, biological treatments, prescribed fire, and grazing management techniques) to maintain, restore, and enhance the health and diversity of plant communities to achieve resource or multi-resource objectives. (GS-4003)
- Maintain sustainable forage levels for livestock and wildlife habitats. (GS-4004)
- Manage grasslands and shrublands to protect, preserve, or enhance plant communities. (GS-4005)
- Manage the siting of facilities and related infrastructure (utility corridors, roads) to reduce impacts to vegetation resources. (GS-4006)
- Manage the planning and development of travel routes, recreational uses, mineral exploration and development sites, and ROW to reduce impacts to the vegetation resource. (GS-4007)
- Develop a contingency plan addressing catastrophic natural events such as drought, wildfires, and large-scale pest infestations, incorporating strategies that best protect vegetation resources. (GS-4008)
- Work with landowners on split estate lands to reestablish disturbed sites to healthy plant communities in accordance with the ecological site potential. (GS-4009)
- Allow desirable non-native plant species for short-term reclamation activities as a component in an authorized reclamation plan followed with planting of native species. (GS-4010)

Conservation Measures Specific to Grassland and Shrubland Communities

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to grassland and shrubland resource management:

- The BLM will ensure that upland vegetation on each ecological site consists of plant communities appropriate to the site which are resilient, diverse, and able to recover from natural and human disturbance. (BLM Wyoming Programmatic Statewide Ute Ladies'-Tresses Orchid BA)
- The BLM will ensure that rangelands are capable of sustaining viable populations and a diversity of native plant and animal species appropriate to the habitat. Habitats that support or could support threatened species, endangered species, species of special concern, or sensitive species will be maintained or enhanced. (BLM Wyoming Programmatic Statewide Ute Ladies'-Tresses Orchid BA)
- Design post restoration management to ensure long term persistence. This could include changes to livestock grazing management and travel management, etc., to achieve and maintain the desired condition of the restoration effort that benefits sage-grouse (Eiswerth and Shonkwiler 2006). (BLM IM 2012-044)
- Consider potential changes in climate (Miller et al. 2011) when proposing restoration seedings using native plants. Consider collection from a warmer component of the species current range when selecting native species (Kramer and Havens 2009). (BLM IM 2012-044)

Impact Analysis and Effects Determination

A summary of the grassland and shrubland resources within the planning area can be found in the Buffalo RMP Revision in Section 3.4.2, the *Vegetation – Grassland and Shrubland Communities* section in Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Management actions of grassland and shrubland communities are not expected to adversely impact the Ute ladies'-tresses orchid. Implementing grassland and shrubland management actions will have *no effect (NE)* on the Ute ladies'-tresses orchid, as the species does not occur in these habitats. This determination is based on the existing conservation measures in place to protect individual plants and habitats, the absence of the species in the planning area, and that this species does not occur in grassland and shrubland habitats.

Northern Long-Eared Bat – Management actions of grassland and shrubland communities are not expected to impact the northern long-eared bat. Implementing grassland and shrubland management actions will have *no effect (NE)* on the northern long-eared bat, as the species does not roost in these habitats.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Management on non-federal lands may add to disturbance of listed or proposed species. Depending on the time of year actions are conducted, increased human presence and use of machinery may cause detrimental impacts to listed or proposed species. If actions on BLM-administered and non-federal lands occur during the same time period and in nearby locations, habitat for listed or proposed species could be limited.

Vegetation - Riparian/Wetland Resources

Proposed Management Actions for Riparian/Wetland Resources

The Proposed RMP proposes the following protections for riparian/wetland resources that benefit listed or proposed species:

- Inventory lotic and lentic riparian/wetland systems. (Riparian-4001)
- Prioritize, and develop activity and implementation plans to manage riparian systems to be at or above, or continue to be improving toward, proper functioning condition while achieving the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming*. (Riparian-4002)
- Manage riparian and wetland systems to enhance forage conditions and improve water quality. Manage all riparian systems with sensitive species concerns to a succession stage appropriate for that system, including vertical as well as horizontal vegetative structure and composition. (Riparian-4003)
- Expand and enhance riparian/wetland systems and habitat in cooperation with stakeholders. (Riparian-4004)
- Prevent degradation, loss, or destruction of riparian/wetland habitat. (Riparian-4005)
- Prohibit conflicting uses within riparian research areas and special exclosures, such as waterfowl reservoirs and wetland systems on springs and streams. (Riparian-4006)
- Evaluate CBNG created riparian and wetland systems for retention or reclamation. (Riparian-4007)
- Allow surface disturbance within 500 feet of riparian/wetlands systems, and aquatic habitats based on resource objectives including, but not limited to soil, slope, and vegetation. (Riparian-4008)
- Apply a CSU stipulation to any mineral lease within 500 feet of riparian/wetlands systems, and aquatic habitats based on other resource values. (Riparian-4009)
- Identify and manage systems capable of achieving Desired Functioning Condition (DFC). (Riparian-4010)
- Restore vegetation in CBNG supported wetland and riparian systems on BLM surface and/or lease in accordance with the ecological site potential. (Riparian-4011)
- Restore Greater Sage-Grouse brood-rearing habitats in riparian/wetland areas. Maintain seeps, springs, wet meadows, and riparian vegetation in a functional and diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas. (SS WL-4012)

Conservation Measures Specific to Riparian/Wetland Resources

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to riparian/wetland resource management:

- In any proposed new access, wetland and riparian areas will be avoided where possible. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)

- The BLM will manage stream habitats to retain, re-create, or mimic natural hydrology, water quality, and related vegetation dynamics. Projects that may alter natural hydrology or water quality change the vegetation of the riparian ecosystem and cause direct ground disturbance will be evaluated and redesigned to ensure that adverse effects to populations of the Ute ladies'-tresses orchid do not occur. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- If revegetation projects are conducted within 0.25 miles of known habitat for the orchid, only native species will be selected. This conservation measure will reduce the possibility that non-native species will be introduced and will compete with Ute ladies'-tresses orchid. (BLM Wyoming Statewide Ute Ladies'-Tresses Orchid BA)
- Maintain and restore the natural species composition and structural diversity of plant communities in riparian zones and wetlands. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- For the protection of the Ute ladies'-tresses orchid and its potential habitat, surface-disturbing activities should be avoided in the following areas when they occur outside the protective 0.25-mile buffer from populations of the Ute ladies'-tresses orchid: (a) identified 100-year flood plains, (b) areas within 500 feet from perennial waters, springs, wells, and wetlands, and (c) areas within 100 feet of the inner gorge of ephemeral channels. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Design post restoration management to ensure long term persistence. This could include changes to livestock grazing management and travel management, etc., to achieve and maintain the desired condition of the restoration effort that benefits sage-grouse (Eiswerth and Shonkwiler 2006). (BLM IM 2012-044)
- Consider potential changes in climate (Miller et al. 2011) when proposing restoration seedings using native plants. Consider collection from a warmer component of the species current range when selecting native species (Kramer and Havens 2009). (BLM IM 2012-044)
- Maintain seeps, springs, wet meadows, and riparian vegetation in a functional and diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Restore lost riparian and wetland plant species diversity and structure by replanting appropriate species near crucial Greater Sage-Grouse habitat. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Treatments should be designed to improve a deficient condition within the community (e.g., poor cover of herbaceous understory). (BLM National Sage-Grouse Habitat Conservation Strategy)
- BLM will avoid/minimize alterations of clean drinking water and foraging areas by:
 - Protecting potential recharge areas of cave streams and other karst features that are hydrologically connected to known or assumed hibernacula.
 - Setting back equipment servicing and maintenance areas at least 300 feet away from streambeds, sinkholes, fissures, or areas draining into sinkholes, fissures, or other karst or mine features.

- Following available standards on spill prevention, containment, and control.
- Restricting use of herbicides for vegetation management near known or assumed Northern Long-Eared Bat hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands).
- Implementing strict adherence to sediment and erosion control measures and reclamation standards. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the riparian/wetland resources within the planning area can be found in the Buffalo RMP Revision in Section 3.4.3, the *Vegetation – Riparian/Wetland Resources* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute-Ladies'-Tresses Orchid – BLM's goal for riparian and wetland management is to promote the health and functional capabilities of riparian and wetland systems (Table 2.17). A few of the management actions include: developing activity and implementation plans to manage riparian systems to be at or above Properly Functioning Condition ... (Riparian-4002); managing riparian systems with sensitive species concerns to a succession state appropriate for that system, including vertical as well as horizontal vegetative structure and composition (Riparian-4003); expanding and enhancing riparian/wetland systems and habitat (Riparian-4004); and preventing the degradation, loss, or destruction of riparian/wetland habitat (Riparian-4005). BLM's riparian and wetland goal would improve potential habitat for the Ute ladies'-tresses orchid by improving the riparian and wetland habitat conditions, on which the species depends.

The WYNDD potential distribution model (Heidel 2007) indicates the orchid is most likely to occur in southwestern Campbell County. Due to BLM's multiple use mandate, a limited amount of surface disturbance will likely be authorized within riparian and wetland areas during the planning period for individual land use activities (i.e., fluid minerals, travel and transportation management, locatable minerals, etc.) which are each addressed within their own section. Management action Riparian-4008 allows surface disturbance within 500 feet of riparian/wetlands systems, and aquatic habitats based on resource objectives including, but not limited to soil, slope, and vegetation. To ensure resource objectives are met, which includes promoting the health and functional capabilities of riparian and wetland systems, the management actions within the Buffalo RMP and conservation measures within the RMP's BA will be applied. A minimum of two years of flowering season surveys will be conducted prior to authorizing a riparian or wetland management project within suitable orchid habitat. BLM will consult with the Service on any riparian enhancements proposed within suitable orchid habitat.

The goal of the riparian/wetland resource management actions is to promote the health and functional capabilities of riparian and wetland systems, which would benefit the Ute ladies'-tresses orchid. Riparian and wetland enhancement projects, while of long-term benefit, could have short-term adverse effects. For example, a stream and riparian enhancement project designed to increase the number and depth of in-stream pools and raise the water table by constructing a rock or log check dam. Check dams are small dams which lower the speed of water flow and tend to form stream pools, which allows water to infiltrate into the ground raising the water table. Under high flow (flood) conditions, water flows over or through the structure. Coarse and medium-grained sediment from runoff tends to be deposited behind check dams, while finer grains are usually allowed through. Extra nutrients, phosphorus, nitrogen, heavy metals, and floating garbage are also trapped or eliminated by the presence of check dams, increasing their

effectiveness as water quality control measures. Heavy equipment and human labor would be used in check dam construction which would result in local surface and vegetation disturbance around the dam location. An undocumented orchid population could be harmed by the action; the potential will be reduced through the survey commitment. The above example could potentially be proposed near a known orchid population for its long-term benefits to the species in which case the enhancement construction would occur outside of the flowering season.

Implementing riparian/wetland resource management actions *may affect, likely to adversely affect* the Ute ladies'-tresses orchid (LAA). This determination is based on potential short-term adverse effects to the Ute ladies'-tresses orchid while enhancing the riparian/wetland habitat upon which the species depends.

Northern Long-Eared Bat – Forested habitats in Campbell County may provide suitable habitat to the northern long-eared bat in the planning area. The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 6% of potential habitat identified by the USFWS overlays riparian habitats on BLM-administered surface lands in Campbell County; however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, occupied habitat that may be affected is extremely limited. Resource activities (i.e., fluid minerals) authorized with potential impacts to the bat are addressed within their own sections. Riparian area management is not likely to have detrimental effects on the bat or its habitat. The management actions related to riparian/wetland resource management will work to protect and improve habitat conditions for northern long-eared bat. The species is likely to utilize riparian and wetland habitats near suitable roosting habitat as sources for water and foraging. Actions taken to improve water quality and promote the proper functioning condition of naturally occurring waters are a benefit to the species. Therefore, implementing riparian/wetland resource management actions *may affect, not likely to adversely affect (NLAA-b)* the species within the planning area, due to beneficial effects.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Protection and enhancement of riparian/wetland resources on non-federal land in the planning area will improve habitat for listed or proposed species. Adverse impacts are not anticipated to occur to listed or proposed species in the long-term.

Invasive Species and Pest Management

Proposed Management Actions for Invasive Species and Pest Management

The Proposed RMP proposes the following protections for invasive species that benefit listed or proposed species:

- Manage designated pests on public surface lands using an *Integrated Pest Management Approach* consistent with DOI Manual 517. (Pest-4001)
- Manage designated pests on public surface lands using an *Integrated Pest Management Approach* consistent with DOI Manual 517 (BLM 2007f). (Pest-4002)

- Limit surface disturbance to the minimum needed for safe project completion to limit the spread of noxious weeds. (Pest-4003)
- Use certified noxious weed seed-free vegetation products on all BLM-administered projects and lands. (Pest-4004)
- Implement and maintain cooperative integrated pest management programs with county weed and pest districts, state agencies, private industry, grazing lessees, and other stakeholders in conjunction with BLM weed and pest control work on public lands adjoining deeded and state lands. (Pest-4005)
- Require surface or vegetation disturbance areas, including areas formerly receiving or holding water, be treated for invasive species and revegetated. (Pest-4006)
- Treat those plants on the State of Wyoming Designated list, the appropriate county lists, and other species of concern as determined by BLM resource specialists. Priority treatments are those areas where infestations on private land are threatening public lands. (Pest-4009)
- Designate and prioritize areas for the treatment of annual brome species. (Pest-4010)

Conservation Measures Specific to Invasive Species and Pest Management

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to invasive species and pest management:

- Allow aerial application of narrow spectrum herbicide treatments within areas containing special status plant species. (SS Plants-4005)
- Biological control of noxious plant species will be prohibited within 1.0 mile from known Ute ladies'-tresses orchid habitat until the impact of the control agent has been fully evaluated and determined not to adversely affect the plant population. The BLM will monitor biological control vectors. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Except in cases of extreme ecological health (insect or weed outbreaks/infestations), herbicide treatment of noxious plants/weeds will be prohibited within 0.25 mile of known populations of the Ute ladies'-tresses orchid unless it is a narrow spectrum herbicide that would not harm the Ute ladies'-tresses orchid (herbicides specific to dicots) and insecticide/pesticide treatments will be prohibited within 1.0 mile of known populations of the orchid to protect pollinators.

Where insect or weed outbreaks have the potential to degrade area ecological health inside the buffers listed above, at the discretion of the BLM's authorized officer and with concurrence by the USFWS, the following will apply: where needed, and only on a case-by-case basis, a pesticide use proposal or other site specific plan will address concerns of proper timing, methods of use, and chemicals. Pesticides specific to dicots will be preferred where these are adequate to control the noxious weeds present.

Aerial application of herbicides will be carefully planned to prevent drift in areas near known populations of the orchid (outside of the 0.25 mile buffer). The BLM will work with the Animal and Plant Health Inspection Service (APHIS), the USFWS and County Weed and Pest Agencies to select pesticides and methods of application that will most effectively manage the infestation and least affect the orchid. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA) **Note:** The conservation measure was modified from the

programmatic BA measure to allow the use of narrow spectrum herbicides when it has been determined that they would not harm the Ute ladies'-tresses orchid.

- The Service recommends that the Bureau monitor and manage invasive species so these do not impact the Ute ladies'-tresses orchid or its habitat. (USFWS Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BO)
- The Service recommends that the Bureau not authorize herbicide use in known or occupied Ute ladies'-tresses habitat without prior review by Service biologists. (USFWS Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BO)
- Restore small areas dominated by invasive species with desirable vegetation to minimize fragmentation of habitat. (BLM National Sage-Grouse Habitat Conservation Strategy)
- BLM will minimize the spread of WNS. If a cave or mine that could harbor hibernating bats must be entered, and it does not have a cave and mine closure policy, BLM will follow approved WNS decontamination protocols. Under no circumstances will clothing, footwear, or equipment that was used in a WNS-affected state or region be used. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- Restrict use of herbicides for vegetation management near known Northern Long-Eared Bat hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands). Minimize use of herbicides and pesticides. If necessary, spot treatment is preferred over aerial application. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid/minimize altering clean drinking water and foraging areas by minimizing use of herbicides and pesticides. If necessary, spot treatment is preferred over aerial application. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- Avoid or minimize pesticide use in areas where *Myotis septentrionalis* is known to occur to avoid direct poisoning and to maintain a food source for this species and other insectivores. Where possible, allow insect outbreaks to proceed naturally. (A Conservation Plan for Bats in Wyoming)

Impact Analysis and Effects Determination

A summary of the invasive species and pest management within the planning area can be found in the Buffalo RMP Revision in Section 3.4.4, the *Invasive Species and Pest Management* section in Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – No known populations of the Ute ladies'-tresses orchid are known to occur in the planning area. The BLM employs biological, chemical, and mechanical actions to manage invasive species. Invasive species control measures would be limited in suitable habitat for the orchid. Application of herbicides that could potentially harm the orchid would not be utilized within 0.25 mile of known populations. Aerial herbicide applications, outside of the 0.25 mile buffer, will be carefully planned to prevent drift. Narrow spectrum herbicides are herbicides designed to target specific weeds and applied in accordance with label-specific conditions and therefore would not affect the Ute ladies'-tresses orchid. Clearance surveys would be required prior to application of any treatments in suitable habitats. The BLM would consult with the USFWS on proposed herbicide use within suitable orchid habitat. If either the BLM

or the Service has any concerns that the orchid could be adversely affected, then the treatment would be redesigned to avoid the impact or would not be authorized except in cases of extreme ecological health concern. The WYNDD potential distribution model indicates potential habitat is predominantly limited to southwestern Campbell County (Heidel 2007).

In areas where habitats are unsuitable for the Ute ladies'-tresses orchid because of invasive species, invasive species control measures may benefit the Ute ladies'-tresses orchid by improving those habitats.

Implementing invasive species and pest control management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to discountable effects (NLAA-d). This determination is based on the pesticide use restrictions, the conservation measures for the Ute ladies'-tresses orchid, the current absence of the species within the planning area, and the limited potential habitat.

Northern Long-Eared Bat – Invasive species are controlled on BLM surface through cooperative agreements with the counties and Pest Control Districts. In addition, the BFO works in cooperation with the WGFD, State Lands Division, State Parks, local NRCS offices, and private landowners to address invasive species. The BLM typically employs biological, chemical, and mechanical actions to manage invasive species. Trees are unlikely to be removed through the invasive species program. Control of invasive species on BLM surface lands could improve habitats for the northern long-eared bat by improving and protecting habitat conditions. Pesticide applications in forested habitats during the spring and summer could impact bats; however, occupied habitat in the planning area is limited, and the likelihood that management actions will affect the species is minimal. Pesticides are typically only used in areas with Mormon cricket or grasshopper infestations, and not likely to occur in forested habitats where the bat is expected to forage. Silviculture treatments are expected to be the primary technique to protect areas infested with pine beetle, as there are currently no chemicals authorized to treat the species, silvicultural treatments are analyzed in the Forest and Woodlands section of this BA. Clearance surveys would be required prior to activities proposed in potential habitat, and activities would be timed to occur when bats were not present. Although no potential hibernacula are present within Campbell County, caves will be managed to prevent the spread of white-nosed syndrome. Therefore, implementing invasive species management actions *may affect, not likely to adversely affect* (NLAA-i) the species within the planning area, due to insignificant effects. This determination is based on the unlikelihood that invasive species management actions will occur in occupied habitat, and the application of conservation measures to avoid impacts to the species.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Surface-disturbing activities and soil disturbance contribute to the spread of invasive species. While much of the surface disturbance from non-BLM actions is anticipated to be reclaimed, the potential for spread of invasive species remains from both short-term and long-term impacts. Surface disturbance is anticipated to continue on non-federal lands. The spread of invasive species could affect listed or proposed species habitats, making them unsuitable. The long-term effectiveness of invasive species control measures on all public and private lands in the planning area depends on continued cooperation, available funding, agency priorities, and the effectiveness and periodic assessment of weed-management actions in accordance with a comprehensive weed management plan. Unchecked invasive species could overwhelm attempts at control and substantially impact fire and fuels management, biological resources, livestock grazing management (by reducing rangeland

productivity and animal unit months), and recreation (by impacting wildlife habitats and scenic quality) throughout the planning area.

Fish and Wildlife Resources

Proposed Management Actions for Fish and Wildlife Resources

The Proposed RMP proposes the following protections for fish and wildlife resources that benefit listed or proposed species:

Fish

- Develop appropriate mitigation for surface-disturbing and disruptive activities associated with fish management through use of the mitigation guidelines. (Fish-4001)
- Manage harmful non-native riparian vegetation in river and stream systems important to fish species in cooperation with the WGFD and other stakeholders. (Fish-4005)
- Maintain or enhance streams and riparian areas associated with Class I and II streams, Powder River, Tongue River, and other appropriate areas for desired fisheries potential. (Fish-4008)
- Maintain or enhance fish habitat with actions affecting perennial waters consistent with other resource values. (Fish-4010)
- Identify and manage fish habitat capable of achieving DFC. Manage all other areas with fish habitat to meet PFC. (Fish-4011)
- Allow surface-disturbing activities within 0.25 mile of naturally occurring water bodies containing native or desirable non-native fish species where fish can be adequately protected. (Fish-4012)
- Apply a CSU stipulation within 0.25 mile of naturally occurring water bodies containing native and desirable non-native fish species. (Fish-4013)
- Perform restoration of important in-stream segments for fish habitat in accordance with WGFD priorities. (Fish-4015)

Wildlife

- Develop appropriate mitigation for surface-disturbing and disruptive activities associated with wildlife habitat management through use of the mitigation guidelines. (WL-4001)
- Maintain or improve important wildlife habitats through vegetative manipulations, habitat improvement projects, livestock grazing strategies and the application of The Wyoming Guidelines for Managing Sagebrush Communities with Emphasis on Fire Management (Wyoming Interagency Vegetation Committee 2002), WGFD Strategic Habitat Plan, State Wildlife Action Plan (SWAP), and similar guidance updated over time. (WL-4002)
- Continue to use existing HMPs and update as necessary to include management objectives and prescriptions for wildlife: South Big Horns HMP, including a portion or all of the Gardner Mountain and North Fork WSAs; Wetlands HMP; and Middle Fork Powder River HMP. (WL-4003)

- Consult with the WGFD, in accordance with the MOU, when applying mitigation for wildlife and before waiving, allowing exceptions to, or modifying wildlife-related land use restrictions and mitigation. (WL-4005)
- Provide, to the extent possible, suitable habitat and forage to support wildlife population objectives as defined by WGFD. The BLM will cooperatively consider proposals by the WGFD to change population objective levels based on habitat capability and availability. (WL-4006)
- Manage access to protect crucial habitats in cooperation with WGFD and other stakeholders. (WL-4007)
- Utilize current research, management and conservation plans, and similar related documents to guide wildlife habitat management. (WL-4008)
- Promote the maintenance and improvement of habitat for migratory bird species of conservation concern in a manner consistent with national, regional, and statewide bird conservation priorities. (WL-4011)
- Prohibit commercial renewable energy (wind and solar) projects in big game crucial winter range, elk calving areas, and identified big game priority travel corridors. (WL-4024)
- Prohibit surface-disturbing, disruptive activities, or surface occupancy within USFWS recommended spatial buffers or seasonal dates for active raptor nests. Apply CSU and TLS to new fluid mineral leases. (WL-4027, WL-4028, WL-4029, WL-4030)

Conservation Measures Specific to Fish and Wildlife Resources

The following Conservation Measures, identified in BA Section 9, may benefit listed or proposed species and are specific to fish and wildlife resource management:

- The BLM will maintain biological diversity of plant and animal species; support the WGFD strategic plan population objective levels to the extent practical and to the extent consistent with BLM multiple use management requirements; maintain, and where possible, improve forage production and quality of rangelands, fisheries, and wildlife habitat; and to the extent possible, provide habitat for threatened and endangered and special status plant and animal species on all public lands in compliance with the ESA and approved recovery plans. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- The BLM will manage stream habitats to retain, re-create, or mimic natural hydrology, water quality, and related vegetation dynamics. Projects that may alter natural hydrology or water quality, change the vegetation of the riparian ecosystem and cause direct ground disturbance will be evaluated and redesigned to ensure that adverse effects to populations of the orchid do not occur. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- BLM will avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming by not clearing occupied spring staging and fall swarming habitat near known Northern Long-Eared Bat hibernacula during the staging and swarming seasons. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will maintain summer maternity habitat by:

- Retaining known roost trees, which includes live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
- Clearly demarcating trees to be protected vs. cut to help ensure that contractors do not accidentally remove more trees than anticipated. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the fish and wildlife resources within the planning area can be found in the Buffalo RMP Revision in Section 3.4.5, the *Fish and Wildlife Resources – Fish* and 3.4.6, *Fish and Wildlife Resources – Wildlife* sections in Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Fish and wildlife management actions will improve habitat for the Ute ladies'-tresses orchid by maintaining or improving riparian and wetland habitat conditions, on which the species depends. Implementing fish and wildlife resource management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *beneficial effects (NLAA-b)*. This determination is based on the potential for improvement of habitat.

Northern Long-Eared Bat – Management actions for fish and wildlife are centered around species protections and habitat improvements. Fish and wildlife resource management actions will protect and improve northern long-eared bat habitat; especially those which occur in forested or riparian areas in northern Campbell County. Timing limitations and disturbance free buffers that overlap with occupied habitat will also protect bats utilizing the protected habitat. Fish and wildlife habitat enhancements would not occur within occupied northern long-eared bat habitat. Suitable habitat would be surveyed prior to any enhancement activities; any projects planned for occupied habitat would be postponed until northern long-eared bats are not present. Implementing fish and wildlife resource management actions *may affect, not likely adversely affect (NLAA-b)* the species within the planning area, due to the beneficial effects of habitat protection and improvement, and protections of individuals.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Fish and wildlife management actions on non-federal lands may result in temporary impacts to listed or proposed species, but are anticipated to benefit listed and proposed species overall through habitat improvements.

Special Status Species – Plants

Proposed Management Actions for Special Status Species - Plants

The Proposed RMP proposes the following protections for special status species – plants resources that benefit listed or proposed species:

- Implement actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate BMPs and reasonable and prudent measures within BOs for Threatened and/or Endangered plant species. (SS Plants-4001)
- Allow treatments within habitat for special status plant species and within known populations that are proven to benefit the species. (SS Plants-4002)

- Allow the following within habitat for special status plant species, though not within known populations (SS Plants-4003):
 - Surface-disturbing activities that could adversely impact special status plant species.
 - Mineral exploration and development activities.
 - All motor vehicle use, including uses related to fire suppression and geophysical exploration activities (surveying, etc.).
 - Use of explosives and blasting.
 - Placement of water developments, salt and mineral supplements.
 - After survey establish site-specific botanic buffer.
- Require predisturbance flowering season surveys for special status plant species prior to approving any project or activity that may impact the habitat for these species. (SS Plants-4004)
- Allow aerial application of narrow spectrum herbicide treatments within areas containing special status plant species. (SS Plants-4005)
- Allow the use of fire suppression chemicals, including foaming agents and surfactants, within areas of known special status plant populations where consistent with the biology of the plant or where human safety or property are at risk. (SS Plants-4006)
- Allow ROWs within areas containing habitat for special status species plants, though not within areas of known populations. (SS Plants-4007)
- Apply a CSU stipulation to mineral leases within habitat for special status plant species. (SS Plants-4008)
- Manage livestock grazing to protect special status plant populations (exclosures, timing). (SS Plants-4009)

Conservation Measures Specific to Special Status Species - Plants Resources

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to special status species - plants resource management:

- Maintain (size and quality) or enhance current habitat utilized by special status species. Enlarge/restore habitat on site specific basis. (SS WL-4013)
- Manage surface-disturbing and disruptive activities to mitigate impacts on special status wildlife species and their habitats. (SS WL-4006)
- The BLM will maintain biological diversity of plant and animal species; support the WGFD strategic plan population objective levels to the extent practical and to the extent consistent with BLM multiple use management requirements; maintain, and where possible, improve forage production and quality of rangelands, fisheries, and wildlife habitat; and to the extent possible, provide habitat for threatened and endangered and special status plant and animal species on all public lands in compliance with the ESA and approved recovery plans. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)

- The BLM will participate in the development of both, a conservation agreement/assessment strategy and a species specific recovery plan for the orchid in coordination with the USFWS and other agencies as appropriate. Orchid habitat on BLM-administered lands will be monitored to determine if recovery/conservation objectives are being met. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- The BLM will coordinate with the USFWS, the NRCS, and private landowners to ensure adequate protection for the orchid and its habitat when new activities are proposed, and to work proactively to enhance the survival of the plant. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Maintain and restore the natural species composition and structural diversity of plant communities in riparian zones and wetlands. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Form a steering committee to develop and prioritize management practices and assist BLM and USFWS with research projects. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Conduct inventories for the orchid in areas with potential habitat. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Maintain a database of all searched, inventoried, or monitored orchid sites. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Analyze vegetation treatments (mowing, prescribed fire, mechanical treatments, etc.) in known or potential habitat for the orchid to determine impacts to the species. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Establish monitoring, biological, ecological, population demographics, and life history studies as funding and staffing allow, such as, monitoring current populations each year for trends, studies regarding identification of pollinators, genetics, life history, effects of pesticides and herbicides, seed viability and germination, and studies regarding monitoring the success of reintroduction efforts. Monitor orchid population sites for invasion by noxious and invasive plant species. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Perform monitoring and analysis pertaining to flow timing, flow quantity, and water table characteristics with the goal of ensuring that riparian vegetation, in areas of known and potential habitat for the orchid, is maintained. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- When possible, collect and bank orchid seeds at local, regional, national, and international arboreta, seed banks, and botanical gardens as insurance against catastrophic events, for use in biological studies, and for possible introduction/reintroduction into potential habitat. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Train law enforcement personnel on protections for the orchid and its habitat, its status, and current threats to its existence. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Educate resource specialists, rangers, and fire crews about the orchid and its habitat to help with project design for the general area and for fire suppression actions occurring in potential

habitat for the orchid and on the habitat characteristics and plant identification for the plant, so that if they encounter the orchid occurring in riparian habitat, they can report it to their office threatened and endangered species specialist. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)

- The BLM should work towards developing reintroduction sites in coordination with the USFWS and to maintain the integrity of these sites for the survival of the orchid. The objective would be to reintroduce populations of the orchid into areas of historic occurrence and introduce new populations in suitable habitat within the plant's historic range. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Develop propagation techniques and use them to reintroduce/introduce the orchid and to repopulate known populations in the event population recovery becomes necessary. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- In known occupied Ute ladies'-tresses habitat, the Service recommends that the Bureau use management actions that are compatible with protection and conservation of pollinators of the Ute ladies'-tresses orchid. (USFWS Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BO)
- Where good habitat quality exists, maintain current management practices considering plant composition and soil type. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Maintain seeps, springs, wet meadows, and riparian vegetation in a functional and diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Restore lost riparian and wetland plant species diversity and structure by replanting appropriate species near crucial Greater Sage-Grouse habitat. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Treatments should be designed to improve a deficient condition within the community (e.g., poor cover of herbaceous understory). (BLM National Sage-Grouse Habitat Conservation Strategy)

Impact Analysis and Effects Determination

A summary of the special status species - plants resources within the planning area can be found in the Buffalo RMP Revision in Section 3.4.7, the *Special Status Species – Plants* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Protection and conservation of the Ute ladies'-tresses orchid and its habitat could have beneficial effects on this species. Restrictions on actions within Ute ladies'-tresses orchid habitat may help to improve habitat. Implementing special status plant management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *beneficial effects (NLAA-b)*. This determination is based on the potential that these actions will limit disturbance in Ute ladies'-tresses orchid potential habitats.

Northern Long-Eared Bat – Overlap of potential special status plant habitat or known occurrences and suitable habitat for northern long-eared bat is extremely limited; the only potential for overlap in the northeast corner of Campbell County (RMP Map 34). The only special status plant species where there is a potential overlap is Porter's sagebrush, which is not expected to

occur within forested habitat, and has not been documented in Campbell County. Implementation of the management actions for special status plant resources will have *no effect (NE)* on the northern long-eared bat, due to the unlikelihood that actions will occur in suitable habitat.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Protection and enhancement of special status plant species on non-federal lands will conserve habitat for listed or proposed species and potentially limit habitat fragmentation.

Special Status Species – Fish and Wildlife

Proposed Management Actions for Special Status Fish and Wildlife Resources

The Proposed RMP proposes the following protections for special status fish and wildlife resources that benefit listed or proposed species:

Fish

- Modify projects that may affect special status species fish to protect these species. Consult with the USFWS in such cases, as required by the ESA. (SS Fish-4001)
- Assist authorized agencies in the restoration, reintroduction, augmentation, or reestablishment of special status species populations and habitats. (SS Fish-4002)
- Prioritize special status fish species over other fish species in the planning and management actions. (SS Fish-4003)
- Implement actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate BMPs and reasonable and prudent measures within BOs for Threatened and/or Endangered fish species. (SS Fish-4004)
- Support WGFD in obtaining water rights for the benefit of special status fish habitat. (SS Fish-4005)
- Restore or improve important stream segments for special status fish. (SS Fish-4006)
- Prohibit new surface-disturbing activities within 0.25 mile of any waters containing special status fish species, unless it benefits the species. Exceptions must demonstrate the proposed impacts cannot be avoided and the proposal is the least environmentally damaging alternative. (SS Fish-4007)
- Apply an NSO stipulation within 0.25 mile of any waters containing special status fish species. (SS Fish-4008)
- All new surface-disturbing activities within 0.25 mile of any waters containing special status fish species, must demonstrate that the proposed action will benefit the species or will be the least environmentally damaging alternative. (SS Fish-4009)

Wildlife

- Utilize current research, management and conservation plans, and similar related documents to guide special status species habitat management. (SS WL-4001)

- Implement actions set forth in recovery plans, conservation measures, terms and conditions, protection measures, and appropriate BMPs and reasonable and prudent measures within BOs for Threatened and/or Endangered wildlife species, including those specific to this RMP and any future statewide programmatic BOs. (SS WL-4002)
- Maintain (size and quality) or enhance current habitat utilized by special status species. Enlarge/restore habitat on a site-specific basis. (SS WL-4003)
- Manage surface-disturbing and disruptive activities to mitigate impacts on special status wildlife species and their habitats. (SS WL-4006)
- Apply a CSU stipulation to fluid mineral leases containing special status species habitat. Surveys required for clearance. (SS WL-4007)
- Restore Greater Sage-Grouse brood-rearing habitats in wetland/riparian areas. Maintain seeps, springs, wet meadows, and riparian vegetation in a functional and diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas. (SS WL-4012)
- Minimize disturbances that would result in alterations to springs and riparian Greater Sage-Grouse habitat. In coordination with stakeholders, develop alternative water sources to replace natural sources that have been affected or destroyed. (SS WL-4014)
- Establish a year-round disturbance-free buffer zone of at least 0.5 mile for known active bald eagle nests. Establish a 1-mile limited activity zone for known active nests (February 1 to August 15). (SS WL-4026)
- Establish a year-round disturbance-free buffer zone of at least 0.5 mile for consistently used bald or golden eagle winter roosts and the following riparian corridors consistently used by bald eagles: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. The stipulation area may be adjusted to 1.0 mile based on topographic features, visibility, disturbance and human activity levels, and other factors. This buffer zone restriction will be based on site specific information and coordinated with the USFWS Wyoming Field Office.

Additionally, establish a 1-mile limited activity zone for consistently used roosts and the identified riparian corridors (November 1 to April 1). The buffer zone restriction will be based on site specific information and coordinated with the USFWS's Wyoming Field Office, which will provide written concurrence. (SS WL-4027)

- Apply an NSO stipulation to fluid mineral leases within 0.5 mile of consistently used bald or golden eagle winter roosts and the following riparian corridors consistently used by bald eagles: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. The stipulation area may be adjusted to 1.0 mile based on topographic features, visibility, disturbance and human activity levels, and other factors. This buffer zone restriction will be based on site specific information and coordinated with the USFWS Wyoming Field Office. (SS WL-4028)

Additionally, apply a 1-mile limited activity TLS for consistently used roosts and the identified riparian corridors (November 1 to April 1). The buffer zone restriction will be based on site specific information and coordinated with the USFWS's Wyoming Field Office, which will provide written concurrence. (SS WL-4028)

- Prohibit surface-disturbing, disruptive activities, or surface occupancy within USFWS recommended spatial buffers or seasonal dates for active raptor nests. Apply NSO and TLS to new fluid mineral leases. (SS WL-4029, SS WL-4030, SS WL-4031, SS WL-4032)
- Require surveys for special status amphibian, reptile, and bat species prior to approving any project or activity that may impact the habitat for these species. Habitat includes: caves, mature forest, perennial waters, vernal pools, playas, wetlands, and south-facing rock outcrops. Allow surface-disturbing and disruptive activities and apply a CSU stipulation to mineral leases within 1,640 feet (500 meters) of caves, mature forest, perennial waters, vernal pools, playas, wetlands, and south facing rock outcrops for the protection of special status amphibian, reptile, and bat species and their habitats when population and habitats can be conserved. (SS WL-4033, SS WL-4034)

Conservation Measures Specific to Special Status Species - Fish and Wildlife Resources

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to special status species fish and wildlife resource management:

- Implement actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate BMPs and reasonable and prudent measures within BOs for Threatened and/or Endangered plant species. (SS Plants-4001)
- Establish monitoring protocols that will be incorporated into project approvals as appropriate and necessary. (BLM IM WY-2012-019)
- Within the potential of the ecological site (soil type, landform, climate, and geology), the BLM will ensure that the soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- The BLM will maintain biological diversity of plant and animal species; support the WGFD strategic plan population objective levels to the extent practical and to the extent consistent with BLM multiple use management requirements; maintain, and where possible, improve forage production and quality of rangelands, fisheries, and wildlife habitat; and to the extent possible, provide habitat for Threatened and Endangered and special status plant and animal species on all public lands in compliance with the ESA and approved recovery plans. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- The BLM will manage stream habitats to retain, re-create, or mimic natural hydrology, water quality, and related vegetation dynamics. Projects that may alter natural hydrology or water quality change the vegetation of the riparian ecosystem and cause direct ground disturbance will be evaluated and redesigned to ensure that adverse effects to populations of the Ute ladies'-tresses orchid do not occur. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Develop and prioritize management practices and assist USFWS with research projects. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Conduct inventories for the orchid in areas with potential habitat. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Maintain a database of all searched, inventoried, or monitored orchid sites. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)

- Analyze vegetation treatments in known or potential habitat for the orchid to determine impacts to the species. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Establish monitoring, biological, ecological, population demographics, and life history studies as funding and staffing allow, such as, monitoring current populations each year for trends, studies regarding identification of pollinators, genetics, life history, effects of pesticides and herbicides, seed viability and germination, and studies regarding monitoring the success of reintroduction efforts. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- When possible, collect and bank orchid seeds at local, regional, national, and international arboreta, seed banks, and botanical gardens as insurance against catastrophic events, for use in biological studies, and for possible introduction/reintroduction into potential habitat. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Train law enforcement personnel on protections for the orchid and its habitat, its status, and current threats to its existence. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Restore lost riparian functioning systems by repairing abnormally incised drainages to raise water tables and increase water storage and brood-rearing habitats within Greater Sage-Grouse habitat. (BLM National Sage-Grouse Habitat Conservation Strategy)
- BLM will take actions to protect Northern Long-Eared Bat hibernacula. Where a known Northern Long-Eared Bat hibernaculum is experiencing threats, BLM work with the USFWS and other partners to provide the necessary protections (e.g., limit human disturbance, install bat-friendly gates, ensure the use of "clean" clothing and gear).
- BLM will participate in actions to manage and reduce the impacts of WNS on Northern Long-Eared Bats. A national plan was prepared by the USFWS and other state and federal agencies that details actions needed to investigate and manage WNS. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid disturbing/injuring hibernating bats by:
 - Not entering Northern Long-Eared Bat hibernacula during the hibernation season, unless coordinated with the Service for survey, research, or other management purposes.
 - Complying with all cave and mine closures, advisories, and regulations. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid destruction/alteration (e.g., fill, cause collapse of) of caves/mines that may support hibernating bats by avoiding modifying cave or mine entrances that support hibernating bats. If there are safety concerns or concerns about bats (e.g., disturbance, vandalism) at a site, only "bat friendly" cave/mine gates will be installed. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid/minimize alterations of clean drinking water and foraging areas by protecting potential recharge areas of cave streams and other karst features that are hydrologically connected to known or assumed hibernacula. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

- BLM will avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming by not clearing occupied spring staging and fall swarming habitat near known Northern Long-Eared Bat hibernacula during the staging and swarming seasons. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will minimize the spread of WNS. If a cave or mine that could harbor hibernating bats must be entered, and it does not have a cave and mine closure policy, BLM follow approved WNS decontamination protocols. Under no circumstances will clothing, footwear, or equipment that was used in a WNS-affected state or region be used. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will determine where Northern Long-Eared Bats occur in the summer.
 - Coordinate with partners to gather and evaluate Northern Long-Eared Bat location information.
 - Review both positive and negative data (e.g., acoustic transect surveys). (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will take actions to protect Northern Long-Eared Bats and their habitat within known Northern Long-Eared Bat home ranges. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid killing or injuring Northern Long-Eared Bats during tree clearing activities by not clearing occupied maternity colony summer habitat during the summer maternity season. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will minimize other direct effects to Northern Long-Eared Bats by not clearing occupied summer habitat during the time of year when females are pregnant or the pups are incapable of flight. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will maintain summer maternity habitat by:
 - Retaining known roost trees, which includes live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
 - Clearly demarcating trees to be protected vs. cut to help ensure that contractors do not accidentally remove more trees than anticipated. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM, in cooperation with the State of Wyoming and/or the Service, will implement inventory and monitoring to determine population status and habitat requirements, as additional information is necessary to guide management actions. (A Conservation Plan for Bats in Wyoming)
- BLM will manage BLM-administered lands where *Myotis septentrionalis* occurs in such a way that provides adequate roosting and foraging habitat to maintain stable populations (that is,

secure roosting sites; diverse, native foraging habitat; and uncontaminated water sources). (A Conservation Plan for Bats in Wyoming)

- BLM will evaluate and where appropriate require BMPs for natural caves and abandoned mines in areas where *Myotis septentrionalis* roosts. (A Conservation Plan for Bats in Wyoming)

Impact Analysis and Effects Determination

A summary of the special status species - fish and special status species - wildlife resources within the planning area can be found in the Buffalo RMP Revision in Section 3.4.8, the *Special Status Species - Fish* and 3.4.9, the *Special Status Species - Wildlife* sections of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Management actions associated with special status species could benefit Ute ladies'-tresses orchid habitat. The restriction of surface-disturbing activities within 0.25 mile of fish bearing streams and 500 feet of wetlands would benefit the Ute ladies'-tresses orchid. Implementing special status wildlife species management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *beneficial effects* (NLAA-b).

Northern Long-Eared Bat – Potential suitable habitat for the northern long-eared bat in the planning area is limited to Campbell County. Management and protection of habitats for other special status wildlife species may influence potential suitable habitat for the species. Special Status Wildlife Species Management Actions under the Proposed RMP in forested habitats will protect existing habitats, mitigate impacts from surface-disturbing and disruptive activities, and lead to enhanced roosting and foraging habitat for the bat. Management actions that protect riparian areas could benefit the species by improving access to water and foraging. There is no overlap between special status fish habitat, which is limited to northwestern Sheridan County (RMP Map 28), and potential suitable habitat for the northern long-eared bat. Special status species habitat enhancements would not occur within occupied northern long-eared bat habitat. Suitable habitat would be surveyed prior to any enhancement activities, any projects planned for occupied habitat would be postponed until northern long-eared bats are not present. Implementing management actions for special status wildlife resources under the Proposed RMP *may affect, not likely to adversely affect* (NLAA-b) the species within the planning area, due to beneficial effects. This determination is based on maintenance and improvement of habitat, and protection of individuals.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Protection of special status fish and wildlife species and maintenance and enhancement of their habitats on non-federal lands will provide additional benefits for listed or proposed species. In addition, limitations to development and disturbance will reduce further habitat fragmentation and species displacement.

Cultural Resources

Proposed Management Actions for Cultural Resources

The Proposed RMP proposes the following protections for cultural resources that benefit listed or proposed species:

- Complete site stabilization and long-term protection for significant sites that are experiencing adverse impacts. (Cultural-5001)

- Prohibit surface disturbance within the following sites: Pumpkin Buttes, Cantonment Reno, Dull Knife Battle, Crazy Woman Battle, Contributing and Unevaluated Segments of the Bozeman Trail, all Rock Art Sites, all Rock Shelter Sites, all Native American Burials. (Cultural-5007)
- Allow surface disturbance and infrastructure within 3 miles of the following sites where development is either not visible, or will result in a weak contrast to the setting: Pumpkin Buttes, Cantonment Reno, Dull Knife Battle, Crazy Woman Battle, Contributing and Unevaluated Segments of the Bozeman Trail, all Rock Art Sites, all Native American Burials. (Cultural-5007)
- Mitigate adverse effects to sensitive sites such as traditional cultural properties (TCPs) and/or sacred sites through appropriate prohibitions and measures to protect setting. (Cultural-5011)

Conservation Measures Specific to Cultural Resources

No conservation measures, identified in BA Section 9, that may benefit listed and proposed species are specific to cultural resource management.

Impact Analysis and Effects Determination

A summary of the cultural resources within the planning area can be found in the Buffalo RMP Revision in Section 3.5.1, the *Cultural Resources* section of Chapter 3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Cultural resource management may affect the Ute ladies'-tresses orchid by excavating soils and removing or trampling vegetation in areas where management actions are implemented. Surface-disturbing activities associated with cultural resource investigations can vary in size and degree of disturbance. Impacts to the Ute ladies'-tresses orchid will depend on the number of people conducting the investigation, the time of year, duration of the field actions, use of heavy machinery or hand tools, and the type of habitat affected. Disturbance to potential Ute ladies'-tresses orchid habitat will only likely occur if large-scale excavation takes place. Avoiding surface-disturbing activities and protecting important cultural sites up to 3 miles from the sites will benefit the species if there is suitable occupied habitat within 3 miles of the sites; cultural sites are often found in riparian habitats. Implementing cultural resource management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *discountable effects (NLAA-d)*. This determination is based on the BLM's commitment to the conservation measures, which make surface-disturbing activities unlikely to occur in potential Ute ladies'-tresses orchid habitats. In addition, the BLM requires surveys to determine the presence or absence of the Ute ladies'-tresses orchid if surface disturbance is planned in potential habitat. If cultural resources are found in potential Ute ladies'-tresses orchid habitats, restrictions protecting the cultural resources may benefit the Ute ladies'-tresses orchid.

Northern Long-Eared Bat – The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 18% of potential habitat identified by the USFWS overlays BLM administered surface lands in Campbell County; however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, occupied habitat that may be affected by cultural actions is limited. Most actions associated with cultural resource inventories,

including surface surveys, record searches, and artifact characterization, will not affect the species. More intensive excavation efforts and development of interpretive sites could disturb the bat if such actions occurred in occupied habitats during the late spring and summer months. Tree removal would be unlikely; however, if tree removal were necessary it would be limited and take place when no bats are present. Developing interpretive sites will occur where the cultural objects and sites themselves are located. If such a site were discovered or occurred in suitable habitat, it could create a conflict; however, the likelihood of this event taking place is negligible and timing of activities would be limited. Activities associated with interpretive sites are also expected to be small in scale and infrequent in nature. Avoiding surface-disturbing activities and protecting important cultural sites will benefit the species if portions of the protected areas are in occupied habitat. Implementing cultural resource management actions *may affect, not likely to adversely affect (NLAA-d)* the species within the planning area, due to discountable effects. If cultural resources are found in suitable habitats, restrictions protecting the cultural resources may benefit the species, and conservation measures to avoid impacts to the bat will be implemented.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. The cumulative effects of cultural resource programs on non-federal lands are anticipated to be limited across the planning area and therefore not result in an adverse effect on listed or proposed species.

Paleontological Resources

Proposed Management Actions for Paleontological Resources

The Proposed RMP proposes the following protections for paleontological resources that benefit listed or proposed species:

- Retain public lands with significant paleontological values. (Paleo-5001)
- Designate areas containing paleontological resources of high quality or importance for special management, as they are identified. (Paleo-5005)
- Avoid areas containing paleontological resources of high quality or importance when developing locatable minerals. (Paleo-5006)
- Apply an NSO stipulation to mineral leases in areas containing paleontological resources of high quality or importance. (Paleo-5007)
- Avoid areas containing paleontological resources of high quality or importance when developing salable minerals. (Paleo-5008)

Conservation Measures Specific to Paleontological Resources

No conservation measures, identified in BA Section 9, that may benefit listed or proposed species are specific to paleontological resource management.

Impact Analysis and Effects Determination

A summary of the paleontological resources within the planning area can be found in the Buffalo RMP Revision in Section 3.5.2, the *Paleontological Resources* section of Chapter 3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Southern Campbell County, the portion of the Buffalo planning area with the best potential for supporting Ute ladies'-tresses orchids (Heidel 2007), has moderate potential for yielding fossils (RMP Map 47). The Pumpkin Buttes have very high fossil potential, however, the buttes are not suitable orchid habitat. Collecting fossils on public land will have minimal effects on the Ute ladies'-tresses orchid and its habitats. Potential impacts depend on the number of people conducting the investigation, the time of year, duration of the field actions, use of heavy machinery or hand tools, and the type of habitats affected. As with any surface-disturbing activity, surveys for Ute ladies'-tresses orchid will be conducted in potentially suitable habitats prior to any surface-disturbing activity taking place. Implementing paleontological management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *discountable effects (NLAA-d)*. This determination is based on existing conservation measures in place that will minimize impacts to the species.

Northern Long-Eared Bat – Northeastern Campbell County has very high fossil potential (RMP Map 47). Collection of fossils on public land will have minimal effects on northern long-eared bat and their habitats. Possible effects include increased human activity and minor surface disturbances associated with fossil retrieval. Tree removal would be minimal and likely to only be individual trees in dig sites. If fossil recovery were planned in occupied habitats, activities would be restricted during sensitive periods such as summer roosting. Collection activities are expected to be small in scale and infrequent in nature. Implementing paleontological resources management *may affect, not likely to adversely affect (NLAA-i)* within the planning area, due to insignificant effects. This determination is based on the existing conservation measures and the relatively small amount of surface disturbance associated with fossil collection.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. No actions associated with paleontology on non-federal lands that could affect listed or proposed species are anticipated.

Visual Resource Management

Proposed Management Actions for Visual Resource Management

The Proposed RMP proposes the following protections for VRM that benefit listed or proposed species:

- Manage WSAs under VRM Class I objectives. Any facilities or structures proposed in WSAs will be designed so as not to impair wilderness suitability. (VRM-5001)
- If the Middle Fork Powder River is designated by Congress as a WSR, the river will be managed as VRM Class I. (VRM-5002)
- Manage VRM Class II areas (except Powder River Breaks and Fortification Creek) and special emphasis areas as VRM Class II. (VRM-5005)
- Complete a visual simulation and mitigation design for all proposed actions within VRM Classes I and II. Visual simulation and mitigation design may be required on a project specific basis within VRM Class III areas with high visual sensitivity. (VRM-5007)

Conservation Measure Specific to Visual Resources

There are no Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species which specific to VRM.

Impact Analysis and Effects Determination

A summary of the visual resources within the planning area can be found in the Buffalo RMP Revision in Section 3.5.3, the *Visual Resources* section of Chapter 3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Development at the scale provided for in VRM Classes III and IV, 48% and 33% of the BLM surface (RMP Map 51), respectively, could potentially remove large areas of suitable habitat. Fortunately most actions, except where necessary, would be sited to avoid riparian areas and therefore Ute ladies'-tresses orchid habitat. Implementing VRM actions *may affect, not likely to adversely affect*, the Ute ladies'-tresses orchid due to *discountable effects* (NLAA-d). This determination is based on no known populations of Ute ladies'-tresses orchid occurring in the planning area and the incorporation of conservation measures.

Northern Long-Eared Bat – The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Based on the distribution maps provided by WYNDD for the species, the likelihood that all the potential habitat identified by the USFWS would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, occupied habitat that may be affected is limited. All activities associated with visual resources management are generally administrative in nature. Development at the scale provided for in VRM Classes III and IV, 48% and 33% of the BLM surface (RMP Map 51), respectively, could potentially remove areas of suitable habitat; however, these actions are analyzed under their respective program areas in this BA. Actions resulting in habitat alteration could impact suitability of habitat, but are not likely to result in the mortality of individuals given that conservation measures such as timing of activities will be applied in occupied habitat. Areas managed as Class I or II, may prevent habitat loss. Implementing VRM actions *may affect, not likely to adversely affect* (NLAA-i) the species within the planning area, due to insignificant effects. This determination is based on the incorporation of management actions that will serve to avoid adverse impacts.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. No actions associated with VRM on non-federal lands that could affect listed or proposed species are anticipated.

Forest Products

Proposed Management Actions for Forest Products

The Proposed RMP proposes the following actions for forest products that benefit listed or proposed species:

- Prohibit forest management activities within 200 feet of surface waters. (FP-6001)
- Allow the sale of permits to meet the public demand for personal use of forest products consistent with wildlife habitat requirements and other resource values. (FP-6002)
- Manage forest product sales to remain within ecologically sustainable limits while maximizing economic return. (FP-6004)

- Design/shape forest management areas to have meandering boundaries, follow topography, avoid natural barriers, and in accordance with other resource values and within the limits of the Wyoming Forestry BMPs and other guidance without limiting the harvest area size. (FP-6006)
- Protect forest regeneration areas that are being damaged or in an area where damage is probable. (FP-6007)
- Evaluate forest management areas and their successional dynamics, and where necessary implement tactics to assure regeneration (forest sustainability). (FP-6008)
- Utilize pre-commercial thinning and other silvicultural practices to create healthy and economically sustainable forest stands consistent with other resource values. (FP-6009)

Conservation Measures Specific to Forest Products

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and that are specific to forest products management:

- BLM will avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming by:
 - not clearing occupied spring staging and fall swarming habitat near known Northern Long-Eared Bat hibernacula during the staging and swarming seasons. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
 - avoiding planned fire or other sources of smoke in known Northern Long-Eared Bat habitat during the swarming/staging or hibernation season, or coordinate with the USFWS. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid killing or injuring Northern Long-Eared Bats during tree clearing activities by not clearing occupied maternity colony summer habitat during the summer maternity season. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will minimize other direct effects to Northern Long-Eared Bats by not clearing occupied summer habitat during the time of year when females are pregnant or the pups are incapable of flight. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will maintain summer maternity habitat by:
 - Retaining known roost trees, which includes live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
 - Clearly demarcating trees to be protected vs. cut to help ensure that contractors do not accidentally remove more trees than anticipated. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will not harvest timber in areas close to occupied roosting sites during the maternity roosting period (Schmidt 2003). Surveys will be conducted to determine occupancy prior to any tree harvest activities. Patch cuts and selective harvesting will be utilized to provide regenerating forest and retain large-diameter snags (Lacki and Schwierjohann 2001). (A Conservation Plan for Bats in Wyoming)

Impact Analysis and Effects Determination

A summary of the forest product resources within the planning area can be found in the Buffalo RMP Revision in Section 3.6.1, the *Forest Products* section of Chapter 3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – The Ute ladies'-tresses orchid is associated with riparian areas, which are not areas targeted for forest product management (RMP Map 52). Potential Ute ladies'-tresses orchid habitats are not expected to experience any effects from forest product management actions. Implementing forest products management actions has *no effect (NE)* on the Ute ladies'-tresses orchid. This determination is based on the absence of forest products management actions occurring in Ute ladies'-tresses orchid potential habitats.

Northern Long-Eared Bat – The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 18% of potential habitat identified by the USFWS overlays BLM administered surface lands in Campbell County; however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. No areas currently identified as forest products management areas (RMP Map 52) overlap areas containing potential habitat for the species. Activities associated with forest products include the sale and harvest of timber through mechanical methods such as cutting. Timber harvest often requires the building of roads that may also remove trees. Actions that open up the canopy of forested areas may improve habitat for the species (USFWS 2014). Increased light penetration may increase some insect taxa and stimulate vegetation growth in the understory (Loeb and Waldrop 2008). Female bats may prefer to roost in stands where the canopy has been opened up (but not clear cut), which may be due to trees located in more open habitat receiving greater solar radiation and therefore speeding development of young bats (USFWS 2013a). If forest product activities are planned in suitable habitat, clearance surveys and seasonal timing limitations would be implemented, as well as identification of important habitat components to be conserved such as live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Specific management is included in the Proposed RMP to utilize forestry tools that may improve and conserve habitat; therefore, implementing forest products management actions *may affect, not likely to adversely affect (NLAA-d)* the species within the planning area. This determination is based on the unlikelihood that activities would occur in suitable habitat within the currently known distribution of the species; no forest management areas are identified within Campbell County.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Forest management on non-federal lands could affect Ute ladies'-tresses orchid and northern long-eared bat potential habitats. Road building in riparian areas, related to forest management, may affect Ute ladies'-tresses orchid potential habitats. Harvesting of timber in occupied habitat could result in habitat loss and fragmentation for long-eared bats.

Lands and Realty

Proposed Management Actions for Lands and Realty

The Proposed RMP proposes the following management actions for lands and realty resources that benefit listed or proposed species:

- Consider land use authorizations (permits, leases, etc.) on a project specific basis consistent with other resource objectives. (L&R-6002)
- Acquire private or state land or interest in land from willing sellers consistent with other resource objectives, on a project specific basis. (L&R-6011)
- Acquire and dispose of land based on all resource values, including but not limited to agricultural potential and water. (L&R-6012)
- Prioritize acquiring land or interests in lands in areas adjacent to large blocks of BLM-administered land before other areas. (L&R-6014)
- Pursue easements accessing public lands that would benefit any resource value. (L&R-6013)

Conservation Measures Specific to Lands and Realty

The following Conservation Measure, identified in BA Section 9, may benefit listed or proposed species and is specific to lands and realty:

- To prevent loss of habitat for the Ute ladies'-tresses orchid, the BLM "shall retain in Federal ownership all habitats essential for the survival and recovery of any listed species, including habitat that was used historically, that has retained its potential to sustain listed species, and is deemed to be essential to their survival." (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)

Impact Analysis and Effects Determination

A summary of the lands and realty program for the planning area can be found in the Buffalo RMP Revision in Section 3.6.2, the *Lands and Realty* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Land disposal and acquisition may impact Ute ladies'-tresses orchid habitats. However, the BLM rarely conveys properties with high resource values, especially those with known Threatened or Endangered species. Land acquisitions and protective withdrawals may benefit the Ute ladies'-tresses orchid by providing conservation measures for Threatened and Endangered species and their habitats. Implementing the lands and realty program *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *discountable effects (NLAA-d)*. This determination is based on low potential for land disposal under BLM management and implementing conservation measures for the Ute ladies'-tresses orchid and its habitats. Land acquisition of potential Ute ladies'-tresses orchid habitats may provide beneficial effects to this species.

Northern Long-Eared Bat – Land disposal and exchanges, are not likely to adversely impact northern long-eared bat habitats. The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 5% of potential habitat identified by the USFWS overlays BLM administered surface lands identified for disposal in Campbell County (RMP Map 54); however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast

Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, occupied habitat that may be affected is extremely limited. Lands identified for disposal that overlap suitable habitat are small parcels adjacent to private lands (RMP Map 54). Although possible, the BLM rarely conveys properties with high resource values, such as those with known special status species habitat. Conversely, land acquisitions and protective withdrawals may provide benefits to the species by acquiring additional land that contains suitable habitat. Implementing management actions for lands and realty resources *may affect, not likely to adversely affect (NLAA-d)* the species within the planning area. Disposal or exchange of lands containing suitable habitat for a proposed species is unlikely, resulting in discountable effects.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Land acquisitions, exchanges, and protective withdrawals have the potential to benefit listed or proposed species. Lands and realty management actions by state, local, or private entities could alter or remove listed or proposed species suitable habitats.

Renewable Energy

Proposed Actions for Renewable Energy

The Proposed RMP proposes the following management actions for renewable energy that benefit listed or proposed species:

- Cooperate with stakeholders to coordinate renewable energy opportunities in accordance with other resource values. (RE-6002)
- Exclude renewable energy development on 352,067 acres in accordance with management outlined in Alternative D: Southern Big Horn Mountains; areas closed to mineral leasing (fluid and solid); areas closed to locatable minerals; areas closed to salable minerals; ROW exclusion areas; areas within 3 miles and visible from historic properties that retain an intact setting; all other areas where surface disturbance is prohibited. (RE-6003)
- Avoid renewable energy development on 374,518 acres in the following areas: Mineral leasing (fluid and solid), NSO, and CSU areas; ROW avoidance areas; areas greater than 3 miles and visible from historic properties that retain an intact setting; all other areas with surface disturbance restrictions. (RE-6004)

Conservation Measure Specific to Renewable Energy Resources

There are no Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and that are specific to renewable energy resource management:

Impact Analysis and Effects Determination

A summary of the renewable energy resources within the planning area can be found in the Buffalo RMP Revision in Section 3.6.3, the *Renewable Energy* section of Chapter 3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Establishment of transmission lines and corridors for renewable energy systems may impact Ute ladies'-tresses orchid habitats. However, the BLM rarely establishes renewable energy projects in areas with high resource values, especially those with known Threatened or Endangered species. Riparian areas have less wind potential than higher

and more open habitats; transmission line siting also tends to avoid riparian areas, and crossings would be perpendicular to minimize riparian disturbance. Implementing the renewable energy actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *discountable effects (NLAA-d)*. This determination is based on low potential for renewable energy projects in suitable Ute ladies'-tresses orchid habitat and implementing conservation measures for the Ute ladies'-tresses orchid and its habitats.

Northern Long-Eared Bat – The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 18% of potential habitat identified by the USFWS overlays BLM administered surface lands in Campbell County; however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, occupied habitat that may be affected is limited. Establishment of transmission lines and corridors for renewable energy systems may cause habitat loss if constructed through forested habitats. Renewable energy projects may adversely impact the species if such actions occur near suitable habitat or in migration corridors. Collision with or barotrauma (injury to the lungs due to a change in air pressure) caused by wind turbines may cause mortality. However, the BLM rarely establishes renewable energy projects in areas with high resource values, such as suitable habitat for special status species, the majority of BLM surface lands that overlap suitable habitat for the species are identified as exclusion or avoidance areas (RMP Map 56), and the wind potential in northern Campbell County is low enough that projects are unlikely to be proposed. Implementing actions associated with renewable energy *may affect, not likely to adversely affect (NLAA-d)* the species within the planning area. Development of renewable energy in or near suitable habitat for a proposed species is unlikely, resulting in discountable effects. This determination is based on the low potential for renewable energy projects to be located in areas occupied by northern long-eared bat, the existing safeguards for protection, and avoidance of special status species habitat.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Renewable energy actions by state, local, or private entities could alter or remove listed or proposed species suitable habitats, or pose direct mortality risks.

Rights-of-Way and Corridors

Proposed Management Actions for Rights-of-Way and Corridors

The Proposed RMP proposes the following management actions for ROW and corridors that benefit listed or proposed species:

- Designate corridors for major ROW to minimize surface disturbance and impacts to other resources. (ROW-6001)
- Provide reasonable access across public land to private land, subject to other resource values. (ROW-6002)
- The preferred location for new ROWs will be in or adjacent to existing disturbed areas associated with existing ROWs, constructed roads, or highways. (ROW-6004)

- Maintain a transportation management system in cooperation with appropriate state and local agencies to meet public and resource management needs. (ROW-6005)
- Make lands available for ROWs in accordance with management identified within Alternative D to conserve other resources. (ROW-6006)
- Designate the following corridors for major ROWs: Echeta Road, Sheridan to Gillette, largely following US 14/16, Highway 59 north of Gillette, Interstate 25, Interstate 90, Gillette to Montana State Line, Powder River, Powder River Breaks (Buffalo to Gillette). Corridor use is required. No above ground lines will be authorized in the Powder River or Powder River Breaks corridors. Lines must be buried within Greater Sage-Grouse Core Population Areas unless within 0.5 mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than 1.0 mile. (ROW-6009)

Conservation Measure Specific to Rights-of-Way and Corridors

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to ROWs and corridors:

- Allow ROWs within areas containing habitat for special status species plants, though not within areas of known populations. (SS Plants-4007)
- In any proposed new access, wetland and riparian areas will be avoided where possible. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- All proposed ROWs projects (powerlines, pipelines, roads, etc.) will be designed and locations selected at least 0.25 miles from any known Ute ladies'-tresses orchid habitat to minimize disturbances. If avoidance of adverse effects is not possible, the BLM will re-initiate consultation with the Service. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Where existing leases or ROWs have had some level of development (road, fence, well, etc.) and are no longer in use, reclaim the site by removing these features and restoring the habitat. (BLM IM 2012-044)
- Where existing leases or ROWs have had some level of development (road, fence, well, etc.) and are no longer in use, reclaim the site by removing these features and restoring the habitat. Within designated priority habitat, reclaim by removing these features and restoring the habitat of these ROW that are no longer in use. (BLM IM 2012-044)
- Place roads outside of riparian areas where possible. (Northeast Wyoming Sage-Grouse Conservation Plan)
- If avoidance is not possible, minimize impacts to riparian, wetland, or wet meadow habitats to limit impacts to brood-rearing areas. (Northeast Wyoming Sage-Grouse Conservation Plan)
- Select sites for construction that will not disturb suitable nest cover or brood-rearing habitats within 3 miles (5 kilometers) of occupied leks, or within identified nesting and brood-rearing habitats outside the 3-mile (5 kilometer) perimeter (Connelly et al. 2000). (Northeast Wyoming Sage-Grouse Conservation Plan)
- Locate any above-ground powerlines off of ridges and out of riparian areas (1,000 ft. (300 m) riparian buffer where feasible). (Northeast Wyoming Sage-Grouse Conservation Plan)

- BLM will avoid destruction/alteration (e.g., fill, cause collapse of) of caves/mines that may support hibernating bats by:
 - Prohibiting woody vegetation or spoil (e.g., soil, rock, etc.) disposal within 100 feet of known hibernacula entrances and associated sinkholes, fissures, or other karst features.
 - When blasting within 0.5 miles of known or presumed occupied hibernacula entrances and passages, BLM will coordinate with the USFWS to ensure that the blasting will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid/minimize alterations of clean drinking water and foraging areas by:
 - Protecting potential recharge areas of cave streams and other karst features that are hydrologically connected to known or assumed hibernacula.
 - Setting back equipment servicing and maintenance areas at least 300 feet away from streambeds, sinkholes, fissures, or areas draining into sinkholes, fissures, or other karst or mine features.
 - Following available standards on spill prevention, containment, and control.
 - Restricting use of herbicides for vegetation management near known or assumed Northern Long-Eared Bat hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands).
 - Implementing strict adherence to sediment and erosion control measures and reclamation standards. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming by not clearing occupied spring staging and fall swarming habitat near known Northern Long-Eared Bat hibernacula during the staging and swarming seasons. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid killing or injuring Northern Long-Eared Bats during tree clearing activities by not clearing occupied maternity colony summer habitat during the summer maternity season. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will minimize other direct effects to Northern Long-Eared Bats by not clearing occupied summer habitat during the time of year when females are pregnant or the pups are incapable of flight. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (Northern Long-Eared Bat Interim Conference and Planning Guidance)
- BLM will avoid/minimize altering clean drinking water and foraging areas by:
 - Implementing sediment and erosion control measures and reclamation standards.
 - Siting equipment servicing and maintenance areas at least 300 feet away from waterbodies (e.g., wetlands, streams). Following available standards on spill prevention, containment, and control. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

- BLM will maintain summer maternity habitat by:
 - Retaining known roost trees, which includes live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
 - Clearly demarcating trees to be protected vs. cut to help ensure that contractors do not accidentally remove more trees than anticipated. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the ROWs and corridors within the planning area can be found in the Buffalo RMP Revision in Section 3.6.4, the *ROW and Corridors* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – New ROW and corridor areas through potential Ute ladies'-tresses orchid habitat are not expected to occur in the planning area. Based on the conservation measures for Ute ladies'-tresses orchid, riparian/wetland habitats would be avoided, thereby minimizing impacts. Existing ROW corridors are the preferred location for ROW grants. These routes or areas are located primarily along existing highways, major pipelines and powerlines, oil fields, and communication sites, which do not typically contain Ute ladies'-tresses orchid habitat. Implementing ROW and corridor management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *discountable effects (NLAA-d)*. This determination is because no Ute ladies'-tresses orchids have been recorded in the planning area, conservation measures are in place, and wetland and riparian areas would be avoided for new construction.

Northern Long-Eared Bat – The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 18% of potential habitat identified by the USFWS overlays BLM administered surface lands in Campbell County; however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, occupied habitat that may be affected is limited. Establishment of new ROW and corridor areas may affect northern long-eared bat, but not to a measurable extent. The BLM rarely establishes new ROW and corridors in areas with high resource values, such as suitable habitat for special status species. Activities resulting from ROW grants include the construction of roads, pipelines, and power lines using heavy equipment. Existing ROW corridors are the preferred location for ROW grants. The construction of roads within established ROWs decreases adverse effects. ROW and corridor activities may adversely affect the species if such actions occur in suitable or occupied habitat during spring and summer months or result in habitat loss; however, the BLM would regulate when construction of facilities could occur, avoiding sensitive time periods. The likelihood that activities would occur in suitable habitat is low due to the scattered land pattern of BLM-administered surface lands, the avoidance areas identified in the RMP (RMP Map 59), and the topography typically associated with forested areas in Campbell County. Burnt Hollow SRMA is identified as an exclusion area, and the majority of Weston Hills SRMA is identified as an avoidance area. Implementing actions associated with ROWs and corridors *may affect, not likely to adversely affect (NLAA-d)* the species within the planning area. Development of powerlines or roads in or near suitable habitat

for the proposed species is unlikely, resulting in discountable effects. This determination is based on the low potential for projects to be located in areas occupied by northern long-eared bat, the existing safeguards for protection, and avoidance of special status species habitat.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. ROW and corridor management on state and private lands may also remove and fragment habitats.

Travel and Transportation Management

Proposed Management Actions for Travel Management

The Proposed RMP proposes the following management actions for comprehensive travel management that benefit listed or proposed species:

- Evaluate roads constructed under other initiatives (e.g., oil and gas exploration) for inclusion in the BLM transportation system. Roads that are no longer needed for their original purposes are assessed for addition to the BLM transportation system prior to reclamation. (Trans-6002)
- Design, construct, and maintain roads or trails based on the specific objectives for that trail or road in consideration of other resources. Design, construct, and maintain roads to minimize surface disturbance, changes to surface water runoff, and erosion. (Trans-6004)
- Maintain transportation system roads under BLM jurisdiction in accordance with assigned maintenance levels and in consideration of other resource values. Maintain administrative roads on an as needed basis, dependent on time, funding, and access priorities. (Trans-6007)
- Restrict motorized travel to signed roads in areas limited to designated roads and trails. (Trans-6010)
- Consider nominations from the public for appropriate OHV use areas, consistent with other resource values. (Trans-6015)
- Prohibit motorized travel on soils if damage to vegetation, soils, or water quality would result. (Trans-6016)
- Allow motorized vehicle use within habitat of special status species consistent with travel management designations for that area. Routes will be designated to avoid occupied habitat. (Trans-6017)
- Limit motorized vehicle use to designated routes within habitat of special status species consistent with travel management designations for that area. Routes will be designated to avoid occupied habitat during travel management planning. (Trans-6019)
- Evaluate existing routes in the vicinity of any new system roads for closure and reclamation consistent with other resource values. (Trans-6020)
- Close areas to motorized vehicle use to protect sensitive resources as defined in the corresponding special designation and resource sections of Alternative D and in addition include: WSAs, Lands with wilderness characteristics, Middle Fork Canyon, Cantonment Reno, Dry Creek Petrified Tree Environmental Education Area (EEA), and a 500-foot buffer of designated nonmotorized trails. (Trans-6021)

- Limit motorized vehicle travel to designated roads and trails, consistent with other resource values in Alternative D. (Trans-6022)
- Allow travel not causing resource damage to go up to 300 feet off designated routes for dispersed camping and game retrieval, consistent with travel management designations in defined areas. (Trans-6025)

Conservation Measure Specific to Travel and Transportation Management

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to travel management:

- In any proposed new access, wetland and riparian areas will be avoided where possible. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- The BLM will limit the use of OHVs to designated roads and trails within 0.5 mile of known Ute ladies'-tresses orchid populations, with no exceptions for the "performance of necessary tasks" other than firefighting and hazardous material cleanup allowed using vehicles off of highways. No OHV competitive events will be allowed within 1.0 mile of known Ute ladies'-tresses orchid populations. Roads that have the potential to impact Ute ladies'-tresses orchid are not required for routine operations or maintenance of developed projects, or lead to abandoned projects will be reclaimed as directed by the Bureau. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- In order to conserve and protect natural areas, planned recreational foot trails are created to control human traffic. The BLM will create programs that will strive to protect the Ute ladies'-tresses habitat and prevent new trails from being constructed within 0.25 miles from known occurrences of the orchid. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Recreational foot trails that may be located adjacent to Ute ladies' tresses plant habitat should be constructed to reduce impacts to this species. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Conduct restoration of roads, primitive roads and trails not designated in travel management plans. This also includes primitive route/roads that were not designated in WSAs and within Lands with Wilderness Characteristics that have been selected for protection. (BLM IM 2012-044)
- Place roads outside of riparian areas where possible. (Northeast Wyoming Sage-Grouse Conservation Plan)
- If avoidance is not possible, minimize impacts to riparian, wetland, or wet meadow habitats to limit impacts to brood-rearing areas. (Northeast Wyoming Sage-Grouse Conservation Plan)
- Select sites for construction that will not disturb suitable nest cover or brood-rearing habitats within 3 miles (5 km) of occupied leks, or within identified nesting and brood-rearing habitats outside the 3-mile (5 km) perimeter (Connelly et al. 2000). (Northeast Wyoming Sage-Grouse Conservation Plan)
- Maintain summer maternity habitat. Avoid/minimize tree clearing that fragments large forested areas or tree lined corridors where possible. For example, route linear features along the edge of a woodlot instead of through the middle of it; use horizontal directional drilling for pipeline

crossings of wooded stream corridors and upland tree lines. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the travel management within the planning area can be found in the Buffalo RMP Revision in Section 3.6.5, the *Travel and Transportation Management* section in Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – No motorized vehicle use is allowed off designated routes within riparian/wetland areas, thereby protecting Ute ladies'-tresses orchid habitat. However, motorized vehicle use on roads and trails adjacent to riparian areas may lead to the spread of invasive species, reducing the suitability of the habitats for the Ute ladies'-tresses orchid. In addition, unauthorized trails in riparian areas and potential stream crossings could adversely impact the Ute ladies'-tresses orchid by altering the habitat. Implementing transportation and access management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *discountable effects (NLAA-d)*. This determination is based on the prohibition of motorized vehicle use in Ute ladies'-tresses orchid habitats and existing conservation measures in place to protect this species.

Northern Long-Eared Bat – The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 18% of potential habitat identified by the USFWS overlays BLM administered surface lands in Campbell County; however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, occupied habitat that may be affected is limited. Establishment of new public roads in areas occupied by the species may contribute to habitat loss and fragmentation, but not to a measurable extent as it is not a foreseeable activity. The suitable habitat in the area is dominated by steep hills and ridges where road construction would be difficult. BLM would be unlikely to propose constructing a public road through occupied special status species habitat. Motorized vehicle use, where authorized, is restricted to designated routes. Surveys and timing limitations associated with construction of new roads will mitigate effects that may occur during the spring and summer. New roads would be designed to avoid occupied habitat, and travel management plans limit travel to designated routes. Closing roads or limiting use could benefit the species by reducing disruptive activities in occupied habitats. Implementing actions associated with travel and transportation management *may affect, not likely to adversely affect (NLAA-i)* the northern long-eared bat. This determination is based on the low potential for projects to be located in areas occupied by the species, the existing safeguards for protection, and avoidance of special status species habitat.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Unauthorized use of motorized vehicles on federal lands could contribute to disturbance of soils, removal of vegetation, and the spread of invasive species. These actions could contribute to degradation of habitats for listed or proposed species.

Recreation

The Proposed RMP proposes the following management actions for recreation resources that benefit listed or proposed species:

- Open the planning area to dispersed recreation where consistent with other resource values. (Rec-6003)
- Avoid riparian habitat or develop and manage recreational sites, recreation facilities, and recreational access in a manner that minimizes impacts to riparian habitats. (Rec-6010)
- Prohibit dispersed camping and commercial camps within 200 feet of perennial surface water. (Rec-6011)
- Allow additional recreation facilities in areas where they are supported by recreational use and are consistent with other resource values. (Rec-6015)
- Divide the planning area into the following ERMA (RMP Map 71): Cabin Canyon ERMA (1,369 acres), Face of the Bighorns/North Fork ERMA (34,477 acres), Gardner Mountain ERMA (55,181 acres), Kaycee Stockrest ERMA (2,685 acres), North Bighorns ERMA (2,926 acres), Powder River Basin ERMA (224,483 acres), Southern Bighorns ERMA (25,535 acres), and Walk-in Area ERMA (3,007 acres). (Rec-6017)
- Designate the following areas as SRMAs and delineate discrete recreation management zone boundaries: Burnt Hollow, Dry Creek Petrified Tree, Middle Fork Powder River, Mosier Gulch, Welch Ranch, Weston Hills, and Hole-in-the-Wall. (Rec-6018)
- Do not lease minerals within the boundary of the following SRMAs: Burnt Hollow, Dry Creek Petrified Tree, Middle Fork Powder River, Mosier Gulch, and Hole-in-the-Wall. Lease fluid minerals with a CSU stipulation to be consistent with SRMA management in the following SRMAs: Weston Hills. (Rec-6019)
- Allow surface disturbance within designated SRMAs for administrative use only, where consistent with other resource values. (Rec-6021)
- Recommend withdrawals from mineral entry under the mining laws in designated SRMAs. (Rec-6022)
- Allow salable mineral development within designated SRMAs for administrative use only. (Rec-6023)

Conservation Measures Specific to Recreation Management

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to recreation management:

- Recreational site development will not be authorized in known Ute ladies'-tresses orchid habitat. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- In order to conserve and protect natural areas, planned recreational foot trails are created to control human traffic. The BLM will create programs that will strive to protect the Ute ladies'-tresses habitat and prevent new trails from being constructed within 0.25 miles from known occurrences of the orchid. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)

- Recreational foot trails that may be located adjacent to Ute ladies'-tresses orchid plant habitat should be constructed to reduce impacts to this species. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- BLM will avoid disturbing/injuring hibernating bats by:
 - Not entering Northern Long-Eared Bat hibernacula during the hibernation season, unless coordinated with the Service for survey, research, or other management purposes.
 - Complying with all cave and mine closures, advisories, and regulations.
 - Avoiding modifying cave or mine entrances that support hibernating bats. If there are safety concerns or concerns about bats (e.g., disturbance, vandalism) at a site, only "bat friendly" cave/mine gates will be installed.
 - BLM will minimize the spread of WNS. If a cave or mine that could harbor hibernating bats must be entered, and it does not have a cave and mine closure policy, BLM follow approved WNS decontamination protocols. Under no circumstances will clothing, footwear, or equipment that was used in a WNS-affected state or region be used. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the recreation management within the planning area can be found in the Buffalo RMP Revision in Section 3.6.6, the *Recreation* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – No known populations of the Ute ladies'-tresses orchid occur near developed or proposed recreational sites (RMP Map 71). Extensive trail systems in riparian areas are not common due to the limited amount of riparian habitat on public surface within the planning area. Ute ladies'-tresses orchid may be indirectly impacted by the spread of invasive species from recreational actions. Invasive species may be spread by hikers and/or their vehicles, degrading potentially suitable Ute ladies'-tresses orchid habitats. Implementing recreational management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *discountable effects (NLAA-d)*. This determination is based on the unlikely event of BLM-authorized actions occurring in Ute ladies'-tresses orchid habitats, the current absence of the species in the planning area, and the conservation strategies implemented if surface-disturbing activities were to occur in suitable habitats.

Northern Long-Eared Bat – The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 18% of potential habitat identified by the USFWS overlays BLM administered surface lands in Campbell County; however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. There are no caves present within Campbell County and therefore no hibernacula habitat. Most BLM surface lands where suitable habitat occurs are inaccessible for recreation by the general public. Under the management actions for recreation, Weston Hills and Burnt Hollow would both be designated as SRMAs (RMP Map 71). Development within these areas would be limited which would benefit the species by reducing

habitat loss, fragmentation and human disturbance. Casual human use in these areas would not be anticipated to affect the bat. Construction of foot or ATV trails may occur using chainsaws or heavy equipment; however, removal of trees in occupied habitat would be prohibited during sensitive periods such as summer roosting. Implementing recreational management actions *may affect, not likely to adversely affect (NLAA-i)* the species in the planning area due to beneficial and insignificant effects. This determination is based on the low potential for recreation to occur in most occupied habitat and the management actions to protect special status species.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Dispersed recreation on non-federal lands may impact listed or proposed species, especially if this action occurs in occupied habitats. However, these types of actions are anticipated to be localized in nature and dispersed throughout the planning area.

Lands with Wilderness Characteristics

Proposed Management Actions for Lands with Wilderness Characteristics

The Proposed RMP proposes the following management actions for Lands with Wilderness Characteristics resources that benefit listed or proposed species:

- Evaluate newly acquired lands, and other parcels meeting the size and naturalness requirements for wilderness characteristics. (LWC-6001)
- Manage Lands with Wilderness Characteristics to emphasize ecosystem health, natural values, and primitive recreational opportunities. (LWC-6002)

Conservation Measures Specific to Lands with Wilderness Characteristics

No conservation measures, identified in BA Section 9, that may benefit listed or proposed species are specific to Lands with Wilderness Characteristics.

Impact Analysis and Effects Determination

A summary of the Lands with Wilderness Characteristics within the planning area can be found in the Buffalo RMP Revision in Section 3.6.7, the *Lands with Wilderness Characteristics* section of Chapter 3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – The Proposed RMP implements special management prescriptions for Lands with Wilderness Characteristics (6,864 acres) along the face of the Big Horn Mountains (RMP Map 74). This area does not contain suitable habitats for Ute ladies'-tresses orchids; therefore, *no effect (NE)* is anticipated to the Ute ladies'-tresses orchid.

Northern Long-Eared Bat – The Proposed RMP implements special management prescriptions for Lands with Wilderness Characteristics (6,864 acres) along the face of the Big Horn Mountains (RMP Map 74). This area is outside the range for the northern long-eared bat; therefore, *no effect (NE)* is anticipated to the species.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Development of Lands with Wilderness Characteristics may have adverse impacts on listed or proposed species if actions take place in occupied habitats.

Livestock Grazing Management

Proposed Management Actions for Livestock Grazing Management

The Buffalo Proposed RMP proposes the following management actions for livestock grazing that benefit listed or proposed species:

- Develop and implement appropriate livestock grazing management actions to achieve the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming*, to provide watershed protection, to improve forage for livestock, forage and habitat for wildlife, and enhance rangeland health. (Grazing-6001)
- Continue to authorize appropriate amounts, kinds, and seasons of use. Grazing leases can adjust forage allocations, either increases or decreases, where supported by monitoring, field observations, rangeland health standards assessment results, or other data. (Grazing-6002)
- Continue implementation of existing Allotment Management Plans (AMPs). Develop and implement new AMPs with grazing lessees and other stakeholders to achieve desired resource goals and objectives. (Grazing-6004)
- Manage livestock grazing to sustain riparian, wetland, mountain mahogany, special status species, or other special habitats. (Grazing-6005)
- Implement strategies that best protect rangeland resources during periods of drought. Cooperate with stakeholders for voluntary adjustments in livestock use. (Grazing-6009)
- Rest prescribed burn areas from livestock grazing prior to treatment when necessary to increase or maintain fuels for burning. (Grazing-6010)
- Restoration treatments may include actions to reduce or eliminate potential grazing impacts to meet regeneration objectives following forest management. (Grazing-6013)
- Manage Category M category allotments to achieve multiple resource health and objectives. (Grazing-6014)
- Develop range improvements in accordance with resource needs and livestock management. (Grazing-6015)
- Conduct baseline inventories. Develop, implement, and monitor AMPs. Base AMP goals/objectives in Category I and M allotments on resource protection and watershed health. (Grazing-6016)
- Allow livestock grazing on all public lands in the resource area except where an evaluation has determined it to be incompatible with other resource uses or values. (Grazing-6017)
- Permanent forage allocations would consider watershed protection, livestock grazing, wildlife habitat, and other resource values. Increases in vegetative production would be allocated for watershed protection first, then for forage and habitat. (Grazing-6018)
- Locate livestock salt or mineral supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands. (Grazing-6019)

- Designate and manage future Resource Reserve allotments as needed. Develop management criteria for the Resource Reserve allotments at the time of designation. (Grazing-6020)
- Provide rest/deferment from livestock grazing following wildfire, prescribed burns, and other vegetative treatments until resource objectives are met. (Grazing-6021)

Conservation Measure Specific to Livestock Grazing Management

The following are Conservation Measures, identified in BA Section 9, that may benefit listed or proposed species and are specific to livestock grazing management:

- Manage livestock grazing to protect special status plant populations (exclosures, timing). (SS Plants-4009)
- The BLM will collaborate with appropriate federal agencies, and the State of Wyoming as contemplated under Governor Executive Order 2013-3, to: (1) develop appropriate conservation objectives; (2) define a framework for evaluating situations where Greater Sage-Grouse conservation objectives are not being achieved on federal land, to determine if a causal relationship exists between improper grazing (by wildlife or livestock) and Greater Sage-Grouse conservation objectives; and (3) identify appropriate site-based action to achieve Greater Sage-Grouse conservation objectives within the framework. (SS WL-4010)
- The BLM will ensure that grazing management practices will restore, maintain, or improve plant communities. Grazing management strategies consider hydrology, physical attributes, and potential for the watershed and the ecological site. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- The BLM will ensure that rangelands are capable of sustaining viable populations and a diversity of native plant and animal species appropriate to the habitat. Habitats that support or could support threatened species, endangered species, species of special concern, or sensitive species will be maintained or enhanced. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- The BLM will ensure that grazing management practices will incorporate the kinds and amounts of use that will restore, maintain, or enhance habitats to assist in the recovery of federally threatened and endangered species or the conservation of federally-listed species of concern and other State-designated special status species. Grazing management practices will maintain existing habitat or facilitate vegetation change toward desired habitats. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Grazing will be intensively managed within known (Ute ladies'-tresses orchid) habitat containing populations from July through September, to allow plants to bloom and go to seed. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- The BLM will ensure the placement of mineral supplements, or new water sources (permanent or temporary), for livestock, wild horses, or wildlife at least one mile from known Ute ladies'-tresses populations. Supplemental feed for livestock or wildlife will not be authorized within one mile of known Ute ladies'-tresses orchid populations. Straw or other feed must be certified weed seed-free. These restrictions are intended to keep free-ranging livestock away from Ute ladies'-tresses populations and potential overgrazing of the areas occupied by the species. Surveys for Ute ladies'-tresses orchid will be conducted in potential Ute ladies'-tresses

habitat prior to livestock operations related construction projects. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)

- The BLM will not increase permitted livestock stocking levels in any allotment with pastures containing known Ute ladies'-tresses populations without consulting with the USFWS. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Livestock grazing, mowing/haying and some burning are specific management tools the BLM may use to maintain favorable habitat conditions for the orchid where feasible. Mowing and grazing, with proper timing and intensity, reduce the native and exotic plant competition for light and possibly for water, space, and nutrients. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)
- Prescribed fire and grazing activities shall be coordinated between biologists, rangeland management specialists, and fire personnel to ensure that no damage occurs to the plant habitat when being used to maintain the habitat for the species. (BLM Wyoming Programmatic Statewide Ute Ladies'-Tresses Orchid BA)
- Work cooperatively with permittees, lessees and other landowners to develop grazing management strategies that integrate both public and private lands into single management units. (BLM IM 2012-044)
- Implement management actions (grazing decisions, AMP/Conservation Plan development, or other agreements) to modify grazing management to meet seasonal sage-grouse habitat requirements (Connelly et al. 2011). (BLM IM 2012-044)
- During drought periods, prioritize evaluating effects of the drought in priority sage-grouse habitat areas relative to their needs for food and cover. Since there is a lag in vegetation recovery following drought (Thurrow and Taylor 1999; Cagney et al. 2010), ensure that post-drought management allows for vegetation recovery that meets sage-grouse needs in priority sage-grouse habitats. (BLM IM 2012-044)
- Any vegetation treatment plan must include pretreatment data on wildlife and habitat condition, establish non-grazing exclosures, and include long-term monitoring where treated areas are monitored for at least three years before grazing returns. Continue monitoring for five years after livestock are returned to the area, and compare to treated, ungrazed exclosures, as well as untreated areas. (BLM IM 2012-044)
- Reduce hot season grazing on riparian and meadow complexes to promote recovery or maintenance of appropriate vegetation and water quality. Utilize fencing/herding techniques or seasonal use or livestock distribution changes to reduce pressure on riparian or wet meadow vegetation used by sage-grouse in the hot season (summer) (Aldridge and Brighman 2002; Crawford et al. 2004; Hagen et al. 2007). (BLM IM 2012-044)
- Avoid grazing and trailing within lekking, nesting, brood-rearing, and winter habitats during periods of the year when these habitats are utilized by sage-grouse. (BLM IM 2012-044)
- Authorize new water development for diversion from spring or seep source only when sage-grouse habitat would benefit from the development. (BLM IM 2012-044)

- Design any new structural range improvements to conserve, enhance, or restore sage-grouse habitat through an improved grazing management system relative to sage-grouse objectives. (BLM IM 2012-044)
- Design all range projects in a manner that minimizes potential for invasive species establishment. Monitor for, and treat invasive species associated with existing range developments (Gelbard and Belnap 2003; Bergquist et al. 2007). (BLM IM 2012-044)
- Locate new livestock management facilities away from crucial breeding, brood-rearing and winter areas; or manage disturbance with seasonal restrictions. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Where good habitat quality exists, maintain current management practices considering plant composition and soil type. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Change mineral supplement and/or watering locations to move domestic livestock to desired areas. However, any change in location of supplement or watering location should consider potential effects to Greater Sage-Grouse habitat. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Grazing use should be adjusted during extended drought periods. Consider transitioning back to pre-drought use when drought conditions have ended. (BLM National Sage-Grouse Habitat Conservation Strategy)
- Where other grazing management options are not achieving, or cannot achieve, the desired objectives, a short-term option may be livestock exclusion. (BLM National Sage-Grouse Habitat Conservation Strategy)
- In general, avoid yearlong and spring-to-fall continuous grazing schemes in sage-grouse habitat. Yearlong and spring-to-fall grazing may be a tool if it is not continued each year. (Northeast Wyoming Sage-Grouse Conservation Plan)
- Where appropriate, implement livestock grazing systems that provide for areas and times of rest or deferment. (Northeast Wyoming Sage-Grouse Conservation Plan)
- Where practicable, avoid heavy utilization of grazed pastures to compensate for rested pastures (a year of rest cannot compensate for a year of excessive use). (NE Wyoming Sage-Grouse Conservation Plan)
- Design grazing systems that provide sage-grouse habitat in riparian areas and around water sources. (Northeast Wyoming Sage-Grouse Conservation Plan)
- Manage stocking rates and rotations to maintain the health and productivity of rangelands for livestock and sage-grouse. Incorporate one of the monitoring programs from the Wyoming Rangeland Monitoring Guide to ensure proper grazing utilization and plant recovery. (Northeast Wyoming Sage-Grouse Conservation Plan)
- In pastures with riparian habitats (assuming riparian vegetation is actively growing), manage livestock grazing to allow herbaceous vegetation recovery. (Northeast Wyoming Sage-Grouse Conservation Plan)
- New spring developments in sage-grouse habitat should be designed to maintain or enhance the free-flowing characteristics of springs and wet meadows with the use of float valves on troughs

or other features where feasible. Spring and wet meadows should be protected from over utilization and trampling by livestock. (Northeast Wyoming Sage-Grouse Conservation Plan)

Impact Analysis and Effects Determination

A summary of the livestock grazing management within the planning area can be found in the Buffalo RMP Revision in Section 3.6.8, the *Livestock Grazing Management* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Livestock grazing in riparian areas could increase soil erosion, stream bank degradation, and the spread of invasive species; however, implementing the *Standards for Healthy Rangelands* will reduce these impacts. Livestock grazing may adversely impact the Ute ladies'-tresses orchid by foraging and trampling individual plants. The USFWS has determined that the foraging and trampling of individual plants by livestock may harm or reduce an individual plant's fitness or survival. Fencing, development of alternative water supplies for livestock, herding, placing feed and mineral supplements away from water sources, and adjusting pasture boundaries and season of use will minimize the impacts to riparian areas. Implementing livestock grazing management actions *may affect, likely to adversely affect (LAA)* the Ute ladies'-tresses orchid. This determination is based on the potential for range management actions to occur within orchid habitat and result in destruction of individuals by grazing or trampling. Livestock grazing in some riparian areas may produce beneficial effects on orchid habitat, however, by reducing competing vegetation.

Northern Long-Eared Bat – The northern long-eared bat has only been positively identified to occur in northeastern Campbell County. Approximately 18% of potential habitat identified by the USFWS overlays BLM administered surface lands in Campbell County; however, based on the distribution maps provided by WYNDD for the species, the likelihood that all of this habitat would be occupied by the species is minimal. WYNDD's predicted occurrence for the species only includes a small portion of forested habitat in northeast Campbell County. Because one individual bat was captured in the Spring Creek area, it is possible that the forested areas in close proximity to that area may also be occupied. Taking this into consideration, occupied habitat that may be affected is limited. Grazing of livestock is not anticipated to have an effect on the species. Bats are likely to utilize water developments near roosting and foraging habitat. The BLM typically discourages placement of water developments on BLM-administered surface due to the majority of lands within allotments typically being privately owned lands. If these developments occur on BLM surface, they will be designed to eliminate mortality risks to wildlife. Stock tanks near suitable habitat would be designed to be easily accessed by bats and equipped with wildlife escape ramps. Additional water sources in occupied habitat may benefit the species. Suitable habitat in the planning area is extremely limited and water developments that pose mortality risks will not occur on BLM-administered surface lands. Therefore, implementing grazing management actions *may affect, not likely to adversely affect (NLAA-i)* on the northern long-eared bat due to insignificant effects. This determination is based on the potential benefits of range improvements and application of protection measures to avoid adverse impacts.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Livestock grazing on private lands may adversely affect listed or proposed species. Grazing in riparian areas could impact stream bank stability, trample vegetation, and increase sedimentation, all of which could adversely impact listed or proposed species that occur in these habitats. Livestock grazing in suitable habitat on non-federal lands could adversely impact these species.

Special Designations - Areas of Critical Environmental Concern

Proposed Management Actions for Areas of Critical Environmental Concern

The Proposed RMP proposes the following protection for ACECs and Other Management Areas that benefit listed or proposed species:

- Designate as appropriate, the following proposed ACECs: Pumpkin Buttes and Welch Ranch. (ACEC-7003)

Conservation Measures Specific to Areas of Critical Environmental Concern

No conservation measures, identified in BA Section 9, that may benefit listed or proposed species are specific to ACECs.

Impact Analysis and Effects Determination

A summary of the ACECs within the planning area can be found in the Buffalo RMP Revision in Section 3.7.1, the *ACEC* section of Chapter 3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Management of ACECs is not anticipated to detrimentally impact Ute ladies'-tresses orchid or their habitats. Management of these areas may have beneficial effects on Ute ladies'-tresses orchid due to access restrictions, limitations on surface disturbance, and management objectives specifically designed to benefit the resources contained within. Implementing ACEC management actions *may affect, not likely to adversely affect* Ute ladies'-tresses orchid due to *beneficial effects (NLAA-b)*. This determination is based on the expansion of the orchid's habitat protection.

Northern Long-Eared Bat – Areas proposed for designation as ACEC (RMP Map 74) do not overlap with suitable habitat for the northern long-eared bat; therefore, *no effect (NE)* is anticipated to the species.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. No actions associated with ACECs on non-federal lands are anticipated to affect listed or proposed species.

Special Designations – Scenic or Back Country Byways

Proposed Management Actions for Scenic or Back Country Byways

The Proposed RMP proposes the following protections for scenic or back country byways that benefit listed or proposed species:

- Manage byways with the objective of encouraging responsible motorized recreational use of the proposed byway, while protecting and displaying the scenic, cultural, geologic, multiple use, and crucial wildlife habitat values that occur in the area. (BCB-7001)

Conservation Measures Specific to Scenic or Back Country Byways

No conservation measures, identified in BA Section 9, that may benefit listed or proposed species are specific to scenic or back country byways.

Impact Analysis and Effects Determination

A summary of the scenic or back country byways within the planning area can be found in the Buffalo RMP Revision in Section 3.7.2, the *Scenic or Back Country Byways* section of Chapter

3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Management of National Back Country Byways is not anticipated to impact Ute ladies'-tresses orchid or their habitats. The Proposed RMP would evaluate roads in coordination with the counties and other stakeholders. Potential routes include Hazelton Road, Slip Road, Trabing/Sussex, Powder River, Rome Hill, and Tipperary/Thompson Road (RMP Map 74). Implementing National Back Country Byways management actions *may affect, not likely to adversely affect* Ute ladies'-tresses orchid due to *beneficial effects (NLAA-b)*. This determination is based on the expansion of Ute ladies'-tresses habitat protection.

Northern Long-Eared Bat – Areas evaluated for scenic or back country byways (RMP Map 74) do not overlap with suitable habitat for the northern long-eared bat; therefore, *no effect (NE)* is anticipated to the species.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. No actions associated with National Back Country Byways on non-federal lands are anticipated to affect listed or proposed species.

Special Designations - Wild and Scenic Rivers

Proposed Management Actions for Wild and Scenic Rivers

The Proposed RMP proposes the following protections for WSRs that benefit listed or proposed species:

- Manage the Middle Fork Powder River in accordance with the Middle Fork Interim Management Plan until Congress acts upon the nomination. (WSR-7001)
- If Congress denies the Middle Fork Powder River WSR nomination, management will continue to retain the free-flowing characteristics and outstanding resource values. (WSR-7003)

Conservation Measure Specific to Wild and Scenic Rivers

The following is a Conservation Measure, identified in BA Section 9, that may benefit listed or proposed species and is specific to WSRs:

- Recreational site development will not be authorized in known Ute ladies'-tresses orchid habitat. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA)

Impact Analysis and Effects Determination

A summary of the WSRs within the planning area can be found in the Buffalo RMP Revision in Section 3.7.3, the *Wild and Scenic Rivers* section of Chapter 3. This summary, the proposed management actions, and above Conservation Measures were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Though the Proposed RMP does implement special management prescriptions for WSRs, Congress is unlikely to act on the nomination; therefore, *no effect (NE)* is anticipated to the Ute ladies'-tresses orchid.

Northern Long-Eared Bat – The Middle Fork Powder River is the only segment that has been nominated for designation as a WSR (RMP Map 75). It does not overlap with suitable habitat for the northern long-eared bat; therefore, *no effect (NE)* is anticipated to the species.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. No actions associated with WSRs on non-federal lands are anticipated to affect listed or proposed species. The eligible river segment, Middle Fork Powder River, is a headwater segment with little non-federal land above it.

Special Designations - Wilderness Study Areas

Proposed Management Actions for Wilderness Study Areas

The Proposed RMP proposes the following protections for WSAs that benefit listed or proposed species:

- If Congress acts on the WSAs (Fortification Creek, Gardner Mountain, North Fork), the RMP will be amended if necessary. (WSA-7001)
- Manage WSAs for the preservation of natural conditions and processes, and to provide opportunities for solitude or a primitive and unconfined type of recreation. (WSA-7002)
- If Congress decides not to designate a WSA as wilderness, manage to emphasize healthy ecosystems, opportunities for solitude, and primitive recreation. (WSA-7003)
- Prohibit all motorized and mechanized equipment within WSAs. (WSA-7004)

Conservation Measure Specific to Wilderness Study Areas

No conservation measures, identified in BA Section 9, that may benefit listed or proposed species are specific to WSAs.

Impact Analysis and Effects Determination

A summary of the WSAs within the planning area can be found in the Buffalo RMP Revision in Section 3.7.4, the *Wilderness Study Areas* section of Chapter 3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Management of WSAs is not anticipated to impact Ute ladies'-tresses orchids or their habitats. The WSA designation is beneficial to the protection of air and watersheds, soil and water quality, ecological stability, plant and animal gene pools, and habitats for wildlife. Management of these areas may have beneficial effects on Ute ladies'-tresses orchids due to access restrictions, limitations on surface disturbance, and management objectives specifically designed to benefit the resources contained within. Implementing WSA management actions will have *no effect (NE)* on Ute ladies'-tresses orchids as habitat does not exist within these areas.

Northern Long-Eared Bat – No areas designated as WSAs (RMP Map 75) overlap with suitable habitat for the northern long-eared bat; therefore, *no effect (NE)* is anticipated to the species.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. No actions associated with WSAs on non-federal lands are anticipated to affect listed or proposed species.

Socioeconomic Resources - Social and Economic

Proposed Management Actions for Social and Economic Resources

The Proposed RMP does not propose management actions for socioeconomic resources that may benefit listed or proposed species.

Conservation Measure Specific to Social and Economic Resources

No conservation measures, identified in BA Section 9, that may benefit listed or proposed species are specific to socioeconomic resources.

Impact Analysis and Effects Determination

A summary of the social and economic resources within the planning area can be found in the Buffalo RMP Revision in Section 3.8.1, the *Social Conditions* and 3.8.2, *Economic Conditions* sections of Chapter 3. This summary was taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Socioeconomic resources are not anticipated to impact Ute ladies'-tresses orchids or their habitats. The Proposed RMP would result in a slight decrease in job opportunities associated with decreased development of oil and gas resources and, therefore, may result in a slight decrease in population, which may benefit listed species. The Proposed RMP would result in some beneficial impacts to air quality, wildlife, and other resources that improve quality of life related to natural characteristics. Implementing socioeconomic resources will have *no effect (NE)* on Ute ladies'-tresses orchids. This determination is based on the lack of specific action in the Proposed RMP related to socioeconomic resources.

Northern Long-Eared Bat – Suitable habitat for northern long-eared bat is limited to small portions of northern Campbell County. Management actions for socioeconomic resources are largely administrative in nature, and are not anticipated to impact the northern long-eared bat or their habitat. The Proposed RMP would result in a slight decrease in job opportunities associated with decreased development of oil and gas resources and, therefore, may result in a slight decrease in population, which may benefit listed species. The Proposed RMP would result in some beneficial impacts to air quality, wildlife, and other resources that improve quality of life related to natural characteristics. Implementing management actions for socioeconomic resources will have *no effect (NE)* on northern long-eared bat.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Housing developments could expand into listed or proposed species habitats. Housing developments could remove, degrade, or fragment habitats for these species.

Socioeconomic Resources – Health and Safety

Proposed Management Actions for Health and Safety

The Proposed RMP proposes the following protections for health and safety resources that benefit listed or proposed species:

- Identify, report, control, and mitigate imminent and potential hazards or threats to human health and/or the environment from hazardous substance releases and physical hazards. (Health-8001)
- Manage the cleanup of hazardous substance and other contaminant spills and releases to reduce human health and/or environmental risk, reclaim and monitor contaminated lands, and carry out emergency response activities. (Health-8002)

- Identify and prioritize abandoned mine sites for reclamation that most affect human health or safety, and the environment. (Health-8003)
- Ensure appropriate review of BLM-authorized activities and the application of effective management controls to minimize hazardous substance and other contaminant spills, releases, and physical hazards. (Health-8005)
- Reduce waste produced by BLM activities and from authorized uses of public lands through waste minimization practices that promote reducing, reusing, recycling, substituting, and other innovative methods of pollution prevention. (Health-8006)
- Identify, monitor, and mitigate hazards to public health and safety from coalbed fires. (Health-8007)

Conservation Measure Specific to Health and Safety

The following is a Conservation Measure, identified in BA Section 9, that may benefit listed or proposed species and is specific to Health and Safety:

- To avoid/minimize alterations of clean drinking water and foraging areas BLM will follow available standards on spill prevention, containment, and control. (Northern Long-Eared Bat Interim Conference and Planning Guidance)

Impact Analysis and Effects Determination

A summary of the health and safety within the planning area can be found in the Buffalo RMP Revision in Section 3.8.3, the *Health and Safety* sections of Chapter 3. This summary and the proposed management actions were taken into consideration for the impact analysis and effects determinations.

Ute Ladies'-Tresses Orchid – Where needed, warning signs and protective fencing would be erected in hazardous waste sites. Typically signage and fencing for health and safety do not take place in riparian habitat, but the construction and maintenance of signs and fencing could conceivably cause disturbance to potential Ute ladies'-tresses orchid habitat. However, these effects will be localized. Additionally, these actions are meant to prevent Ute ladies'-tresses orchid habitat from becoming contaminated. Implementing health and safety management actions *may affect, not likely to adversely affect* the Ute ladies'-tresses orchid due to *discountable effects* (NLAA-d).

Northern Long-Eared Bat – Protection of the environment from hazardous substances would benefit the northern long-eared bat and their habitat. Reclaiming abandoned mines could reduce potential winter habitat for the species; however, no underground mines are presently known to occur in Campbell County, and no hibernacula have been identified in Wyoming. Implementing health and safety management actions *may affect, not likely to adversely affect* (NLAA-d) the species in the planning area due to beneficial and discountable effects. This determination is based on the low potential for health and safety threats to be present in most occupied habitat, the management actions to protect special status species, and the unlikelihood that underground mines are present in Campbell County.

Cumulative Effects – Cumulative effects include future state, tribal, local, or private actions reasonably certain to occur in the planning area. Disposal or an accidental spill of hazardous materials on non-federal land could be detrimental to listed or proposed species if the disposal or spill occurred in or adjacent to their habitats.

I.7. Summary of Cumulative Effects

Cumulative effects are the collective incremental impacts of the Proposed RMP regardless of the entity undertaking the action. Cumulative effects include future state, tribal, local, or private actions that are reasonably certain to occur in the planning area. Future federal actions that are unrelated to the Proposed Plan are not considered because they require separate consultation pursuant to section 7 of the ESA.

Surface-disturbing and other disruptive activities that occur on non-BLM-administered lands are not subject to the restrictions designed to protect wildlife habitat on BLM-administered lands and therefore may increase the cumulative impacts on wildlife habitat. Non-federal actions that may affect listed or proposed species or their habitats in the planning area include:

- Increased residential development may contribute to a reduction of suitable habitat for listed or proposed species through degradation, removal, and fragmentation of habitat, including additional sediment loading of waterways.
- An expanded network of roads on state and private lands will impact listed or proposed species habitat through the fragmentation or direct loss of habitats.
- Fragmentation, loss, or degradation of listed or proposed species habitat due to the infrastructure associated with urban expansion and mineral development including pipelines and powerlines.
- Fragmentation, loss, or degradation of listed or proposed species habitat, and direct mortality threat, due to the infrastructure associated with renewable energy development including wind turbines and distribution lines.
- Spread of invasive species on state and private lands throughout the planning area.
- Actions by private landowners that impact the health of wetland/riparian areas and their performance of critical water quality protection functions, and actions that remove forested habitats.
- Surface-disturbing activities caused by mineral and other development, the construction and maintenance of ROWs, and vegetation treatments (e.g., prescribed burns and mechanical fuels treatments) on state and private lands contribute to short- or long-term losses of vegetation and increased sedimentation.
- Surface disturbance associated with oil and gas development including permanent facilities such as roads and well pads.
- Surface disturbance associated with salable and locatable mineral development that may remove habitat for Threatened and Endangered species.

I.8. Summary of Effects Determinations

Table I.3. Summary of Effects Determinations

Biological Assessment on the Effects of BLM Management Actions Within the Planning Area on Species Listed Under the ESA	Ute Ladies'-Tresses Orchid	Northern Long-Eared Bat
Physical Resources		
Air Quality	NE	NLAA-i
Soil	NLAA-b	NLAA-i
Water	NLAA-d	NLAA-d
Cave and Karst Resources	NE	NE
Mineral Resources		
Mineral Resources – Locatable	NLAA-d	NLAA-d
Leasable Minerals – Coal	LAA	NLAA-i
Leasable Minerals – Oil and Gas	LAA	NLAA-d
Salable	NLAA-d	NLAA-i
Fire and Fuels Management		
Fire and Fuels Management (Wildfire)	NLAA-d	LAA
Fire and Fuels Management (Prescribed Fire)	NLAA-d	NLAA-d
Biological Resources		
Forests and Woodlands	NE	NLAA-i
Grassland and Shrubland Communities	NE	NE
Riparian/Wetland Resources	LAA	NLAA-b
Invasive Species and Pest Management	NLAA-d	NLAA-i
Fish and Wildlife Resources	NLAA-b	NLAA-b
Special Status Species (Plants)	NLAA-b	NE
Special Status Species (Fish and Wildlife)	NLAA-b	NLAA-b
Heritage and Visual Resources		
Cultural Resources	NLAA-d	NLAA-d
Paleontological Resources	NLAA-d	NLAA-d
Visual Resource Management	NLAA-d	NLAA-i
Land Resources		
Forest Products	NE	NLAA-d
Lands and Realty	NLAA-d	NLAA-d
Renewable Energy	NLAA-d	NLAA-d
Rights-of-Way Corridors	NLAA-d	NLAA-d
Travel and Transportation Management	NLAA-d	NLAA-i
Recreation	NLAA-d	NLAA-i
Non-Wilderness Study Area Lands with Wilderness Characteristics	NE	NE
Livestock Grazing Management	LAA	NLAA-i
Special Designations		
ACECs	NLAA-b	NE
National Back Country Byways	NLAA-b	NE
Wild and Scenic Rivers	NE	NE
Wilderness Study Areas	NE	NE
Social and Economic Resources		

Biological Assessment on the Effects of BLM Management Actions Within the Planning Area on Species Listed Under the ESA	Ute Ladies'-Tresses Orchid	Northern Long-Eared Bat
Socioeconomic	NE	NE
Health and Safety	NLAA-d	NLAA-d
NLAA-b-i-d – May affect, not likely to adversely affect due to beneficial, insignificant, or discountable effects LAA – May affect, is likely to adversely affect NE – No effect NLJ – May affect, not likely to jeopardize the continued existence of the species LJ – May affect, likely to jeopardize the continued existence of the species NI – No Impact BLM – Bureau of Land Management ESA – Endangered Species Act ACEC – Area of Critical Environmental Concern		

I.9. Conservation Measures

Implementing the following conservation measures is intended to minimize adverse effects that are likely to result from implementing the management actions identified for the RMP. This section describes (1) proposed protections in the Proposed RMP specific to listed or proposed species conservation, and (2) conservation measures for Buffalo planning area listed or proposed species from other sources. Proposed protections in the Proposed RMP designed for other resources but that also benefit listed or proposed species are identified in Section 6 for the resource for which the protection was designed. The BLM will also consider implementing any appropriate BMPs to further protect the species and its habitat. In the event new populations of the species are discovered, these measures will apply until such time that further investigation and subsequent consultation with the USFWS result in more appropriate management prescriptions.

I.9.1. Proposed Protections under the Proposed RMP

- Implement actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate BMPs and reasonable and prudent measures within BOs for Threatened and/or Endangered plant species. (SS Plants-4001)
- Allow treatments within habitat for special status plant species and within known populations that are proven to benefit the species. (SS Plants-4002)
- Allow the following within habitat for special status plant species, though not within known populations: surface-disturbing activities that could adversely impact special status plant species, mineral exploration and development activities, motor vehicle use, including uses related to fire suppression and geophysical exploration activities (surveying, etc.), use of explosives and blasting, and placement of water developments, salt and mineral supplements. (SS Plants-4003)
- Require predisturbance flowering season surveys for special status plant species prior to approving any project or activity that may impact the habitat for these species as modeled and surveyed by WYNDD and BLM. A mitigation and monitoring plan is to be developed within occupied habitat. (SS Plants-4004)
- Allow aerial application of narrow spectrum herbicide treatments within areas containing special status plant species. (SS Plants-4005)

- Allow the use of fire suppression chemicals, including foaming agents and surfactants, within areas of known special status plant populations where consistent with the biology of the plant or where human safety or property are at risk. (SS Plants-4006)
- Allow ROWs within areas containing habitat for special status species plants, though not within areas of known populations. (SS Plants-4007)
- Apply a CSU stipulation to mineral leases within habitat for special status plant species. Require necessary surveys and establish site specific buffer. Apply an NSO stipulation to fluid mineral leases within known special status plant populations. (SS Plants-4008)
- Manage livestock grazing to protect special status plant populations (exclosures, timing). (SS Plants-4009)
- Prohibit new surface-disturbing activities within 0.25 mile of any waters containing special status fish species unless it benefits the species. Exceptions must demonstrate the proposed impacts cannot be avoided and the proposal is the least environmentally damaging alternative. (SS Fish-4007)
- Apply an NSO stipulation within 0.25 mile of any waters containing special status fish species. (SS Fish-4008)
- Utilize current research, management and conservation plans, and similar related documents to guide special status species habitat management. (SS WL-4001)
- Implement actions set forth in recovery plans, conservation measures, terms and conditions, protection measures, and appropriate BMPs and reasonable and prudent measures within BOs for Threatened and/or Endangered wildlife species, including those specific to this RMP and any future statewide programmatic BOs. (SS WL-4002)
- Maintain (size and quality) or enhance current habitat utilized by special status species. Enlarge/restore habitat on site specific basis. (SS WL-4003)
- Maintain or enhance the integrity of identified special status wildlife species migration corridors. Manage identified special status wildlife species travel corridors consistent with other resource values. (SS WL-4004)
- Locate and manage facilities to mitigate noise impacts on special status species. (SS WL-4005)
- Manage surface-disturbing and disruptive activities to mitigate impacts on special status wildlife species and their habitats. (SS WL-4006)
- Apply a CSU stipulation to mineral leases containing special status species habitat. Surveys required for clearance. (SS WL-4007)
- The BLM will collaborate with appropriate federal agencies, and the State of Wyoming as contemplated under Governor Executive Order 2013-3, to: (1) develop appropriate conservation objectives; (2) define a framework for evaluating situations where Greater Sage-Grouse conservation objectives are not being achieved on federal land, to determine if a causal relationship exists between improper grazing (by wildlife or livestock) and Greater Sage-Grouse conservation objectives; and (3) identify appropriate site-based action to achieve Greater Sage-Grouse conservation objectives within the framework. (SS WL-4010)

- Develop avoidance areas restricting the application of broad-spectrum pesticides in areas containing Greater Sage-Grouse nesting and brood-rearing habitats. (SS WL-4011)
- Restore Greater Sage-Grouse brood-rearing habitats in riparian/wetland areas. Maintain seeps, springs, wet meadows, and riparian vegetation in a functional and diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas. (SS WL-4012)
- Minimize disturbances that would result in alterations to springs and riparian Greater Sage-Grouse habitat. In coordination with stakeholders, develop alternative water sources to replace natural sources that have been affected or destroyed. (SS WL-4014)
- Design and locate fences to reduce impacts to important Greater Sage-Grouse habitat. (SS WL-4017)
- Allow surface disturbance and occupancy within the USFWS recommended biologic buffer zone around active raptor nests when nest productivity would not be harmed. (WL-4027 and SS WL-4030)
- Prohibit surface-disturbing activities potentially disruptive to nesting raptors within USFWS recommended spatial buffers and seasonal dates for active raptor nests. (WL-4029 and SS WL-4029)
- Require surveys for special status amphibian, reptile, and bat species prior to approving any project or activity that may impact the habitat for these species. Habitat includes: caves, mature forest, perennial waters, vernal pools, playas, wetlands, and south-facing rock outcrops. Allow surface-disturbing and disruptive activities within 1,640 feet (500 meters) of caves, mature forest, perennial waters, vernal pools, playas, wetlands, and south facing rock outcrops when special status amphibian, reptile, and bat species populations and habitat can be conserved. (SS WL-4033)
- Require surveys for special status amphibian, reptile, and bat species prior to approving any project or activity that may impact the habitat for these species. Habitat includes: caves, mature forest, perennial waters, vernal pools, playas, wetlands, and south-facing rock outcrops. Apply a CSU stipulation to fluid mineral leases for the protection of special status amphibian, reptile, and bat species and their habitats within 1,640 feet (500 meters) of caves, mature forest, perennial waters, vernal pools, playas, wetlands, and south facing rock outcrops. (SS WL-4034)

I.9.2. Conservation Measures from Other Sources

BLM Wyoming: Statewide Programmatic Biological Assessment: Ute Ladies'-Tresses Orchid (*Spiranthes diluvialis*)

Conservation Measures Committed to by BLM

1. The Wyoming BLM Standard Mitigation Guidelines for Surface Disturbing Activities requires any lessee or permittee to conduct inventories or studies in accordance with BLM and USFWS guidelines to verify the presence or absence of threatened or endangered species before any activities can begin on site. In the event the presence of one or more of these species is verified, the operation plans of a proposed action will be modified to include the protection of the species and its habitat, as necessary. Possible protective measures

may include seasonal or activity limitations, or other surface management and occupancy constraints (BLM 1990).

- Surface disturbance will be prohibited within 500 feet of surface water and/or riparian areas. Exception, waiver, or modification of this limitation may be approved in writing, including documented supporting analysis, by the authorized officer. (Wyoming BLM Mitigation Guidelines for Surface-disturbing and Disruptive Activities). **Note:** this conservation measure was revised from the programmatic BA by adding the second sentence to clarify that exception, waiver, or modifications from the prohibition are possible.
 - NSO will be allowed within special management areas (e.g., known threatened or endangered species habitat) (Wyoming BLM Mitigation Guidelines for Surface-disturbing and Disruptive Activities).
 - Portions of the authorized use area are known or suspected to be essential habitat for threatened or endangered species. Prior to conducting any onsite activities, the lessee/permittee will be required to conduct inventories or studies in accordance with BLM and USFWS guidelines to verify the presence or absence of this species. In the event that an occurrence is identified, the lessee/permittee will be required to modify operational plans to include the protection requirements of this species and its habitat (e.g., seasonal use restrictions, occupancy limitations, facility design modifications) (Wyoming BLM Mitigation Guidelines for Surface-disturbing and Disruptive Activities).
2. Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the Bureau of Land Management in the State of Wyoming, Specifically:
- Standard 1 - Within the potential of the ecological site (soil type, landform, climate, and geology), soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff.

Grazing management practices will restore, maintain, or improve plant communities. Grazing management strategies consider hydrology, physical attributes, and potential for the watershed and the ecological site (BLM Wyoming Guidelines for Livestock Grazing Management).

- Standard 3 - Upland vegetation on each ecological site consists of plant communities appropriate to the site which are resilient, diverse, and able to recover from natural and human disturbance.
- Standard 4 - Rangelands are capable of sustaining viable populations and a diversity of native plant and animal species appropriate to the habitat. Habitats that support or could support threatened species, endangered species, species of special concern, or sensitive species will be maintained or enhanced.

Grazing management practices will incorporate the kinds and amounts of use that will restore, maintain, or enhance habitats to assist in the recovery of federal threatened and endangered species or the conservation of federally-listed species of concern and other state-designated special status species. Grazing management practices will maintain existing habitat or facilitate vegetation change toward desired habitats. Grazing

management will consider threatened and endangered species and their habitats (BLM Wyoming Guidelines for Livestock Grazing Management).

3. The BLM will maintain biological diversity of plant and animal species; support WGFD strategic plan population objective levels to the extent practical and to the extent consistent with BLM multiple use management requirements; maintain, and where possible, improve forage production and quality of rangelands, fisheries, and wildlife habitat; and to the extent possible, provide habitat for threatened and endangered and special status plant and animal species on all public lands in compliance with the ESA and approved recovery plans (Buffalo RMP, p. 33).
4. In any proposed new access, wetland and riparian areas will be avoided where possible (18 CFR 725.2 – Floodplain Management and Protection of Wetlands).
5. Place mineral supplements, new water sources (permanent or temporary), or supplemental feed for livestock for livestock, wild horses, or wildlife at least 1.0 mile from known orchid populations. Hay or other feed and straw must be certified weed-free. These restrictions are intended to keep free-ranging livestock away from populations of the orchid and subsequent grazing on individual orchid plants. Surveys for the orchid will be conducted in potential orchid habitat prior to livestock operations projects. Placement of mineral supplements, straw or other feed for livestock within 1.0 mile of known populations of the orchid will be evaluated and approved by the BLM with concurrence by USFWS and implemented on a case-by-case basis only.
6. The BLM will not increase permitted livestock stocking levels in any allotment with pastures containing known orchid populations without consulting with the USFWS. It is unknown to what extent overall impacts due to livestock grazing have on the orchid, whether it is detrimental due to actual grazing and trampling of plants or beneficial due to livestock removal of adjacent competing vegetation.
7. Grazing will be intensively managed within known habitat containing populations from July through September, to allow plants to bloom and go to seed.
8. Recreational site development will not be authorized in known Ute ladies'-tresses habitat.
9. The Bureau will manage stream habitats to retain, re-create, or mimic natural hydrology, water quality, and related vegetation dynamics. Projects that may alter natural hydrology or water quality, change the vegetation of the riparian ecosystem and cause direct ground disturbance will be evaluated and redesigned to ensure that adverse effects to populations of the orchid do not occur.
10. Biological control of noxious plant species will be prohibited within 1.0 mile from known orchid habitat until the impact of the control agent has been fully evaluated and determined not to adversely affect the plant population. BLM will monitor biological control vectors.
11. Except in cases of extreme ecological health (insect or weed outbreaks/infestations), herbicide treatment of noxious plants/weeds will be prohibited within 0.25 mile of known populations of the Ute ladies'-tresses orchid unless it is a narrow spectrum herbicide that would not harm the Ute ladies'-tresses orchid (herbicides specific to dicots) and insecticide/pesticide treatments will be prohibited within 1.0 mile of known populations of the orchid to protect pollinators.

Where insect or weed outbreaks have the potential to degrade area ecological health inside the buffers listed above, at the discretion of the BLM's authorized officer and with concurrence by the USFWS, the following will apply: where needed, and only on a case-by-case basis, a pesticide use proposal or other site specific plan will address concerns of proper timing, methods of use, and chemicals. Pesticides specific to dicots will be preferred where these are adequate to control the noxious weeds present.

Aerial application of herbicides will be carefully planned to prevent drift in areas near known populations of the orchid (outside of the 0.25 mile buffer). The BLM will work with the Animal and Plant Health Inspection Service (APHIS), the USFWS and County Weed and Pest Agencies to select pesticides and methods of application that will most effectively manage the infestation and least affect the orchid. (BLM Wyoming Statewide Programmatic Ute Ladies'-Tresses Orchid BA) **Note:** The conservation measure was modified from the programmatic BA measure to allow the use of narrow spectrum herbicides when it has been determined that they would not harm the Ute ladies'-tresses orchid.

12. If revegetation projects are conducted within 0.25 miles of known habitat for the orchid, only native species will be selected. This conservation measure will keep non-native species from competing with the orchid.
13. Limit the use of off road vehicles (OHVs) to designated roads and trails within 0.5 mile of known populations of the orchid, with no exceptions for the "performance of necessary tasks" other than firefighting and hazardous material cleanup allowed using vehicles off of highways. No OHV competitive events will be allowed within 1.0 mile of known populations of the orchid. Roads that have the potential to impact the orchid and are not required for routine operations or maintenance of developed projects, or lead to abandoned projects will be reclaimed as directed by the BLM.
14. Apply a COA on all APDs oil and gas wells for sites within 0.25 miles of any known populations of the orchid. This condition will prohibit all authorized surface disturbance and OHV travel from sites containing populations of the orchid. Operations outside of the 0.25 mile buffer of orchid populations, such as "directional drilling" to reach oil or gas resources underneath the orchid's habitat, would be acceptable.
15. For known Ute ladies'-tresses populations, the BLM will place a CSU stipulation prohibiting all surface disturbances on new oil and gas leases, buffering the area within 0.25 miles of known Ute ladies'-tresses populations. For existing oil and gas leases with known Ute ladies'-tresses populations (these would be for newly discovered populations not currently documented), the Bureau will require the COA in conservation measure 14 above including the same 0.25 mile buffer area around those known Ute ladies'-tresses populations.
16. Prohibit the sale and disposal of salable minerals in habitat containing known populations of the orchid (within a 0.25 mile buffer area of known orchid populations), and where possible pursue acquisition of property with known populations of the orchid with salable minerals. The disposal (sale and removal) of salable minerals is a discretionary BLM action and is prohibited within a 0.25 mile buffer area of known populations of the orchid.
17. To prevent loss of habitat for the orchid, the BLM "shall retain in Federal ownership all habitats essential for the survival and recovery of any listed species, including habitat that was used historically, that has retained its potential to sustain listed species, and is deemed to be essential to their survival" (BLM 2001). Prior to any land tenure adjustments in known

habitat for the orchid, the BLM will survey to assess the habitat boundary and retain that area in federal ownership. BLM-administered public lands that contain identified habitat for the orchid will not be exchanged or sold, unless it benefits the species.

18. All proposed ROW projects (powerlines, pipelines, roads, etc.) will be designed and locations selected at least 0.25 miles from any known orchid habitat to minimize disturbances. ROW actions for roads, powerlines, pipelines, etc. will avoid occupied habitat for the orchid. If avoidance of adverse effects is not possible, the Bureau will re-initiate consultation with the Service.
19. All proposed projects will be designed and locations selected to minimize disturbances to known populations of the orchid, and if the avoidance of adverse affects is not possible, the BLM will re-initiate consultation with the USFWS. Projects will not be authorized closer than 0.25 miles from any known populations of the orchid without concurrence of the USFWS and the BLM authorized officer. No ground disturbing construction activities will be authorized within 0.25 miles of any known populations of the orchid during the essential growing season time period (from July to September, the growing, flowering and fruiting stages) to reduce impacts to this species.
20. In order to conserve and protect natural areas, planned recreational foot trails are created to control human traffic. BLM will create programs that will strive to protect the orchid's habitat and prevent new trails from being constructed within 0.25 miles from known occurrences of the orchid.

Best Management Practices

1. When project proposals are received, BLM will initiate coordination with the USFWS at the earliest possible date so that both agencies can advise on project design. This should minimize the need to redesign projects at a later date to include orchid conservation measures, determined as appropriate by the USFWS.
2. The BLM will participate in the development of both, a conservation agreement/assessment strategy and a species specific recovery plan for the orchid in coordination with the USFWS and other agencies as appropriate. Orchid habitat on BLM-administered lands will be monitored to determine if recovery/conservation objectives are being met.
3. The BLM will coordinate with the USFWS, the NRCS, and private landowners to ensure adequate protection for the orchid and its habitat when new activities are proposed, and to work proactively to enhance the survival of the plant.
4. In the event that a new population of the orchid is found, the USFWS Wyoming Field Office (307-772-2374) will be notified within 48 hours of discovery.
5. Livestock grazing, mowing/haying, and some burning are specific management tools that the BLM may use to maintain favorable habitat conditions for the orchid where feasible. Mowing and grazing, with proper timing and intensity, reduce the native and exotic plant competition for light and possibly for water, space and nutrients.
6. Recreational foot trails that may be located adjacent to Ute ladies' tresses plant habitat should be constructed to reduce impacts to this species.

7. To prevent loss of habitat for the orchid, the BLM "shall retain in Federal ownership all habitats essential for the survival and recovery of any listed species, including habitat that was used historically, that has retained its potential to sustain listed species, and is deemed to be essential to their survival" (BLM 2001). Prior to any land tenure adjustments in *potential* orchid habitat, the BLM will survey to assess the potential for the existence of the orchid. While it is difficult to assess whether the orchid was historically present on such sites, the BLM should try and retain in federal ownership all habitats essential for the survival and recovery of the orchid, including habitat that was used historically, that has retained its potential to sustain this listed species, and is deemed to be essential to their survival (BLM 2001). Potential orchid habitat may be used for reintroduction efforts and is important for the recovery and enhancement of the species.
8. Prescribed fire and grazing activities shall be coordinated between biologists, rangeland management specialists, and fire personnel to ensure that no damage occurs to the plant habitat when being used to maintain the habitat for the species.
9. Maintain and restore the dynamics of stream systems, including the movement of streams within their floodplains, which are vital for the life cycle of the orchid. Flow timing, flow quantity, and water table characteristics should be evaluated to ensure that the riparian system is maintained where these plants occur. The Bureau should continue water use in a manner that maintains suitable habitat for the Ute ladies' tresses orchid to benefit the species.
10. Maintain and restore the natural species composition and structural diversity of plant communities in riparian zones and wetlands.
11. For the protection of the orchid and its potential habitat, surface-disturbing activities listed above, should be avoided in the following areas when they occur outside of the protective 0.25 buffer from populations of the orchid: (a) identified 100-year flood plains; (b) areas within 500 feet from perennial waters, springs, wells, and wetlands, and; (c) areas within 100 feet from the inner gorge of ephemeral channels.
12. Form a steering committee to develop and prioritize management practices and assist BLM and USFWS with research projects.
13. Conduct inventories for the orchid in areas with potential habitat.
14. Maintain a database of all searched, inventoried, or monitored orchid sites.
15. Analyze vegetation treatments (mowing, prescribed fire, mechanical treatments, etc.) in known or potential habitat for the orchid to determine impacts to the species.
16. Establish monitoring, biological, ecological, population demographics, and life history studies as funding and staffing allow, such as, monitoring current populations each year for trends, studies regarding identification of pollinators, genetics, life history, effects of pesticides and herbicides, seed viability and germination, and studies regarding monitoring the success of reintroduction efforts. Monitor orchid population sites for invasion by noxious and invasive plant species.
17. Perform monitoring and analysis pertaining to flow timing, flow quantity, and water table characteristics with the goal of ensuring that riparian vegetation, in areas of known and potential habitat for the orchid, is maintained.

18. When possible, collect and bank orchid seeds at local, regional, national, and international arboreta, seed banks, and botanical gardens as insurance against catastrophic events, for use in biological studies, and for possible introduction/reintroduction into potential habitat.
19. Train law enforcement personnel on protections for the orchid and its habitat, its status, and current threats to its existence.
20. Educate resource specialists, rangers, and fire crews about the orchid and its habitat to help with project design for the general area and for fire suppression actions occurring in potential habitat for the orchid and on the habitat characteristics and plant identification for the plant, so that if they encounter the orchid occurring in riparian habitat, they can report it to their office threatened and endangered species specialist.
21. The BLM should work towards developing reintroduction sites in coordination with the USFWS and to maintain the integrity of these sites for the survival of the orchid. The objective would be to reintroduce populations of the orchid into areas of historic occurrence and introduce new populations in suitable habitat within the plant's historic range.
22. Develop propagation techniques and use them to reintroduce/introduce the orchid and to repopulate known populations in the event population recovery becomes necessary.

USFWS Programmatic Biological Opinion (USFWS 2007)

1. In known occupied Ute ladies'-tresses habitat, the Service recommends that the Bureau use management actions that are compatible with protection and conservation of pollinators of the Ute ladies'-tresses orchid.
2. The Service recommends that the Bureau monitor and manage invasive species so these do not impact the Ute ladies'-tresses orchid or its habitat.
3. The Service recommends that the Bureau not authorize herbicide use in known or occupied Ute ladies'-tresses habitat without prior review by Service biologists.

BLM National Greater Sage-Grouse Land Use Planning Strategy (BLM IM 2012-044) (BLM 2012b)

Lands and Realty

- Where existing leases or ROWs have had some level of development (road, fence, well, etc.) and are no longer in use, reclaim the site by removing these features and restoring the habitat. Within designated priority habitat, reclaim by removing these features and restoring the habitat of these ROW that are no longer in use.

Vegetation Management

- Design post restoration management to ensure long term persistence. This could include changes to livestock grazing management and travel management, etc., to achieve and maintain the desired condition of the restoration effort that benefits sage-grouse (Eiswerth and Shonkwiler 2006).
- Consider potential changes in climate (Miller et al. 2011) when proposing restoration seedings using native plants. Consider collection from warmer component of the species current range when selecting native species (Kramer and Havens 2009).

Livestock Grazing Management

- Work cooperatively with permittees, lessees and other landowners to develop grazing management strategies that integrate both public and private lands into single management units.
- Implement management actions (grazing decisions, AMP/Conservation Plan development, or other agreements) to modify grazing management to meet seasonal sage-grouse habitat requirements (Connelly et al. 2011). Consider singly, or in combination, changes in:
 1. Season or timing of use;
 2. Number of livestock (includes temporary non-use or livestock removal);
 3. Distribution of livestock use;
 4. Intensity of use; and
 5. Type of livestock (e.g., cattle, sheep, horses, llamas, yaks, alpacas and goats) (Briske et al. 2011).
- During drought periods, prioritize evaluating effects of the drought in priority sage-grouse habitat areas relative to their needs for food and cover. Since there is a lag in vegetation recovery following drought (Thurrow and Taylor 1999; Cagney et al. 2010), ensure that post-drought management allows for vegetation recovery that meets sage-grouse needs in priority sage-grouse habitats.
- Reduce hot season grazing on riparian and meadow complexes to promote recovery or maintenance of appropriate vegetation and water quality. Utilize fencing/herding techniques or seasonal use or livestock distribution changes to reduce pressure on riparian or wet meadow vegetation used by sage-grouse in the hot season (summer) (Aldridge and Brigham 2002; Crawford et al. 2004; Hagen et al. 2007).
- Avoid grazing and trailing within lekking, nesting, brood-rearing, and winter habitats during periods of the year when these habitats are utilized by sage-grouse.
- Authorize new water development for diversion from spring or seep source only when sage-grouse habitat would benefit from the development. This includes developing new water sources for livestock as part of an AMP/conservation plan to improve sage-grouse habitat.
- Design any new structural range improvements to conserve, enhance, or restore sage-grouse habitat through an improved grazing management system relative to sage-grouse objectives. Structural range improvements, in this context, include but are not limited to: cattleguards, fences, enclosures, corrals or other livestock handling structures; pipelines, troughs, storage tanks (including moveable tanks used in livestock water hauling), windmills, ponds/reservoirs, solar panels and spring developments.
- Design all range projects in a manner that minimizes potential for invasive species establishment. Monitor for, and treat invasive species associated with existing range developments (Gelbard and Belnap 2003; Bergquist et al. 2007).
- Any vegetation treatment plan must include pretreatment data on wildlife and habitat condition, establish non-grazing exclosures, and include long-term monitoring where treated areas are

monitored for at least three years before grazing returns. Continue monitoring for five years after livestock are returned to the area, and compare to treated, ungrazed exclosures, as well as untreated areas.

BLM National Sage-Grouse Habitat Conservation Strategy's Suggested Management Practices (BLM 2004)

- Reduce habitat loss associated with mineral exploration and development by consolidating facilities as much as possible. The possibility of burying utility and flow lines beneath or along roads, centralizing tank batteries, and drilling multiple wells from a single location should be considered.
- Design and construct mineral exploration and development operations so as to disturb the smallest footprint practical on the landscape while meeting all safety requirements. Where feasible, consider mowing of parking and storage areas on portions of oil and gas well drilling locations rather than stripping the topsoil and vegetation from the entire location, and the use of two-track trails to conduct exploration activities. Minimize traffic by limiting public vehicular access in new development areas, use remote monitoring of production facilities, encourage car-pooling and the use of buses, and encourage operator-enforced speed limits to reduce dust, noise, and potential collisions with Greater Sage-Grouse so as to reduce habitat impacts. Consider using stakeless geophysical exploration activities to reduce vehicle traffic in sagebrush habitat.
- Plan and construct mining and mineral development activities, to the degree possible given State water rights, to minimize disturbances that would result in alterations to springs and riparian habitat. Greater Sage-Grouse can be impacted by the loss of surface water. Alternative water sources should be developed to replace natural sources that have been negatively affected or destroyed during these development activities. Water storage impoundments should be designed to avoid or minimize loss or degradation of Greater Sage-Grouse habitat. Water storage impoundments should be monitored and treated to prevent mosquito breeding (and the associated spread of West Nile Virus). Evaporation, reserve, work over, and production pits should also be designed with adequate fencing/netting or other protective features to reduce mortality of Greater Sage-Grouse due to drowning or entrapment.
- Steps such as recontouring, resspreading topsoil, revegetating all disturbed areas not needed for well or mine production, including cuts, fills, borrow ditches, and well pads up to the production facilities are suggested. Additionally, allowing room for the setup of work over rigs, and allowing future setup and parking on the top of new vegetation will minimize the need for future disturbances. The use of native species of shrubs, forbs, and grasses in seed mixes appropriate for each ecological site will also enhance habitat value or Greater Sage-Grouse.
- Evaluate (e.g., monitor) burned areas for up to three years post-fire and continue management restrictions until the recovering or seeded plant community reflects the desired condition.
- Reclaim unnecessary or redundant roads and facilities by removing surfacing material, reestablishing the original contour, spreading topsoil, and seeding to restore habitat.
- Encourage vegetative restoration along roads, ROWs, on well pads, and at existing facilities where habitat needs for Greater Sage-Grouse are not currently met.

- Place new roads where construction activity and use is concentrated and does not impact critical areas such as leks, nesting, early brood-rearing, winter habitat, riparian areas, springs and wetlands.
- Require successful seeding of appropriate vegetation on any new disturbance associated with mineral and energy facility developments, livestock management facilities, and recreation facilities.
- Restore small areas dominated by invasive species with desirable vegetation to minimize fragmentation of habitat.
- Where good habitat quality exists, maintain current management practices considering plant composition and soil type.
- Change mineral supplement and/or watering locations to move domestic livestock to desired areas. However, any change in location of supplement or watering location should consider potential effects to Greater Sage-Grouse habitat.
- Maintain seeps, springs, wet meadows, and riparian vegetation in a functional and diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas. Consider fencing if vegetation associated with these wet areas cannot be maintained with current livestock or wildlife use and the impacts of the fence are outweighed by the improved habitat quality.
- Grazing use should be adjusted during extended drought periods. Consider transitioning back to pre-drought use when drought conditions have ended.
- Where other grazing management options are not achieving, or cannot achieve, the desired objectives, a short-term option may be livestock exclusion.
- Restore lost riparian and wetland plant species diversity and structure by replanting appropriate species near crucial Greater Sage-Grouse habitat.
- Treatments should be designed to improve a deficient condition within the community (e.g., poor cover of herbaceous understory).

Northeast Wyoming Sage-Grouse Conservation Plan (NWSGLWG 2006)

- Roads
 - Place roads outside of riparian areas where possible.
 - If avoidance is not possible, minimize impacts to riparian, wetland, or wet meadow habitats to limit impacts to brood rearing areas. (exploration, drilling, production and operations).
 - Select sites for construction that will not disturb suitable nest cover or brood-rearing habitats within 3 miles (5 kilometers) of occupied leks, or within identified nesting and brood-rearing habitats outside the 3-mile (5 kilometer) perimeter (Connelly et al. 2000).
- Powerlines

- Select sites for construction that will not disturb suitable nest cover and brood-rearing habitats within 3 miles (Connelly et al. 2000) of a lek.
- Locate any above-ground powerlines off of ridges and out of riparian areas (1,000 feet (300 meter) riparian buffer where feasible).
- General Mineral Development
 - Avoid surface and sub-surface water depletion that impacts sage-grouse habitats.
- Livestock Grazing Management
 - In general, avoid yearlong and spring-to-fall continuous grazing schemes in sage-grouse habitat. Yearlong and spring-to-fall grazing may be a tool if it is not continued each year.
 - Where appropriate, implement livestock grazing systems that provide for areas and times of rest or deferment.
 - Where practicable, avoid heavy utilization of grazed pastures to compensate for rested pastures (a year of rest cannot compensate for a year of excessive use).
 - Design grazing systems that provide sage-grouse habitat in riparian areas and around water sources.
 - Manage stocking rates and rotations to maintain the health and productivity of rangelands for livestock and sage-grouse. Incorporate one of the monitoring programs from the Wyoming Rangeland Monitoring Guide to ensure proper grazing utilization and plant recovery.
 - In pastures with riparian habitats (assuming riparian vegetation is actively growing), manage livestock grazing to allow herbaceous vegetation recovery.
 - New spring developments in sage-grouse habitat should be designed to maintain or enhance the free-flowing characteristics of springs and wet meadows with the use of float valves on troughs or other features where feasible. Spring and wet meadows should be protected from over utilization and trampling by livestock.

Northern Long-Eared Bat Interim Conference and Planning Guidance (USFWS 2014)

Measures that BLM is willing to fully commit to have been re-worded to reflect the BLM's commitment; and the measures have been re-ordered placing the committed conservation measures above the recommended best management practices.

Hibernacula, Spring Staging and Fall Swarming Habitat (Oct 1 - May 14):

Conservation Measures

- BLM will take actions to protect Northern Long-Eared Bat hibernacula. Where a known Northern Long-Eared Bat hibernaculum is experiencing threats, BLM work with the USFWS and other partners to provide the necessary protections (e.g., limit human disturbance, install bat-friendly gates, ensure the use of “clean” clothing and gear).
- BLM will participate in actions to manage and reduce the impacts of WNS on Northern Long-Eared Bats. A national plan was prepared by the USFWS and other state and federal agencies that details actions needed to investigate and manage WNS.

- BLM will avoid disturbing/injuring hibernating bats by:
 - Not entering Northern Long-Eared Bat hibernacula during the hibernation season, unless coordinated with the Service for survey, research, or other management purposes.
 - Complying with all cave and mine closures, advisories, and regulations.
 - Avoiding planned fire or other sources of smoke within 0.25 mile of known Northern Long-Eared Bat during hibernation season, or coordinate with the USFWS.
- BLM will avoid destruction/alteration (e.g., fill, cause collapse of) of caves/mines that may support hibernating bats by:
 - Prohibiting woody vegetation or spoil (e.g., soil, rock, etc.) disposal within 100 feet of known hibernacula entrances and associated sinkholes, fissures, or other karst features.
 - When blasting within 0.5 miles of known or presumed known or presumed occupied hibernacula entrances and passages, BLM will coordinate with the USFWS to ensure that the blasting will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula.
 - When drilling or hydraulic fracturing within 0.5 miles of a known or presumed occupied hibernacula entrances and passages, BLM will coordinate with the USFWS to ensure that the drilling will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula.
 - Avoiding modifying cave or mine entrances that support hibernating bats. If there are safety concerns or concerns about bats (e.g., disturbance, vandalism) at a site, only "bat friendly" cave/mine gates will be installed.
- BLM will avoid/minimize alterations of clean drinking water and foraging areas by:
 - Protecting potential recharge areas of cave streams and other karst features that are hydrologically connected to known or assumed hibernacula.
 - Setting back equipment servicing and maintenance areas at least 300 feet away from streambeds, sinkholes, fissures, or areas draining into sinkholes, fissures, or other karst or mine features.
 - Following available standards on spill prevention, containment, and control.
 - Restricting use of herbicides for vegetation management near known or assumed Northern Long-Eared Bat hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands).
 - Implement strict adherence to sediment and erosion control measures and reclamation standards.
- BLM will avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming by:

- not clearing occupied spring staging and fall swarming habitat near known Northern Long-Eared Bat hibernacula during the staging and swarming seasons. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
- avoiding planned fire or other sources of smoke in known Northern Long-Eared Bat habitat during the swarming/staging or hibernation season, or coordinate with the USFWS.
- BLM will minimize the spread of WNS. If a cave or mine that could harbor hibernating bats must be entered, and it does not have a cave and mine closure policy, BLM follow approved WNS decontamination protocols. Under no circumstances will clothing, footwear, or equipment that was used in a WNS-affected state or region be used.

Best Management Practices

- Avoid disturbing/killing/injuring Northern Long-Eared Bats during spring staging/fall swarming by:
 - Avoid clearing suitable spring staging and fall swarming habitat within 5.0 miles of known Northern Long-Eared Bat hibernacula during the staging and swarming seasons.
 - Activities involving continuing (i.e., longer than 24 hours) noise disturbances greater than 75 decibels measured on the A scale (e.g., loud machinery) within a five-mile radius of known hibernacula would be avoided during the spring staging and fall swarming seasons.
 - During spring staging and fall swarming, use tanks to store waste fluids to ensure no loss of bats by entrapment in waste pits within 5 miles of known or presumed hibernacula.
 - Operate wind turbines during periods (e.g., months, hours, wind speeds) when Northern Long-Eared Bat activity is unlikely.
- Maintain spring staging/fall swarming forested habitat within 5.0 miles of known Northern Long-Eared Bat hibernacula.
 - Retain snags, dead/dying trees, and trees with exfoliating (loose) bark ≥ 3 -inch diameter at breast height in areas \leq one mile from water.
 - Minimize impacts to all forest patches.
 - Maintain forest patches and forested connections (e.g., hedgerows, riparian corridors) between patches.
 - Maintain natural vegetation between forest patches/connections and developed areas.

Summer Habitat (May 15 - Sep 30):

Conservation Measures

- BLM will determine where Northern Long-Eared Bats occur in the summer.
 - Coordinate with partners to gather and evaluate Northern Long-Eared Bat location information.
 - Review both positive and negative data (e.g., acoustic transect surveys).

- BLM will take actions to protect Northern Long-Eared Bats and their habitat within known Northern Long-Eared Bat home ranges.
- BLM will avoid killing or injuring Northern Long-Eared Bats during tree clearing activities by not clearing occupied maternity colony summer habitat during the summer maternity season. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
- BLM will minimize other direct effects to Northern Long-Eared Bats by not clearing occupied summer habitat during the time of year when females are pregnant or the pups are incapable of flight. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
- BLM will not conduct planned fire within occupied summer habitat during the time of year when females are pregnant or the pups are incapable of flight. Surveys will be conducted to determine occupancy prior to any tree clearing activities. (fire only)
- BLM will avoid/minimize altering clean drinking water and foraging areas by:
 - Implementing sediment and erosion control measures and reclamation standards.
 - Siting equipment servicing and maintenance areas at least 300 feet away from waterbodies (e.g., wetlands, streams). Following available standards on spill prevention, containment, and control.
- BLM will maintain summer maternity habitat by:
 - Retaining known roost trees, which includes live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Surveys will be conducted to determine occupancy prior to any tree clearing activities.
 - Clearly demarcating trees to be protected vs. cut to help ensure that contractors do not accidentally remove more trees than anticipated.

Best Management Practices

- Determine where Northern Long-Eared Bats occur in the summer by performing baseline bat surveys.
- BLM will minimize direct effects by:
 - During prescribed burns, where the proposed perimeter fire line is constructed by hand, construct it at least two tree-lengths away from any known habitat, or potential roost trees that have been identified. If such trees are adjacent to a fixed part of the fire line such as the road, a trail, or the river, they will have fire line constructed around the bases, so long as their remaining in place does not jeopardize firefighter safety.
 - Whenever possible, conduct prescribed burns outside of the summer maternity season. Burns conducted during the summer maternity season should be low/moderate intensity to minimize direct impacts to Northern Long-Eared Bats.
 - Fire-effects monitoring should be used before, during, and after the burns to ensure that burning conditions and effects are within the desired ranges.
 - Use tanks to store waste fluids to ensure no loss of bats by entrapment in waste pits.

- Avoid conducting construction activities after sunset in known or suitable summer habitat to avoid harassment of foraging Northern Long-Eared Bats.
- Operate wind turbines during periods (e.g., months, hours, wind speeds) when Northern Long-Eared Bat activity is unlikely.
- BLM will avoid/minimize altering clean drinking water and foraging areas by:
 - Minimizing use of herbicides and pesticides. If necessary, spot treatment is preferred over aerial application.
 - Minimizing use of chemicals in/around storm water detention basins.
 - Minimizing potential lighting impacts (e.g., reduce the number of lights, use motion sensors, use shields/full cut-off lens, angle lights downward and away from forest).
 - Contaminants, including but not limited to oils and solvents, would be controlled so the quality, quantity, and timing of prey resources are not affected.
 - Avoiding filling, channelizing, or degrading streams, wetlands, and other watering areas where possible.
- BLM will maintain summer maternity habitat by:
 - Retaining and avoiding potential roost trees, which includes live or dead trees and snags ≥ 3 inches diameter at breast height that have exfoliating bark, cracks, crevices, or cavities. Not removing trees surrounding potential roosts to maintain the microclimate.
 - Where possible and not a safety hazard, leaving dead or dying trees standing.
 - Avoiding reducing the suitability of forest patches with known Northern Long-Eared Bat use.
 - Maintaining or improving forest patches.
 - Avoiding/minimizing tree clearing that fragments large forested areas or tree lined corridors. For example, routing linear features along the edge of a woodlot instead of through the middle of it; using horizontal directional drilling for pipeline crossings of wooded stream corridors and upland tree lines.

A Conservation Plan for Bats in Wyoming (Hester and Grenier 2005)

Measures that BLM is willing to fully commit to have been re-worded to reflect the BLM's commitment; and the measures have been re-ordered placing the committed conservation measures above the recommended best management practices.

Conservation Measures

- BLM, in cooperation with the State of Wyoming and/or the Service, will implement inventory and monitoring to determine population status and habitat requirements, as additional information is necessary to guide management actions.
- BLM will manage BLM administered lands where *Myotis septentrionalis* occurs in such a way that provides adequate roosting and foraging habitat to maintain stable populations (that is, secure roosting sites; diverse, native foraging habitat; and uncontaminated water sources).

- BLM will not harvest timber in areas close to occupied roosting sites during the maternity roosting period (Schmidt 2003). Surveys will be conducted to determine occupancy prior to any tree harvest activities. Patch cuts and selective harvesting will be utilized to provide regenerating forest and retain large-diameter snags (Lacki and Schwierjohann 2001).
- BLM will evaluate and where appropriate require BMPs for natural caves and abandoned mines in areas where *Myotis septentrionalis* roosts.

Best Management Practices

- Retain all large-diameter snags, particularly those greater than 21 cm (8 in) diameter at breast height (Schmidt 2003), as potential roost sites for *Myotis septentrionalis* and other snag-dependent species. Provide large-diameter snags in early states of decay, particularly snags with large amounts of exfoliating bark (Lacki and Schwierjohann 2001). Retain mature and decadent trees for future snag production, particularly where existing snags are few. Because the northern myotis switches tree roosts frequently and may need several suitable roosts over the course of a summer (Foster and Kurta 1999; Caceres and Barclay 2000), retain all snags in areas where bats are known to roost.
- Implement BMPs for natural caves and abandoned mines in areas where *Myotis septentrionalis* roosts.
- Avoid or minimize pesticide use in areas where the *Myotis septentrionalis* is known to occur to avoid direct poisoning and to maintain a food source for this species and other insectivores. Where possible, allow insect outbreaks to proceed naturally.

Bureau of Land Management White-nose Syndrome Interim Response Strategy (Washington Office Instruction Memorandum No. 2010-181 [BLM 2010d])

- BLM will coordinate and conduct outreach with appropriate internal and external stakeholders to prevent or contain the spread of WNS.
- BLM will identify caves and abandoned mine features with important bat resources (refer to all three attachments for more detail).
- BLM will follow the Containment and Decontamination Procedures for Bureau of Land Management Administered Lands to Minimize the Spread of White-Nose Syndrome in Caves and Abandoned Mines August 5, 2010 outlined in WO IM No. 2010-181.
- BLM will participate in interagency groups to develop state WNS response plans.
- BLM will recommend locations to test for the presence of WNS at a subset of the sites that have been identified as having important bat resources and support WNS research efforts where practicable and feasible within budgetary constraints.

A Strategic Plan for White-nose Syndrome in Wyoming (Abel and Grenier 2011)

- BLM will coordinate with the State of Wyoming and the Service to implement Wyoming's strategic plan for WNS prevention, and continue to work with the WGFD and other stakeholders in minimizing the risk of WNS spread into Wyoming.

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Appendix J. Mitigation Guidelines for Surface-Disturbing and Disruptive Activities, Wyoming Bureau of Land Management

J.1. Introduction

Wyoming Mitigation Guidelines are a compilation of practices employed by Bureau of Land Management (BLM) to mitigate impacts from surface disturbance. They apply to activities such as road or pipeline construction, range improvements, and permitted recreation activities. The guidelines are designed to protect resources such as soils and vegetation, wildlife habitat, and cultural or historic properties. The guidelines are presented as an appendix of the Resource Management Plan (RMP) and Environmental Impact Statement (EIS) for easy reference as they apply to many resources and derive from many laws. All BLM RMPs have included these guidelines as appendices. Public comment on the guidelines, per se, has not been requested. The guidelines are not land use decisions; rather they are examples of mitigation measures that could be applied, as appropriate, based on site-specific National Environmental Policy Act (NEPA) analysis for individual proposals. Comment on the use and application of specific mitigation measures can be made during the NEPA process for individual proposals. Because mitigation measures change or are modified, based on new information, the guidelines are updated periodically for all field offices in Wyoming.

These guidelines are primarily for the purpose of attaining statewide consistency in how requirements are determined for avoiding and mitigating environmental impacts and resource and land use conflicts. Consistency in this sense does not mean that identical requirements would be applied for all similar types of land use activities that may cause similar types of impacts. Nor does it mean that the requirements or guidelines for a single land use activity would be identical in all areas.

There are two ways the mitigation guidelines are used in the RMP and EIS process: (1) as part of the planning criteria in developing the RMP alternatives; and (2) in the analytical processes of both developing the alternatives and analyzing the impacts of the alternatives. In the first case, an assumption is made that any one or more of the mitigations will be appropriately included as conditions of relevant actions being proposed or considered in each alternative. In the second case, the mitigations are used (1) to develop a baseline for measuring and comparing impacts among the alternatives; (2) to identify other actions and alternatives that should be considered; and (3) to help determine whether more stringent or less stringent mitigations should be considered.

The EIS for the RMP does not decide or dictate the exact wording or inclusion of these guidelines. Rather, the guidelines are used in the RMP and EIS process as a tool to help develop the RMP alternatives and to provide a baseline for comparative impact analysis in arriving at RMP decisions. These guidelines will be used in the same manner in analyzing activity plans and other site-specific proposals. These guidelines and their wording are matters of policy. As such, specific wording is subject to change primarily through administrative review, not through the RMP and EIS process. Any further changes that may be made in the continuing refinement of

*Appendix J Mitigation Guidelines for
Surface-Disturbing and Disruptive Activities,
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these guidelines and any development of program-specific standard stipulations will be handled in another forum, including appropriate public involvement and input.

J.1.1. Purpose

The purposes of the “Wyoming BLM Mitigation Guidelines” are (1) to reserve, for the BLM, the right to modify the operations of all surface and other human presence disturbance activities as part of the statutory requirements for environmental protection; and (2) to inform a potential lessee, permittee, or operator of the requirements that must be met when using BLM-administered public lands. These guidelines have been written in a format that will allow for (1) their direct use as stipulations, and (2) the addition of specific or specialized mitigation following the submission of a detailed plan of development or other project proposal, and an environmental analysis.

Those resource activities or programs currently without a standardized set of permit or operation stipulations can use the mitigation guidelines as stipulations or as conditions of approval, or as a baseline for developing specific stipulations for a given activity or program.

Because use of the mitigation guidelines was integrated into the RMP EIS process and will be integrated into the site-specific environmental analysis process, the application of stipulations or mitigation requirements derived through the guidelines will provide more consistency with planning decisions and plan implementation than has occurred in the past. Application of the mitigation guidelines to all surface and other human presence disturbance activities concerning BLM-administered public lands and resources will provide more uniformity in mitigation than has occurred in the past.

J.2. Mitigation Guidelines

J.2.1. Surface Disturbance Mitigation Guideline

Surface disturbance will be prohibited in any of the following areas or conditions. Exception, waiver, or modification of this limitation may be approved in writing, including documented supporting analysis, by the authorized officer.

- Slopes in excess of 25 percent.
- Within important scenic areas (Class I and II Visual Resource Management Areas).
- Within 500 feet of surface water and/or riparian areas.
- Within either 0.25 mile or the visual horizon (whichever is closer) of historic trails.
- Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur.

Guidance

The intent of the Surface Disturbance Mitigation Guideline is to inform interested parties (potential lessees, permittees, or operators) that when one or more of the five conditions exist, surface-disturbing activities will be prohibited unless or until a permittee or his designated representative and the surface management agency arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development.

Specific criteria (e.g., 500 feet from water) have been established based upon the best information available. However, such items as geographical areas and seasons must be delineated at the field level. Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, and applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

J.2.2. Wildlife Mitigation Guideline

When a proposed discretionary land use has potential for affecting wildlife or their habitat, mitigation will be considered. BLM will consult with the U.S. Fish and Wildlife Service (USFWS) on any proposals that may affect Endangered Species Act (ESA) listed, proposed, or candidate species.

Guidance

The Wildlife Mitigation Guideline is intended to provide two basic types of protection: seasonal restriction and prohibition of activities or surface use. Legal descriptions will ultimately be required when applying mitigation and should be measurable and legally definable. There are no minimum subdivision requirements at this time. The area delineated can and should be defined as necessary, based upon current biological data, prior to the time of processing an application and issuing the use authorization. The legal description must eventually become a part of the condition for approval of the permit, plan of development, and/or other use authorization.

Seasonal restrictions protect wildlife during sensitive times of the year such as during the winter when many species are stressed and the spring when most species are bearing and rearing young.

The prohibition of activity or surface use, is intended for protection of specific wildlife habitat areas or values within the use area that cannot be protected by using seasonal restrictions. These areas or values must be factors that limit life-cycle activities (e.g., Greater Sage-Grouse strutting grounds, known Threatened and Endangered species habitat). Frequently, prohibition areas are found within seasonal restriction areas.

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

J.2.3. Cultural Resource Mitigation Guideline

When a proposed discretionary land use has potential for affecting the characteristics which qualify a cultural property for the National Register of Historic Places (NRHP), mitigation will be considered. In accordance with Section 106 of the Historic Preservation Act, procedures specified in 36 Code of Federal Regulation (CFR) 800 will be used in consultation with the Wyoming State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation in arriving at determinations regarding the need and type of mitigation to be required.

Guidance

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Wildlife Mitigation Guideline*

The preferred strategy for treating potential adverse effects on cultural properties is “avoidance.” If avoidance involves project relocation, the new project area may also require cultural resource inventory. If avoidance is imprudent or unfeasible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative measures.

Reports documenting results of cultural resource inventory, evaluation, and the establishment of mitigation alternatives (if necessary) shall be written according to standards contained in BLM Manuals, the cultural resource permit stipulations, and in other policy issued by the BLM. These reports must provide sufficient information for Section 106 consultation. Reports shall be reviewed for adequacy by the appropriate BLM cultural resource specialist. If cultural properties on, or eligible for, the NRHP are located within these areas of potential impact and cannot be avoided, the authorized officer shall consult with the SHPO in accordance with National Historic Preservation Act Section 106 and the procedures contained in 36 CFR 800.

Mitigation measures shall be implemented according to the mitigation plan approved by the BLM authorized officer. Such plans are usually prepared by the land use applicant according to BLM specifications. Mitigation plans will be reviewed as part of Section 106 consultation for NRHP eligible or listed properties. The extent and nature of recommended mitigation shall be commensurate with the significance of the cultural resource involved and the anticipated extent of damage. Reasonable costs for mitigation will be borne by the land use applicant. Mitigation must be cost effective and realistic. It must consider project requirements and limitations, input from concerned parties, and be BLM approved or BLM formulated.

Mitigation of paleontological and natural history sites will be treated on a project specific basis. Factors such as site significance, economics, safety, and project urgency must be taken into account when making a decision to mitigate. Authority to protect (through mitigation) such values is provided for in the Federal Land Policy and Management Act (FLPMA), Section 102(a)(8). When avoidance is not possible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative protection measures.

J.2.4. Special Resource Mitigation Guideline

To protect (resource value), activities or surface use will not be allowed (i.e., within a specific distance of the resource value or between date to date) in (legal description).

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the authorized officer.

Example Resource Categories (select or identify category and specific resource value):

- Recreation areas
- Special natural history or paleontological features
- Special management areas
- Sections of major rivers
- Prior existing rights-of-way
- Occupied dwellings

- Other (specify)

Guidance

The Special Resource Mitigation Guideline is intended for use only in site-specific situations where one of the first three general mitigation guidelines will not adequately address the concern. The resource value, location, and specific restrictions must be clearly identified. A detailed plan addressing specific mitigation and special restrictions will be required prior to disturbance or development and will become a condition for approval of the permit, plan of development, or other use authorization.

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

J.2.5. No Surface Occupancy Guideline

No Surface Occupancy (NSO) will be allowed on the following described lands (legal description) because of (resource value).

Example Resource Categories (select or identify category and specific resource value):

- Recreation areas (e.g., campgrounds, historic trails, national monuments)
- Major reservoirs/dams
- Special management area (e.g., known Threatened or Endangered species habitat, areas suitable for consideration for wild and scenic rivers designation)
- Other (specify)

Guidance

The NSO Mitigation Guideline is intended for use only when other mitigation is determined insufficient to adequately protect the public interest and is the only alternative to “no development” or “no leasing.” The legal description and resource value of concern must be identified and be tied to an NSO land use planning decision.

Waiver of, or exception(s) to, the NSO requirement will be subject to the same test used to initially justify its imposition. If, upon evaluation of a site-specific proposal, it is found that less restrictive mitigation would adequately protect the public interest or value of concern, then a waiver or exception to the NSO requirement is possible. The record must show that because conditions or uses have changed, less restrictive requirements will protect the public interest. An environmental analysis must be conducted and documented (e.g., environmental assessment, EIS, etc., as necessary) in order to provide the basis for a waiver or exception to an NSO planning decision. Modification of the NSO requirement will pertain only to refinement or correction of the location(s) to which it applied. If the waiver, exception, or modification is found to be consistent with the intent of the planning decision, it may be granted. If found inconsistent with the intent of the planning decision, a plan amendment would be required before the waiver, exception, or modification could be granted.

When considering the “no development” or “no leasing” option, a rigorous test must be met and fully documented in the record. This test must be based upon stringent standards described in the land use planning document. Since rejection of all development rights is more severe than the most restrictive mitigation requirement, the record must show that consideration was given to development subject to reasonable mitigation, including “no surface occupancy.” The record must also show that other mitigation was determined to be insufficient to adequately protect the public interest. A “no development” or “no leasing” decision should not be made solely because it appears that conventional methods of development would be unfeasible, especially where an NSO restriction may be acceptable to a potential permittee. In such cases, the potential permittee should have the opportunity to decide whether or not to go ahead with the proposal (or accept the use authorization), recognizing that an NSO restriction is involved.

Appendix K. Biological Resources Support Documents

K.1. Biological Resources of the Buffalo Planning Area

Table K.1. Common and Scientific Names of Plant and Wildlife Species Identified in the Buffalo Resource Management Plan and Environmental Impact Statement

Common Name	Scientific Name
Plants*	
Alder	<i>Alnus spp. Mill.</i>
Alfalfa	<i>Medicago sativa L.</i>
Alkali sacaton	<i>Sporobolus airoides (Torr.) Torr.</i>
Alpine poppy	<i>Papaver pygmaeum Rydb.</i>
American plum	<i>Prunus americana Marshall</i>
Antelope bitterbrush	<i>Purshia tridentata (Pursh) DC.</i>
Barley	<i>Hordeum spp. L.</i>
Basin big sagebrush	<i>Artemisia tridentata Nutt. ssp. tridentata</i>
Basin wildrye	<i>Leymus cinereus (Scribn. & Merr.) Á. Löve</i>
Beardtongue	<i>Penstemon spp. Schmidel</i>
Birch	<i>Betula spp. L.</i>
Bitterbrush	<i>Purshia DC. ex Poir.</i>
Black henbane	<i>Hyoscyamus niger L</i>
Black sagebrush	<i>Artemisia nova A. Nelson</i>
Blowout penstemon (beardtongue)	<i>Penstemon haydenii S. Watson</i>
Blue elderberry	<i>Sambucus nigra L. ssp. cerulea (Raf.) R. Bolli</i>
Blue grama	<i>Bouteloua gracilis (Willd. ex Kunth) Lag. ex Griffiths</i>
Bluebell	<i>Mertensia spp. Roth</i>
Bluebunch wheatgrass	<i>Pseudoroegneria spicata (Pursh) Á. Löve</i>
Boxelder	<i>Acer negundo L.</i>
Broad-leaved (broadlipped) twayblade	<i>Listera convallarioides (Sw.) Nutt. ex Elliott</i>
Buckwheat	<i>Eriogonum Michx.</i>
Buffalobur (nightshade)	<i>Solanum rostratum Dunal</i>
Buffalograss	<i>Bouteloua dactyloides (Nutt.) J.T. Columbus</i>
Canada thistle	<i>Cirsium arvense (L.) Scop.</i>
Cheatgrass	<i>Bromus tectorum L.</i>
Chokecherry	<i>Prunus virginiana L.</i>
Cocklebur	<i>Xanthium spp. L.</i>
Coiled-beaked (coiled) lousewort	<i>Pedicularis contorta Benth.</i>
Columbia needlegrass	<i>Achnatherum nelsonii (Scribn.) Barkworth</i>
Columbine	<i>Aquilegia spp. L.</i>
Common (lesser) burdock	<i>Arctium minus Bernh.</i>
Common crupina	<i>Crupina vulgaris Cass.</i>
Common mullein	<i>Verbascum thapsus L.</i>
Common snowberry	<i>Symphoricarpos albus (L.) S.F. Blake</i>
Common St. Johnswort	<i>Hypericum perforatum L.</i>
Common tansy	<i>Tanacetum vulgare L.</i>
Common yarrow	<i>Achillea millefolium L.</i>
Cottonwood	<i>Populus spp. L.</i>
Curl-leaf mountain mahogany	<i>Cercocarpus ledifolius Nutt.</i>
Curly dock	<i>Rumex crispus L.</i>

Common Name	Scientific Name
Currant	<i>Ribes</i> spp. L.
Cusick's (Nuttall's) alkaligrass	<i>Puccinellia nuttalliana</i> (Schult.) Hitchc.
Dalmatian toadflax	<i>Linaria dalmatica</i> (L.) Mill. ssp. <i>dalmatica</i>
Desert parsley	<i>Lomatium</i> spp.
Diffuse knapweed	<i>Centaurea diffusa</i> Lam.
Douglas-fir	<i>Pseudotsuga menziesii</i> (Mirb.) Franco
Dwarf (short) woolyheads	<i>Psilocarphus brevissimus</i> Nutt.
Dwarf mistletoe	<i>Arceuthobium</i> M. Bieb.
Dyer's woad	<i>Isatis tinctoria</i> L.
Fall (Douglas') knotweed	<i>Polygonum douglasii</i> Greene
False agoseris	<i>Agoseris glauca</i> (Pursh) Raf. var. <i>laciniata</i>
Field bindweed	<i>Convolvulus arvensis</i> L.
Field horsetail	<i>Equisetum arvense</i> L.
Field pussytoes	<i>Antennaria neglecta</i> Greene
Fourwing saltbush	<i>Atriplex canescens</i> (Pursh) Nutt.
Fringed sage (prairie sagewort)	<i>Artemisia frigida</i> Willd.
Gardner's saltbush	<i>Atriplex gardneri</i> (Moq.) D. Dietr.
Goosefoot	<i>Chenopodium</i> spp. L.
Greasewood	<i>Sarcobatus vermiculatus</i> (Hook.) Torr.
Green ash	<i>Fraxinus pennsylvanica</i> Marshall
Green needlegrass	<i>Nassella viridula</i> (Trin.) Barkworth
(Hairy) tranquil goldenweed	<i>Pyrrocoma clementis</i> Rydb.
Hall's (plains rough) fescue	<i>Festuca hallii</i> (Vasey) Piper
Halogeton	<i>Halogeton glomeratus</i> (M. Bieb.) C.A. Mey.
Hawthorn	<i>Crataegus</i> spp. L.
Houndstongue (gypsyflower)	<i>Cynoglossum officinale</i> L.
Idaho fescue	<i>Festuca idahoensis</i> Elmer
Indian paintbrush	<i>Castilleja</i> spp. Mutis ex L. f.
Indian ricegrass	<i>Achnatherum hymenoides</i> (Roem. & Schult.) Barkworth
Japanese brome	<i>Bromus japonicus</i> Thunb.
Kentucky bluegrass	<i>Poa pratensis</i> L.
Kotzebue's grass of Parnassus	<i>Parnassia kotzebuei</i> Cham. ex Spreng.
Large (broadfruit) bur-reed	<i>Sparganium eurycarpum</i> Engelm.
Large (lesser) yellow lady's slipper	<i>Cypripedium parviflorum</i> Salisb.
Large-leaved (largeleaf) pondweed	<i>Potamogeton amplifolius</i> Tuck.
Larkspur	<i>Delphinium</i> spp. L.
Leafy (elk) thistle	<i>Cirsium foliosum</i> (Hook.) DC.
Leafy spurge	<i>Euphorbia esula</i> L.
Leafy wildparsley	<i>Musineon divaricatum</i> (Pursh) Raf.
Locoweed	<i>Oxytropis</i> spp. DC.
Longleaf (composite) dropseed	<i>Sporobolus compositus</i> (Poir.) Merr.
Lupine	<i>Lupinus</i> spp. L.
Medusahead	<i>Taeniatherum caput-medusae</i> (L.) Nevski
Milkvetch	<i>Astragalus</i> spp. L.
Moschatel (muskroot)	<i>Adoxa moschatellina</i> L.
Mountain big sagebrush	<i>Artemisia tridentata</i> Nutt. ssp. <i>vaseyana</i> (Rydb.) Beetle
Mountain lady's slipper	<i>Cypripedium montanum</i> Douglas ex Lindl.
Mountain mahogany (curl-leaf)	<i>Cercocarpus ledifolius</i> Nutt.
Musk (nodding plumeless) thistle	<i>Carduus nutans</i> L.
Muttongrass	<i>Poa fendleriana</i> (Steud.) Vasey
Needle and thread	<i>Hesperostipa comata</i> (Trin. & Rupr.) Barkworth
Northern (longleaf) arnica	<i>Arnica lonchophylla</i> Greene
Northern blackberry (dwarf raspberry)	<i>Rubus arcticus</i> L. ssp. <i>acaulis</i> (Michx.) Focke

Common Name	Scientific Name
Oxeye daisy	<i>Leucanthemum vulgare</i> Lam.
Perennial (broadleaved) pepperweed/giant whitetop	<i>Lepidium latifolium</i> L.
Perennial (field) sowthistle	<i>Sonchus arvensis</i> L.
Phlox	<i>Phlox</i> spp. L.
Plains pricklypear	<i>Opuntia polyacantha</i> Haw.
Plumeless (spiny plumeless) thistle	<i>Carduus acanthoides</i> L.
Porter's sagebrush (wormwood)	<i>Artemisia porteri</i> Cronquist
Prairie junegrass	<i>Koeleria macrantha</i> (Ledeb.) Schult.
Pretty (bigseed alfalfa) dodder	<i>Cuscuta indecora</i> Choisy
Puncturevine	<i>Tribulus terrestris</i> L.
Purple loosestrife	<i>Lythrum salicaria</i> L.
Quackgrass	<i>Elymus repens</i> (L.) Gould
Quaking aspen	<i>Populus tremuloides</i> Michx.
Ragwort	<i>Senecio</i> L.
Rubber rabbitbrush	<i>Ericameria nauseosa</i> (Pall. ex Pursh) G.L. Nesom & Baird
Russet (chamisso's) cottongrass	<i>Eriophorum chamissonis</i> C.A. Mey.
Saltgrass	<i>Distichlis spicata</i> (L.) Greene
Sand dropseed	<i>Sporobolus cryptandrus</i> (Torr.) A. Gray
Sandberg bluegrass	<i>Poa secunda</i> J. Presl
Sandwort	<i>Arenaria</i> spp. L.
Sartwell's sedge	<i>Carex sartwellii</i> Dewey
Saskatoon serviceberry	<i>Amelanchier alnifolia</i> (Nutt.) Nutt. ex M. Roem.
Scarlet globemallow	<i>Sphaeralcea coccinea</i> (Nutt.) Rydb.
Scotch (cotton) thistle	<i>Onopordum acanthium</i> L.
Sea purslane (verrucose seapurslane)	<i>Sesuvium verrucosum</i> Raf.
Shadscale saltbush	<i>Atriplex confertifolia</i> (Torr. & Frém.) S. Watson
Sheathed musineon (wildparsley)	<i>Musineon vaginatum</i> Rydb.
Short-leaf (shortleaved) sedge	<i>Carex misandra</i> R. Br.
Showy milkweed	<i>Asclepias speciosa</i> Torr.
Shrubby cinquefoil	<i>Dasiphora fruticosa</i> (L.) Rydb.
Silver sagebrush	<i>Artemisia cana</i> Pursh
Single-headed (pygmy) pussytoes	<i>Antennaria monocephala</i> DC.
Skeletonleaf bursage (ragweed)	<i>Ambrosia tomentosa</i> Nutt.
Skunkbush sumac	<i>Rhus trilobata</i> Nutt.
Slender bulrush	<i>Schoenoplectus heterochaetus</i> (Chase) Soják
Slim scurfpea	<i>Psoralidium tenuiflorum</i> (Pursh) Rydb.
Slimpod Venus' looking-glass	<i>Triodanis leptocarpa</i> (Nutt.) Nieuwl.
Small-flowered-fame flowere (sunbright)	<i>Phemeranthus parviflorus</i> (Nutt.) Kiger
Snowberry	<i>Symphoricarpos</i> spp. Duham.
Spike fescue	<i>Leucopoa kingii</i> (S. Watson) W.A. Weber
Spiny hopsage	<i>Grayia spinosa</i> (Hook.) Moq.
Spiny phlox	<i>Phlox hoodii</i> Richardson
Spotted knapweed	<i>Centaurea stoebe</i> L. ssp. <i>micranthos</i> (Gugler) Hayek
Squirreltail	<i>Elymus elymoides</i> (Raf.) Swezey
Sulphur-flower buckwheat	<i>Eriogonum umbellatum</i> Torr.
Sweetclover	<i>Melilotus officinalis</i> (L.) Lam
Tall larkspur	<i>Delphinium exaltatum</i> Aiton
Tamarisk	<i>Tamarix dioica</i> Roxb. ex Roth
Teal lovegrass	<i>Eragrostis hypnoides</i> (Lam.) Britton, Sterns & Poggenb.
Threadleaf sedge	<i>Carex filifolia</i> Nutt.
Three-flowered (three-hulled) rush	<i>Juncus triglumis</i> L.
Threetip sagebrush	<i>Artemisia tripartita</i> Rydb.

Common Name	Scientific Name
Ute ladies' -tresses	<i>Spiranthes diluvialis</i> Sheviak
Violet	<i>Viola</i> L.
Watson's goosefoot	<i>Chenopodium watsonii</i> A. Nelson
Western wheatgrass	<i>Pascopyrum smithii</i> (Rydb.) Á. Löve
White arctic whitlow-grass (Austrian draba)	<i>Draba fladnizensis</i> Wulfen var. <i>pattersonii</i> (O.E. Schultz) Rollins
Whitetop	<i>Cardaria draba</i> (L.) Desv.
Wild (American) licorice	<i>Glycyrrhiza lepidota</i> Pursh
Williams' wafer-parsnip (springparsley)	<i>Cymopterus williamsii</i> R.L. Hartm. & Constance
Willow	<i>Salix</i> spp. L.
Winterfat	<i>Krascheninnikovia lanata</i> (Pursh) A. Meeuse & Smit
Woodland horsetail	<i>Equisetum sylvaticum</i> L.
Woods' rose	<i>Rosa woodsii</i> Lindl.
Woolly (common) twinpod	<i>Physaria didymocarpa</i> (Hook.) A. Gray var. <i>lanata</i> A. Nelson
Wyoming big sagebrush	<i>Artemisia tridentata</i> Nutt. ssp. <i>wyomingensis</i> Beetle & Young
Yellow rabbitbrush	<i>Chrysothamnus viscidiflorus</i> (Hook.) Nutt.
Yellow toadflax (butter and eggs)	<i>Linaria vulgaris</i> Mill.
Zephyr (narcissus) windflower	<i>Anemone narcissiflora</i> L. var. <i>zephyra</i> (A. Nelson) Dutton & Keener
Gymnosperms	
Blue spruce	<i>Picea pungens</i> Engelm.
Douglas-fir	<i>Pseudotsuga menziesii</i> (Mirb.) Franco
Engelmann spruce	<i>Picea engelmannii</i> Parry ex Engelm.
Juniper	<i>Juniperus</i> spp. L.
Limber pine	<i>Pinus flexilis</i> James
Lodgepole pine	<i>Pinus contorta</i> Douglas ex Loudon
Ponderosa pine	<i>Pinus ponderosa</i> Lawson & C. Lawson
Subalpine fir	<i>Abies lasiocarpa</i> (Hook.) Nutt.
Ferns	
Fragile rockbrake	<i>Cryptogramma stelleri</i> (S.G. Gmel.) Prantl
Green (brightgreen) spleenwort	<i>Asplenium trichomanes-ramosum</i> L.
Lance-leaved moonwort (lanceleaf grapefern)	<i>Botrychium lanceolatum</i> (S.G. Gmel.) Angstr. var. <i>lanceolatum</i>
Mingan moonwort	<i>Botrychium minganense</i> Vict.
Puzzling (peculiar) moonwort	<i>Botrychium paradoxum</i> W.H. Wagner
Rattlesnake fern	<i>Botrychium virginianum</i> (L.) Sw.
Upward-lobed (trianglelobe) moonwort	<i>Botrychium ascendens</i> W.H. Wagner
Fungi	
Blister rust	<i>Cronartium ribicola</i>
Fish	
Black bullhead	<i>Ameiurus melas</i>
Brassy minnow	<i>Hybognathus hankinsoni</i>
Brook trout	<i>Salvelinus fontinalis</i>
Brown trout	<i>Salmo trutta</i>
Catfish	<i>Ictalurus</i> spp.
Channel catfish	<i>Ictalurus punctatus</i>
Common carp	<i>Cyprinus carpio</i>
Creek chub	<i>Semotilus atromaculatus</i>
Cutthroat trout	<i>Oncorhynchus clarki</i>
Fathead minnow	<i>Pimephales promelas</i>
Flathead chub	<i>Platygobio gracilis</i>

Common Name	Scientific Name
Green sunfish	<i>Lepomis cyanellus</i>
Green sunfish	<i>Lepomis cyanellus</i>
Largemouth bass	<i>Micropterus salmoides</i>
Longnose dace	<i>Rhinichthys cataractae</i>
Longnose sucker	<i>Catostomus catostomus</i>
Mountain sucker	<i>Catostomus platyrhynchus</i>
Pallid sturgeon	<i>Scaphirhynchus albus</i>
Northern plains killifish	<i>Fundulus kansae</i>
Plains minnow	<i>Hybognathus placitus</i>
Plains topminnow	<i>Fundulus sciadicus</i>
Rainbow trout	<i>Oncorhynchus mykiss</i>
River carpsucker	<i>Carpionodes carpio</i>
Rock bass	<i>Ambloplites rupestris</i>
Sand shiner	<i>Notropis stramineus</i>
Sauger	<i>Sander canadensis</i>
Shovelnose sturgeon	<i>Scaphirhynchus platyrhynchus</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
Stonecat	<i>Noturus flavus</i>
Sturgeon chub	<i>Macrhybopsis gelida</i>
Walleye	<i>Sander vitreus</i>
Western silvery minnow	<i>Hybognathus argyritis</i>
White sucker	<i>Catostomus commersoni</i>
Yellowstone cutthroat trout	<i>Oncorhynchus clarki bouvieri</i>
Wildlife	
American marten	<i>Martes americana</i>
Badger	<i>Taxidea taxus</i>
Baird's sparrow	<i>Ammodramus bairdii</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Beaver	<i>Castor canadensis</i>
Beet leafhopper	<i>Circulifer tenellus</i>
Bighorn Mountain pika	<i>Ochotona princeps obscura</i>
Bighorn Mountain snowshoe hare	<i>Lepus americanus seclusus</i>
Black bear	<i>Ursus americanus</i>
Blackbilled cuckoo	<i>Coccyzus erythrophthalmus</i>
Black-tailed prairie dog	<i>Cynomys ludovicianus</i>
Blue heron	<i>Ardea herodias</i>
Bobcat	<i>Lynx rufus</i>
Boreal chorus frog	<i>Pseudacris triseriata</i>
Boreal owl	<i>Aegolius funereus</i>
Brewer's sparrow	<i>Spizella breweri</i>
Bull snake	<i>Pituophis catenifer</i>
Burrowing owl	<i>Speotyto cunicularia</i>
Calliope hummingbird	<i>Stellula calliope</i>
Chukar partridge	<i>Alectoris chukar</i>
Columbian sharp-tailed grouse	<i>Tympanuchus phasianellus columbianus</i>
Common loon	<i>Gavia immer</i>
Common merganser	<i>Mergus merganser</i>
Cormorant	<i>Phalacrocorax spp.</i>
Cottontail rabbit	<i>Sylvilagus spp.</i>
Coyote	<i>Canis latrans</i>
Eastern racer	<i>Coluber constrictor</i>
Elk	<i>Cervus elaphus</i>
Ferruginous hawk	<i>Buteo regalis</i>

Common Name	Scientific Name
Fisher	<i>Martes pennanti</i>
Fox squirrel	<i>Sciurus niger</i>
Fringed myotis	<i>Myotis thysanodes</i>
Garter snake	<i>Thamnophis sirtalis</i>
Golden eagle	<i>Aquila chrysaetos</i>
Gopher	<i>Gopherus spp.</i>
Gopher snake	<i>Pituophis catenifer</i>
Gray partridge	<i>Perdix perdix</i>
Gray squirrel	<i>Sciurus carolinensis</i>
Gray wolf	<i>Canis lupus</i>
Great horned owl	<i>Bubo virginianus</i>
Greater Sage-Grouse	<i>Centrocercus urophasianus</i>
Ground squirrel	<i>Spermophilus spp.</i>
Hayden's shrew	<i>Sorex haydeni</i>
Hispid pocket mouse	<i>Chaetodipus hispidus</i>
Hoary bat	<i>Lasiurus cinereus</i>
Horse	<i>Equus ferus caballus</i>
Hungarian partridge	<i>Perdix perdix</i>
Jackrabbit	<i>Lepus spp.</i>
Leopard frog	<i>Rana pipiens</i>
Long-eared owl	<i>Asio otus</i>
Marten	<i>Martes spp.</i>
Mink	<i>Mustela vison</i>
Moose	<i>Alces alces</i>
Mountain lion	<i>Puma concolor</i>
Mountain plover	<i>Charadrius montanus</i>
Mule deer	<i>Odocoileus hermionus</i>
Muskrat	<i>Ondatra zibethicus</i>
North American wolverine	<i>Gulo gulo luscus</i>
Northern goshawk	<i>Accipiter gentilis</i>
Northern harrier	<i>Circus cyaneus</i>
Northern leopard frog	<i>Rana pipiens</i>
Northern long-eared bat	<i>Myotis septentrionalis</i>
Peregrine falcon	<i>Falco peregrinus</i>
Piping plover	<i>Charadrius melodus</i>
Pheasant	<i>Phasianus colchicus</i>
Plains gartersnake	<i>Thamnophis radix</i>
Plains harvest mouse	<i>Reithrodontomys montanus</i>
Plains pocket gopher	<i>Geomys bursarius</i>
Porcupine	<i>Erethizon dorsatum</i>
Prairie falcon	<i>Falco mexicanus</i>
Prairie rattlesnake	<i>Crotalus viridis</i>
Pronghorn	<i>Antilocapra americana</i>
Pygmy nuthatch	<i>Sitta pygmaea</i>
Pygmy rabbit	<i>Brachylagus idahoensis</i>
Raccoon	<i>Procyon lotor</i>
Rail	family Rallidae
Red fox	<i>Vulpes vulpes</i>
Red squirrel	<i>Tamiasciurus hudsonicus</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Ring-necked pheasant	<i>Phasianus colchicus</i>
Sage sparrow	<i>Amphispiza belli</i>
Sage thrasher	<i>Oreoscoptes montanus</i>

Common Name	Scientific Name
Sagebrush lizard	<i>Sceloporus graciosus</i>
Sagebrush vole	<i>Lemmiscus curtatus</i>
Short-eared owl	<i>Asio flammeus</i>
Snipe	<i>Gallinago spp.</i>
Snowshoe hare	<i>Lepus americanus</i>
Spotted bat	<i>Euderma maculatum</i>
Spotted frog	<i>Rana luteiventris</i>
Spotted skunk	<i>Spilogale gracilis</i>
Striped skunk	<i>Mephitis mephitis</i>
Swainson's hawk	<i>Buteo swainsoni</i>
Swift fox	<i>Vulpes velox</i>
Terrestrial gartersnake	<i>Thamnophis elegans</i>
Three-toed woodpecker	<i>Picoides dorsalis</i>
Tiger salamander	<i>Ambystoma tigrinum mavortium</i>
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>
Trumpeter swan	<i>Cygnus buccinator</i>
Turkey	<i>Meleagris gallopavo</i>
Turkey vulture	<i>Cathartes aura</i>
Virginia's warbler	<i>Vermivora virginiae</i>
Vole	<i>Microtus spp.</i>
Water vole	<i>Arvicola amphibius</i>
Weasel	<i>Mustela spp.</i>
Western burrowing owl	<i>Athene cunicularia hypugea</i>
White-faced ibis	<i>Plegadis chihi</i>
White-tailed deer	<i>Odocoileus virginianus</i>
Wild turkey	<i>Meleagris gallopavo</i>
Williamson's sapsucker	<i>Sphyrapicus thyroideus</i>
Woodhouse's toad	<i>Bufo woodhousii</i>
Wyoming ground squirrel	<i>Spermophilus elegans</i>
Yellow-billed cuckoo	<i>Coccyzus americanus</i>
Yuma myotis	<i>Myotis yumanensis</i>
Invertebrates	
Mosquito	<i>Anopheles spp.</i>
Grasshopper	suborder Caelifera; order Orthoptera
Mussel	various
Crayfish	various
Mountain pine beetle	<i>Dendroctonus ponderosae</i>
Mormon cricket	<i>Anabrus simplex</i>
Alfalfa weevil	<i>Hypera postica glyllenhal</i>
*Names in parentheses are United States Department of Agriculture Plants Database common name.	
Source: BLM 2011c	

Table K.2. Special Status Plant Species Potentially Occurring in the Planning Area

Common Name	Habitat	Status
Ute ladies'-tresses orchid	Mesic to wet riparian meadows, marshes, and stream banks.	Threatened
Williams' wafer-parsnip	Open ridgetops and upper slopes with exposed limestone outcrops or rock slides 6,000 to 8,300 feet.	BLM Sensitive Plant Species, WYNDD Plant Species of Concern
Porter's sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstones and clay slopes.	BLM Sensitive Plant Species, WYNDD Plant Species of Concern

Common Name	Habitat	Status
Limber pine	Mountains, associated with high elevation conifer species.	BLM Sensitive Plant Species
Alpine poppy	Open, rocky slopes with delayed snowmelt in the alpine zone.	WYNDD Plant Species of Concern
Blue elderberry	Stream banks, riverside woodlands, and open areas in the forest understory.	WYNDD Plant Species of Concern
Broad-leaved twayblade	Grows with moss and grasses in damp, often shady, spots with cool, moist growing conditions.	WYNDD Plant Species of Concern
Coil-beaked lousewort	Ridge tops and meadows in the upper subalpine and alpine zones.	WYNDD Plant Species of Concern
Cusick's alkali-grass	Moist riparian areas and alkaline seeps and draws.	WYNDD Plant Species of Concern
Dwarf woolly-heads	Drying mud of ponds and other vernal wet soil in the valleys and on the plains.	WYNDD Plant Species of Concern
Fall knotweed	Gravelly or sandy hills and plains.	WYNDD Plant Species of Concern
False agoseris	Wetland riparian areas.	WYNDD Plant Species of Concern
Field pussytoes	Sub-irrigated meadows within broad stream channels.	WYNDD Plant Species of Concern
Fragile rockbrake	Sheltered calcareous cliff crevices and rock ledges, typically in coniferous forest or other boreal habitats.	WYNDD Plant Species of Concern
Green spleenwort	Rock crevices in forest cover.	WYNDD Plant Species of Concern
Hairy tranquil goldenweed	Sagebrush grasslands and montane meadows, often on limestone substrates.	WYNDD Plant Species of Concern
Hall's fescue	Montane meadows, slopes, and edges of open coniferous woods and meadows. Usually on soils derived from calcareous parent material or volcanic soils.	WYNDD Plant Species of Concern
Kotzebuei's grass-of-parnassus	Mesic to wet arctic and alpine habitats at high elevation.	WYNDD Plant Species of Potential Concern
Lance-leaved moonwort	Mature as well as second-growth mesic northern hardwood forests in soil with a rich humus layer.	WYNDD Plant Species of Concern
Large bur-reed	Continuous fringe with sedges, flags, and reeds along the sides of a river or stream.	WYNDD Plant Species of Concern
Large yellow lady-slipper	Moist woods and bogs.	WYNDD Plant Species of Concern
Large-leaved pondweed	Riparian wetland areas.	WYNDD Plant Species of Concern
Leafy thistle	Moist soil, grasslands, meadows, edges, and openings in boreal forest, sub-alpine forests, and alpine slopes.	WYNDD Plant Species of Concern
Longleaf dropseed	Open forests and grasslands on the plains.	WYNDD Plant Species of Concern
Mingan moonwort	Dense shade, sparse understory, with an alluvium substrate.	WYNDD Plant Species of Concern
Moschatel	Clay soils and shaded areas in fields and woodland areas.	WYNDD Plant Species of Concern
Mountain lady-slipper	Dry or moist, open or lightly shaded, brushy or wooded valleys and slopes.	WYNDD Plant Species of Concern

Common Name	Habitat	Status
Northern arnica	Open woods and slopes on sandy-gravel or limestone and shady, moist north-facing birch-hazelnut forests from 6,500 to 8,000 feet.	WYNDD Plant Species of Potential Concern
Northern blackberry	Damp soils in sunny-edged woodlands.	WYNDD Plant Species of Concern
Pretty dodder	Floodplains of creeks and streams.	WYNDD Plant Species of Concern
Puzzling moonwort	Mesic to wet subalpine mountain meadows dominated by grasses, sedges, and in some cases, dense herbaceous cover.	WYNDD Plant Species of Concern
Rattlesnake fern	Rich moist or dry woods, moist thickets, or higher spots in bogs.	WYNDD Plant Species of Concern
Russet cotton-grass	Wet areas, preferably the acidic, nutrient-poor conditions of peatlands.	WYNDD Plant Species of Potential Concern
Sartwell's sedge	Dense large stands, rich fens and swamps, and sometimes on the edges of ponds.	WYNDD Plant Species of Concern
Sea purslane	Damp, sandy locations such as mangroves, beaches, dunes, salt flats, and marsh edges.	WYNDD Plant Species of Concern
Sheathed musineon	This species is found on rocky slopes, and in meadows, aspen groves, and ponderosa pine communities.	WYNDD Plant Species of Concern
Short-leaf sedge	Wet meadows, along stream banks, in willow thickets, and in stony or turfy places in the alpine and upper subalpine zones.	WYNDD Plant Species of Concern
Single-head pussytoes	Wind-swept, open slopes and ridges in alpine or subalpine tundra. Areas dominated by forbs and bunchgrass with occasional patches of whitebark pine and Engelmann spruce.	WYNDD Plant Species of Concern
Slender bulrush	Lake edges and wetlands.	WYNDD Plant Species of Concern
Slim-pod Venus' looking-glass	Dry, sandy prairies, pastures, and disturbed areas.	WYNDD Plant Species of Concern
Small-flowered fame flower	Bare sandy, acidic soils overlying rocks.	WYNDD Plant Species of Concern
Teal love grass	Borders of streams and rivers, edge of ponds and lakes, or in sloughs.	WYNDD Plant Species of Concern
Three-flower rush	Montane stream banks, bogs, and short willow and sedge meadows on wet to saturated soils, sometimes influenced by limestone.	WYNDD Plant Species of Concern
Upward-lobe moonwort	Well-drained natural and artificially maintained habitats including alpine meadows, avalanche meadows, pastured forest meadows and grassy roadsides.	WYNDD Plant Species of Concern
Watson goosefoot	Found in a variety of habitats from desert, cliffs, talus, and moist shaded areas under aspen, junipers, or pinyons, often in riparian habitats.	WYNDD Plant Species of Concern
White arctic whitlow-grass	Found in talus and scree, on rocky slopes and flats, and in alpine meadows.	WYNDD Plant Species of Concern

Common Name	Habitat	Status
Woodland horsetail	Lowland wet conifer forests and mixed upland, dry conifer, and deciduous forest habitats. Moist open woods, bogs, swamps, prairies, meadows, and stream banks.	WYNDD Plant Species of Concern
Woolly twinpod	Extending from plains to montane zones.	WYNDD Plant Species of Concern
Zephyr windflower	Big Horn Mountains from fellfields to alpine meadows, to tundra. Usually moist or swampy soil.	WYNDD Plant Species of Concern
Source: BLM 2010d; Keinath et al. 2003; Heidel 2012 BLM Bureau of Land Management WYNDD Wyoming Natural Diversity Database		

Table K.3. Fish Species of Importance within the Planning Area

Common Name	Habitat	Status				
		Federal Threatened (T), Endangered (E) or Candidate (C) Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	TNC Primary (P) and Secondary (S) Target Species
Brassy Minnow	Weedy streams, clear creeks with sand and gravel bottoms, and occasionally in lakes.				SGCN NSS4	
Flathead chub	Turbid waters.			X	SGCN NSS4	S
Goldeye	Tolerant of widely fluctuating environmental conditions, such as turbidity, salinity, and water temperature.				SGCN NSS3	
Mountain whitefish	Prefers deep, fast water in large, clear cold rivers. Sometimes abundant in lakes.				SGCN NSS4	

Common Name	Habitat	Status				
		Federal Threatened (T), Endangered (E) or Candidate (C) Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	TNC Primary (P) and Secondary (S) Target Species
Pallid sturgeon	Moderate to swift river currents and turbid waterways, depths 3 to 24 feet, with sandy substrates.	E				P
Plains minnow	Large, turbid streams, slow water and side pool habitat.			X	SGCN NSS3	S
Sauger	Large rivers, but may also be found in reservoirs. Tolerant of turbid waters.				SGCN NSS3	
Shovelnose sturgeon	River bottoms, often in areas with swift current and sand or gravel bottom and turbid water.				SGCN NSS3	
Sturgeon chub	Turbid water with moderate to strong current over bottoms ranging from rocks and gravel to coarse sand.			X	SGCN NSS1	P
Western silvery minnow	Sluggish pools and backwaters, usually over mud or sand, of small to large rivers.				SGCN NSS2	
Yellowstone cutthroat trout	Relatively clear, cold creeks, rivers, and lakes at temperatures between 4 and 15 degrees Celsius.		X	X	SGCN NSS2	

Common Name	Habitat	Status				
		Federal Threatened (T), Endangered (E) or Candidate (C) Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	TNC Primary (P) and Secondary (S) Target Species
Source: WGFD 2010b; BLM 2010d; Keinath et al. 2003; BLM 2003c						
BLM Bureau of Land Management			SGCN Species of Greatest Conservation Need			
NSS1 Native Species Status 1			TNC The Nature Conservancy			
NSS2 Native Species Status 2			USFS United States Forest Service			
NSS3 Native Species Status 3			WGFD Wyoming Game and Fish Department			
NSS4 Native Species Status 4						

Table K.4. Wildlife Species of Importance Potentially Occurring within the Planning Area

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Big Game										
Moose	Engelmann spruce, Douglas-fir and subalpine fir, and lodgepole pine forests plus associated habitats.				SGCN NSS4					
Upland Game										
Greater Sage-Grouse	Sagebrush habitats.	C	X	X	SGCN NSS2		I	X		S
Blue grouse	Coniferous forests, aspen, willow, mountain park-meadows, logged forests. Nests on the ground.						III	X		
Birds of Prey										
Bald eagle	Near large lakes and rivers in forested habitat where adequate prey and old, large-diameter cottonwood or conifer trees are available for nesting.		X	X	SGCN NSS2	X	I			P
Boreal owl	Mature, high elevation forests of Engelmann spruce, subalpine fir, and lodgepole pine interspersed mature aspen.				SGCN NSS3		II	X		

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Eastern screech owl	Open woodlands, deciduous forests, wooded urban areas, cottonwood-riparian. Nests in tree cavities or hollow stump.						II			
Ferruginous hawk	Arid and semiarid grassland regions with is open, level, or rolling prairies. Foothills or middle elevation plateaus largely devoid of trees, and cultivated shelterbelts or riparian corridors.		X	X	SGCN NSSU	X	I	X		
Flammulated owl	Montane forests, especially ponderosa pine.			X		X				
Golden eagle	Most habitats with open areas for foraging. Nests in a tree or on a cliff.					X	III			
Merlin	Open woodlands, savannah, grasslands, and shrub-steppe. Nest in large trees usually in old domed magpie nests, in open woodlands within a short distance of open sagebrush-grassland.				SGCN NSSU		II			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Northern goshawk	Mature, high-elevation forests of Engelmann spruce, subalpine fir, and lodgepole pine interspersed with mature aspen stands. Need a home range of over 2,500 acres.		X	X	SGCN NSSU		I			
Northern harrier	Open country, like grasslands, steppes, wetlands, meadows, cultivated areas, and tundra. Nests on the ground in thick grass, shrubbery, or other vegetation			X			III			
Peregrine falcon	Open habitats from open woodlands and forests to shrub-steppe, grasslands, marshes, and riparian habitats. Nests in cliffs.		X	X	SGCN NSS3	X	I			P
Prairie falcon	Cliffs in all habitats with open areas. Nests in a hole or on a ledge on a cliff or rock outcrop.					X	III			
Short-eared owl	Broad expanses of open habitat with dense, low vegetation, including prairies, grasslands, marshes, and open sagebrush shrublands. Dependent on the meadow vole, which comprises at least 90% of its diet.			X	SGCN NSS4	X	I	X		

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Swainson's hawk	Open grasslands, prairies, farmlands, and deserts that have some trees for nesting.				SGCN NSSU		I	X		
Western burrowing owl	Arid and semiarid environments, with well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground. It prefers open prairie, grassland, desert, and shrub-steppe habitats, and may also inhabit agricultural areas. Dependent on burrowing mammals, like prairie dogs and ground squirrels.		X	X	SGCN NSSU	X	I			S
Migratory Birds (excluding birds of prey)										
American avocet	Marshes, ponds, shorelines. Nests on the ground close to water among tufts of vegetation.						III			
American bittern	Marshes with open water in the center, gradual slopes, a band of emergent vegetation around the periphery, and idle grassland in the adjacent uplands.			X	SGCN NSS3	X	I			
American dipper	Swift mountain streams. Nests on a cliff face, behind a waterfall, or on a midstream rock.						II			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
American three-toed woodpecker	Coniferous forests, primarily above 8,900 feet. Must include unfragmented blocks of old-growth and an abundance of dying trees with occasional disturbances.			X	SGCN NSSU		II			
American white pelican	Rivers, streams, lakes, ponds, and marshes. Nests colonially on large freshwater lakes, and requires islands isolated from mammalian predators.						II			P
American wigeon	Marshes, lakes, mostly below 8,000 feet.								MH	
Baird's sparrow	Native mixed-grass and fescue prairie.		X			X	I	X		S
Barrow's goldeneye	Montane and subalpine lakes and rivers, beaver ponds, and small sloughs. Nests almost exclusively in tree cavities.				SGCN NSS3		IV			
Black-backed woodpecker	Lodgepole pine, Douglas-fir, Engelmann spruce-subalpine fir, especially those forests that have been burned. Nests in a cavity in a conifer.			X	SGCN NSSU		II			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Black-billed cuckoo	Deciduous and mixed coniferous/deciduous forests, open woodlands, especially cottonwood-riparian, urban areas. Nests against tree trunk, on a log, occasionally in vine tangles.			X		X	II			
Black-billed magpie	All habitats below 8,000 feet. Nest is large and conspicuous in a small tree or shrub.						IV			
Black-chinned hummingbird	Basin-prairie shrublands, riparian shrub. Nests on a small limb of a deciduous tree, often near or over a stream.						II			
Black-crowned night heron	Marshes, swamps, wooded streams, and shores of lakes and ponds. Nests in colonies in emergent vegetation or in shrubs near the edge of water.				SGCN NSS3					
Black-headed grosbeak	Aspen and riparian woodlands below 8,000 feet. Nests in a deciduous tree or shrub.						IV			
Black rosy-finch	Alpine grasslands, alpine moss-lichen-forb, barren ground, fallow agricultural areas. Nests on the ground or on a cliff.				SGCN NSSU	X	III			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Black tern	Biologically rich marshes and aquatic areas. Prefers marshes or marsh complexes greater than 50 acres. Nests in small, loose colonies, generally in areas of still water, with 25% to 75% of the surface covered by emergent vegetation, and well-interspersed with open water.			X	SGCN NSS3		I			
Black-throated gray warbler	Pine-juniper, woodland chaparral, mountain-foothills shrublands. Nests far out on a horizontal branch, usually in a conifer.						III			
Blue-winged teal	Marshes and lakes in association with most habitats below 8,000 feet. Nests on ground in good vegetative cover.								MH	
Bobolink	Grasslands; large expanses of grass or forb cover.				SGCN NSS4		II			
Brewer's sparrow	Northern Rocky Mountains including sagebrush and alpine meadows.		X	X	SGCN NSS4		I	X		

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Broad-tailed hummingbird	Riparian shrub; mountain-foothills grasslands; coniferous forests; wet-moist meadows within Douglas-fir, Engelmann spruce-subalpine fir, other coniferous or mixed forests, and aspen.						II			
Brown creeper	Coniferous forests, aspen, cottonwood-riparian. Nests in a cavity excavated in a rotten branch or stump, occasionally in a deserted woodpecker cavity.						II			
Bufflehead	Aspen; cottonwood-riparian; marshes; lakes and rivers associated with lodgepole pine, Douglas-fir, and other mixed coniferous forests. Nests in a cavity, usually in a dead tree.						IV			
Bullock's oriole	Cottonwood-riparian, cottonwood-dryland, rural developments, urban areas. Nests in deciduous trees; nests usually hung from a drooping branch.						III			
California gull	Large lakes, scavenges in most open habitats below 8,000 feet. Nests on sticks and dried weeds on the ground close to water.						IV			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Calliope hummingbird	Coniferous forests, woodland-chaparral, mountain foothills shrublands, riparian shrub, mountain park-meadows, alpine grasslands. Nests on a limb of a tree or on a conifer cone.						II			
Canvasback	Deep, open, permanent ponds, marshes and potholes. Breeding may occur in small lakes, deep-water marshes, sheltered bays of large freshwater and alkali lakes, permanent and semi-permanent ponds, sloughs, potholes, and shallow river impoundments.				SGCN NSS3		IV		MH	
Canyon wren	Cliffs in canyons and mountains; rock outcrops/rock piles in pine-juniper, woodland-chaparral, basin-prairie and mountain-foothills shrublands. Nests in a crevice or cave on a bank or cliff.						III			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Cassin's finch	Coniferous forests up to timberline, including burns. Nests in a conifer, nest is usually placed near the end of a large limb.					X	IV			
Cassin's kingbird	Ponderosa pine savannah, pine-juniper, cottonwood-riparian, cottonwood-dryland, woodland-chaparral, basin-prairie and mountain-foothills shrublands. Nests on a horizontal branch near the trunk of a tree.						II			
Caspian tern	Marshes and aquatic areas; prefers open areas with sparse vegetation. Nests in small colonies on sandy or gravelly beaches along lakes, rivers, and marshes.				SGCN NSS3					
Chestnut-collared longspur	Shortgrass and open mixed-grass prairies. Prefers relatively mesic areas. Low, moist areas and wet-meadow zones around wetlands may provide suitable habitat.			X	SGCN NSS4	X	II			S
Chimney swift	Feeds in the air over many habitats below 7,500 feet, especially in urban areas. Nests in a hollow tree or chimney or other suitable human-built structure.						IV			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Cinnamon teal	Marshes and lakes in association with most habitats below 8,000 feet. Nests on the ground in a marsh or meadow.						IV			
Clark's grebe	Marshes and lakes, usually with extensive areas of open water and bordered by tall emergent vegetation. Nests in areas that provide large clumps of emergent vegetation interspersed with open water so that the vegetation blocks wave action.				SGCN NSS4					
Clark's nutcracker	Coniferous forests, aspen, cliffs in canyons or mountains, juniper-sagebrush, ponderosa pine-juniper. Nests on a horizontal limb of a mature conifer.						III			
Clay-colored sparrow	Ponderosa pine savannah, pine-juniper, aspen, cottonwood-riparian, mountain-foothills shrublands, sagebrush-grasslands, shelterbelts. Nests in a shrub or on the ground.						IV			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Common loon	Lakes at least 10 acres, secluded from humans, with clear water, and islands or protected shores for nesting between 6,000-8,000 feet.				SGCN NSS1		II			
Common poorwill	A variety of habitats below 8,000 feet including pine-juniper, woodland-chaparral, basin prairie and mountain-foothills shrublands, grasslands, agricultural areas. Nests on the ground.						III			
Dickcissel	Grasslands with taller grasses, forbs, or shrubs, but also uses alfalfa and hayfields.				SGCN NSS4		II	X		
Dusky flycatcher	Ponderosa pine savannah, pine-juniper, aspen, cottonwood-riparian, woodland-chaparral, riparian shrub. Nests in the crotch of a juniper or sagebrush, or near the base of a thorny shrub.						II			
Forester's tern	Freshwater marshes and marshy borders of ponds and lakes, and prefers large marsh complexes with vegetated nests sites near patches of open water.				SGCN NSS3		I			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Franklin's gull	Marshes and sloughs with sparse emergent vegetation. Nests in colonies in marshes no denser than 10 plants less than 1 meter tall per square meter, and usually near patches of open water.				SGCN NSS3		I			S
Golden-crowned kinglet	Coniferous forests, aspen-conifer. Nest is hung from branches near the trunk of a conifer.						II			
Grasshopper sparrow	Shortgrass prairies, mixed grasslands, meadows, open sagebrush-grasslands, and agricultural areas.			X	SGCN NSS4	X	II			
Green-tailed towhee	Mixed coniferous forests, woodland-chaparral, juniper-sagebrush, basin-prairie and mountain-foothills shrublands, riparian shrub.						IV			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Harlequin duck	Cold, shallow, rapid mountain streams away from concentrated human activities. Nests on ground along streams with less than 5% gradient, dense shrubs lining the banks, braided channels, swift currents, abundant aquatic insects, and good water quality.			X	SGCN NSS3		II			
Harris's sparrow	Deciduous forests, agricultural areas, urban areas.							X		
Lark bunting	Shortgrass and mixed-grass prairies, as well as disturbed grasslands, sagebrush grassland and shrub-steppe habitats, mountain-foothill shrublands, and agricultural areas.				SGCN NSS4		II			
Lark sparrow	Pine-juniper, woodland-chaparral, basin-prairie and mountain-foothills shrublands, grasslands, agricultural areas. Nests in hollow depression on the ground.						II			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Lazuli bunting	Pine-juniper, woodland chaparral, mountain-foothills shrublands with aspen, cottonwood-riparian.						III			
Lesser scaup	Permanent, intermittently exposed, and semipermanent wetlands 2 acres in size or greater. Nest in uplands, usually close to water's edge.				SGCN NSS3				H	
Lewis' woodpecker	Ponderosa pine savannah, pine-juniper, other coniferous forests, aspen, cottonwood-riparian, below 8,500 feet. Nests in a cavity in a dead tree or live tree on in a pole.			X	SGCN NSSU	X	II	X		
Loggerhead shrike	Grasslands interspersed with scattered trees and shrubs that provide nesting and perching sites.		X	X		X	II			
Long-billed curlew	Plains, grasslands, and prairies. Nests on the ground in habitat that usually includes: grass less than 12 inches high; bare ground; shade; abundant invertebrate prey; and a minimum of suitable habitat.		X	X	SGCN NSS3	X	I	X		

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
MacGillivray's warbler	Aspen, cottonwood-riparian, riparian shrub, below 9,000 feet. Nests close to the ground in dense shrubs.						II			
Mallard	Marshes and lakes in association with most habitats below 9,000 feet. Nests on ground near water.								H	
Marbled godwit	Wet-moist meadow grasslands, marshes, aquatic areas, shorelines, irrigated native meadows.					X		X		
Marsh wren	Marshes. Nest is attached to reeds.						II			
McCown's longspur	Open, dry, sparsely vegetated areas. It prefers shortgrass prairie and basin-prairie shrubland habitats, and also inhabits plowed and stubble fields, grazed pastures, dry lake beds, and other sparse, bare, dry ground.			X	SGCN NSS4	X	I	X		
Mountain bluebird	Most habitats with nesting cavities and open areas for foraging. Nests usually in a woodpecker cavity in a snag.						IV			
Mountain chickadee	Coniferous forest, aspen, juniper-sagebrush. Nests in a natural or woodpecker cavity in a tree or snag.						IV			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Mountain plover	Low, open habitats such as arid shortgrass, and mixed grass prairies dominated by blue grama and buffalograss with scattered clumps of cacti and forbs, and saltbush habitats of the shrub-steppe of central and western Wyoming.		X	X	SGCN NSSU	X	I	X		P
Northern bobwhite	Cottonwood-riparian, riparian shrub, agricultural areas. Nests on the ground.						IV			
Northern pintail	Marshes and lakes below 8,000 feet in elevation.				SGCN NSS3				H	
Northern rough-winged swallow	Adjacent to aquatic areas. Forages over a variety of habitats below 8,000 feet.						III			
Olive-sided flycatcher	Coniferous forests from 8,000 feet to timberline, aspen-riparian. Nests often high in a conifer on a horizontal branch.			X			II	X		
Ovenbird	Aspen, cottonwood-riparian. Nests on the leaf-covered forest floor.						III			
Pinyon jay	Ponderosa pine savannah, pine-juniper, woodland-chaparral, mountain-foothills shrublands. Nests in a juniper or pine, occasionally an oak.					X	IV	X		

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Plumbeous vireo	Douglas-fir, ponderosa pine savannah, ponderosa pine-Douglas-fir, other or mixed coniferous forests, aspen, cottonwood-riparian. Nests in a conifer, occasionally an oak.						II			
Pygmy nuthatch	Ponderosa pine forests, although it also occurs in other coniferous habitats. It prefers mature to old-growth stands that are fairly open with a component of vigorous trees of intermediate age.				SGCN NSSU		II			
Redhead	Permanently and semipermanently flooded palustrine wetlands. Also may inhabit cropland ponds, alkali lakes, sewage ponds, reservoirs, stream, and oxbows.				SGCN NSS3		IV		MH	
Red-headed woodpecker	Cottonwood-riparian, ponderosa pine savannah. Nests in a cavity in a barkless dead tree or a stub on a live tree.					X	III	X		
Red-naped sapsucker	Aspen and cottonwood-riparian from 5,000 to 9,000 feet. Also coniferous forests. Nests in cavity in a deciduous tree, often near water.						II			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Rock wren	Rock outcrops/rock piles in pine-juniper, woodland-chaparral, basin-prairie and mountain-foothills shrublands, grasslands. Nests in a hole or crevice, often under or around rocks.						III			
Rufous hummingbird	Riparian shrub; mountain-foothills grasslands; coniferous forests; wet-moist meadows within lodgepole pine, Douglas-fir, other coniferous or mixed forests, aspen, and mountain-foothills shrublands.						II	X		
Sage sparrow	Sagebrush flats, alkaline flats with saltbush, and semi-desert shrublands in the lowlands.		X	X	SGCN NSS4	X	I			
Sage thrasher	Open, shrub-steppe country dominated by sagebrush or bitterbrush, with native grasses intermixed, generally avoiding cheatgrass-dominated landscapes.		X		SGCN NSS4	X	II			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Sandhill crane	Wet-moist meadow grasslands, sedge meadows, irrigated native and introduced meadows, small grains, marshes. Nests on the ground.				SGCN NSS4		IV			
Say's phoebe	Basin-prairie shrublands, grasslands. Nests in a cliff or bank, occasionally under an eave or bridge.						III			
Snowy egret	Grassy marshes, reservoirs, lakes, ponds, and wet meadows. Nests in mixed colonies in emergent vegetation or in shrubs on islands.				SGCN NSS3					
Townsend's solitaire	Coniferous forests, aspen. Nests often amid tree roots or other shelter on the ground.						II			
Trumpeter swan	Foraging grounds during migration include wetlands, lakes and reservoirs.		X	X	SGCN NSS2		I			
Upland sandpiper	Open grasslands, including prairies, meadows, pastures, hayfields, alfalfa fields, and highway rights-of-way.				SGCN NSSU	X	I			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Veery	Aspen, cottonwood-riparian, coniferous forests, below 9,000 feet. Nests on the ground or in a shrub.						III			
Vesper sparrow	Basin-prairie and mountain-foothills shrublands, grasslands, and agricultural areas.						II			
Virginia's warbler	Pinyon-juniper, woodland chaparral. Nests on the ground, usually hidden by vegetation.						III			
Warbling vireo	Deciduous and coniferous forests, urban areas.						IV			
Western bluebird	Pine-juniper, juniper woodlands, associated with edges. Often nests in a woodpecker cavity in a snag.						II			
Western grebe	Marshes and lakes, usually with extensive areas of open water and bordered by tall emergent vegetation. Nests in areas that provide large clumps of emergent vegetation interspersed with open water so that the vegetation blocks wave action.						III			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Western tanager	Coniferous and deciduous forests. Usually nests in a conifer, in a fork or on a horizontal branch, well out from the trunk.						IV			
Whimbrel	Marshes, ponds, lakes, shorelines.							X		
White-faced ibis	Shallow lake waters, muddy ground of wet meadows, marshes, ponds, lakes, rivers, flooded fields, and estuaries.		X		SGCN NSS3					
White-throated swift	Aerially feeds over most habitats with cliffs below 9,000 feet. Nests deep in a crack or crevice of a rock wall.						II	X		
Willet	Wet-moist meadow grasslands, marshes, irrigated native meadows, shorelines. Nest on the ground, commonly on exposed beach or shore.						III			
Williamson's sapsucker	Coniferous forests, especially those that have burned. Also aspen. Nests in cavity in and aspen, pine, or fir.						II			

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Willow flycatcher	Riparian obligate: Uses willow or alder thickets along streams, especially where streams are bordered by open stands of cottonwoods.				SGCN NSS4	X	II	X		
Wilson's phalarope	Marshes, lakes, and shorelines. Nests on damp ground near water.						I	X		
Wilson's warbler	Riparian shrub from 7,000 to 10,500 feet. Usually nests on the ground, often in a vine tangle.						II			
Wood duck	Cottonwood-riparian, marshes, lakes, rivers. Nests in a tree cavity.			X			IV	X		
Yellow-billed cuckoo	Riparian obligate: Prefers extensive areas of dense thickets and mature deciduous forests near water, and requires low, dense, shrubby vegetation for nest sites.		X	X	SGCN NSSU		II			
Mammals										

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Big brown bat	Man-made and natural roosts, including tree cavities, rock crevices, caves, abandoned mines and bridges in a wide variety of habitats and elevations, including cottonwood riparian woodlands, sagebrush-steppe, juniper woodlands, conifer forests, and aspen woodlands.				SGCN NSS4					
Black-footed ferret	Shortgrass and midgrass prairies in close association with prairie dog colonies.	E			SGCN NSS1					
Black-tailed prairie dog	Dry, flat, open, shortgrass and mixed-grass grasslands with low, relatively sparse vegetation, including areas overgrazed by cattle.		X	X						P
Bobcat	Habitat varies widely from forests and mountainous areas to semi-deserts and brush land.									S

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Dwarf shrew	Rocky areas such as talus slopes in a variety of habitats, from alpine tundra through subalpine forests and rock slides, and, at lower elevations, from montane forests and foothills to arid shortgrass prairie.				SGCN NSS3					
Fisher	Extensive coniferous forests (mature to late successional) with a high degree of continuous overhead cover.				SGCN NSSU					
Fringed myotis	Hot desert scrubland, grassland, xeric woodland, sagegrass steppe, mesic old growth forest, and multiaged sub-alpine coniferous and mixed deciduous forest. Xeric woodlands (oak and pinyon juniper).		X		SGCN NSS3					
Hayden's shrew	Grasslands, prairies, marshes, riparian areas, and wet meadow. Nests under logs or rocks or in crevices.				SGCN NSS4					
Hispid pocket mouse	Rocky or gravelly areas with heavy soils in dry grassland habitats.				SGCN NSS3					

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Least weasel	Burrows made by a vole or mole in rolling gentle ridges dominated by sagebrush and grasses that are divided by riparian habitats of willows and cottonwoods.				SGCN NSSU					
Little brown myotis	Coniferous forest, riparian areas, woodlots, shelterbelts, and urban areas. Roosts in buildings, tree cavities, loose tree bark, bridges, rock crevices, caves, and abandoned mines.				SGCN NSS4					
Long-eared myotis	Coniferous forests in mountain areas. Roosts in small colonies in caves, buildings, and under tree bark.		X		SGCN NSS3					
Long-legged myotis	Open, mature forests with standing dead trees. Roosts in tree cavities, buildings, rock crevices, caves, abandoned mines, and under loose bark.				SGCN NSS3					
Marten	Mature and old-growth conifer and mixed stands. Dens in tree cavities, rotten logs, and underground.			X						
Mountain lion	Typically found in remote areas that have dense cover and rocky, rugged terrain.									S

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
North American wolverine	Subalpine coniferous forests, especially dense, continuous stands in remote mountain areas, and alpine habitats.			X						
Northern flying squirrel	Coniferous, deciduous, mixed, and riparian forests and woodlands, often most abundant near wetlands or streams.				SGCN NSS4					
Northern long-eared bat (Northern myotis)	Forested regions, conifer and deciduous woodlands. Roosts in crevices and cavities of trees, under loose bark, and occasionally in buildings.	P			SGCN NSS3					
Northern river otter	Permanent riverine, aquatic, and riparian areas. Dens in hollow logs, beaver lodges, burrows dug by other animals, log or rock piles, or dense thickets near water.			X	SGCN NSSU					
Olive-backed pocket mouse	Variety of arid and semiarid upland habitats, primarily sparsely vegetated grasslands and sagebrush-grasslands.				SGCN NSS4					

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Pallid bat	Low desert shrublands, juniper woodlands, and grasslands, and occasionally cottonwood-riparian zones. Roosts in rock crevices, buildings, rock piles, tree cavities, shallow caves, and abandoned mines.				SGCN NSS3					
Preble's shrew	The habitat needs are poorly known. Collected in arid and semiarid sagebrush-grasslands and openings on subalpine coniferous forests dominated by sagebrush. Also known to occur near creeks and bogs bordered by willow or riparian shrub, in wet areas in open conifer stands, and areas covered by marsh grasses.				SGCN NSS3					
Silky pocket mouse	Variety of arid, and sometimes barren, habitats. Prefers thin low grasses and a minimum of bare soil.				SGCN NSS3					
Spotted bat	Prominent rock features in extreme, low desert habitats to high elevation forests.		X	X	SGCN NSS3					

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Swift fox	Grasslands, plains, and foothills in shortgrass prairies and deserts.		X	X	SGCN NSS4					P
Townsend's big-eared bat	Mines, caves, and structures in woodlands and forests to elevations above 9,500 feet.		X	X	SGCN NSS2					S
Vagrant shrew	Riparian shrub, moist meadow grasslands, bogs, and riparian or marsh habitats with moist soil within a variety of habitat types from sagebrush-grasslands and mixed shrubland to conifer forest.				SGCN NSS4					
Water vole	Moist subalpine and alpine meadows of willows, grasses, and forbs atop deep soils.			X	SGCN NSS3					
Western small-footed myotis	Arid, rocky areas within a variety of habitats. Roosts in crevices, overhangs, cliffs, under rocks, caves, buildings, bridges, or under loose bark and/or abandoned mines.				SGCN NSS4					
Reptiles and Amphibians										
Columbia spotted frog	Sub-alpine forests grasslands and sagebrush habitats at elevations from 1,700 feet to 6,400 feet.		X	X	SGCN NSS3					

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Eastern yellow-bellied racer	Scarp woodlands of the plains and foothill zones, and woodland communities, usually close to streams or rocky outcrops with cover nearby.									S
Great plains toad	Grasslands, sand hills and agricultural areas below 6,000 feet in elevation.				SGCN NSSU					
Greater short-horned lizard	Grassland and sagebrush habitats.				SGCN NSS4					S
Northern leopard frog	Permanent ponds, swamps, marshes, and slow-moving streams throughout forest, open, and urban areas. Water bodies with abundant aquatic vegetation.		X	X	SGCN NSSU4					
Pale milksnake	Grasslands, sandhills, and scarp woodlands below 6,000 feet in elevation.				SGCN NSS3					
Plains gartersnake	Residential areas, dry grasslands, and sandhills near small streams, sloughs, marshes, and ponds.				SGCN NSSU					
Plains hog-nosed snake	Grasslands and sandhills. Burrows in loose soils.				SGCN NSSU					
Plains spadefoot	Grasslands and sagebrush communities in the plains zone below 6,000 feet in elevation.				SGCN NSSU					

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conserva- tion Con- cern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Pri- mary and Sec- ondary Target Species
Western painted turtle	Swampy habitats, small lakes, ponds, and muddy streams below 6,000 feet in elevation in the plains zone.				SGCN NSS4					
Western spiny softshell turtle	Permanent lakes, ponds, and large streams below 6,000 feet in elevation in the plains.				SGCN NSS4					

Common Name	Habitat	Status								
		Federal T, E, P, or C Species	BLM Sensitive Species	USFS Sensitive Species	WGFD	USFWS Birds of Conservation Concern	PIF Priority Bird Species Level (I – IV)	Audubon Watchlist (2002) Species	NAWMP Priority Species	TNC Primary and Secondary Target Species
Wood frog	Beaver ponds, slowly moving streams, small lakes, wet meadows and willow thickets in the montane zone, usually around 9,000 feet in elevation.			X	SGCN NSS2					
<p>Source: WGFD 2010b; BLM 2010d; Keinath et al. 2003; BLM 2003c</p> <p>¹ Occurrence in the planning area is vague or unsubstantiated, according to WYNDD.</p> <p>Note: Canada lynx is listed as Threatened under the ESA. Although WYNDD considers the Canada lynx a species of concern in Johnson and Sheridan Counties, the USFWS has not designated critical habitat within the planning area, and impacts to this species are therefore not considered in management decisions.</p> <p>BLM Bureau of Land Management C Candidate E Endangered ESA Endangered Species Act H High MH Moderately High NAWMP North American Waterfowl Management Plan NSS1 Native Species Status 1 NSS2 Native Species Status 2 NSS3 Native Species Status 3 NSS4 Native Species Status 4 NSSU Native Species Status Unknown P Proposed PIF Partners in Flight SGCN Species of Greatest Conservation Need T Threatened TNC The Nature Conservancy USFS United States Forest Service USFWS United States Fish and Wildlife Service WGFD Wyoming Game and Fish Department WYNDD Wyoming Natural Diversity Database</p>										

K.2. Raptor Management

Protections for Raptors

Raptors, or birds of prey, and the majority of other birds in the United States are protected by the Migratory Bird Treaty Act (MBTA), 16 United States Code (U.S.C.) 703. A complete list of migratory bird species can be found in the Code of Federal Regulations (CFR) at 50 CFR 10.13. Eagles are also protected by the Bald and Golden Eagle Protection Act, 16 U.S.C. 668 (Eagle Act).

The MBTA protects migratory birds, eggs and nests from possession, sale, purchase, barter, transport, import, export, and take. The regulatory definition of take, defined in 50 CFR 10.12, means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to hunt, shoot, wound, kill, trap, capture, or collect a migratory bird. Activities that result in the unpermitted take (e.g., result in death, possession, collection, or wounding) of migratory birds or their eggs are illegal and fully prosecutable under the MBTA. Removal or destruction of active nests (i.e., nests that contain eggs or young), or causing abandonment of an active nest, could constitute a violation of the MBTA, the Eagle Act, or both statutes. Removal of any active migratory bird nest or any structure that contains an active nest (e.g., tree) where such removal results in take is prohibited. Therefore, if nesting migratory birds are present on or near a project area, project timing is an important consideration during project planning. As discussed below, the Eagle Act provides additional protections for bald and golden eagles and their nests. For additional information concerning nests and protections under the MBTA, please see the U.S. Fish and Wildlife Service's (USFWS) Migratory Bird Permit Memorandum, MBMP-2.

The USFWS Wyoming Ecological Services Field Office works to raise public awareness about the possible occurrence of birds in proposed project areas and the risk of violating the MBTA, while also providing guidance to minimize the likelihood that take will occur. They encourage you to coordinate with their office before conducting actions that could lead to the take of a migratory bird, their young, eggs, or active nests (e.g., construction or other activity in the vicinity of a nest that could result in a take). If nest manipulation is proposed for a project in Wyoming, the project proponent should also contact the USFWS's Migratory Bird Office in Denver at 303-236-8171 to see if a permit can be issued. Permits generally are not issued for an active nest of any migratory bird species, unless removal of the nest is necessary for human health and safety. If a permit cannot be issued, the project may need to be modified to ensure take of migratory birds, their young or eggs will not occur.

For infrastructure (or facilities) that have potential to cause direct avian mortality (e.g., wind turbines, guyed towers, airports, wastewater disposal facilities, transmission lines), the USFWS recommends locating structures away from high avian-use areas such as those used for nesting, foraging, roosting or migrating, and the travel zones between high-use areas. If the wildlife survey data available for the proposed project area and vicinity do not provide the detail needed to identify normal bird habitat use and movements, they recommend collecting that information prior to determining locations for any infrastructure that may create an increased potential for avian mortalities. The USFWS also recommends contacting the USFWS Wyoming Ecological Services Office for project-specific recommendations.

Additional Protections for Eagles

The Eagle Act protections include provisions not included in the MBTA, such as the protection of unoccupied nests and a prohibition on disturbing eagles. Specifically, the Eagle Act prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald

or golden eagle or their body parts, nests, chicks or eggs, which includes collection, possession, molestation, disturbance, or killing. The term “disturb” is defined as “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior” (50 CFR 22.3 and see also 72 Federal Register [FR] 31132).

The Eagle Act includes limited exceptions to its prohibitions through a permitting process. The USFWS has issued regulations concerning the permit procedures for exceptions to the Eagle Act’s prohibitions (74 FR 46836), including permits to take golden eagle nests which interfere with resource development or recovery operations (50 CFR 22.25). The regulations identify the conditions under which a permit may be issued (i.e., status of eagles, need for action), application requirements, and other issues (e.g., mitigation, monitoring) necessary in order for a permit to be issued.

For additional recommendations specific to Bald Eagles please see the USFWS Bald Eagle information web page (http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/BaldEagle.html).

Recommended Steps for Addressing Raptors in Project Planning

Using the following steps in early project planning proponents can more easily minimize impacts to raptors, streamline planning and permitting processes, and incorporate measures into an adaptive management program:

1. Coordinate with appropriate USFWS offices, Wyoming Game and Fish Department (WGFD), Tribal governments, and land-management agencies at the earliest stage of project planning.
2. Identify species and distribution of raptors occurring within the project area by searching existing data sources (e.g., WGFD, federal land-management agencies) and by conducting onsite surveys.
3. Plan and schedule short-term and long-term project disturbances and human-related activities to avoid raptor nesting and roosting areas, particularly during crucial breeding and wintering periods
4. Determine location and distribution of important raptor habitat, nests, roost sites, migration zones and, if feasible, available prey base in the project impact area.
5. Document the type, extent, timing, and duration of raptor activity in important use areas to establish a baseline of raptor activity.
6. Ascertain the type, extent, timing, and duration of development or human activities proposed to occur, and the extent to which this differs from baseline conditions.
7. Consider cumulative effects to raptors from proposed projects when added to past, present, and reasonably foreseeable actions. Ensure that project mitigation adequately addresses cumulative effects to raptors.
8. Minimize loss of raptor habitats and avoid long-term habitat degradation. Mitigate for unavoidable losses of high-valued raptor habitats, including (but not limited to) nesting, roosting, migration, and foraging areas.
9. Monitor and document the status of raptor populations and, if feasible, their prey base post project completion, and evaluate the success of mitigation efforts.
10. Document meaningful data and evaluations in a format that can be readily shared and incorporated into wildlife databases (contact the USFWS Wyoming Ecological Services Office for details).

Protection of nesting, wintering (including communal roost sites), and foraging activities is considered essential to conserving raptors. In order to promote the conservation of migratory bird populations and their habitats, federal agencies should implement those strategies directed by Executive Order (EO) 13186, “Responsibilities of Federal Agencies To Protect Migratory Birds” (66 FR 3853).

Recommended Seasonal and Spatial Buffers to Protect Nesting Raptors

Because many raptors are particularly sensitive to disturbance (that may result in take) during the breeding season, the USFWS recommends implementing spatial and seasonal buffer zones to protect individual nest sites/territories (Table K.5, “Wyoming Ecological Services Field Office’s Recommended Spatial and Seasonal Buffers for Breeding Raptors” (p. 2208)). The buffers serve to minimize visual and auditory impacts associated with human activities near nest sites. Ideally, buffers would be large enough to protect existing nest trees and provide for alternative or replacement nest trees. The size and shape of effective buffers vary depending on the topography and other ecological characteristics surrounding the nest site. In open areas where there is little or no forested or topographical separation, distance alone must serve as the buffer. Adequate nesting buffers will help ensure activities do not take breeding birds, their young or eggs. For optimal conservation benefit, the USFWS recommends that no temporary or permanent surface occupancy occur within species-specific spatial buffer zones. For some activities with very substantial auditory impacts (e.g., seismic exploration and blasting) or visual impacts (e.g., tall drilling rig), a larger buffer than listed in Table K.5, “Wyoming Ecological Services Field Office’s Recommended Spatial and Seasonal Buffers for Breeding Raptors” (p. 2208) may be necessary, please contact the USFWS Wyoming Ecological Services Office for project specific recommendations on adequate buffers.

As discussed above, for infrastructure that may create an increased potential for raptor mortalities, the spatial buffers listed in Table K.5, “Wyoming Ecological Services Field Office’s Recommended Spatial and Seasonal Buffers for Breeding Raptors” (p. 2208) may not be sufficient to reduce the incidence of raptor mortalities (for example, if a wind turbine is placed outside a nest disturbance buffer, but inadvertently still within areas of normal daily or migratory bird movements); therefore, please contact the USFWS Wyoming Ecological Services Office for project specific recommendations on adequate buffers.

Buffer recommendations may be modified on a site-specific or project-specific basis based on field observations and local conditions. The sensitivity of raptors to disturbance may be dependent on local topography, density of vegetation, and intensity of activities. Additionally, individual birds may be habituated to varying levels of disturbance and human-induced impacts. Modification of protective buffer recommendations may be considered where biologically supported and developed in coordination with the USFWS Wyoming Ecological Services Field Office.

Because raptor nests are not always identified to species (e.g., preliminary aerial surveys in winter), nests of unknown raptor species will be considered as golden eagle nests when located in trees or similar vertical structure and as ferruginous hawk nests when located on the ground (including creek bank, rock outcrop, cliff, or erosional feature). Ferruginous hawks receive the most conservative buffers of ground-nesting species while golden eagles receive the most conservative buffers of those species which typically nest in trees. The Buffalo Field Office database (queried September 12, 2013) contains 1,403 nests identified as ferruginous hawk of which 1,278 or 91 percent are ground nests; of the remaining 9 percent of ferruginous hawk nests many did not have the nest substrate recorded. Once the raptor species is confirmed, we then make species-specific and site-specific recommendations on seasonal and spatial buffers

(Table K.5, “Wyoming Ecological Services Field Office’s Recommended Spatial and Seasonal Buffers for Breeding Raptors” (p. 2208)).

Activities should not occur within the spatial/seasonal buffer of any nest (occupied or unoccupied) when raptors are in the process of courtship and nest site selection. Long-term land-use activities and human-use activities should not occur within the species-specific spatial buffer of occupied nests. Short-term land use and human-use activities proposed to occur within the spatial buffer of an occupied nest should only proceed during the seasonal buffer after coordination with the USFWS, state, and land-management agency biologists. If, after coordination, it is determined that due to human or environmental safety or otherwise unavoidable factors, activities require temporary incursions within the spatial and seasonal buffers, those activities should be planned to minimize impacts and monitored to determine whether impacts to birds occurred. Mitigation for habitat loss or degradation should be identified and planned in coordination with applicable agencies.

Please contact the USFWS Wyoming Ecological Services Field Office if you have any questions regarding the status of the bald eagle, permit requirements, or if you require technical assistance regarding the MBTA, Eagle Act, or the above recommendations. The recommended spatial and seasonal buffers do not supersede provisions of the MBTA, Eagle Act, (Migratory Bird Permit Memorandum (MBMP-2), and Endangered Species Act (ESA) (16 U.S.C 1531 et seq.). Assessing legal compliance with the MBTA or the Eagle Act and the implementing regulations is ultimately the authority and responsibility of the USFWS law enforcement personnel. The USFWS recommendations also do not supersede federal, state, local, or tribal regulations or permit conditions that may be more restrictive.

Table K.5. Wyoming Ecological Services Field Office’s Recommended Spatial and Seasonal Buffers for Breeding Raptors

Common Name	Spatial buffer (miles)	Seasonal buffer
Raptors of Conservation Concern (see below for more information)		
Golden Eagle	0.50	January 15 - July 31
Ferruginous Hawk	1.00	March 15 - July 31
Swainson's Hawk	0.25	April 1 - August 31
Bald Eagle	see Bald Eagle information web page ¹	
Prairie Falcon	0.50	March 1 - August 15
Peregrine Falcon	0.50	March 1 - August 15
Short-eared Owl	0.25	March 15 - August 1
Burrowing Owl	0.25	April 1 - September 15
Northern Goshawk	0.50	April 1 - August 15
Additional Wyoming Raptors		
Osprey	0.25	April 1 - August 31
Cooper's Hawk	0.25	March 15 - August 31
Sharp-shinned Hawk	0.25	March 15 - August 31
Red-tailed Hawk	0.25	February 1 - August 15
Rough-legged Hawk (winter resident only)	----	----
Northern Harrier	0.25	April 1 - August 15
Merlin	0.50	April 1 - August 15
American Kestrel	0.125	April 1 - August 15
Common Barn Owl	0.125	February 1 - September 15
Northern Saw-whet Owl	0.25	March 1 - August 31
Boreal Owl	0.25	February 1 - July 31

Common Name	Spatial buffer (miles)	Seasonal buffer
Long-eared Owl	0.25	February 1 - August 15
Great Horned Owl	0.125	December 1 - September 30
Northern Pygmy-Owl	0.25	April 1 - August 1
Eastern Screech-owl	0.125	March 1 - August 15
Western Screech-owl	0.125	March 1 - August 15
Great Gray Owl	0.25	March 15 - August 31
¹ http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/BaldEagle.html		

Raptors of Conservation Concern

The USFWS Birds of Conservation Concern (2008) report identifies “species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing” under the ESA (16 U.S.C. 1531 et seq.). This report is intended to stimulate coordinated and proactive conservation actions among federal, state, and private partners. The Wyoming Partners in Flight Wyoming Bird Conservation Plan identifies priority bird species and habitats, and establishes objectives for bird populations and habitats in Wyoming. This plan also recommends conservation actions to accomplish the population and habitat objectives.

We encourage project planners to develop and implement protective measures for the Birds of Conservation Concern as well as other high-priority species identified in the Wyoming Bird Conservation Plan. For additional information on the Birds of Conservation Concern that occur in Wyoming, please see the USFWS Birds of Conservation Concern web page.

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Appendix L. Lands Identified for Disposal Through Exchange or Sale

The Buffalo Field Office (BFO) Resource Management Plan (RMP) revision project specifically identifies areas available for consideration for disposal by employing the “isolated, difficult or expensive to manage, or needed-for community expansion” disposal criteria in the Federal Land Policy and Management Act (FLPMA). The areas in the table below were identified during the RMP revision process as meeting the FLPMA disposal criteria. Inclusion in this table does not constitute a decision that the land will be disposed. Before taking any disposal action, consideration will be given to each individual tract and will include public involvement.

As stated elsewhere in the RMP, the preferred method of disposal or acquisition of lands is through land exchanges. Proposals for disposal of lands not identified in this table will be considered if they are consistent with the objectives of the approved RMP and may require a land use plan amendment.

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Range 69 West			
T. 45 N., R. 69 W.			
Sec. 3: Lots 11, 18 ^a	79.69	Yes	Yes
Sec. 10: Lots 2-4	122.46	Yes	Yes
Sec. 11: Lots 1-4	165.76	Yes	Yes
Sec. 12: Lots 2-8	285.17	Yes	Yes
Sec. 14: Lot 4	41.98	Yes	Yes
Sec. 15: Lot 12	41.37	Yes	Yes
Sec. 22: Lots 1, 2, 5	125.89	Yes	Yes
Sec. 23: Lots 3-6, 10-13	333.05	Yes	Yes
Sec. 25: Lot 6	41.65	Yes	Yes
Sec. 26: Lots 11-14	161.54	Yes	Yes
Sec. 27: Lots 2, 4-6, 9, 10	243.21	Yes	Yes
Sec. 28: Lots 1, 6-9, 14, 15	295.51	Yes	Yes
Sec. 34: Lot 2, 3, 7, 10, 16	199.74	Yes	Yes
Sec. 35: Lots 1-4, 7-10	327.86	Yes	Yes
T. 46 N., R. 69 W.			
Sec. 2: Lots 5-19	617.51	Yes	Yes
Sec. 3: Lot 16	38.44	Yes	Yes
Sec. 34: Lot 1	39.82	Yes	Yes
T. 47 N., R. 69 W.			
Sec. 11: Lot 2	40.82	Yes	Yes
Sec. 20: Lot 1	43.21	Yes	Yes
Sec. 21: Lot 1	40.89	Yes	Yes
T. 48 N., R. 69 W.			
Sec. 6: Lots 10-13, 17-20	309.58	Yes	Yes
Sec. 11: Lots 1, 2	79.64	Yes	Yes
Sec. 18: Lots 6, 7	79.39	Yes	Yes
Sec. 19: Lots 7-9, 15, 16	194.16	Yes	Yes
T. 49 N., R. 69 W.			
Sec. 20: Lot 1	40.53	Yes	Yes
Sec. 22: Lot 5	41.25	Yes	Yes
Sec. 31: Lots 11, 14, 19	123.35	Yes	Yes
T. 50 N., R. 69 W.			

Appendix L Lands Identified for Disposal Through Exchange or Sale

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 5: Lot 6	39.81	Yes	Yes
T. 51 N., R. 69 W.			
Sec. 2: Lots 5, 6, 9, 10, 13	205.18	Yes	Yes
Sec. 22: Lot 12	40.12	Yes	Yes
Sec. 23: Lot 5	40.23	Yes	Yes
T. 52 N., R. 69 W.			
Sec. 15: Lots 9, 10	84.01	Yes	Yes
Sec. 20: Lot 12	39.02	Yes	Yes
Sec. 22: Lots 1, 2, 5, 6	170.40	Yes	Yes
Sec. 27: Lots 1, 2, 4, 5, 11-14	355.16	Yes	Yes
T. 53 N., R. 69 W.			
Sec. 10: Lot 5	39.75	Yes	Yes
Sec. 13: Lot 7	45.25	Yes	Yes
Sec. 15: Lots 9, 16	84.01	Yes	Yes
Sec. 18: Lots 5, 10, 11 14	144.46	Yes	Yes
Sec. 22: Lots 3-6	171.53	Yes	Yes
Sec. 30: Lots 6, 7	77.87	Yes	Yes
T. 56 N., R. 69 W.			
Sec. 1: SWSW	39.92	Yes	Yes
Sec. 12: NWNW	39.93	Yes	Yes
Sec. 13: Lots 2-4, NWNE, W2SW	252.41	Yes	Yes
Sec. 14: Lots 4-6, S2NE	148.72	Yes	Yes
Sec. 15: Lots 1, 3, 4	38.65	Yes	Yes
Sec. 19: S2SE	79.89	Yes	Yes
Sec. 29: W2NW, NWSW	119.80	Yes	Yes
Sec. 30: Lots 6-10, 15-18, 20, NWNE, NESE	434.41	Yes	Yes
Sec. 31: Lots 5, 12, 14	110.46	Yes	Yes
Sec. 32: SWNE	39.95	Yes	Yes
Sec. 35: Lot 6	18.41	Yes	Yes
T. 56 1/2 N., R. 69 W.			
Sec. 35: Lot 1	13.77	No	Yes
T. 57 N., R. 69 W.			
Sec. 17: Lot 4	34.29	Yes	Yes
Sec. 28: Lot 6	23.80	Yes	Yes
T. 58 N., R. 69 W.			
Sec. 30: Lots 9, 10	74.67	Yes	Yes
Range 70 West			
T. 45 N., R. 70 W.			
Sec. 29: Lot 12	41.15	Yes	Yes
Sec. 30: Lot 16	39.48	Yes	Yes
T. 46 N., R. 70 W.			
Sec. 3: Lots 14, 15	82.53	Yes	Yes
Sec. 4: Lots 5, 7-10, 14	244.06	Yes	Yes
Sec. 5: Lots 5, 6, 11-14, 19, 20	322.94	Yes	Yes
Sec. 6: Lots 18, 19, 21	119.16	Yes	Yes
Sec. 8: Lots 1, 8	79.85	Yes	Yes
Sec. 9: Lots 5, 7, 10, 12	159.41	Yes	Yes
Sec. 10: Lots 1, 5, 11, 12	163.52	Yes	Yes
Sec. 11: Lots 4, 7, 8	120.53	Yes	Yes
Sec. 13: Lot 13	40.09	Yes	Yes
Sec. 14: Lots 10, 15, 16	120.76	Yes	Yes
Sec. 15: Lots 5, 6	81.34	Yes	Yes
Sec. 20: Lots 1, 8, 9	121.67	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 21: Lots 11, 12, 14	121.99	Yes	Yes
Sec. 22: Lots 5, 12	80.87	Yes	Yes
Sec. 23: Lots 2, 5, 8, 11-13	242.73	Yes	Yes
Sec. 24: Lots 4, 5	80.28	Yes	Yes
Sec. 26: Lot 12	40.33	Yes	Yes
Sec. 27: Lot 5	41.13	Yes	Yes
Sec. 31: Lots 6, 18	80.07	Yes	Yes
Sec. 32: Lots 1, 2, 11	127.02	Yes	Yes
Sec. 34: Lots 1, 2	80.73	Yes	Yes
T. 47 N., R. 70 W.,			
Sec. 21: Lots 1, 8	79.75	Yes	Yes
Sec. 22: Lots 1, 3-6	198.53	Yes	Yes
Sec. 33: Lot 14	40.44	Yes	Yes
T. 48 N., R. 70 W.,			
Sec. 1: Lots 7-10	152.59	Yes	Yes
Sec. 2: Lot 5	39.40	Yes	Yes
Sec. 3: Lots 13, 19, 20	113.83	Yes	Yes
Sec. 12: Lots 1-3, 6	160.33	Yes	Yes
Sec. 13: Lots 1, 2, 7-9	204.62	Yes	Yes
Sec. 22: Lot 3	40.27	No	Yes
Sec. 24: Lots 1, 8, 9, 15	161.41	Yes	Yes
Sec. 25: Lots 1, 2, 7, 8	164.65	Yes	Yes
Sec. 29: Lot 16	40.86	Yes	Yes
T. 49 N., R. 70 W.,			
Sec. 27: Lot 3	40.09	Yes	Yes
Sec. 33: Lots 1, 8, 13	122.12	Yes	Yes
T. 50 N., R. 70 W.,			
Sec. 4: Lot 6	35.23	Yes	Yes
Sec. 15: Lot 4	39.90	Yes	Yes
Sec. 19: Lot 15	40.69	Yes	Yes
Sec. 30: Lot 15	39.39	No	Yes
Sec. 34: Lots 3, 4	82.19	Yes	Yes
T. 51 N., R. 70 W.,			
Sec. 4: Lot 7	40.35	Yes	Yes
Sec. 7: Lot 10	40.40	Yes	Yes
Sec. 10: Lot 3	41.33	Yes	Yes
Sec. 18: Lots 5, 11	83.61	Yes	Yes
T. 52 N., R. 70 W.,			
Sec. 4: Lot 11	39.97	Yes	Yes
Sec. 28: Lot 1	40.24	Yes	Yes
Sec. 32: Lots 1, 4	83.51	Yes	Yes
Sec. 33: Lot 3	39.59	Yes	Yes
Sec. 35: Lot 7	41.61	Yes	Yes
T. 53 N., R. 70 W.,			
Sec. 2: Lot 9	39.91	Yes	Yes
Sec. 15: Lots 14, 15	81.23	Yes	Yes
Sec. 22: Lot 2	41.57	Yes	Yes
Sec. 23: Lots 4, 5	81.69	Yes	Yes
T. 56 N., R. 70 W.,			
Sec. 6: Lots 25, 29, 30	119.85	Yes	Yes
Sec. 7: Lots 5-10, 13, 14	201.61	Yes	Yes
Sec. 9: NW	159.62	Yes	Yes
Sec. 18: Lot 10	15.49	Yes	Yes

Appendix L Lands Identified for Disposal
Through Exchange or Sale

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 19: Lots 5-11	174.17	Yes	Yes
Sec. 20: SWSE	39.95	Yes	Yes
Sec. 24: Lots 4, 7	40.55	Yes	Yes
Sec. 25: Lots 2-5, 7, 8, 11, 12	319.92	Yes	Yes
Sec. 26: N2NE, NWSW	119.87	Yes	Yes
Sec. 29: N2NE	79.89	Yes	Yes
Sec. 30: Lots 5-10, NWSE	252.40	Yes	Yes
Sec. 33: S2NW	79.97	Yes	Yes
Sec. 35: Lots 1, 2	80.84	Yes	Yes
T. 57 N., R. 70 W.,			
Sec. 6: Lot 12	31.49	Yes	Yes
Sec. 19: SESE	39.95	Yes	Yes
Sec. 20: S2SW	80.10	Yes	Yes
Sec. 22: SESE	39.94	Yes	Yes
Sec. 25: SWNE, S2SW, SE	279.96	Yes	Yes
Sec. 26: NESW	39.94	Yes	Yes
Sec. 29: NENW, N2SW, NWSE	160.04	Yes	Yes
Sec. 30: Lots 5, 6, SWNE, SENW, NESW, NWSE	238.93	Yes	Yes
Sec. 31: Lot 7, NWNE	53.22	Yes	Yes
Sec. 32: N2NW	79.94	Yes	Yes
Sec. 33: S2NE, NENW	119.99	Yes	Yes
Sec. 36: Lots 1, 2	34.70	No	Yes
Sec. 36: N2NE, NENW	119.99	Yes	Yes
T. 58 N., R. 70 W.,			
Sec. 25: Lot 6	27.76	Yes	Yes
Sec. 27: SWSE	40.01	Yes	Yes
Sec. 31: Lots 6, 12	22.12	Yes	Yes
Sec. 32: Lot 4	36.95	Yes	Yes
Sec. 34: S2NE, NENW	119.99	Yes	Yes
Range 71 West			
T. 44 N., R. 71 W.,			
Sec. 30: Lots 17, 18	76.31	Yes	Yes
T. 45 N., R. 71 W.,			
Sec. 3: Lot 14	41.19	Yes	Yes
Sec. 4: Lots 5, 12	84.99	Yes	Yes
T. 46 N., R. 71 W.,			
Sec. 1: Lot 11	40.28	Yes	Yes
Sec. 2: Lot 13	40.60	Yes	Yes
Sec. 4: Lots 19, 20	81.30	Yes	Yes
Sec. 9: Lots 1, 2, 4-7	245.18	Yes	Yes
Sec. 10: Lots 3-5, 8-10	243.59	Yes	Yes
Sec. 11: Lot 4	40.61	Yes	Yes
Sec. 15: Lots 1, 2	81.21	Yes	Yes
T. 47 N., R. 71 W.,			
Sec. 29: Lot 7	40.70	Yes	Yes
T. 49 N., R. 71 W.,			
Sec. 8: Lot 9	40.79	Yes	Yes
Sec. 9: Lots 8, 10	81.13	Yes	Yes
T. 50 N., R. 71 W.,			
Sec. 4: Lot 5	38.70	Yes	Yes
T. 51 N., R. 71 W.,			
Sec. 35: Lot 7	40.50	Yes	Yes
T. 52 N., R. 71 W.,			

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 25: Lot 5	39.64	Yes	Yes
Sec. 30: Lots 5, 12	75.11	Yes	Yes
T. 53 N., R. 71 W.,			
Sec. 15: Lots 2, 7	78.98	Yes	Yes
Sec. 21: Lot 1	39.39	Yes	Yes
Sec. 28: Lot 1, W2NW	124.25	Yes	Yes
Sec. 29: Lots 1, 8, 9	119.05	Yes	Yes
T. 54 N., R. 71 W.,			
Sec. 10: Lot 4	40.74	Yes	Yes
Sec. 17: Lots 9, 10	80.83	Yes	Yes
T. 55 N., R. 71 W.,			
Sec. 1: Lot 7	41.13	Yes	Yes
Sec. 2: Lots 10, 11, 14, 15, 19, 20	248.02	Yes	Yes
Sec. 8: Lot 1	37.70	Yes	Yes
Sec. 24: Lots 3, 5, 6, 9	147.24	Yes	Yes
Sec. 25: Lot 11	39.76	Yes	Yes
Sec. 28: Lot 3	42.34	Yes	Yes
T. 56 N., R. 71 W.,			
Sec. 6: Lot 10	38.62	Yes	Yes
Sec. 12: E2NE	79.87	Yes	Yes
Sec. 13: SESW	39.95	Yes	Yes
Sec. 24: Lot 1, E2W2, W2SE	276.75	Yes	Yes
Sec. 25: Lot 1, W2NE, E2NW	162.14	Yes	Yes
Sec. 29: NWNW	40.00	Yes	Yes
T. 57 N., R. 71 W.,			
Sec. 1: Lot 5	11.64	Yes	Yes
Sec. 1: Lots 6, 9	2.17	No	Yes
Sec. 3: Lot 8	40.03	Yes	Yes
Sec. 4: Lot 8, SWNW	79.97	Yes	Yes
Sec. 5: ALL	640.78	Yes	Yes
Sec. 8: N2NW	80.05	Yes	Yes
Sec. 10: SWSE	39.95	Yes	Yes
Sec. 13: Lot 3	43.52	Yes	Yes
Sec. 27: E2SE	79.90	Yes	Yes
Sec. 31: SESE	39.97	Yes	Yes
Sec. 34: SENW	39.96	Yes	Yes
Sec. 35: Track 46D	39.95	Yes	Yes
Range 72 West			
T. 44 N., R. 72 W.,			
Sec. 7: Lots 13, 14, 19, 20	163.72	Yes	Yes
Sec. 18: Lots 5, 11, 12	122.29	Yes	Yes
Sec. 19: Lot 5	40.14	Yes	Yes
T. 45 N., R. 72 W.,			
Sec. 15: Lot 10	40.95	Yes	Yes
Sec. 18: Lot 6	43.61	Yes	Yes
Sec. 23: Lot 12	40.97	Yes	Yes
T. 46 N., R. 72 W.,			
Sec. 14: Lot 10	40.36	Yes	Yes
Sec. 25: Lots 5, 6, 7	119.89	Yes	Yes
Sec. 26: Lot 6	37.82	Yes	Yes
Sec. 31: Lot 20	42.86	Yes	Yes
T. 47 N., R. 72 W.,			
Sec. 2: Lots 8, 9	81.23	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 3: Lot 10	39.91	Yes	Yes
Sec. 7: Lots 16, 17	85.15	Yes	Yes
T. 48 N., R. 72 W.,			
Sec. 14: Lot 13	41.02	Yes	Yes
Sec. 15: Lot 13	40.34	Yes	Yes
Sec. 22: Lot 6	40.62	Yes	Yes
T. 49 N., R. 72 W.,			
Sec. 12: Lot 11	39.99	Yes	Yes
T. 50 N., R. 72 W.,			
Sec. 1: Lot 5	39.38	Yes	Yes
Sec. 7: Lots 13, 20	83.09	Yes	Yes
T. 51 N., R. 72 W.,			
Sec. 11: Lot 4	35.91	Yes	Yes
T. 53 N., R. 72 W.,			
Sec. 6: Lot 8	37.83	Yes	Yes
Sec. 7: Lots 5-7	111.18	Yes	Yes
T. 54 N., R. 72 W.,			
Sec. 3: Lots 6-11, 14-19	474.25	Yes	Yes
Sec. 8: Lots 1-8, 10-16	609.34	Yes	Yes
Sec. 11: Lots 9-13	226.36	Yes	Yes
T. 55 N., R. 72 W.,			
Sec. 6: Lots 15-17	117.75	Yes	Yes
Sec. 7: Lots 11, 12, 14, 19	159.91	Yes	Yes
Sec. 8: Lots 3, 4	79.36	Yes	Yes
Sec. 9: Lots 8-11	160.91	Yes	Yes
Sec. 10: Lot 8	39.62	Yes	Yes
Sec. 11: Lot 4	39.69	Yes	Yes
Sec. 12: Lots 2, 7, 10, 15	157.01	Yes	Yes
Sec. 17: Lots 1-3	120.30	Yes	Yes
Sec. 18: Lots 9, 10	77.33	Yes	Yes
Sec. 19: Lot 10	40.69	Yes	Yes
Sec. 21: Lots 2, 13	78.26	Yes	Yes
Sec. 22: Lot 3	38.56	Yes	Yes
Sec. 28: Lot 4	38.67	Yes	Yes
Sec. 29: Lots 5-9	198.21	Yes	Yes
Sec. 30: Lots 9, 13, 15, 16	156.33	Yes	Yes
Sec. 31: Lots 12-14	119.92	Yes	Yes
Sec. 33: Lots 3-5, 7, 8	197.84	Yes	Yes
Sec. 34: Lots 6-8	119.38	Yes	Yes
T. 56 N., R. 72 W.,			
Sec. 3: Lots 17, 19	77.85	No	Yes
Sec. 5: Lot 17	39.92	Yes	Yes
Sec. 6: Lots 16, 17, 22, 23	159.80	Yes	Yes
Sec. 8: Lot 1	49.81	Yes	Yes
Sec. 19: Lots 8, 11-14	114.62	Yes	Yes
Sec. 23: SESE	40.00	Yes	Yes
Sec. 24: N2SE, SESE	119.89	Yes	Yes
Sec. 25: NWNW, SENW	79.94	Yes	Yes
T. 57 N., R. 72 W.,			
Sec. 7: Lots 6, 7	74.53	Yes	Yes
Sec. 15: SESE	39.91	Yes	Yes
Sec. 16: Lot 5	11.42	Yes	Yes
Sec. 18: Lot 8, E2SE	38.84	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 19: N2NE, SENE	119.87	Yes	Yes
Sec. 20: N2NW, SENW	119.89	Yes	Yes
Sec. 21: Lot 3	4.26	Yes	Yes
Sec. 22: Lot 3	0.57	Yes	Yes
Sec. 26: NWSW	39.93	Yes	Yes
Sec. 29: Lot 2, SWSW, E2SW	159.34	Yes	Yes
Sec. 30: Lot 10, SESE	79.25	Yes	Yes
Sec. 31: Lots 5-7	4.17	Yes	Yes
Sec. 32: Lot 1, NENW	43.07	Yes	Yes
Sec. 33: Lots 3, 4	48.91	Yes	Yes
Sec. 34: Lot 2, E2SW	106.58	Yes	Yes
T. 58 N., R. 72 W.,			
Sec. 19: Lot 11	37.29	Yes	Yes
Sec. 30: Lot 5	35.62	Yes	Yes
Range 73 West			
T. 44 N., R. 73 W.,			
Sec. 6: Lot 17	40.15	Yes	Yes
Sec. 14: Lots 1-3, 6-13, 15	477.17	Yes	Yes
T. 45 N., R. 73 W.,			
Sec. 2: Lot 18	40.20	Yes	Yes
Sec. 33: Lot 15	39.64	Yes	Yes
T. 51 N., R. 73 W.,			
Sec. 3: Lots 9-11	119.44	Yes	Yes
Sec. 4: Lots 11, 12, 15	119.86	Yes	Yes
Sec. 5: Lots 11-14, 19	198.82	Yes	Yes
Sec. 6: Lot 16	40.05	Yes	Yes
Sec. 9: Lot 7	40.27	Yes	Yes
Sec. 30: Lot 13	39.94	Yes	Yes
T. 52 N., R. 73 W.,			
Sec. 29: Lot 14	40.02	Yes	Yes
Sec. 33: Lots 13-16	156.13	Yes	Yes
T. 53 N., R. 73 W.,			
Sec. 3: Lot 19	42.07	Yes	Yes
Sec. 9: Lots 9, 16	80.42	Yes	Yes
Sec. 12: Lot 2	41.90	Yes	Yes
Sec. 13: Lots 2-4	121.91	Yes	Yes
Sec. 14: Lot 3	39.34	Yes	Yes
Sec. 15: Lots 2, 3	81.08	Yes	Yes
T. 54 N., R. 73 W.,			
Sec. 2: Lot 10	39.30	Yes	Yes
Sec. 10: Lots 3, 4	80.10	Yes	Yes
Sec. 13: Lots 1-14	564.50	Yes	Yes
Sec. 15: Lot 4	40.11	Yes	Yes
Sec. 17: Lot 5	38.99	Yes	Yes
Sec. 24: Lots 3, 4, 13, 14	162.24	Yes	Yes
Sec. 33: Lots 2-4, 7, 9, 10	243.38	Yes	Yes
Sec. 35: Lots 9, 10, 15, 16	162.26	Yes	Yes
T. 55 N., R. 73 W.,			
Sec. 1: Lot 5	40.27	Yes	Yes
Sec. 2: Lots 5-7, Tracts 42A, 42B, 42C, 42D	161.69	Yes	Yes
Sec. 11: Tract 42D	11.74	Yes	Yes
Sec. 12: Lots 3, 7	68.88	Yes	Yes
Sec. 13: Lot 6	44.90	Yes	Yes

Appendix L Lands Identified for Disposal
Through Exchange or Sale

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 14: Lot 1	27.42	Yes	Yes
Sec. 23: Lot 2	12.84	Yes	Yes
T. 56 N., R. 73 W.,			
Sec. 5: Lots 5	36.37	Yes	Yes
Sec. 8: Lots 1, 15	81.29	Yes	Yes
Sec. 12: Lots 1	41.29	Yes	Yes
Sec. 15: Lots 12, 13	80.57	Yes	Yes
Sec. 17: Lots 3, 6, 7	122.50	Yes	Yes
Sec. 21: Lots 2, 7, 10	121.91	Yes	Yes
Sec. 22: Lots 3, 6	81.42	Yes	Yes
Sec. 27: Lot 16	40.68	Yes	Yes
Sec. 35: Lot 1, NWNW, S2NW, SESW	166.94	Yes	Yes
T. 57 N., R. 73 W.,			
Sec. 3: Lot 8, SWNW	78.60	Yes	Yes
Sec. 4: SENE	39.97	Yes	Yes
Sec. 7: Lot 8	39.25	Yes	Yes
Sec. 9: E2SW	79.90	Yes	Yes
Sec. 18: Lot 5	39.31	Yes	Yes
Sec. 22: NW, N2SW	239.79	Yes	Yes
Sec. 25: SENW	39.95	Yes	Yes
Sec. 28: NESW	39.92	Yes	Yes
Sec. 32: Lot 12	13.41	Yes	Yes
T. 58 N., R. 73 W.,			
Sec. 21: Lot 6, NWSW, S2SE	164.28	Yes	Yes
Sec. 22: Lot 3	44.42	Yes	Yes
Sec. 27: Lot 1, NWNE, W2NW	56.03	Yes	Yes
Sec. 28: NWNW	40.03	Yes	Yes
Sec. 31: Lots 5, 6	71.11	Yes	Yes
Sec. 32: NWNE, N2NW	119.82	Yes	Yes
Range 74 West			
T. 42 N., R. 74 W.,			
Sec. 22: Lot 10	40.05	Yes	Yes
T. 46 N., R. 74 W.,			
Sec. 10: Lots 2, 7, 10	122.06	Yes	Yes
Sec. 11: Lot 16	40.53	Yes	Yes
T. 47 N., R. 74 W.,			
Sec. 26: Lot 9	40.17	Yes	Yes
T. 48 N., R. 74 W.,			
Sec. 3: Lots 16, 17	77.17	Yes	Yes
Sec. 4: Lots 13-15, 18-20	230.52	Yes	Yes
Sec. 9: Lots 1-3, 6-8	228.99	Yes	Yes
Sec. 10: Lots 2, 4, 5	116.08	Yes	Yes
T. 50 N., R. 74 W.,			
Sec. 10: Lots 4, 5, 11, 12, 14	203.72	Yes	Yes
Sec. 15: Lot 3	40.76	Yes	Yes
Sec. 20: Lot 8	40.35	Yes	Yes
Sec. 21: Lot 13	40.23	Yes	Yes
Sec. 22: Lot 8	40.74	Yes	Yes
Sec. 23: Lots 3, 14	81.73	Yes	Yes
Sec. 27: Lot 4	40.27	Yes	Yes
T. 51 N., R. 74 W.,			
Sec. 3: Lots 7, 8, 10	108.98	Yes	Yes
Sec. 4: Lot 20	37.17	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 5: Lot 17	36.78	Yes	Yes
Sec. 7: Lots 8, 9, 11, 12	142.45	Yes	Yes
Sec. 9: Lot 3	41.06	Yes	Yes
Sec. 18: Lots 6, 7	77.71	Yes	Yes
Sec. 27: Lots 1, 2	80.12	Yes	Yes
Sec. 28: Lots 3, 7	81.99	Yes	Yes
Sec. 34: Lot 8	43.01	Yes	Yes
T. 52 N., R. 74 W.,			
Sec. 4: Lots 16, 17	81.94	Yes	Yes
Sec. 18: Lots 17, 18	79.63	Yes	Yes
T. 53 N., R. 74 W.,			
Sec. 6: Lots 15	40.17	Yes	Yes
Sec. 7: Lot 8	36.14	Yes	Yes
Sec. 8: Lot 15, SENW	79.73	Yes	Yes
Sec. 9: Lot 14	39.59	Yes	Yes
Sec. 10: Lots 3, 4	80.17	Yes	Yes
Sec. 11: Lots 1, 2, 7-9	239.02	Yes	Yes
Sec. 12: Lots 1, 7-10	199.14	Yes	Yes
Sec. 13: Lots 2-4	121.53	Yes	Yes
Sec. 15: Lots 5, 6, 11-13	202.08	Yes	Yes
Sec. 17: Lots 1, 8	79.33	Yes	Yes
Sec. 22: Lot 1	40.25	Yes	Yes
Sec. 26: Lots 1, 2	80.80	Yes	Yes
T. 54 N., R. 74 W.,			
Sec. 4: Lot 7	41.11	Yes	Yes
Sec. 5: Lot 20	39.56	Yes	Yes
Sec. 9: Lot 16	40.17	Yes	Yes
Sec. 15: Lots 15, 16	80.69	Yes	Yes
Sec. 17: Lot 10	40.32	Yes	Yes
Sec. 19: Lot 5	39.56	Yes	Yes
Sec. 20: Lots 1-4	157.89	Yes	Yes
Sec. 21: Lots 11-14	158.91	Yes	Yes
T. 55 N., R. 74 W.,			
Sec. 4: Lot 5	59.84	Yes	Yes
Sec. 5: Lots 6, 11, NWSW	79.77	Yes	Yes
Sec. 16: Lot 5	4.56	Yes	Yes
Sec. 20: NWSE	40.00	Yes	Yes
Sec. 21: Lot 1	35.40	Yes	Yes
Sec. 27: NESW	40.00	Yes	Yes
T. 56 N., R. 74 W.,			
Sec. 3: Lot 19	41.26	Yes	Yes
Sec. 6: Lots 14-17, 22, 23	245.17	Yes	Yes
Sec. 7: Lots 6, 11	81.74	Yes	Yes
Sec. 9: Lots 3, 4	80.98	Yes	Yes
Sec. 10: Lot 2	41.15	Yes	Yes
Sec. 11: Lot 8	40.85	Yes	Yes
Sec. 12: Lot 1	39.43	Yes	Yes
Sec. 13: Lot 9	39.88	Yes	Yes
Sec. 17: Lots 4, 6	81.65	Yes	Yes
Sec. 18: Lots 5, 20	81.64	Yes	Yes
Sec. 19: Lots 6, 11	81.45	Yes	Yes
Sec. 20: Lots 3, 4, 6, 7, 9, 10, 13, 16	327.03	Yes	Yes
Sec. 23: Lot 9	39.20	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 29: Lots 1, 8	81.70	Yes	Yes
Sec. 33: Lots 9, 10	80.67	Yes	Yes
T. 57 N., R. 74 W.,			
Sec. 4: SWNW	40.03	Yes	Yes
Sec. 5: Lot 13, SESE	59.30	Yes	Yes
Sec. 7: E2NW	80.04	Yes	Yes
Sec. 8: Lot 1	38.57	Yes	Yes
Sec. 14: S2NW, NWSW	120.41	Yes	Yes
Sec. 15: NE, NESE	200.18	Yes	Yes
Sec. 17: Lots 1, 2, NWNW	81.00	Yes	Yes
Sec. 18: NENE	40.00	Yes	Yes
Sec. 23: Lot 2, SENW	66.13	Yes	Yes
Sec. 27: Lots 6, 7	72.46	Yes	Yes
Sec. 31: Lots 7, 8, 14	120.05	Yes	Yes
Sec. 32: Lots 9-12	205.95	Yes	Yes
Sec. 34: Lots 1, 2, NENE	84.82	Yes	Yes
Sec. 35: SWNW	39.92	Yes	Yes
T. 58 N., R. 74 W.,			
Sec. 26: W2SE	80.00	Yes	Yes
Sec. 29: Lot 8	20.55	Yes	Yes
Sec. 30: Lot 13	21.90	Yes	Yes
Sec. 32: SWNE	40.01	Yes	Yes
Range 75 West			
T. 43 N., R. 75 W.,			
Sec. 3: SENW	43.08	Yes	Yes
T. 47 N., R. 75 W.,			
Sec. 2: Lots 5, 6, 11-20	483.93	Yes	Yes
Sec. 3: Lots 6-8	120.44	Yes	Yes
Sec. 5: Lots 7, 8	82.22	Yes	Yes
Sec. 7: Lots 9, 10, 13-20	393.41	Yes	Yes
Sec. 8: Lot 3	40.94	Yes	Yes
Sec. 12: Lots 3-6, 13	202.11	Yes	Yes
Sec. 13: Lot 14	39.91	Yes	Yes
Sec. 21: Lot 13	39.42	Yes	Yes
Sec. 23: Lots 3, 6	80.48	Yes	Yes
T. 48 N., R. 75 W.,			
Sec. 4: Lots 8, 9	75.35	Yes	Yes
Sec. 5: Lots 7, 8	70.38	Yes	Yes
Sec. 33: Lots 9-16	323.43	Yes	Yes
Sec. 34: Lots 12, 13, SWSW	119.95	Yes	Yes
T. 49 N., R. 75 W.,			
Sec. 4: E2SE	81.61	Yes	Yes
Sec. 5: Lots 3, 4, S2NW, N2S2	322.49	Yes	Yes
Sec. 6: Lots 1, 2, S2NE, SE	323.18	Yes	Yes
Sec. 9: E2E2	163.32	Yes	Yes
Sec. 10: W2SW	81.31	Yes	Yes
Sec. 31: NWSE, N2SE	80.02	Yes	Yes
Sec. 32: SENE	39.82	Yes	Yes
T. 50 N., R. 75 W.,			
Sec. 5: Lots 13, 20	79.79	Yes	Yes
Sec. 6: Lots 14, 15	83.73	Yes	Yes
Sec. 9: Lots 3, 7, 15, 16	158.12	Yes	Yes
Sec. 15: Lots 5, 12	79.28	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 31: Lots 9, 10	79.28	Yes	Yes
T. 51 N., R. 75 W.,			
Sec. 1: Lots 5, 12, 13	114.96	No	Yes
Sec. 2: Lot 5	40.05	No	Yes
Sec. 7: Lots 18, 19	81.64	Yes	Yes
Sec. 10: Lot 14	39.84	Yes	Yes
Sec. 11: Lots 2, 5, 12	119.26	Yes	Yes
Sec. 13: Lot 13	39.91	Yes	Yes
Sec. 14: Lot 14	40.04	Yes	Yes
Sec. 15: Lots 11, 12	80.54	No	Yes
Sec. 19: Lots 11, 19	80.55	Yes	Yes
Sec. 20: Lot 7	40.73	Yes	Yes
Sec. 22: Lots 1, 8, 11, 13, 14	203.46	Yes	Yes
Sec. 24: Lots 2-4	120.64	Yes	Yes
Sec. 25: Lots 1-2, 13-15	201.18	Yes	Yes
Sec. 26: Lot 8	40.54	Yes	Yes
Sec. 27: Lots 2, 3, 6, 7	165.74	Yes	Yes
Sec. 32: Lots 9, 16	81.03	Yes	Yes
Sec. 33: Lots 1, 8, 9, 12, 13, 16	246.11	Yes	Yes
Sec. 34: Lots 2-4, 6, 7, 10, 11, 14, 15	369.94	Yes	Yes
Sec. 35: Lots 3, 8, 9	122.79	Yes	Yes
T. 52 N., R. 75 W.,			
Sec. 6: Lots 11, 17	72.32	Yes	Yes
Sec. 13: Lots 7, 9, 10, 15, 16	203.06	Yes	Yes
Sec. 21: Lot 12	39.77	Yes	Yes
Sec. 24: Lots 1, 2, 7-10	246.41	Yes	Yes
Sec. 26: Lot 6	41.57	Yes	Yes
Sec. 28: Lots 3, 4	85.94	Yes	Yes
Sec. 33: Lots 1-3	126.71	Yes	Yes
Sec. 34: Lots 5-7, 9-12	291.97	Yes	Yes
Sec. 35: Lot 10	42.37	Yes	Yes
T. 53 N., R. 75 W.,			
Sec. 5: Lot 12	39.80	Yes	Yes
Sec. 12: Lots 2, 8	80.39	Yes	Yes
Sec. 19: Lots 6, 7, 10, 11, 16, NESW	238.86	Yes	Yes
T. 54 N., R. 75 W.,			
Sec. 7: Lot 16	37.24	Yes	Yes
Sec. 18: Lot 8	37.21	Yes	Yes
Sec. 22: Lots 10, 11, 14, 15	160.24	Yes	Yes
T. 55 N., R. 75 W.,			
Sec. 5: Lot 10	40.70	Yes	Yes
Sec. 6: Lot 16	40.72	Yes	Yes
Sec. 7: Lots 6, 11	81.37	Yes	Yes
Sec. 15: Lots 9-12	158.48	Yes	Yes
Sec. 21: Lots 2, 3	80.07	Yes	Yes
Sec. 26: Lots 2, 3	80.78	Yes	Yes
Sec. 31: Lot 5	35.37	Yes	Yes
Sec. 34: Lot 14	34.88	Yes	Yes
T. 56 N., R. 75 W.,			
Sec. 2: Lots 5, 6	84.23	Yes	Yes
Sec. 4: Lots 7, 11-13, 20	216.21	Yes	Yes
Sec. 7: Lots 8-10, 16, 17	182.66	Yes	Yes
Sec. 8: Lot 5	41.94	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 15: Lots 15, 16	79.69	Yes	Yes
Sec. 27: Lot 4	40.63	Yes	Yes
T. 57 N., 75 W.,			
Sec. 3: SENE, SWNW	79.96	Yes	Yes
Sec. 4: Lot 6, SENE, SESE	119.12	Yes	Yes
Sec. 5: Lot 10, SENE	69.00	Yes	Yes
Sec. 8: SWNE	40.02	Yes	Yes
Sec. 9: NESE	39.88	Yes	Yes
Sec. 10: SESW, SWSE	79.95	Yes	Yes
Sec. 12: N2SW	79.95	Yes	Yes
Sec. 15: NW, NESW	199.96	Yes	Yes
Sec. 17: Lots 1, 3	45.34	Yes	Yes
Sec. 19: Lot 5	39.71	Yes	Yes
Sec. 25: S2NW	80.03	Yes	Yes
Sec. 26: SENW	40.00	Yes	Yes
Sec. 28: Lot 8	14.30	Yes	Yes
Sec. 33: Lots 5, 8, 13, 14, E2NW	263.62	Yes	Yes
Sec. 35: Lot 9	7.78	Yes	Yes
T. 58 N., R. 75 W.,			
Sec. 21: Lots 6-8, NWSW	172.91	Yes	Yes
Sec. 22: Lots 5, 6, N2SE, SESE	210.14	Yes	Yes
Sec. 23: Lot 8, W2SW	125.04	Yes	Yes
Sec. 26: SENE, NWNW, E2SW, SE	319.43	Yes	Yes
Sec. 33: NWNE, S2NE, NENW, E2SW, W2SE, NENSE	359.86	Yes	Yes
Sec. 34: S2NE, SWNW, W2SW, SE	360.00	Yes	Yes
Sec. 35: Lot 1, SWSW	52.12	Yes	Yes
Range 76 West			
T. 41 N., R. 76 W.,			
Sec. 6: Lots 5-7	118.81	Yes	Yes
Sec. 24: ALL	652.01	Yes	Yes
Sec. 25: NENE	40.40	Yes	Yes
Sec. 29: E2NE	83.51	Yes	Yes
T. 42 N., R. 76 W.,			
Sec. 19: Lots 5-8	166.56	Yes	Yes
Sec. 20: SESE	41.03	Yes	Yes
Sec. 21: SWNW, NWSW	81.46	Yes	Yes
Sec. 29: NENE	41.01	Yes	Yes
Sec. 31: Lot 5	40.13	Yes	Yes
T. 43 N., R. 76 W.,			
Sec. 30: SENE	40.54	Yes	Yes
T. 46 N., R. 76 W.,			
Sec. 12: Lots 14, 15	78.97	Yes	Yes
Sec. 13: Lots 2, 3, 6	117.16	Yes	Yes
Sec. 14: Lots 4, 5, 12	119.14	Yes	Yes
Sec. 15: Lot 13	39.33	Yes	Yes
Sec. 23: Lots 3, 4, 11	119.08	Yes	Yes
T. 47 N., R. 76 W.,			
Sec. 1: Lot 18	37.62	Yes	Yes
Sec. 35: Lot 13	40.32	Yes	Yes
T. 48 N., R. 76 W.,			
Sec. 1: Lot 18	39.84	Yes	Yes
Sec. 2: Lot 11	39.62	Yes	Yes
Sec. 3: Lot 5	34.72	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 10: Lot 10	39.49	Yes	Yes
Sec. 12: Lots 6, 7	79.36	Yes	Yes
T. 49 N., R. 76 W.,			
Sec. 1: SENW, NESW	80.68	Yes	Yes
Sec. 14: NWSE	40.59	Yes	Yes
Sec. 23: SWNE, SENW, NESW, W2SE	202.64	Yes	Yes
Sec. 26: NWSE	40.11	Yes	Yes
Sec. 34: SESE	39.94	Yes	Yes
T. 50 N., R. 76 W.,			
Sec. 6: Lots 12, 23	81.48	No	Yes
Sec. 13: Lots 7, 8	80.79	No	Yes
Sec. 22: Lots 3-8	243.11	Yes	Yes
Sec. 26: Lot 7	40.52	Yes	Yes
Sec. 33: Lot 10	40.70	Yes	Yes
Sec. 34: Lots 12, 13	81.30	No	Yes
T. 51 N., R. 76 W.,			
Sec. 5: Lots 9, 10	81.70	Yes	Yes
Sec. 6: Lots 8, 9, 15	122.32	Yes	Yes
Sec. 20: Lots 3-6, 11-14	330.23	Yes	Yes
Sec. 31: Lots 19, 20	41.00	No	Yes
Sec. 32: Lots 1, 8	83.40	No	Yes
T. 52 N., R. 76 W.,			
Sec. 1: Lots 17	40.33	No	Yes
Sec. 2: Lots 7, 10, 19, 20	166.93	Yes	Yes
Sec. 11: Lots 1, 15, 16	123.23	Yes	Yes
Sec. 12: Lots 11, 14	82.34	Yes	Yes
Sec. 31: Lot 18	40.86	Yes	Yes
T. 53 N., R. 76 W.,			
Sec. 2: Lot 9	39.47	Yes	Yes
Sec. 10: Lots 7-10, 15, 16	234.60	Yes	Yes
Sec. 14: Lot 11	39.24	Yes	Yes
Sec. 15: Lots 1, 2	78.13	Yes	Yes
Sec. 24: Lots 15, 16	78.70	Yes	Yes
Sec. 27: Lot 3	39.36	Yes	Yes
Sec. 31: Lots 9, 10	76.22	Yes	Yes
T. 54 N., R. 76 W.,			
Sec. 1: Lot 20	40.16	Yes	Yes
Sec. 9: Lots 9, 10, 15, 16	155.52	Yes	Yes
Sec. 12: Lots 9, 10, 14, NESE	160.04	Yes	Yes
Sec. 17: Lots 9, 16	81.10	Yes	Yes
Sec. 20: Lot 7	39.75	Yes	Yes
Sec. 31: Lots 13, 14, 20	117.80	Yes	Yes
T. 55 N., R. 76 W.,			
Sec. 7: Lots 17, 18	67.68	Yes	Yes
Sec. 17: Lot 12	40.16	Yes	Yes
Sec. 18: Lots 5, 6, 11, 14, 20	182.69	Yes	Yes
Sec. 19: Lot 16	31.50	Yes	Yes
Sec. 20: Lot 11	39.81	Yes	Yes
Sec. 25: Lot 13	37.41	Yes	Yes
Sec. 26: Lots 3, 6	77.74	Yes	Yes
Sec. 29: Lots 4, 5	78.69	Yes	Yes
Sec. 35: Lots 1-3	110.82	Yes	Yes
T. 56 N., R. 76 W.,			

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 1: Lots 19, 20	89.68	Yes	Yes
Sec. 11: Lots 1, 7, 8, 10	172.39	Yes	Yes
Sec. 12: Lots 1-8	314.93	Yes	Yes
Sec. 13: Lots 4, 5, 12, 13	157.61	Yes	Yes
Sec. 14: Lots 1, 8, 10, 11, 14	199.08	Yes	Yes
Sec. 15: Lots 3, 4, 8	118.16	Yes	Yes
Sec. 21: Lots 8, 10	80.33	Yes	Yes
Sec. 23: Lots 1, 7-10, 14, 15	276.79	Yes	Yes
Sec. 31: Lot 13	39.26	Yes	Yes
Sec. 32: Lot 13	39.19	Yes	Yes
T. 57 N., R. 76 W.,			
Sec. 19: Lots 11, 14	53.67	Yes	Yes
Sec. 31: Lot 9	39.91	Yes	Yes
T. 58 N., R. 76 W.,			
Sec. 28: Lot 4	25.21	Yes	Yes
Sec. 32: Lot 1, 3	50.40	Yes	Yes
Sec. 36: Lots 1, 3-8	139.31	Yes	Yes
Range 77 West			
T. 41 N., R. 77 W.,			
Sec. 2: S2SE	80.36	Yes	Yes
Sec. 4: SWNW	41.59	Yes	Yes
Sec. 11: N2NE	79.06	Yes	Yes
Sec. 13: SWSW	41.64	Yes	Yes
Sec. 14: SWNE, S2	371.80	Yes	Yes
Sec. 24: SESW	40.97	Yes	Yes
T. 42 N., R. 77 W.,			
Sec. 2: W2SE	83.16	Yes	Yes
Sec. 12: E2SE	81.50	Yes	Yes
Sec. 13: E2E2	163.01	Yes	Yes
Sec. 14: W2SW	82.37	Yes	Yes
Sec. 22: E2SE, SE	164.24	Yes	Yes
Sec. 23: W2	329.67	Yes	Yes
Sec. 24: Lots 1-4	167.66	Yes	Yes
Sec. 27: S2	322.91	Yes	Yes
Sec. 32: SENE	40.54	Yes	Yes
Sec. 34: N2	320.17	Yes	Yes
T. 43 N., R. 77 W.,			
Sec. 23: SENE, NESE	80.98	Yes	Yes
Sec. 24: SWNW, NWSW	80.89	Yes	Yes
Sec. 34: N2SW	80.03	Yes	Yes
T. 44 N., R. 77 W.,			
Sec. 19: Lot 13	40.59	Yes	Yes
Sec. 30: Lots 11, 13-16	205.11	Yes	Yes
Sec. 33: Lot 12	40.05	Yes	Yes
Sec. 34: Lots 7, 8	78.61	Yes	Yes
Sec. 35: Lots 13, 14	78.28	Yes	Yes
T. 45 N., R. 77 W.,			
Sec. 4: Lot 21	39.89	Yes	Yes
Sec. 5: Lot 18	40.51	Yes	Yes
Sec. 6: Lot 19	40.01	Yes	Yes
Sec. 7: Lots 6-20	609.64	Yes	Yes
Sec. 8: Lots 10, 13-15	161.94	Yes	Yes
Sec. 18: Lots, 7-10	162.10	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 23: Lots 1, 8 T. 47 N., R. 77 W.,	80.42	Yes	Yes
Sec. 13: Lots 7-10	151.26	Yes	Yes
Sec. 35: Lots 3, 4, 8 T. 48 N., R. 77 W.,	112.10	Yes	Yes
Sec. 20: Lot 3	40.16	Yes	Yes
Sec. 30: Lots 8, 14, 16 T. 49 N., R. 77 W.,	120.87	Yes	Yes
Sec. 22: SWSW T. 50 N., R. 77 W.,	39.70	Yes	Yes
Sec. 5: Lot 6	13.95	Yes	Yes
Sec. 7: Lots 5-8	94.64	No	Yes
Sec. 8: Lots 1, 3	44.51	No	Yes
Sec. 9: Lot 5, SWSE	58.75	No	Yes
Sec. 10: Lot 1	6.02	No	Yes
Sec. 11: Lot 2, W2NW	85.86	No	Yes
Sec. 16: Lot 3	16.37	No	Yes
Sec. 17: Lot 3	31.70	No	Yes
Sec. 21: Lots 2, 6	64.67	No	Yes
Sec. 27: Lot 2	16.84	No	Yes
Sec. 34: Lot 5, NESW T. 51 N., R. 77 W.,	88.12	No	Yes
Sec. 12: NWNW	39.98	Yes	Yes
Sec. 29: Lots 4, 6	25.31	Yes	Yes
Sec. 30: Lots 5, 10	39.98	Yes	Yes
Sec. 32: SWNW T. 52 N., R. 77 W.,	39.98	Yes	Yes
Sec. 1: Lots 5-8, 11-14	276.65	Yes	Yes
Sec. 4: Lots 5-12, SWSW	282.99	Yes	Yes
Sec. 5: Lots 5, 6, 11, 12, 14	157.97	Yes	Yes
Sec. 6: Lots 15, 16, NESE	119.68	Yes	Yes
Sec. 8: NWNE	39.96	Yes	Yes
Sec. 16: Lot 1	2.89	No	Yes
Sec. 21: Lots 6, 7	17.48	Yes	Yes
Sec. 26: Lots 8, 9, 10 T. 53 N., R. 77 W.,	28.39	No	Yes
Sec. 7: Lot 11	17.04	Yes	Yes
Sec. 8: Lots 1-3	22.88	Yes	Yes
Sec. 17: Lot 4	19.84	Yes	Yes
Sec. 26: Lot 5	41.53	Yes	Yes
Sec. 28: S2NW	79.91	Yes	Yes
Sec. 29: W2SE T. 54 N., R. 77 W.,	80.03	Yes	Yes
Sec. 27: NWNW	39.83	Yes	Yes
Sec. 32: NW, N2SW T. 55 N., R. 77 W.,	239.91	Yes	Yes
Sec. 4: SWNE	40.00	Yes	Yes
Sec. 6: Lot 8	32.12	Yes	Yes
Sec. 9: Lots 1, 2, SWNE	108.55	Yes	Yes
Sec. 12: SWSE	39.86	Yes	Yes
Sec. 13: Lot 1, W2SE	119.33	Yes	Yes
Sec. 14: Lots 2, 4, 5	80.93	Yes	Yes
Sec. 15: Lots 10, 11	43.18	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 20: E2E2	161.08	Yes	Yes
Sec. 21: SWNW, NWSW	80.47	Yes	Yes
Sec. 23: Lot 1, SENW, NESW, NWSE	151.94	Yes	Yes
Sec. 25: W2SW, SESW, SWSE	161.13	Yes	Yes
Sec. 28: NWNW	40.02	Yes	Yes
Sec. 29: E2NE	79.85	Yes	Yes
Sec. 32: NWNE, S2NE, N2SE	196.28	Yes	Yes
Sec. 33: Lots 3, 4, NWSW	103.37	Yes	Yes
Sec. 35: Lot 2, NWNE	68.81	Yes	Yes
T. 56 N., R. 77 W.,			
Sec. 4: Lot 19	45.93	Yes	Yes
Sec. 8: Lots 1, 4, NWSE	112.67	Yes	Yes
Sec. 16: Lots 1, 2	14.01	Yes	Yes
Sec. 18: Lots 5-9	94.19	Yes	Yes
Sec. 19: Lot 8, SESE	69.22	Yes	Yes
Sec. 26: Lot 3, NWSW	54.35	Yes	Yes
Sec. 29: Lots 1, 4	39.04	Yes	Yes
Sec. 30: Lot 5	13.62	Yes	Yes
Sec. 31: Lot 8	39.96	Yes	Yes
Sec. 32: NWNE	40.03	Yes	Yes
Sec. 34: SWSE	39.61	Yes	Yes
Sec. 35: Lot 7	33.03	Yes	Yes
Sec. 36: Lots 1, 2	10.99	Yes	Yes
T. 57 N., R. 77 W.,			
Sec. 7: Lot 6, Tract 41E	57.60	Yes	Yes
Sec. 11: N2NE, NENW, SENE, NESE	199.89	Yes	Yes
Sec. 12: Lots 3, 4, S2, W2SE	324.70	Yes	Yes
Sec. 13: NENW	39.29	Yes	Yes
Sec. 16: Lot 1	5.66	Yes	Yes
Sec. 17: Lots 6, 7	10.87	Yes	Yes
Sec. 18: Lot 8	30.57	Yes	Yes
Sec. 19: SENW, SESW	79.66	Yes	Yes
Sec. 21: Lot 1	4.97	Yes	Yes
Sec. 35: Lot 3, NWSE	84.05	Yes	Yes
T. 58 N., R. 77 W.,			
Sec. 19: NWSE	39.97	Yes	Yes
Sec. 21: Lots 6-8	70.60	Yes	Yes
Sec. 21: Lots 9, 10	21.26	No	Yes
Sec. 22: Lot 14	6.38	Yes	Yes
Sec. 26: Lot 4	6.27	No	Yes
Sec. 27: Lot 1	8.77	No	Yes
Sec. 28: W2SW	79.93	Yes	Yes
Sec. 29: NWNE, NENW	79.91	Yes	Yes
Range 78 West			
T. 42 N., R. 78 W.,			
Sec. 2: SW	167.65	Yes	Yes
Sec. 3: SE	166.49	Yes	Yes
Sec. 4: S2NW, N2SW, SESW	204.87	Yes	Yes
Sec. 5: SENE	39.53	Yes	Yes
Sec. 8: NWNW	39.11	Yes	Yes
Sec. 13: SW	158.91	Yes	Yes
Sec. 17: S2NE, SENW, NESE	156.17	Yes	Yes
Sec. 18: Lot 3, NESW	75.43	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 19: SENE	39.71	Yes	Yes
T. 43 N., R. 78 W.,			
Sec. 12: W2	309.90	Yes	Yes
Sec. 20: SWSE	39.70	Yes	Yes
Sec. 28: ALL	628.67	Yes	Yes
Sec. 29: NWNE, NESE	78.57	Yes	Yes
Sec. 30: Lots 1, 2, NE, E2NW	307.20	Yes	Yes
Sec. 31: Lots 3, 4, E2SW	145.12	Yes	Yes
Sec. 32: W2NW	77.61	Yes	Yes
T. 44 N., R. 78 W.,			
Sec. 3: Lot 17	41.64	Yes	Yes
Sec. 4: Lot 19	40.57	Yes	Yes
Sec. 9: Lot 3	40.40	Yes	Yes
Sec. 23: Lot 6	42.24	Yes	Yes
Sec. 25: Lots 2-4, 8, 9, 14, 15	295.09	Yes	Yes
Sec. 30: Lot 7	31.35	Yes	Yes
T. 45 N., R. 78 W.,			
Sec. 1: NESW, S2SW	123.54	Yes	Yes
Sec. 5: Lot 1, SENE	81.43	Yes	Yes
Sec. 9: SWSE	41.22	Yes	Yes
Sec. 12: SENE	40.20	Yes	Yes
Sec. 26: SESW	39.96	Yes	Yes
T. 47 N., R. 78 W.,			
Sec. 6: Lots 10, 13	82.76	Yes	Yes
Sec. 19: Lots 6, 11	81.25	Yes	Yes
T. 48 N., R. 78 W.,			
Sec. 10: Lots 1, 2, 7, 8	158.76	Yes	Yes
T. 50 N., R. 78 W.,			
Sec. 19: Lots 15, 16	77.61	No	Yes
T. 51 N., R. 78 W.,			
Sec. 10: Lots 9, 12, 16	119.63	No	Yes
Sec. 29: Lots 7-10	160.93	Yes	Yes
T. 52 N., R. 78 W.,			
Sec. 1: Lot 8	55.21	Yes	Yes
Sec. 2: Lot 5	54.89	Yes	Yes
Sec. 17: SENW	39.96	Yes	Yes
Sec. 18: Lots 7, 9, NE, NESE	269.25	Yes	Yes
Sec. 20: Lot 1	10.63	Yes	Yes
Sec. 33: Lot 4	44.73	Yes	Yes
T. 53 N., R. 78 W.,			
Sec. 1: Lots 5-10, S2NW	299.66	Yes	Yes
Sec. 2: Lots 5-8, S2N2, E2SE	332.81	Yes	Yes
Sec. 3: Lot 7	16.14	Yes	Yes
Sec. 15: Lot 1	15.96	Yes	Yes
Sec. 22: W2E2	159.54	Yes	Yes
Sec. 25: Lot 3, NWSE	70.57	Yes	Yes
Sec. 27: N2	319.26	Yes	Yes
Sec. 28: NE, E2SE	239.59	Yes	Yes
Sec. 32: E2NE, SWNE	119.65	Yes	Yes
Sec. 33: Lot 1, E2NE, NESE	155.09	Yes	Yes
Sec. 35: NESE	39.94	Yes	Yes
T. 54 N., R. 78 W.,			
Sec. 2: Lots 7-9, 11	160.74	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 3: Lots 5-7, 10-20	559.46	Yes	Yes
Sec. 4: Lots 13, 20	79.28	Yes	Yes
Sec. 6: Lots 19, 20, 24, 25	114.15	Yes	Yes
Sec. 7: Lots 17, 18, 23, 32	119.22	Yes	Yes
Sec. 8: Lot 5	40.13	Yes	Yes
Sec. 10: Lots 6, 11, 14	120.71	Yes	Yes
Sec. 15: Lots 1, 2	80.42	Yes	Yes
Sec. 20: Lots 1, 2, 8	120.71	Yes	Yes
Sec. 22: Lots 11-14	161.95	Yes	Yes
Sec. 24: Lot 7	39.87	Yes	Yes
Sec. 29: Lots 3-6, 11-14	320.85	Yes	Yes
Sec. 30: Lots 13, 14, 21-24, 31, 32	322.21	Yes	Yes
Sec. 33: Lot 4	40.61	Yes	Yes
Sec. 35: Lot 16	40.42	Yes	Yes
T. 55 N., R. 78 W.,			
Sec. 1: Lot 8	52.59	Yes	Yes
Sec. 9: Lots 4-6	114.63	Yes	Yes
Sec. 10: Lot 5	28.68	Yes	Yes
Sec. 15: Lot 1	1.49	No	Yes
Sec. 16: Lot 1	5.91	No	Yes
Sec. 17: Lots 5, 6	69.51	Yes	Yes
Sec. 22: Lot 4	23.34	Yes	Yes
Sec. 23: Lots 1,2	11.13	No	Yes
Sec. 27: Lot 2, SESE	62.50	Yes	Yes
Sec. 29: Lot 4	2.34	Yes	Yes
Sec. 30: Lots 5, 6	24.08	Yes	Yes
Sec. 31: Lots 7-8, 13-24	472.76	Yes	Yes
Sec. 31: Lot 9	52.35	No	
Sec. 32: Lot 2	7.21	Yes	Yes
Sec. 32: Lot 3	18.15	No	
Sec. 34: NWSE	39.95	Yes	Yes
T. 56 N., R 78 W.,			
Sec. 3: Lot 15	19.66	Yes	Yes
Sec. 25: E2NE	79.81	Yes	Yes
T. 57 N., R. 78 W.,			
Sec. 2: Lot 2, SWNE	80.79	Yes	Yes
Sec. 3: Lot 3	39.43	Yes	Yes
Sec. 4: SENE	39.37	Yes	Yes
Sec. 5: SENW, NWSW	78.76	Yes	Yes
Sec. 7: SENE	39.51	Yes	Yes
Sec. 12: W2NW	78.71	Yes	Yes
Sec. 13: SWNE	38.33	Yes	Yes
Sec. 23: SENW	37.56	Yes	Yes
Sec. 24: NESE	39.47	Yes	Yes
T. 58 N., R. 78 W.,			
Sec. 23: Lots 1, 2	35.51	Yes	Yes
Sec. 26: NESE	37.61	Yes	Yes
Sec. 27: NENE	37.93	Yes	Yes
Sec. 30: Lot 1	36.77	Yes	Yes
Sec. 31: SWNE	39.56	Yes	Yes
Sec. 33: N2SW, SESW, NWSE, S2SE	232.77	Yes	Yes
Sec. 34: S2SW	76.90	Yes	Yes
Sec. 35: S2SE	75.58	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Range 79 West			
T. 42 N., R. 79 W.,			
Sec. 25: W2NW, SENW	116.15	Yes	Yes
Sec. 26: N2NE, NENW	117.30	Yes	Yes
Sec. 27: N2NW	79.27	Yes	Yes
Sec. 28: NENE	39.29	Yes	Yes
T. 43 N., R. 79 W.,			
Sec. 19: Lot 4, SESW, NESE	115.72	Yes	Yes
Sec. 20: S2NE, SWNW, NWSW	152.06	Yes	Yes
Sec. 21: S2NW, S2SW	160.40	Yes	Yes
Sec. 23: NENW	40.75	Yes	Yes
Sec. 25: SW	157.61	Yes	Yes
Sec. 27: S2SW, NESW, SE	271.79	Yes	Yes
Sec. 30: Lot 1, NENW	74.30	Yes	Yes
T. 44 N., R. 79 W.,			
Sec. 4: Lots 1, 2	66.90	Yes	Yes
Sec. 6: Lots 4-7	121.76	Yes	Yes
Sec. 24: N2NW	78.62	Yes	Yes
T. 45 N., R. 79 W.,			
Sec. 3: SW, W2SE, SESE	279.54	Yes	Yes
Sec. 4: SENW	40.15	Yes	Yes
Sec. 12: SWNE	40.29	Yes	Yes
Sec. 30: NE	160.61	Yes	Yes
T. 46 N., R. 79 W.,			
Sec. 3: Lots 1, 2, S2NE, SE	318.75	Yes	Yes
Sec. 11: NE	161.19	Yes	Yes
T. 47 N., R. 79 W.,			
Sec. 4: Lots 19, 20	80.19	Yes	Yes
Sec. 9: Lots 1, 2, 7-10, 15, 16	321.17	Yes	Yes
Sec. 10: Lot 4	40.20	Yes	Yes
Sec. 22: Lots 15, 16	80.09	Yes	Yes
T. 48 N., R. 79 W.,			
Sec. 5: Lots 15-18, SW	160.10	Yes	Yes
Sec. 6: Lots 16, 22, 23	120.58	Yes	Yes
Sec. 7: Lots 5-13, 20	391.81	Yes	Yes
Sec. 10: Lots 13, 15, SESW	119.81	Yes	Yes
Sec. 14: Lots 3, 4, 6, 7, 9-11	280.61	Yes	Yes
Sec. 15: Lots 1, 5, 11	119.84	Yes	Yes
T. 49 N., R. 79 W.,			
Sec. 17: Lots 12-15	160.30	Yes	Yes
Sec. 20: Lots 2-5, 12, 13	239.82	Yes	Yes
Sec. 24: Lots 10, 15	79.83	Yes	Yes
Sec. 26: Lots 3-5, 12	158.95	Yes	Yes
Sec. 27: Lot 13	40.04	Yes	Yes
Sec. 29: Lots 3-11, 14-16	476.01	Yes	Yes
Sec. 30: Lots 8, 17	79.85	Yes	Yes
Sec. 35: Lot 8	39.82	Yes	Yes
T. 50 N., R. 79 W.,			
Sec. 17: SESW	39.96	Yes	Yes
Sec. 20: SESE	39.88	Yes	Yes
Sec. 22: Lot 13	39.90	Yes	Yes
Sec. 27: Lots 4, 11, 12, SWNW	159.97	Yes	Yes
T. 52 N., R. 79 W.,			

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 1: Lots 9-11	25.44	Yes	Yes
Sec. 3: Lots 5-7	37.89	No	Yes
Sec. 5: Lots 6, 9, 10	65.90	Yes	Yes
Sec. 7: Lot 7, Tracts 43A, 43B	88.44	Yes	Yes
Sec. 10: Lots 2, 4, 7, SWSW	132.49	No	Yes
Sec. 14: Lot 5	12.53	Yes	Yes
Sec. 17: Tracts 43C, 43H	79.95	Yes	Yes
Sec. 18: Lots 3, 4	16.92	No	Yes
Sec. 19: Lots 5, 6	75.78	Yes	Yes
Sec. 22: W2NE, NWSE	119.90	Yes	Yes
Sec. 31: S2NENE	18.58	No	Yes
Sec. 35: Lots 1, 2	20.97	Yes	Yes
T. 53 N., R. 79 W.,			
Sec. 11: NESE	39.71	Yes	Yes
Sec. 17: Lot 7	22.86	Yes	Yes
Sec. 19: Lot 21, SWSE	81.76	Yes	Yes
Sec. 20: Lot 1, Tracts 55A, 55B, 55C, 55D, 55G, 55H	227.66	Yes	Yes
Sec. 21: Lots 2-6, Tract 55E, portion of 55E, SENE, NESW, W2SE	340.36	Yes	Yes
Sec. 28: NWSW, portion of Tract 55F	50.01	Yes	Yes
Sec. 29: Portions of tracts 55H, 55G, 55F	26.16	Yes	Yes
Sec. 30: Tract 57I	39.56	Yes	Yes
Sec. 32: Lot 1	12.36	No	Yes
Sec. 34: Tract 67, SENW	87.13	Yes	Yes
T. 54 N., R. 79 W.,			
Sec. 2: Lots 14, 15	84.49	Yes	Yes
Sec. 3: Lot 5	42.81	Yes	Yes
Sec. 10: Lot 1	40.53	Yes	Yes
Sec. 25: Lot 13	40.25	Yes	Yes
T. 55 N., R. 79 W.,			
Sec. 6: Lot 9	40.14	Yes	Yes
Sec. 13: Lot 13	39.61	Yes	Yes
Sec. 14: Lots 9-11	118.53	Yes	Yes
Sec. 15: Lots 7, 8	78.21	Yes	Yes
Sec. 17: Lot 4	39.82	Yes	Yes
Sec. 18: Lots 5, 6, 12	118.93	Yes	Yes
Sec. 19: Lots 5, 11-14	197.71	Yes	Yes
Sec. 20: Lots 3-6, 9, 11-16	436.67	Yes	Yes
Sec. 21: Lot 13	39.61	Yes	Yes
Sec. 26: Lot 5	40.41	Yes	Yes
Sec. 27: Lots 1, 2, 8	119.21	Yes	Yes
Sec. 32: Lot 4	38.98	Yes	Yes
Sec. 33: Lots 8, 9	80.83	Yes	Yes
Sec. 34: Lot 2	40.06	Yes	Yes
T. 56 N., R. 79 W.,			
Sec. 1: Lots 5-12	337.85	Yes	Yes
Sec. 2: Lots 5-7, 10-12, 14, 15	292.65	Yes	Yes
Sec. 4: Lots 5-17, N2SW, SESW	541.01	Yes	Yes
Sec. 5: NWSE	40.16	Yes	Yes
Sec. 6: Lots 8, 9	108.21	Yes	Yes
Sec. 13: TRACT 51B	39.10	Yes	Yes
Sec. 17: Lot 1	12.03	Yes	Yes
Sec. 23: Lot 1	11.68	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 26: Lots 1, 2	24.37	Yes	Yes
T. 57 N., R. 79 W.,			
Sec. 5: SENE, NWSW	80.56	Yes	Yes
Sec. 6: Lot 1	40.68	Yes	Yes
Sec. 7: NWNE	40.65	Yes	Yes
Sec. 7: SENE	40.00	No	Yes
Sec. 8: SENW, SW	200.89	Yes	Yes
Sec. 11: SENW	40.10	Yes	Yes
Sec. 18: Lots 3, 4, SESW, NESE	157.52	Yes	Yes
Sec. 19: Lot 1, NWNE, NENW	118.95	Yes	Yes
Sec. 22: SENW	39.61	Yes	Yes
Sec. 26: W2NW	78.61	Yes	Yes
Sec. 27: SWNE, SWSW, NWSE, SESE	157.76	Yes	Yes
Sec. 28: SW, W2SE, SESE	274.68	Yes	Yes
Sec. 30: Lot 4, NESW, S2SE	156.29	Yes	Yes
Sec. 31: Lots 1-4, NE, SENW, E2SW, SE	593.74	Yes	Yes
Sec. 33: N2, SW	469.76	Yes	Yes
Sec. 34: NENW, W2NW, SESE	157.18	Yes	Yes
Sec. 35: S2SW, NESE	117.10	Yes	Yes
T. 58 N., R. 79 W.,			
Sec. 18: Lot 2	32.97	Yes	Yes
Sec. 19: Lot 4, E2NE	121.32	Yes	Yes
Sec. 20: E2NE	82.31	Yes	Yes
Sec. 25: SE	162.08	Yes	Yes
Sec. 31: Lots 1, 4, E2SE	158.26	Yes	Yes
Sec. 34: NESW	40.99	Yes	Yes
Range 80 West			
T. 41 N., R. 80 W.,			
Sec. 17: NENE, NWNW	75.96	Yes	Yes
Sec. 21: E2NW, SESE	117.18	Yes	Yes
Sec. 22: E2SW	77.22	Yes	Yes
T. 42 N., R. 80 W.,			
Sec. 17: S2SW, SWSE	115.57	Yes	Yes
Sec. 18: SESE	37.30	Yes	Yes
Sec. 20: NESW, NESE	77.14	Yes	Yes
Sec. 21: NWSW	38.97	Yes	Yes
Sec. 29: SESW	38.85	Yes	Yes
T. 43 N., R. 80 W.,			
Sec. 7: E2NE, NESE	102.60	Yes	Yes
Sec. 8: N2, N2S2	467.52	Yes	Yes
Sec. 11: E2SE	80.59	Yes	Yes
Sec. 14: NWNE	40.71	Yes	Yes
Sec. 17: SWSE	36.96	Yes	Yes
Sec. 18: Lots 1, 2, SESE	104.99	Yes	Yes
Sec. 19: E2NE	79.23	Yes	Yes
T. 45 N., R. 80 W.,			
Sec. 5: SENW, E2SW, W2SE	200.91	Yes	Yes
Sec. 7: Lot 1, SESE	83.31	Yes	Yes
T. 48 N., R. 80 W.,			
Sec. 10: NENE	40.35	Yes	Yes
Sec. 21: SENW	40.49	Yes	Yes
Sec. 23: Lots 13, 14	81.26	Yes	Yes
Sec. 26: Lots 3-6, 11-14	319.80	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
T. 49 N., R. 80 W.,			
Sec. 2: SENW	39.97	Yes	Yes
T. 50 N., R. 80 W.,			
Sec. 2: Lots 9, 10, NESE	52.29	Yes	Yes
Sec. 10: E2	318.33	Yes	Yes
Sec. 15: W2E2	158.83	Yes	Yes
Sec. 28: NENE, W2NE	120.09	Yes	Yes
Sec. 34: W2E2, E2NW	239.58	Yes	Yes
T. 51 N., R. 80 W.,			
Sec. 4: Lots 7, 10	79.99	Yes	Yes
Sec. 5: Lots 5, 6, 7	67.93	Yes	Yes
Sec. 7: Lots 5, 6	49.99	Yes	Yes
Sec. 8: Lots 1-3, NWNE	127.91	Yes	Yes
Sec. 12: Lots 2, 3	79.15	Yes	Yes
Sec. 28: Lot 1	39.96	Yes	Yes
T. 52 N., R. 80 W.,			
Sec. 1: Lot 12, SWSE	50.41	Yes	Yes
Sec. 9: Tract 48A	18.15	Yes	Yes
Sec. 10: Tract 48A	21.68	Yes	Yes
Sec. 12: Lots 5, 8	49.24	Yes	Yes
Sec. 14: Lot 1	11.16	Yes	Yes
Sec. 15: Lot 1	38.49	Yes	Yes
Sec. 23: Lot 1	26.26	Yes	Yes
Sec. 29: Lot 6, N2SW, SESW	137.60	Yes	Yes
Sec. 32: Tracts 91E, 91F, 91G	91.71	Yes	Yes
Sec. 33: Lot 1	5.89	Yes	Yes
T. 53 N., R. 80 W.,			
Sec. 4: N2SE	81.10	Yes	Yes
T. 54 N., R. 80 W.,			
Sec. 10: NWNE	39.76	Yes	Yes
Sec. 11: SWNW	40.29	Yes	Yes
T. 55 N., R. 80 W.,			
Sec. 3: SWSW	39.44	Yes	Yes
Sec. 10: SESW	40.10	Yes	Yes
Sec. 23: NESE	38.76	Yes	Yes
Sec. 24: SWSW	39.43	Yes	Yes
Sec. 26: NESW	39.18	Yes	Yes
T. 56 N., R. 80 W.,			
Sec. 31: Lot 6	43.60	Yes	Yes
T. 57 N., R. 80 W.,			
Sec. 3: Lot 2	39.31	Yes	Yes
Sec. 11: N2NE, SENE	118.82	Yes	Yes
Sec. 12: N2, SE	478.23	Yes	Yes
Sec. 25: SWNE, S2NW	118.25	Yes	Yes
T. 58 N., R. 80 W.,			
Sec. 13: Lots 1, 2	74.90	Yes	Yes
Sec. 14: Lot 1	36.95	Yes	Yes
Sec. 21: NENW	40.42	Yes	Yes
Range 81 West			
T. 42 N., R. 81 W.,			
Sec. 11: NESW	40.53	Yes	Yes
T. 43 N., R. 81 W.,			
Sec. 5: NWSE	40.07	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 14: SESE	39.56	Yes	Yes
Sec. 19: Lot 2, SWNE, SENW	119.94	Yes	Yes
Sec. 23: SESE	39.96	Yes	Yes
T. 44 N., R. 81 W.,			
Sec. 9: SESW, SWSE	79.95	Yes	Yes
Sec. 14: W2SW	80.14	Yes	Yes
Sec. 15: SWNW	39.91	Yes	Yes
Sec. 17: NW, NESW	200.47	Yes	Yes
Sec. 18: Lots 3, 4, E2NE	157.34	Yes	Yes
Sec. 20: SESW	40.02	Yes	Yes
Sec. 21: SENE	39.86	Yes	Yes
Sec. 22: NE, N2NW, E2SE	319.90	Yes	Yes
Sec. 23: W2W2	159.84	Yes	Yes
Sec. 25: W2W2, NESW	201.59	Yes	Yes
Sec. 26: E2	320.05	Yes	Yes
Sec. 29: E2NW, NWSE	120.08	Yes	Yes
Sec. 31: E2NE	79.68	Yes	Yes
Sec. 32: W2NW	80.08	Yes	Yes
Sec. 33: SESW	40.07	Yes	Yes
T. 45 N., R. 81 W.,			
Sec. 3: S2NW, NWSW	119.98	Yes	Yes
Sec. 7: Lot 1	38.45	Yes	Yes
Sec. 21: SWSW	40.30	Yes	Yes
Sec. 28: SE	161.94	Yes	Yes
Sec. 29: SWSE	40.34	Yes	Yes
Sec. 33: SENE	40.44	Yes	Yes
T. 46 N., R. 81 W.,			
Sec. 4: Lot 2	38.66	Yes	Yes
T. 47 N., R. 81 W.,			
Sec. 7: Lot 1, NWNE, NENW	114.45	Yes	Yes
Sec. 8: NWNW	39.78	Yes	Yes
Sec. 25: NWSE	40.05	Yes	Yes
T. 48 N., R. 81 W.,			
Sec. 18: Lot 4	35.85	Yes	Yes
Sec. 19: Lots 1-4	143.91	Yes	Yes
Sec. 30: Lot 1, 2	72.31	Yes	Yes
Sec. 31: SENE, W2SE	121.90	Yes	Yes
T. 50 N., R. 81 W.,			
Sec. 27: W2SW	80.44	Yes	Yes
Sec. 28: E2SE	80.18	Yes	Yes
Sec. 33: NENE	40.06	Yes	Yes
Sec. 34: N2NW	80.34	Yes	Yes
T. 52 N., R. 81 W.,			
Sec. 7: SWSE	39.50	Yes	Yes
Sec. 18: Lot 2	39.98	Yes	Yes
Sec. 33: E2NE	79.90	Yes	Yes
T. 53 N., R. 81 W.,			
Sec. 35: SESE	40.12	Yes	Yes
T. 55 N., R. 81 W.,			
Sec. 1: SWSE	40.55	Yes	Yes
Sec. 8: NWSW	39.91	Yes	Yes
Sec. 10: SENW, NESW, NWSE	121.59	Yes	Yes
Sec. 11: SWNW, NWSW	79.53	Yes	Yes

Appendix L Lands Identified for Disposal
Through Exchange or Sale

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 15: SENW	40.17	Yes	Yes
Sec. 26: Lots 1-5	199.74	Yes	Yes
T. 56 N., R. 81 W.,			
Sec. 20: NWSE	39.58	Yes	Yes
Sec. 23: NENW	39.73	Yes	Yes
Sec. 27: SWSW	39.07	Yes	Yes
Sec. 31: Lot 2, SENE	78.55	Yes	Yes
T. 57 N., R. 81 W.,			
Sec. 29: W2NW	79.95	Yes	Yes
Sec. 32: NWSW	39.98	Yes	Yes
Range 82 West			
T. 41 N., R. 82 W.,			
Sec. 1: Lot 4, SENE, E2SE	158.00	No	Yes
Sec. 12: NESE	38.92	No	Yes
Sec. 19: SENE, S2SE	119.98	Yes	Yes
Sec. 21: SWNW	40.01	No	Yes
Sec. 22: NENE	39.83	No	Yes
Sec. 29: W2NE, NW	239.13	Yes	Yes
Sec. 30: E2NE	79.99	Yes	Yes
T. 42 N., R. 82 W.,			
Sec. 6: Lots 1-3, SENW, NESW, N2SE, SESE	314.83	Yes	Yes
Sec. 7: Lot 1	37.53	Yes	Yes
Sec. 8: NE, E2NW	238.36	Yes	Yes
Sec. 18: W2E2	158.51	Yes	Yes
Sec. 19: Lots 2-4, E2NW, E2SW, W2SE, NESE	397.39	Yes	Yes
T. 43 N., R. 82 W.,			
Sec. 2: Lot 4	39.51	Yes	Yes
Sec. 3: SWNW, NWSW	79.64	Yes	Yes
Sec. 4: Lots 1, 2, N2SE, SWSE	197.20	Yes	Yes
Sec. 9: SESE	40.19	No	Yes
Sec. 14: E2SW	79.29	Yes	Yes
Sec. 15: SESW	38.87	Yes	Yes
Sec. 18: Lots 3, 4, E2SW	154.26	Yes	Yes
Sec. 22: N2NE, E2NW	157.08	Yes	Yes
Sec. 23: N2N2, SWNW, SESE	237.72	Yes	Yes
Sec. 26: NE, E2NW	237.80	Yes	Yes
Sec. 28: SENE	39.62	No	Yes
Sec. 31: E2SW, NWSSE, E2SE	199.95	Yes	Yes
T. 44 N., R. 82 W.,			
Sec. 2: SWSW	40.35	Yes	Yes
Sec. 3: SESW, S2SE	121.10	Yes	Yes
Sec. 7: S2SE	82.55	Yes	Yes
Sec. 8: W2NE, NWSE	123.45	Yes	Yes
Sec. 9: W2NE, N2SE	165.09	Yes	Yes
Sec. 11: NWNW	40.61	Yes	Yes
Sec. 17: N2NE, SENE	121.99	Yes	Yes
Sec. 18: NENE	40.46	Yes	Yes
Sec. 19: Lot 2, SENW	77.37	Yes	Yes
Sec. 30: NWSE	40.51	Yes	Yes
Sec. 34: S2NE, SENW, NESW, N2SE	240.37	Yes	Yes
Sec. 35: SWNW, W2SW	120.71	Yes	Yes
T. 45 N., R. 82 W.,			
Sec. 2: N2SW, W2SE	160.53	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 13: NENE	40.73	Yes	Yes
Sec. 23: NWNW	40.56	Yes	Yes
Sec. 25: NENE	40.33	Yes	Yes
T. 46 N., R. 82 W.,			
Sec. 4: SWSE	39.78	Yes	Yes
T. 47 N., R. 82 W.,			
Sec. 31: NESE	39.51	Yes	Yes
T. 48 N., R. 82 W.,			
Sec. 9: NWSW	40.12	Yes	Yes
Sec. 18: NWSE	39.58	Yes	Yes
Sec. 20: NENW	40.04	Yes	Yes
Sec. 29: SWNW	39.90	Yes	Yes
Sec. 32: SESE	39.84	Yes	Yes
T. 49 N., R. 82 W.,			
Sec. 31: Lot 4	39.43	Yes	Yes
T. 50 N., R. 82 W.,			
Sec. 30: NWNE	40.14	Yes	Yes
T. 52 N., R. 82 W.,			
Sec. 2: Lots 3, 4, N2SW	167.28	Yes	Yes
Sec. 3: Lot 1	43.49	Yes	Yes
T. 53 N., R. 82 W.,			
Sec. 13: NENE	41.19	Yes	Yes
Sec. 17: SESW, SWSE	81.57	Yes	Yes
Sec. 18: NESE	42.07	Yes	Yes
Sec. 33: NWNE, NESW	78.99	Yes	Yes
Sec. 35: SWSW	39.45	Yes	Yes
T. 56 N., R. 82 W.,			
Sec. 11: SWSE	40.40	Yes	Yes
Sec. 27: SWNW, NWSE	80.40	Yes	Yes
Sec. 28: E2NE, NESE	121.03	Yes	Yes
Sec. 31: SENE, E2SE	120.81	Yes	Yes
T. 57 N., R. 82 W.,			
Sec. 7: SWSE	40.41	Yes	Yes
Sec. 20: W2SE	81.24	Yes	Yes
Sec. 30: S2NE	81.09	Yes	Yes
T. 58 N., R. 82 W.,			
Sec. 21: SENE	40.91	Yes	Yes
Range 83 West			
T. 42 N., R. 83 W.,			
Sec. 2: S2NE, SENW, NESW	156.08	Yes	Yes
Sec. 11: S2SWNW, NWSNW, NENWSW, N2SWSW, SWSWSW	69.45	Yes	Yes
Sec. 12: N2SE	77.34	Yes	Yes
Sec. 14: NWNWNW, S2NWNW	30.55	Yes	Yes
Sec. 20: SESW	40.64	Yes	Yes
Sec. 25: W2NE	80.00	Yes	Yes
Sec. 29: NWNE	40.69	Yes	Yes
T. 43 N., R. 83 W.,			
Sec. 3: Lots 5, 6	22.36	Yes	Yes
Sec. 4: Lots 7-8, 11, SESE	138.63	Yes	Yes
Sec. 9: Lots 1, 4, Tract 44 I, NENE	141.68	Yes	Yes
Sec. 10: Lots 1, 2	23.49	Yes	Yes
Sec. 11: Lots 1-5	139.64	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 12: Lot 1	4.12	Yes	Yes
Sec. 13: Lots 1, 2, 5, 6	63.13	Yes	Yes
Sec. 14: Lots 1-5, E2NE, NWNE	248.88	Yes	Yes
Sec. 24: Lot 1	30.68	Yes	Yes
Sec. 26: Lots 6, 7	70.35	Yes	Yes
Sec. 27: Lots 3, 4	56.21	Yes	Yes
Sec. 35: Lot 4	38.19	Yes	Yes
T. 44 N., R. 83 W.,			
Sec. 2: Lot 5	61.82	Yes	Yes
Sec. 3: W2SW	79.55	Yes	Yes
Sec. 6: Lot 16	39.82	Yes	Yes
Sec. 12: SESE	39.83	Yes	Yes
Sec. 13: SESE	39.53	Yes	Yes
Sec. 23: NWNE, NENW, SESE	121.20	Yes	Yes
Sec. 24: SWNE, SENW, SW, W2SE	318.63	Yes	Yes
Sec. 25: E2NE, N2NW	160.19	Yes	Yes
Sec. 26: NENE	40.46	Yes	Yes
Sec. 33: SE	158.46	Yes	Yes
Sec. 34: E2NW, SWNW, SW	283.38	Yes	Yes
T. 45 N., R. 83 W.,			
Sec. 5: Lot 8	46.00	Yes	Yes
Sec. 7: Lots 8, 9	23.39	Yes	Yes
Sec. 8: Lots 2, 5	24.10	Yes	Yes
Sec. 9: Lot 9	23.13	Yes	Yes
Sec. 10: W2NE	81.64	Yes	Yes
Sec. 11: SWSE	48.14	Yes	Yes
Sec. 16: Tract 67, Lots 1, 2	10.21	Yes	Yes
Sec. 17: Lots 1-6, NWSW	211.41	Yes	Yes
Sec. 18: Lots 5, 6, 9	79.99	Yes	Yes
Sec. 20: Lot 2	17.61	Yes	Yes
Sec. 21: Lots 1, 2	65.23	Yes	Yes
T. 47 N., R. 83 W.,			
Sec. 26: NESW	40.21	No	Yes
Sec. 27: W2NE, S2NW	158.54	No	Yes
T. 48 N., R. 83 W.,			
Sec. 1: SWSW	39.40	Yes	Yes
T. 49 N., R. 83 W.,			
Sec. 1: SWNW	40.41	Yes	Yes
Sec. 2: Lots 1, 2	78.98	Yes	Yes
T. 50 N., R. 83 W.,			
Sec. 22: SENW	40.47	Yes	Yes
Sec. 27: SENW, NESW	80.60	Yes	Yes
T. 55 N., R. 83 W.,			
Sec. 4: Lot 3	39.90	Yes	Yes
T. 56 N., R. 83 W.,			
Sec. 12: W2E2	161.23	Yes	Yes
T. 57 N., R. 83 W.,			
Sec. 10: SENE	40.66	Yes	Yes
Sec. 13: SWSW	40.81	Yes	Yes
Sec. 14: SESE	40.68	Yes	Yes
Sec. 24: NWNW	40.78	Yes	Yes
T. 58 N., R. 83 W.,			
Sec. 24: Lot 2	32.36	Yes	Yes

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
Sec. 25: W2SE	81.66	Yes	Yes
Range 84 West			
T. 57 N., R. 84 W.,			
Sec. 5: Lot 3, SESW, SWSE	127.50	Yes	Yes
Sec. 6: Lot 5	39.68	Yes	Yes
Sec. 9: SENW	39.69	Yes	Yes
T. 58 N., R. 84 W.,			
Sec. 17: Lot 1	31.81	Yes	Yes
Sec. 18: Lot 1	44.47	Yes	Yes
Sec. 20: N2NE	81.09	Yes	Yes
Sec. 21: NWNW	40.27	Yes	Yes
Range 85 West			
T. 42 N., R. 85 W.,			
Sec. 4: Lots 3, 4, SWNE, S2NW, SW, SESE	406.89	Yes	Yes
Sec. 5: Lots 1-3, S2NE	202.71	Yes	Yes
Sec. 18: N2NE	80.52	Yes	Yes
T. 43 N., R. 85 W.,			
Sec. 4: SWNE, NWSE	79.26	Yes	Yes
Sec. 5: Lots 1, 2	79.30	Yes	Yes
Sec. 8: N2NE, SENE	121.96	Yes	Yes
Sec. 17: W2NW, N2SW	160.49	Yes	Yes
Sec. 20: NWNE	40.33	Yes	Yes
Sec. 22: SWSW	39.80	Yes	Yes
Sec. 27: NWNE, NWNW	79.76	Yes	Yes
Sec. 35: N2SW	82.18	Yes	Yes
T. 44 N., R. 85 W.,			
Sec. 32: SESE	39.88	Yes	Yes
Sec. 33: N2SW	79.27	Yes	Yes
T. 45 N., R. 85 W.,			
Sec. 3: S2SW, SWSE	121.69	Yes	Yes
Sec. 4: SE, S2SE	80.70	Yes	Yes
Sec. 5: SESE	40.06	Yes	Yes
Sec. 6: Lot 6, NESW	81.06	Yes	Yes
Sec. 7: SESE	39.82	Yes	Yes
Sec. 9: NENE	40.70	Yes	Yes
Sec. 10: NENW	39.92	Yes	Yes
Sec. 12: W2SE	80.60	Yes	Yes
Sec. 15: NWNE, SENE, W2SW, E2SE	241.56	Yes	Yes
Sec. 18: Lots 1, 2, N2NE, NENW	198.96	Yes	Yes
Sec. 19: SENE, E2SE	119.52	Yes	Yes
Sec. 20: NWNW	40.15	Yes	Yes
Sec. 23: NESE	40.54	Yes	Yes
Sec. 24: NWSW	40.72	Yes	Yes
Sec. 30: E2NE	80.69	Yes	Yes
Sec. 34: SENE	40.43	Yes	Yes
Sec. 35: W2SW	79.69	Yes	Yes
T. 46 N., R. 85 W.,			
Sec. 5: SWNE, SENW	81.33	Yes	Yes
Sec. 6: Lot 2	40.22	Yes	Yes
T. 47 N., R. 85 W.,			
Sec. 19: Lots 3, 4	80.94	Yes	Yes
T. 53 N., R. 85 W.,			
Sec. 12: Lots 1-8, SENE, N2SW, SESW, N2SE, SWSE	317.57	Yes	Yes

Appendix L Lands Identified for Disposal
Through Exchange or Sale

Legal Description	Approximate Acreage	Alternative A (1985 RMP)	Alternatives B, C, D
T. 54 N., R. 85 W.,			
Sec. 27: NWNE, W2NW, NWSW, S2S2	319.08	Yes	Yes
T. 56 N., R. 85 W.,			
Sec. 8: N2NE	80.68	Yes	Yes
T. 58 N., R. 85 W.,			
Sec. 22: SWNE	40.83	Yes	Yes
Sec. 26: S2SW	80.54	Yes	Yes
Sec. 27: S2SE	81.13	Yes	Yes
Sec. 29: SENE	42.60	Yes	Yes
Range 86 West			
T. 55 N., R. 86 W.,			
Sec. 27: SW	160.40	Yes	Yes
Sec. 34: N2N2, SENE, SENW, NESW	279.15	Yes	Yes
T. 58 N., R. 86 W.,			
Sec. 13: Lots 1, 2	100.20	Yes	Yes
Sec. 14: Lot 4	37.76	Yes	Yes
Sec. 15: Lot 1	39.73	Yes	Yes
Sec. 22: NENE, SE	213.67	Yes	Yes
Sec. 23: W2SW	84.47	Yes	Yes
Sec. 26: W2SW	84.46	No	Yes
Sec. 27: SWNE, NWSE	84.96	Yes	Yes
Sec. 34: SWSW	42.20	Yes	Yes
Range 87 West			
T. 56 N., R. 87 W.,			
Sec. 5: Lots 5-7, 9-11	60.59	Yes	Yes
Sec. 23: S2S2	160.07	Yes	Yes
Sec. 25: S2SW	80.04	Yes	Yes
Sec. 36: ALL	648.59	Yes	Yes
T. 57 N., R. 87 W.,			
Sec. 19: Lots 1, 3, 4, E2SW, SE	342.96	Yes	Yes
Sec. 20: S2SW	78.40	Yes	Yes
Sec. 29: SW	154.32	Yes	Yes
Range 88 West			
T. 57 N., R. 88 W.,			
Sec. 14: Lot 1	19.71	Yes	Yes
Sec. 15: Lots 5, 6, S2SW	152.09	Yes	Yes
Sec. 16: Lot 3	26.29	Yes	Yes
Range 89 West			
T. 58 N., R. 89 W.,			
Sec. 20: NWNW	38.32	Yes	Yes
E East N North R Range RMP Resource Management Plan S South Sec. Section T Township W West			

^a The number of lots indicates the number of parcels within the section; i.e., 2 parcels within this section.

Appendix M. Technical Support Document for Air Quality

M.1. Introduction

This technical support document summarizes the data, methodologies, and approaches followed in the analysis of air resources impacts that are included in Chapter 4 of the Buffalo Proposed Resource Management Plan (RMP) and Final Environmental Impact Statement (EIS). The analysis of impacts primarily involved the estimation of emissions from the various resource activities occurring in the planning area for the base year (2005) and for the alternatives in the future years (2015 and 2024).

M.2. Study Area

The study area for this analysis (Map 1) is the Buffalo planning area and the analysis includes consideration of cumulative emission sources and potential impacts to Class I areas within 150 kilometers of the area, as mandated by the Prevention of Significant Deterioration (PSD) program under the 1970 Clean Air Act (CAA). Although there are no Class I areas within the Buffalo planning area boundary or within the 150-kilometer range, this study included three Class I areas (Wind Cave National Park, Northern Cheyenne Indian Reservation, and Badlands Wilderness Area) that are within 150 kilometers.

M.3. Pollutants Addressed in the Analysis

The basic framework for controlling air pollutants in the United States is mandated by the CAA and its amendments, Environmental Protection Agency (EPA) regulations, including the 1999 Regional Haze Regulations, and state and local air quality regulations. The CAA addresses criteria air pollutants, state and NAAQS for criteria air pollutants, and the PSD program. The Regional Haze Regulations address visibility impairment. EPA regulations address ambient air quality standards for criteria pollutants, emission control technology, air quality monitoring, and State Implementation Plan development (which may include air quality modeling), and air quality related value (AQRV) analyses related to regional haze.

Air pollutants addressed in this study include criteria pollutants, hazardous air pollutants (HAPs), sulfur and nitrogen compounds (which could cause visibility impairment or atmospheric deposition impacts), and greenhouse gases (GHGs). These pollutants were included in this analysis because of the following: (1) they were identified as compounds that had potential to be emitted by management actions and activities, (2) adequate operational and activity data were available to estimate emissions, and (3) current emission factors were available to quantify emissions.

Criteria Pollutants

Criteria pollutants are those for which national standards of concentration have been established. Ambient air concentrations of these constituents greater than the standards represent a risk to human health. Criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur

dioxide (SO₂), ozone (O₃), particulate matter (PM₁₀, PM_{2.5}), and lead, each of which is listed below.

Carbon Monoxide. CO is an odorless, colorless gas formed during any combustion process, such as operation of engines, fireplaces, and furnaces. High concentrations of CO affect the oxygen-carrying capacity of the blood and can lead to unconsciousness and asphyxiation. Wildfires are natural sources of CO.

Nitrogen Dioxide. NO₂ is a red-brown gas formed during the operation of internal combustion engines or other burning processes. Such processes emit a mixture of nitrogen gases, collectively called nitrogen oxides (NO_x). NO_x can contribute to brown cloud conditions and can convert to ammonium nitrate particles and nitric acid, which can cause visibility impairment and acid rain. Bacterial action in soil can be a natural source of nitrogen compounds.

Sulfur Dioxide. SO₂ forms during combustion from trace levels of sulfur in coal or diesel fuel. It can convert to ammonium sulfate and sulfuric acid, which can cause visibility impairment and acid rain. Volcanoes are natural sources of SO₂. Anthropogenic sources include refineries and power plants.

Ozone. O₃ is a gas that generally is not emitted directly into the atmosphere, but is formed from NO_x and volatile reactive organic compound (VOC) emissions. As stated above, internal combustion engines are the main source of NO_x. VOCs, such as terpenes, are very reactive. Sources of VOCs include, but are not limited to, paint, varnish, and types of vegetation. The faint acrid smell common after thunderstorms is caused by O₃ formation caused by lightning. O₃ is a strong oxidizing chemical that can burn lungs and eyes, as well as damage plants.

Particulate Matter. Particulate matter (e.g., soil particles, hair, pollen) are essentially small particles suspended in the air that settle to the ground slowly and may be re-suspended if disturbed. Separate allowable concentration levels for particulate matter are based on the relative size of the particle:

- PM₁₀ particles, particles with diameters of less than 10 micrometers, are small enough to be inhaled and can cause adverse health impacts.
- PM_{2.5} particles, particles with diameters of less than 2.5 micrometers, are so small that they can be drawn deeply into the lungs and cause serious health problems. Particles of this size also are the main cause of visibility impairment.

Lead. Before the widespread use of unleaded fuel in automobiles, lead particles were emitted from automobile tailpipes. Lead is not considered in this analysis because emissions of lead from projected activities would be negligible.

Hazardous Air Pollutants

Although HAPs, including N-hexane, ethylbenzene, toluene, xylene, formaldehyde, and benzene, do not have ambient air quality standards, the EPA has issued reference concentrations for evaluating the inhalation risk for cancerous and noncancerous health impacts, known as reference concentrations for chronic inhalation. The EIS associated with the Buffalo RMP is a National Environmental Policy Act (NEPA) document and not a regulatory document, but the Record of Decision is binding and a “public record” (see 40 Code of Federal Regulations [CFR] 1505.2). In addition, there are regulatory issues that should be taken into account in preparing this Proposed RMP and Final EIS and ensuing project-specific EISs. Actual regulation of HAPs is achieved through compliance with the applicable maximum achievable control technology (MACT) standards and not through ambient air quality standards. Regulatory agencies implement control through Section 112 programs, specifically Section 112(g) case-by-case MACT determinations based on 40 CFR Part 63, Subpart B, and Section 112(d) MACT emission standards.

HAP emissions are associated with industrial activities, such as oil and gas operations, refineries, paint shops, dry cleaning facilities, and woodworking shops. Because this analysis is qualitative, no specific analyses of either short- or long-term HAP impacts are made.

Atmospheric Deposition Constituents

Sulfur and nitrogen compounds that can be deposited in terrestrial and aquatic ecosystems include nitric acid, nitrate, ammonium, and sulfate. Nitric acid and nitrate are not emitted directly into the air, but form in the atmosphere from industrial and automotive emissions of NO_x. Sulfate is formed in the atmosphere from industrial emission of SO₂. Deposition of nitric acid, nitrate, and sulfate can adversely impact plant growth, soil chemistry, lichens, aquatic environments, and petroglyphs. Ammonium is primarily associated with feedlots and agricultural fertilization. Ammonium deposits can affect terrestrial and aquatic vegetation.

Greenhouse Gases

GHGs are pollutants that are effective in preventing heat from escaping the earth's atmosphere and have been attributed to altering components of the earth's climate. These include carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). Other identified GHGs, including hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride were not included in the analysis because proposed activities are not sources of these pollutants and emissions are expected to be insignificant or zero.

M.4. Thresholds of Significance

Criteria Pollutants

National Ambient Air Quality Standards (NAAQS) and Wyoming Ambient Air Quality Standards (WAAQS) are health-based standards that identify maximum limits for criteria air pollutant concentrations at all locations to which the public has access. The NAAQS and WAAQS are legally enforceable standards. Concentrations that are above the NAAQS and WAAQS represent a risk to human health and by law, require public safeguards be implemented. State standards must be at least as protective of human health as federal standards, and may be more restrictive than the federal standards as allowed by the CAA. The EPA has developed standards for each pollutant for a specific averaging time. Short averaging times (1, 8, and 24 hours) address short-term exposure, while the annual standards address long-term exposure.

Chapter 3 of the **Proposed** RMP and **Final** EIS presented the national primary air quality standards and the Wyoming primary air quality standards. Analyses of proposed alternatives for project-specific EISs compare cumulative concentrations of air pollutants to the NAAQS and WAAQS. The Bureau of Land Management (BLM) cannot authorize any activity that would not conform to all applicable local, state, tribal, and federal air quality laws, regulations, and standards.

Prevention of Significant Deterioration

The goal of the PSD program is to ensure that air quality in areas with clean air does not significantly deteriorate, while a margin for future industrial growth is maintained. Under

the PSD program, each area in the United States is classified by the air quality in that region according to the following system:

PSD Class I Areas. Areas with pristine air quality, such as wilderness areas, national parks, and some Native American reservations, are accorded the strictest protection. Only very small incremental increases in pollutant concentrations are allowed in order to maintain the very clean air quality in these areas.

PSD Class II Areas. Essentially, all areas that are not designated as Class I are designated as Class II. Moderate incremental increases in pollutant concentrations are allowed, although the concentrations are not allowed to reach the concentrations set by Wyoming and federal standards (WAAQS and NAAQS).

PSD Class III Areas. No areas have been designated yet as Class III. A larger incremental increase in pollutant concentrations would be allowed, up to the applicable WAAQS and NAAQS.

Table M.1, “Prevention of Significant Deterioration Increments” (p. 2242) provides the incremental increases allowed for specific pollutants in Class I and Class II areas.

Comparisons of potential PM₁₀, NO₂, and SO₂ concentrations with PSD increments are intended to evaluate a threshold of concern only and do not represent a regulatory PSD increment consumption analysis. Regulatory PSD increment consumption analyses are solely the responsibility of the State of Wyoming, which has been granted primacy (with EPA oversight) under the CAA. In project-specific EISs, the BLM does not expect that a PSD analysis will be performed; rather, the PSD standards are used as a reference only to give the public a better understanding of the level of potential impact.

Table M.1. Prevention of Significant Deterioration Increments

Pollutant	Averaging Period	PSD Increment – Class I (µg/m ³)	PSD Increment – Class II (µg/m ³)
Sulfur Dioxide (SO ₂)	3 Hours	25	512
	24 Hours	5	91
	Annual	2	20
Particulate Matter (PM ₁₀)	24-Hours	8	30
	Annual	4	17
Nitrogen Dioxide (NO ₂)	Annual	2.5	25
Carbon Monoxide (CO)	1-Hour	None	None
	8-Hours	None	None
Lead	3 months	None	None
Source: Wyoming DEQ 2004b			
PSD Prevention of Significant Deterioration µg/m ³ micrograms per cubic meter			

Hazardous Air Pollutants

Section 112 of the CAA lists more than 180 chemicals as HAPs. In addition, Sections 112 (d) and 112(g) require regulatory agencies to establish MACT Standards for sources that emit HAPs. Any source that emits or has the potential to emit 10 tons per year or more of any HAP or 25 tons per year or more of any combination of HAPs is considered a major source and will require a Title V,

Part 70, operating permit review and permit. In addition to MACT standards, EPA has listed (on its Air Toxics Database) Reference Exposure Levels (RELs) for many of the HAPs. RELs are defined as concentrations at or below which no adverse health effects are expected.

Visibility and Regional Haze

Visibility impairment in the form of regional haze obscures the clarity, color, texture, and form of what we see. Haze-causing pollutants (mostly fine particles) are directly emitted into the atmosphere or are formed when gases emitted into the air form particles as they are carried downwind. Emissions from human-caused and natural sources can be carried great distances, contributing to regional haze. Changes in visibility or regional haze are caused by fine particles and gases scattering and absorbing light. The current method for assessing impacts on visibility is described in the Federal Land Managers' Air Quality Related Values Work Group (FLAG) Phase I Report—Revised 2010 and is hereafter referred to as the FLAG 2010 method (FLAG 2010). This method compares incremental changes in light extinction relative to estimated natural background to a 5% change in light extinction threshold and a 10% change in light extinction threshold. Using the 98th percentile values, a 5% change in light extinction (approximately equal to 0.5 deciview) is the threshold recommended in FLAG 2010 and is considered to contribute to regional haze visibility impairment. A 10% change in light extinction (approximately equal to 1.0 deciview) is considered to cause visibility impairment when compared to background conditions.

Atmospheric Deposition

As described in the FLAG Phase I Report – Revised 2010 (NPS 2010), the National Park Service, the U.S. Forest Service, and the U.S. Fish and Wildlife Service (USFWS) have established thresholds to evaluate nitrogen and sulfur deposition within Class I areas. These deposition analysis thresholds are defined as 0.005 kilogram per hectare per year in the western United States for both nitrogen and sulfur. These thresholds are typically used to analyze impacts of individual projects. Cumulative impacts are typically compared to the level of concern, which is defined by the National Park Service and USFWS as 3 kilogram per hectare per year for nitrogen and 5 kilogram per hectare per year for sulfur in Rocky Mountain regions. Deposition rates that are below the level of concern are believed to cause no adverse impacts.

Lake Chemistry

The USFWS considers lake chemistry changes to be potentially significant if the screening methodology predicts decreases in acid neutralizing capacity (ANC) of more than defined limits of acceptable change (LAC). A lake's LAC depends on its background ANC value. The LAC is defined as a 10% change for lakes with ANC background values greater than 25 microequivalents per liter and is defined as a change of 1 microequivalents per liter for lakes with ANC background values less than 25 microequivalents per liter. If the ANC of a lake is predicted to decrease by more than the applicable LAC then potential changes to lake chemistry may cause adverse effects and a more detailed analysis of lake chemistry impacts would be required.

Emissions Generating Activities Included in the Analysis

Emissions of criteria pollutants and GHGs were estimated for 11 different types of management activities that were identified as having the potential to generate emissions of the specified

pollutants and for which activity, operation, and equipment data were available. In addition to these activities, emissions for **Coal Mining** operations in the planning area were also estimated using a different methodology (see below). The following is a list of the 11 sectors and the specific activities under each sector for which potential emissions were quantified:

Leasable Fluid Minerals – Conventional Natural Gas Development

- Well pad and compressor station pad construction
- Road construction and maintenance
- Well drilling, completion, and testing
- Well completion flares
- Well workovers
- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Natural gas fired compressors
- Dehydrator, separator, and water tank heaters
- Dehydrator vents
- Tank venting, flashing, and load-out
- Wellhead equipment leaks
- Pneumatic pumps and devices
- Well pad and road reclamation
- Wind erosion

Leasable Fluid Minerals – Coalbed Natural Gas Development

- Well pad, compressor station pad, and water disposal well pad construction
- Road construction and maintenance
- Well drilling, completion, and testing
- Well workovers
- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Natural gas fired compressors
- Dehydrator and tank heaters
- Dehydrator vents
- Wellhead equipment leaks
- Pneumatic pumps and devices
- Well pad and road reclamation
- Wind erosion
- Produced water evaporation ponds

Leasable Fluid Minerals – Oil Development

- Well pad and compressor station pad construction
- Road construction and maintenance
- Well drilling, completion, and testing
- Well completion flares
- Well workovers
- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust

Natural gas fired compressors
Dehydrator, separator, and water tank heaters
Dehydrator vents
Tank venting, flashing, and load-out
Wellhead equipment leaks
Pneumatic pumps and devices
Well pad and road reclamation
Wind erosion

Locatable Minerals – Bentonite Mining

Construction vehicle exhaust and fugitive dust
Maintenance vehicle exhaust and fugitive dust
Commuting vehicle exhaust and fugitive dust
Exploratory drilling
Exploratory excavation and reclamation
Mine development excavation and reclamation
Product handling, transfer, and storage

Locatable Minerals – Uranium Mining

Construction vehicle exhaust and fugitive dust
Maintenance vehicle exhaust and fugitive dust
Commuting vehicle exhaust and fugitive dust
Injection well, production well, and monitoring well construction
Well drilling and workovers
Road and pipeline construction
Road and well pad maintenance and reclamation
Transport of resin

Salable Minerals – Sand, Gravel, and other Mineral Development

Construction vehicle exhaust and fugitive dust
Maintenance vehicle exhaust and fugitive dust
Commuting vehicle exhaust and fugitive dust
Product handling, transfer, and storage
Wind erosion

Fire Management and Ecology – Prescribed Fire

Heavy equipment exhaust and fugitive dust
Commuting vehicle exhaust and fugitive dust
Mechanical equipment (chainsaws, etc.) exhaust
Smoke from prescribed fire

Forest Products

Heavy equipment and mechanical equipment exhaust and fugitive dust associated with tree harvesting, pole and post harvesting, firewood collection, tree salvaging, and weed control.
Commuting vehicle exhaust and fugitive dust

Land Resources– Rights-of-Way and Renewable Energy Projects

Heavy equipment and mechanical equipment exhaust and fugitive dust associated with the construction of wind energy projects, telephone and fiber optics sites, pipelines, roads, powerlines, and communication sites.

Commuting vehicle exhaust and fugitive dust

Land Resources – Travel and Transportation Management

Recreation trail and road maintenance
Off-highway vehicles

Land Resources – Livestock Grazing Management

Heavy equipment exhaust and fugitive dust associated with construction of springs, reservoirs, wells, pipelines, fences, and reservoir maintenance.
Commuting vehicle exhaust and fugitive dust
Enteric fermentation and manure

There were some management activities that emissions were not estimated for because development potential was low, emissions were considered to be minor, or insufficient data was available to calculate emissions. Emissions from the following management activities were not estimated because the potential for development was considered low: phosphate mining, oil shale development, geothermal development, gemstones and lapidary materials development. Emissions from the following management activities were not estimated because (1) the level of activity is not expected to change between alternatives, *and* (2) the magnitude of emissions from the activity is considered to be very small in comparison to other management activities, or (3) sufficient operational or production data were not available to quantify emissions: wildland (unplanned) fires, invasive species and pest management, grassland and shrubland management, wild horse management and activities related to heritage and visual resources, socioeconomic resources, and fish and wildlife resources.

M.5. Emissions Calculations

For this analysis, emissions of PM₁₀, PM_{2.5}, NO_x, SO₂, CO, VOC, HAPs, and GHGs were estimated for a 20-year period, beginning with 2005 as the base year, 2015 as the mid-point interim year, and 2024 as the end of this period. Emissions were estimated for the four alternatives: Alternative A (No Action Alternative), Alternative B (Resource Conservation), Alternative C (Resource Utilization), and Alternative D (Proposed RMP). Emissions were estimated for the base year 2005 corresponding to Alternative A while emissions for all alternatives were estimated for 2015 and 2024. A set of spreadsheets, originally developed for use in estimating emissions for the Lander RMP revision (BLM 2013g), were updated and adapted for use in estimating emissions for the Buffalo planning area for these years. Emission factors used to estimate emissions for various categories were obtained from (1) the EPA NONROAD2008a Emissions Model (EPA 2008); (2) Wyoming Department of Environmental Quality (DEQ) best available control technology (BACT) levels for natural gas-fired internal combustion engines (Wyoming DEQ 2013c); (3) the EPA MOBILE6.2.03 mobile emissions factor model for on-road motor vehicles (EPA 2003), (4) EPA AP-42 Compilation of Air Pollutant Emissions Factors (EPA 1995), (5) the American Petroleum Institute (API) Compendium of GHG Emissions Estimation Methodologies for Oil and Natural Gas Industry (American Petroleum Institute 2009); (6) EPA State Inventory Tool Module (EPA 2011c), and (7) the Western Governors Association Western Regional Air Partnership (Western Regional Air Partnership 2005), (8) 40 CFR Part 98 - Subpart W, (9) Wyoming DEQ Guidance on Oil and Gas Production Facilities (2013), and (10) EPA's National Emission Inventory (NEI) (EPA 2013b). Information regarding equipment types, numbers, activity, etc., was provided by specialists in the BLM BFO for some of the resources and information included in the *Surface Disturbance and Reasonable Foreseeable Action (RFA)* tables (Appendix G (p. 1937)) for the

planning area. Emissions estimates for coal mining activities were estimated using emission estimates contained in the 2008 version of EPA's NEI (EPA 2011b) and information contained in the latest version of the Mineral Occurrence Report for the planning area (BLM 2009c).

When reviewing the emission inventory, it is important to understand that assumptions were made regarding development. For example, there is uncertainty regarding ultimate development of energy resources (e.g., number of wells, equipment used, specific locations of wells, etc.). In general, the assumptions that were made would tend to result in a conservatively high estimate of emissions. For instance, given the number of sources included in this analysis, the likelihood that all emission sources would actually operate at their reasonable, foreseeable maximum emission rates over an entire year (or even 24 hours) is small. Also, depending on future economic conditions, mining and drilling methods, air pollution control technologies, and other factors that influence the pace of development, actual future emissions could be considerably different than presented. In addition, the size, location, and pace of development for future projects are not well known at this planning stage. For these reasons, it was determined that air quality modeling would not be included in this analysis. (A summary discussion of air quality modeling that has been and is being conducted in the planning area, primarily focused on the impacts of coal mining in the Powder River Basin, is provided in the *Air Quality* section in Chapter 3). As part of the NEPA analysis for actual development projects, the BLM will conduct an air quality analysis that will include air dispersion modeling of both project and cumulative impacts for those projects that may have a significant impact on air quality within the planning area.

A summary of total emissions for each pollutant species from all BLM activities is presented in Chapter 4, *Air Quality* section. Detailed emission totals for each category/planning year are presented at the end of this section.

Assumptions Used in Developing Emissions for the Buffalo RMP

The following assumptions were used in the emission calculations:

- All emission sources operated at their reasonably foreseeable maximum emission rates (as identified in the other resource sections of this document) simultaneously throughout the area.
- Induced or secondary growth related to increases in vehicle miles traveled is not included in the emissions inventory. Only activities directly related to BLM actions are considered.
- Stationary sources associated with oil and gas development would operate at emission levels based on currently observed BACT levels, and compressor stations for natural gas would be equipped with nonselective catalytic reduction catalyst. Also, it is assumed that conventional natural gas well fields would use gas gathering systems and process gas through centralized dehydration units.
- Activity data associated with management activities other than those related to conventional natural gas wells were averaged over the entire analysis period to produce annual average emissions, except for renewable energy development, where the single development activity was assumed to occur in one year (2015).
- EPA off-road emission standards were used to estimate emissions for non-road sources in project years 2005, 2015, and 2024. This approach simulates the replacement of existing sources by new lower-emitting equipment with future EPA off-road engine emission standards.
- Use of water application as a Best Management Practice would reduce fugitive dust emissions from ground-disturbing activities during construction and reclamation activities and maintenance of roads at project sites by 50% from uncontrolled levels.

Detailed descriptions for emissions estimation for each activity follow. Individual tables of air emissions for all BLM activities were calculated in spreadsheets for each activity.

Emissions Calculations by Category

Leasable Fluid Minerals – Conventional Oil, Natural Gas and Coalbed Natural Gas Development

The basis for emission calculations for conventional oil and gas development is Table G.1, “RFA-1A Reasonable Foreseeable Development Assumptions: Oil and Gas” (p. 1938) in Appendix G (p. 1937). However the values reported in Table G.1, “RFA-1A Reasonable Foreseeable Development Assumptions: Oil and Gas” (p. 1938) represented the combined totals for conventional Oil and Gas wells. For the calculations, the values in Table G.1, “RFA-1A Reasonable Foreseeable Development Assumptions: Oil and Gas” (p. 1938) were proportioned per the directive of the Buffalo Field Office (BFO) resource specialist and it was assumed that conventional oil wells represent 91% of the total wells and natural gas wells represented 9% of the total. Table M.2, “Number of Existing and Proposed Wells by Alternative” (p. 2248) presents the number and types of wells for each alternative on federal land as well as the cumulative totals on all lands (private, state, federal).

Table M.2. Number of Existing and Proposed Wells by Alternative

Alternative	Conventional Oil Wells Federal	Conventional Oil Wells Cumulative	Conventional NG Wells Federal	Conventional NG Wells Cumulative	CBNG wells Federal	CBNG wells Cumulative
Existing	1,992	4,133	197	372	9,211	26,064
Year 2015						
Alternative A	2,381	4,629	235	458	4,900	11,111
Alternative B	1,593	3,842	158	380	4,639	11,373
Alternative C	2,451	3,699	242	465	6,328	9,684
Alternative D	2,357	4,606	233	456	3,444	10,518
Year 2024						
Alternative A	2,769	5,497	274	544	589	3,842
Alternative B	1,195	3,923	118	388	66	3,319
Alternative C	2,909	5,637	288	558	3,444	6,697
Alternative D	2,723	5,451	269	539	1,775	5,028
Source: Appendix G (p. 1937)						
CBNG coalbed natural gas						
NG natural gas						

The following list identifies the assumptions and sources of information used in the calculations of emissions for conventional oil, natural gas and coalbed natural gas development:

- Per well production information for conventional oil and gas wells were determined from the Powder River Basin Revised Projected “Oil” Production and Powder River Basin Revised Projected “Gas” Production tables revised August 16, 2010. Again per the BLM BFO resource specialist, 2% of the “oil” production is actually condensate and that along with what was in the “Gas” tables represents natural gas; 98% of the oil production is “just oil” and used for conventional oil computations.
- Emission factors for drill rig engines, diesel powered heavy (construction) equipment, generator engines, and other oil field equipment were obtained from EPA NONROADS 2008a Emissions Model.

- Emission factors for natural gas fired compressor engines were based on New Source Performance Standards Emission Standards for Spark Ignition Engines 40 CFR Part 60 JJJJ, recent BACT determinations by Wyoming DEQ, EPA's AP-42 Compilation of Air Pollutant Emission Factors (EPA 1995), and API Compendium of GHG Emissions Estimation Methodologies for the Oil and Natural Gas Industry (EPA 2006).
- Emission factors for on-road vehicles were obtained from EPA's MOBILE6.2 Motor Vehicle Emission Factor Model (EPA 2003),
- Emission factors for VOC and HAP emissions oil and gas sources were based on EPA's AP-42, EPA's Protocol for Equipment Leak Emissions Estimates (EPA 1995), GRI GLYCalc 4.0 emissions estimating software, EPA's Natural Gas STAR Program (http://www.epa.gov/gasstar/documents/ll_pneumatics.pdf), Wyoming DEQ's Oil and Gas Production Facilities Permitting Guidance, Chapter 6, Section 2 revised March 2010 (Wyoming DEQ 2010), and field gas analyses from the Lander Planning area (BLM 2013k).
- Activity and equipment data were obtained from resource specialists in the BFO, existing operator experience from producing fields in the Buffalo planning area, and professional judgment.

Emissions were estimated for produced water evaporation ponds based on several sources of information. Thoma (2009) reports both emission rates from evaporation ponds and concentrations in pond water. A mass balance calculation based on a methodology presented by the Colorado Department of Public Health and Environment (CDPHE 2007) was also used. Thoma (2009) reports results of measurements of pollutant fluxes from ponds at two facilities in western Colorado. One facility (Williams) includes a skim pond that holds produced water temporarily. The produced water is later transferred to an evaporation pond. The other facility (EnCana) includes only an evaporation pond. Thoma reports emission rates for some individual species such as benzene, toluene, xylene, and CH₄. Emissions for these species were used to calculate a ratio of the reported alkane (which was equivalenced to VOC) emissions to the sum of the individual species emissions. The ratio of CH₄ emissions to the sum of the individual species emissions was also calculated. These ratios are 1.888 and 0.395 for VOC and CH₄, respectively.

Thoma reports the concentrations of several species in the pond water and for our emissions estimates, mid-range values were used. Using a mass balance calculation as outlined in the Colorado Department of Public Health and Environment report (CDPHE 2007), the concentrations were used to calculate emissions rates. The mass balance calculation simply uses the concentration in the produced water multiplied by the volume of produced water with appropriate unit conversions to obtain an emission rate. The ratio of VOC to the sum of the individual species mass was used to obtain an emission rate for VOC. Similarly, an emission rate for CH₄ was obtained using the ratio of CH₄ to the sum of individual species emissions. Per well emission rates were estimated for these species using the current volume of produced water of 80,000 acre-feet per year, and, for the per-well calculations, 10 gallons per minute per well was assumed. This information was provided by the BLM. The calculated rates are presented in Table M.3, "Estimated Emissions Rates for Hydrocarbon Species from Produced Water Evaporation Ponds" (p. 2249). Multiplying these per well emission rates times the number of wells provides an estimate of evaporative pond emissions for hydrocarbons.

Table M.3. Estimated Emissions Rates for Hydrocarbon Species from Produced Water Evaporation Ponds

Species	Current Emissions (kilograms/year)	Emissions per well (kilograms/year)
Benzene	588,575	118
Toluene	1,354,307	273

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Species	Current Emissions (kilograms/year)	Emissions per well (kilograms/year)
m,p-xylene	785,809	158
Volatile Organic Compounds	5,151,915	1,038
Methane	1,077,842	217
Source: CDPHE 2007		

Leasable Solid Minerals – Coal Mining

Criteria pollutant emissions for NO_x, SO₂, CO, PM₁₀, and PM_{2.5} from coal mining activities in the planning area for the base year were obtained from EPA's NEI 2008 emission inventory (EPA 2011a). The information contained in this inventory was originally prepared for the entire state by Wyoming DEQ and submitted to EPA for inclusion in the NEI. Activities for which emissions are provided include mining, cleaning, and material handling processes. Estimates for VOCs and HAPs emissions are not available for coal mining activities in the NEI. To estimate emissions related to coal mining activities in the Buffalo planning area (Campbell, Sheridan, and Johnson Counties) for the future years (2015 and 2024), existing emissions estimates for 2008 were used along with estimates of future coal production in the Final Mineral Occurrence and Development Potential Report (BLM 2009c). In reviewing the NEI, all source category codes related to mining activity were selected and reviewed to consider whether they were related to coal mining activities. Using the list of coal related source category codes, emissions information for 2008 from the NEI were extracted for all three counties. Only Campbell County included emissions identified as coal related, since Campbell County includes the majority of the known coal deposits in the Powder River Basin, there is limited coal mining in Sheridan County, and no coal mining in Johnson County.

To project to the future years, the annual coal production estimates from the Mineral Occurrence Report were used. These include 381 million tons for 2008, 461 million tons for 2015, and 489 million tons for 2024. As an example, for NO_x, coal related emissions in Campbell County are 509 tpy in the 2008 NEI and coal production from the Mineral Report is 381 million tons. Taking the ratio of these two values gives 1.33 tpy of NO_x emission per million tons of coal production. Coal production in Campbell County in 2015 is estimated to be 461 million tons. Using the emissions ratio for NO_x, the estimated emissions for Campbell County for 2015 is 618 tpy. Since the NEI does not include coal mining emissions information for Sheridan County, it is assumed that the same ratio holds. Using the estimated coal production for Sheridan County in 2015 of 9 million tons, estimated NO_x emissions are therefore 12 tpy. Although the Mineral Occurrence Report includes low and high estimates for coal production in the area, the estimates are not very different and thus emissions for different alternatives, presented for all of the other managed resources, are not available for coal.

To estimate GHGs for coal mining activities, EPA's State Inventory Tool Module (EPA 2011c) was used. This tool provides estimates of CH₄ emissions from surface and underground mines for mining and post-mine (processing) activities in the Powder River Basin of Wyoming. The coal production numbers for planning area (above) were used to derive CH₄ and CO₂ equivalent emissions for coal mining activity.

Locatable Minerals – Bentonite Mining

Emissions estimates for future bentonite mining were based on operating data from the two existing bentonite mines in the Buffalo planning area (Petersen Draw and Mayoworth) and current authorized bentonite plans summarized in the Mineral Occurrence and Development Potential Report (June 2009), and updated through June 2010. In addition, input from the BLM

BFO resource specialist was considered. Emission factors for this category were obtained from EPA's AP-42 (EPA 1995), EPA's NONROADS 2008a Emissions model (EPA 2008), EPA's MOBILE6.2 motor vehicle emission factor model (EPA 2003), and API Compendium of GHG Emissions Estimation Methodologies for the Oil and Natural Gas Industry (American Petroleum Institute 2009).

Locatable Minerals – Uranium Mining

Emission estimates for future uranium mining were based on the three active uranium mines in the Buffalo area as well as current authorized and pending uranium plans of operations within the Buffalo planning area summarized in BFO Mineral Occurrence and Development Potential Report (June 2009), and updated through June 2010. In addition, input from the BLM BFO resource specialist was considered. It was assumed that all future uranium mining will utilize in-situ recovery rather than open-pit mining. Future emissions were based on the assumption that by 2013 Buffalo would have 2 operating in situ recovery mines (Willow Creek and Nichols Ranch/Hank) plus one still inactive mine (Ruth). Emission factors for this category were obtained from EPA's AP-42 (EPA 1995), EPA's NONROADS 2008a Emissions model (EPA 2008), EPA's MOBILE6.2 motor vehicle emission factor model (EPA 2003), and API Compendium of GHG Emissions Estimation Methodologies for the Oil and Natural Gas Industry (American Petroleum Institute 2009).

Salable Minerals – Sand, Gravel, and other Mineral Development

Emissions were estimated for this category primarily for sand and gravel sales using existing (June 2010) data, plus estimated future activity based outlined in Table G.2, "RFA-1B Reasonable Foreseeable Development Assumptions: Other Resource Uses" (p. 1942) of Appendix G (p. 1937). Existing emission calculations were based on current June 2010 data. Future emissions were calculated using estimated tons of material to be processed for each alternative. Emission factors for this category were obtained from EPA's AP-42 (EPA 1995), EPA's NONROADS 2008a Emissions model (EPA 2008), and EPA's MOBILE6.2 motor vehicle emission factor model (EPA 2003).

Fire Management and Ecology – Prescribed Fire

Emission estimates for fire management were based on the number of acres of disturbance projected for each alternative for prescribed burning. Per BLM resource staff, no mechanical fire treatments were included. Buffalo emissions factors for mechanical treatments (heavy equipment, all-terrain vehicles, and chain saws) were obtained from EPA's NONROADS 2008a emissions model (EPA 2008) and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model (EPA 2003). Emission factors for PM₁₀, PM_{2.5}, NO_x, SO₂, CO, VOCs, CH₄, and N₂O from smoke were obtained from the 2008 FETS Emissions Data provided by Wyoming DEQ for Campbell and Johnson counties (Western Regional Air Partnership 2008). No fire data were reported for Sheridan County.

Forest Products

Emissions for this category were estimated using values provided in Table G.2, "RFA-1B Reasonable Foreseeable Development Assumptions: Other Resource Uses" (p. 1942) of Appendix G (p. 1937). In addition, input was provided by the BLM resource specialist. Invasive species treated by prescribed fire in other areas were included in this category because they are now chemically treated. Emission factors for this category were obtained from EPA's AP-42

(EPA 1995), EPA's NONROADS 2008a Emissions model (EPA 2008), EPA's MOBILE6.2 motor vehicle emission factor model (EPA 2003), the User's Guide: Emission Control Technologies and Emission Factors for Unpaved Road Fugitive Emissions (EPA 1987) and API Compendium of GHG Emissions Estimation Methodologies for the Oil and Natural Gas Industry (EPA 2003).

Land Resources – Rights-of-Way and Corridors and Renewable Energy Projects

Emissions were estimated for this category for several surface disturbing projects under Land resources. Table M.4, "Basis for Emissions Calculations for Land Resource Projects in the Buffalo Planning Area" (p. 2252) shows the key criteria projected under each alternative that were used to as the basis for emissions calculations. Note that there were zero acres estimated for telephone and fiber optics projects, so this disturbance was not included in the table. Emission factors for surface-disturbing activities were obtained from EPA's AP-42 (EPA 1995). Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a emissions model (EPA 2008) and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model (EPA 2003).

Table M.4. Basis for Emissions Calculations for Land Resource Projects in the Buffalo Planning Area

Type of Project	Alternative A	Alternative B	Alternative C	Alternative D
Wind energy projects - acres of disturbance for planning area (over 20 years)	20,000	5,000	40,000	75,000
Wind energy projects - number of met towers	200	50	200	80
Pipelines projects - acres of disturbance/year	1,400	400	2,000	1,400
Roads (non-mineral) projects - acres of disturbance/year	6,275	2,090	8,364	6,275
Powerline projects - acres of disturbance/year	3,600	1,546	4,400	3,600
Communication sites - acres of disturbance/year	28	5	38	28

Source: Appendix G (p. 1937)

Per BLM resource specialists, the following were assumed:

- one activity equals one site equals 1,000 acres for wind disturbance
- one activity equals one site equals 1 acre for met towers
- one activity equals 1.91 acres per mile for pipelines
- one activity equals 3.637 acres per mile for roads and powerlines
- one activity equals one site equals one acre for communication sites

Land Resources – Travel and Transportation Management

Emission sources under this category include activities at the only two recreation areas to accommodate off-highway vehicle (OHV) use (Middle Fork and Weston Hills) that the BFO manages. Emissions do not include the hundreds of miles of routes on BLM-administered lands without rights-of-way that the BLM might maintain less regularly. Based on the transportation

and access for recreation for Buffalo (per BLM specialist A. Barnes), maintenance occurs almost exclusively in the summer months. No roads are plowed during winter months and therefore winter activities were set to zero. Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a emissions model (EPA 2008) and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor mode (EPA 2003). OHV emissions were estimated using EPA's NONROADS 2008a emissions model (EPA 2008) which calculated annual emissions based on EPA's National Emissions Inventory and county population for 2005. Emissions were then projected for 2015, and 2024. Emission factors for surface-disturbing activities were obtained from EPA's AP-42 (EPA 1995).

Land Resources – Livestock Grazing Management

Emissions were estimated for six construction activities related to livestock grazing: springs, wells, fence, reservoir, and pipeline construction and reservoir maintenance. Emission estimates for these activities were based on the number of acres of disturbance projected for each activity under alternative provided in Table G.3, "RFA-2 Summary of Projected Acres of Surface Disturbance by Resource" (p. 1946) of Appendix G (p. 1937). In addition, CH₄ emissions related to animal enteric fermentation and manure deposits were calculated for estimated head of cattle, sheep, and horses projected for each alternative based on current livestock grazing permits. Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a emissions model (EPA 2008) and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model (EPA 2003). Emission factors for enteric fermentation and manure management were obtained from Intergovernmental Panel on Climate Change Guidelines for National GHG Inventories (Intergovernmental Panel on Climate Change 2006).

M.6. Summary of Emissions for All BLM Activities

The following tables summarize the projected total annual emissions for each alternative by resource for the years 2005, 2015, and 2024.

Table M.5. Total Annual Emissions from Natural Gas Wells - Year 2005 - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ e-qmetric Tonnes
Well Pad & Station Construction - Fugitive Dust	3	0	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions ^a	0	0	0	0	0	0	0	39	0	0.00	39	36
Well Completion Flaring	0	0	0	0	0	0	0	0	0	0.00	0	0
Commuting Vehicles - Construction	0	0	0	0	0	0	0	2	0		2	2
Wind Erosion	0	0	---	---	---	---	---	---	---		---	---
Sub-total: Construction	4	0	0	0	0	0	0	41	0	0.00	41	37
Natural Gas Compression - Operations ^a	3	3	95	0	48	48	14	37,966	79	0.34	39,739	36,119

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ e-qmetric Tonnes
Separator, Dehydrator & Water Tank Heaters - Operations ^a	0	0	0	0	0	0	0	19	0	0.00	19	17
Dehy-venting and flashing	---	---	---	---	---	6	2	60	4		137	132
Station Visits - Operations	7	1	0	0	0	0	0	25	0		25	23
Well Workover - Operations	0	0	0	0	0	0	0	0	0	0.00	0	0
Well & Pipeline visits for Inspection & Repair - Operations	6	1	0	0	0	0	0	11	0		11	10
Tanks Condensate and Loadout	---	---	---	---	---	1	0	0	0		3	3
Wellhead Fugitives	---	---	---	---	---	93	9	55	853		17,961	17,956
Pneumatic Devices	---	---	---	---	---	68	7	40	626		13,191	13,187
	7	0	0	0	0	0	0	18	0		18	16
Sub-total: Operations	24	5	95	0	48	216	33	38,193	1,562	0.34	71,103	67,462

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Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ e-qmetric Tonnes
Road Maintenance	0	0	0	0	0	0	0	13	0		13	12
Sub-total: Maintenance	0	0	0	0	0	0	0	13	0	0.00	13	12
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	8	0		8	7
Sub-total: Reclamation	0	0	0	0	0	0	0	8	0	0.00	8	8
Total Emissions	28	5	96	0	48	216	33	38,256	1,562	0.34	71,166	67,519
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.6. Total Annual Emissions from Natural Gas Wells - Year 2015 - Alternative A - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	37	1	10	3	0	4,272	0	0.04	4,286	3,877
Well Completion Flaring	0	0	0	0	0	2	0	0	0	0.00	0	0
Commuting Vehicles - Construction	8	1	0	0	0	0	0	43	0		43	39
Wind Erosion	2	0	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	18	4	37	1	10	5	0	4,315	0	0.04	4,329	3,917
Natural Gas Compression - Operations a	4	4	114	0	57	57	17	45,374	95	0.41	47,493	43,167

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydrator & Water Tank Heaters - Operations	0	0	0	0	0	0	0	22	0	0.00	22	20
Dehy-venting and flashing	---	---	---	---	---	7	2	72	4		164	157
Station Visits - Operations	9	1	0	0	0	0	0	30	0		30	27
Well Workover - Operations	0	0	1	0	0	0	0	87	0	0.00	87	79
Well & Pipeline visits for Inspection & Repair - Operations	7	1	0	0	0	0	0	13	0		13	12
Tanks Condensate and Load-out	---	---	---	---	---	1	0	0	0		4	4
Wellhead Fugitives	---	---	---	---	---	111	11	65	1,019		21,465	21,459
Pneumatic Devices	---	---	---	---	---	82	8	48	748		15,765	15,760
	8	1	0	0	0	0	0	21	0		21	19
Sub-total: Operations	28	6	115	0	58	258	39	45,732	1,867	0.41	85,064	80,705

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Road Maintenance	0	0	0	0	0	0	0	15	0		15	14
Sub-total: Maintenance	0	0	0	0	0	0	0	15	0	0.00	15	14
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	10	0		10	9
Sub-total: Reclamation	0	0	0	0	0	0	0	10	0	0.00	10	9
Total Emissions	47	10	152	1	68	262	39	50,073	1,867	0.45	89,419	84,644
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

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Table M.7. Total Annual Emissions from Natural Gas Wells - Year 2024 - Alternative A - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	6	1	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions ^a	2	2	37	1	10	3	0	4,272	0	0.04	4,286	3,877
Well Completion Flaring	0	0	0	0	0	2	0	0	0	0.00	0	0
Commuting Vehicles - Construction	8	1	0	0	0	0	0	43	0		43	39
Wind Erosion	2	0	---	---	---	---	---	---	---		---	---
Sub-total: Construction	18	4	37	1	10	5	0	4,315	0	0.04	4,329	3,917
Natural Gas Compression - Operations ^a	5	5	132	0	66	66	20	52,780	110	0.48	55,245	50,212

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	26	0	0.00	26	23
Dehy venting and flashing	---	---	---	---	---	6	2	61	4		138	133
Station Visits - Operations	10	1	0	0	1	0	0	35	0		35	32
Well Workover - Operations	0	0	1	0	0	0	0	87	0	0.00	87	79
Well & Pipeline visits for Inspection & Repair - Operations	9	1	0	0	0	0	0	15	0		15	13
Tanks Condensate and Load-out	---	---	---	---	---	1	0	0	0		4	4
Wellhead Fugitives	---	---	---	---	---	129	13	76	1,185		24,969	24,962
Pneumatic Devices	---	---	---	---	---	95	9	56	871		18,338	18,333
	10	1	0	0	0	0	0	25	0		25	22
Sub-total: Operations	33	7	133	0	67	297	44	53,160	2,170	0.48	98,881	93,813

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Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	18	0		18	16
Sub-total: Maintenance	1	0	0	0	0	0	0	18	0	0.00	18	16
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	11	0		11	10
Sub-total: Reclamation	0	0	0	0	0	0	0	12	0	0.00	12	10
Total Emissions	52	11	170	1	78	302	45	57,505	2,170	0.52	103,240	97,757
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.8. Total Annual Emissions from Natural Gas Wells - Year 2015 - Alternative B - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	0	0	0	0	0	50	0	0.00	50	46
Well Completion Flaring	0	0	0	0	0	0	0	0	0	0.00	0	0
Commuting Vehicles - Construction	0	0	0	0	0	0	0	2	0		2	2
Wind Erosion	0	0	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	3	0	0	0	0	0	0	52	0	0.00	53	48
Natural Gas Compression - Operations a	3	3	76	0	38	38	11	30,371	64	0.27	31,789	28,893

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	15	0	0.00	15	13
Dehy-venting and flashing	---	---	---	---	---	4	2	48	3		110	105
Station Visits - Operations	6	1	0	0	0	0	0	20	0		20	18
Well Workover - Operations	0	0	0	0	0	0	0	0	0	0.00	0	0
Well & Pipeline visits for Inspection & Repair - Operations	5	0	0	0	0	0	0	9	0		9	8
Tanks Condensate and Load-out	---	---	---	---	---	1	0	0	0		3	3
Wellhead Fugitives	---	---	---	---	---	74	7	44	682		14,368	14,364
Pneumatic Devices	---	---	---	---	---	55	5	32	501		10,552	10,549
	6	1	0	0	0	0	0	14	0		14	13
Sub-total: Operations	19	4	76	0	39	172	26	30,553	1,250	0.27	56,879	53,967

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	0	0	0	0	0	0	0	10	0		10	9
Sub-total: Maintenance	0	0	0	0	0	0	0	10	0	0.00	10	9
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	6	0		6	6
Sub-total: Reclamation	0	0	0	0	0	0	0	7	0	0.00	7	6
Total Emissions	23	5	77	0	39	173	26	30,622	1,250	0.27	56,949	54,030
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

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Summary of Emissions for All BLM Activities

Table M.9. Total Annual Emissions from Natural Gas Wells - Year 2024 - Alternative B - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	3	0	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	0	0	0	0	0	0	0	50	0	0.00	50	46
Well Completion Flaring	0	0	0	0	0	0	0	0	0	0.00	0	0
Commuting Vehicles - Construction	0	0	0	0	0	0	0	2	0		2	2
Wind Erosion	0	0	---	---	---	---	---	---	---		---	---
Sub-total: Construction	3	0	0	0	0	0	0	52	0	0.00	53	48
Natural Gas Compression - Operations a	2	2	57	0	29	29	9	22,774	48	0.20	23,837	21,666

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	11	0	0.00	11	10
Dehy- venting and flashing	---	---	---	---	---	2	1	26	2		60	57
Station Visits - Operations	4	0	0	0	0	0	0	15	0		15	14
Well Workover - Operations	0	0	0	0	0	0	0	0	0	0.00	0	0
Well & Pipeline visits for Inspection & Repair - Operations	4	0	0	0	0	0	0	6	0		6	6
Tanks Con- densate and Load- out	---	---	---	---	---	1	0	0	0		2	2
Wellhead Fugitives	---	---	---	---	---	56	6	33	511		10,774	10,771
Pneumatic Devices	---	---	---	---	---	41	4	24	376		7,913	7,910
	4	0	0	0	0	0	0	11	0		11	10
Sub-total: Operations	14	3	57	0	29	128	19	22,900	936	0.21	42,629	40,445

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Summary of Emissions for All BLM Activities

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	0	0	0	0	0	0	0	8	0		8	7
Sub-total: Maintenance	0	0	0	0	0	0	0	8	0	0.00	8	7
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	5	0		5	4
Sub-total: Reclamation	0	0	0	0	0	0	0	5	0	0.00	5	5
Total Emissions	18	4	58	0	29	128	19	22,966	936	0.21	42,694	40,505

^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table M.10. Total Annual Emissions from Natural Gas Wells - Year 2015 - Alternative C - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	40	1	11	3	0	4,646	0	0.05	4,662	4,217
Well Completion Flaring	0	0	0	0	0	2	0	0	0	0.00	0	0
Commuting Vehicles - Construction	8	1	0	0	0	0	0	47	0		47	42
Wind Erosion	2	0	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	19	4	40	1	11	5	1	4,693	0	0.05	4,709	4,260
Natural Gas Compression - Operations a	4	4	117	0	59	59	18	46,710	98	0.42	48,891	44,437

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	23	0	0.00	23	21
Dehy-venting and flashing	---	---	---	---	---	7	3	74	5		169	162
Station Visits - Operations	9	1	0	0	0	0	0	31	0		31	28
Well Workover - Operations	0	0	1	0	0	0	0	94	0	0.00	95	86
Well & Pipeline visits for Inspection & Repair - Operations	8	1	0	0	0	0	0	13	0		13	12
Tanks Condensate and Load-out	---	---	---	---	---	1	0	0	0		4	4
Wellhead Fugitives	---	---	---	---	---	114	11	67	1,049		22,097	22,091
Pneumatic Devices	---	---	---	---	---	84	8	49	770		16,229	16,224
	9	1	0	0	0	0	0	22	0		22	20
Sub-total: Operations	29	7	118	0	59	265	40	47,084	1,922	0.42	87,573	83,085

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	0	0	0	0	0	0	0	16	0		16	14
Sub-total: Maintenance	0	0	0	0	0	0	0	16	0	0.00	16	14
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	10	0		10	9
Sub-total: Reclamation	0	0	0	0	0	0	0	10	0	0.00	10	9
Total Emissions	49	11	159	1	71	270	41	51,803	1,922	0.47	92,308	87,368
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

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Summary of Emissions for All BLM Activities

Table M.11. Total Annual Emissions from Natural Gas Wells - Year 2024 - Alternative C - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	6	1	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	2	2	40	1	11	3	0	4,646	0	0.05	4,662	4,217
Well Completion Flaring	0	0	0	0	0	2	0	0	0	0.00	0	0
Commuting Vehicles - Construction	8	1	0	0	0	0	0	47	0		47	42
Wind Erosion	2	0	---	---	---	---	---	---	---		---	---
Sub-total: Construction	19	4	40	1	11	5	1	4,693	0	0.05	4,709	4,260
Natural Gas Compression - Operations a	5	5	139	0	69	69	21	55,451	116	0.50	58,041	52,754

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	27	0	0.00	27	25
Dehy-venting and flashing	---	---	---	---	---	6	2	64	4		145	139
Station Visits - Operations	11	1	0	0	1	0	0	36	0		36	33
Well Workover - Operations	0	0	1	0	0	0	0	94	0	0.00	95	86
Well & Pipeline visits for Inspection & Repair - Operations	9	1	0	0	0	0	0	16	0		16	14
Tanks Condensate and Load-out	---	---	---	---	---	1	0	0	0		4	4
Wellhead Fugitives	---	---	---	---	---	136	14	80	1,245		26,233	26,225
Pneumatic Devices	---	---	---	---	---	100	10	59	915		19,266	19,261
	10	1	0	0	0	0	0	26	0		26	24
Sub-total: Operations	35	8	140	0	71	312	47	55,853	2,280	0.50	103,889	98,564

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Summary of Emissions for All BLM Activities

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	19	0		19	17
Sub-total: Maintenance	1	0	0	0	0	0	0	19	0	0.00	19	17
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	12	0		12	11
Sub-total: Reclamation	0	0	0	0	0	0	0	12	0	0.00	12	11
Total Emissions	55	12	180	1	82	317	47	60,577	2,280	0.55	108,629	102,852

^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table M.12. Total Annual Emissions from Natural Gas Wells - Year 2015 - Alternative D - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	36	1	10	3	0	4,140	0	0.04	4,154	3,758
Well Completion Flaring	0	0	0	0	0	2	0	0	0	0.00	0	0
Commuting Vehicles - Construction	8	1	0	0	0	0	0	42	0		42	38
Wind Erosion	2	0	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	17	4	36	1	10	5	0	4,182	0	0.04	4,196	3,796
Natural Gas Compression - Operations a	4	4	113	0	56	56	17	44,932	94	0.40	47,030	42,746

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	22	0	0.00	22	20
Dehy-venting and flashing	---	---	---	---	---	7	2	71	4		162	156
Station Visits - Operations	9	1	0	0	0	0	0	30	0		30	27
Well Workover - Operations	0	0	1	0	0	0	0	84	0	0.00	84	76
Well & Pipeline visits for Inspection & Repair - Operations	7	1	0	0	0	0	0	13	0		13	11
Tanks Condensate and Load-out	---	---	---	---	---	1	0	0	0		4	4
Wellhead Fugitives	---	---	---	---	---	110	11	65	1,009		21,256	21,250
Pneumatic Devices	---	---	---	---	---	81	8	48	741		15,611	15,607
	8	1	0	0	0	0	0	21	0		21	19
Sub-total: Operations	28	6	114	0	57	255	39	45,285	1,849	0.41	84,233	79,916

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	0	0	0	0	0	0	0	15	0		15	14
Sub-total: Maintenance	0	0	0	0	0	0	0	15	0	0.00	15	14
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	10	0		10	9
Sub-total: Reclamation	0	0	0	0	0	0	0	10	0	0.00	10	9
Total Emissions	46	10	150	1	67	260	39	49,492	1,849	0.45	88,454	83,735
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

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Summary of Emissions for All BLM Activities

Table M.13. Total Annual Emissions from Natural Gas Wells - Year 2024 - Alternative D - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	5	1	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	2	2	36	1	10	3	0	4,140	0	0.04	4,154	3,758
Well Completion Flaring	0	0	0	0	0	2	0	0	0	0.00	0	0
Commuting Vehicles - Construction	8	1	0	0	0	0	0	42	0		42	38
Wind Erosion	2	0	---	---	---	---	---	---	---		---	---
Sub-total: Construction	17	4	36	1	10	5	0	4,182	0	0.04	4,196	3,796
Natural Gas Compression - Operations a	4	4	130	0	65	65	20	51,896	109	0.47	54,319	49,371

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	25	0	0.00	25	23
Dehy-venting and flashing	---	---	---	---	---	5	2	60	4		136	131
Station Visits - Operations	10	1	0	0	1	0	0	34	0		34	31
Well Workover - Operations	0	0	1	0	0	0	0	84	0	0.00	84	76
Well & Pipeline visits for Inspection & Repair - Operations	8	1	0	0	0	0	0	15	0		15	13
Tanks Condensate and Load-out	---	---	---	---	---	1	0	0	0		4	4
Wellhead Fugitives	---	---	---	---	---	127	13	75	1,166		24,551	24,544
Pneumatic Devices	---	---	---	---	---	93	9	55	856		18,031	18,026
	10	1	0	0	0	0	0	24	0		24	22
Sub-total: Operations	33	7	131	0	66	292	44	52,268	2,134	0.47	97,223	92,240

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Summary of Emissions for All BLM Activities

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	18	0		18	16
Sub-total: Maintenance	1	0	0	0	0	0	0	18	0	0.00	18	16
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	11	0		11	10
Sub-total: Reclamation	0	0	0	0	0	0	0	11	0	0.00	11	10
Total Emissions	50	11	167	1	76	297	44	56,479	2,134	0.51	101,448	96,062
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.14. Total Annual Emissions from Natural Gas Wells - Year 2005 - Cumulative Effects

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Well Pad & Station Construction - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	1	0	0	0	0	73	0	0.00	73	67
Well Completion Flaring	0	0	0	0	0	0	0	0	0	0.00	0	0
Commuting Vehicles - Construction	1	0	0	0	0	0	0	14	0	---	14	13
Wind Erosion	0	0	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	7	1	1	0	0	0	0	87	0	0.00	87	79
Natural Gas Compression - Operations a	6	6	180	0	90	90	27	71,686	150	0.65	75,034	68,199

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	70	0	0.00	70	63
Dehy-venting and flashing	---	---	---	---	---	10	4	114	7		259	249
Station Visits - Operations	14	1	0	0	1	0	0	47	0		47	43
Well Workover - Operations	0	0	0	0	0	0	0	0	0	0.00	0	0
Well & Pipeline visits for Inspection & Repair - Operations	12	1	0	0	0	0	0	20	0		20	18
Tanks Condensate and Load-out	---	---	---	---	---	7	1	1	1		26	26
Wellhead Fugitives	---	---	---	---	---	176	18	103	1,610		33,913	33,904
Pneumatic Devices	---	---	---	---	---	129	13	76	1,182		24,907	24,900
	13	0	0	0	0	0	0	34	0		34	30
Sub-total: Operations	45	9	180	0	91	413	62	72,150	2,950	0.65	134,310	127,432

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	24	0		24	22
Sub-total: Maintenance	1	0	0	0	0	0	0	24	0	0.00	24	22
Road Reclamation	0	0	0	0	0	0	0	1	0		1	0
Well Reclamation	1	0	0	0	0	0	0	15	0		15	14
Sub-total: Reclamation	1	0	0	0	0	0	0	16	0	0.00	16	14
Total Emissions	53	10	181	0	92	413	62	72,278	2,950	0.65	134,437	127,547
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

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Summary of Emissions for All BLM Activities

Table M.15. Total Annual Emissions from Natural Gas Wells - Year 2015 - Alternative A - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	11	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	4	4	75	2	20	6	1	8,643	0	0.09	8,672	7,845
Well Completion Flaring	0	0	0	0	0	4	0	0	0	0.00	0	0
Commuting Vehicles - Construction	16	2	1	0	1	0	0	160	0		160	145
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	35	7	75	2	21	9	1	8,803	0	0.09	8,832	7,990
Natural Gas Compression - Operations a	8	8	221	0	111	111	33	88,233	184	0.79	92,353	83,940

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	86	0	0.00	86	78
Dehy- venting and flashing	---	---	---	---	---	13	5	140	9		319	306
Station Visits - Operations	17	2	0	0	1	0	0	58	0		58	53
Well Workover - Operations	0	0	1	0	0	0	0	176	0	0.00	176	160
Well & Pipeline visits for Inspection & Repair - Operations	14	1	0	0	0	0	0	25	0		25	23
Tanks Con- densate and Load- out	---	---	---	---	---	9	1	1	2		32	32
Wellhead Fugitives	---	---	---	---	---	216	22	127	1,982		41,741	41,729
Pneumatic Devices	---	---	---	---	---	159	16	93	1,455		30,656	30,647
	16	2	0	0	0	0	0	41	0		41	38
Sub-total: Operations	55	12	223	1	112	508	76	88,980	3,631	0.80	165,488	157,006

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Summary of Emissions for All BLM Activities

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	30	0		30	27
Sub-total: Maintenance	1	0	0	0	0	0	0	30	0	0.00	30	27
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	17
Sub-total: Reclamation	1	0	0	0	0	0	0	19	0	0.00	19	18
Total Emissions	92	20	299	2	133	517	77	97,832	3,632	0.88	174,369	165,040
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.16. Total Annual Emissions from Natural Gas Wells - Year 2024 - Alternative A - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	11	1	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	4	4	75	2	20	6	1	8,643	0	0.09	8,672	7,845
Well Completion Flaring	0	0	0	0	0	4	0	0	0	0.00	0	0
Commuting Vehicles - Construction	16	2	1	0	1	0	0	160	0		160	145
Wind Erosion	4	1	---	---	---	---	---	---	---		---	---
Sub-total: Construction	35	7	75	2	21	9	1	8,803	0	0.09	8,832	7,990
Natural Gas Compression - Operations a	9	9	262	1	131	131	39	104,780	219	0.94	109,673	99,682

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydra- tor & Wa- ter Tank Heaters - Operations a	0	0	0	0	0	0	0	102	0	0.00	102	93
Dehy- venting and flashing	---	---	---	---	---	11	4	120	7		275	264
Station Visits - Operations	20	2	0	0	1	0	0	69	0		69	63
Well Workover - Operations	0	0	1	0	0	0	0	176	0	0.00	176	160
Well & Pipeline visits for Inspection & Repair - Operations	17	2	0	0	0	0	0	29	0		29	27
Tanks Con- densate and Load- out	---	---	---	---	---	8	1	1	1		28	28
Wellhead Fugitives	---	---	---	---	---	257	26	151	2,353		49,569	49,555
Pneumatic Devices	---	---	---	---	---	188	19	111	1,728		36,405	36,395
	19	2	0	0	0	0	0	49	0		49	45
Sub-total: Operations	66	15	265	1	133	596	89	105,588	4,309	0.95	196,376	186,310

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	36	0		36	32
Sub-total: Maintenance	1	0	0	0	0	0	0	36	0	0.00	36	32
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	22	0		22	20
Sub-total: Reclamation	1	0	0	0	0	0	0	23	0	0.00	23	21
Total Emissions	102	22	340	2	154	606	90	114,450	4,309	1.03	205,266	194,352
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

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Summary of Emissions for All BLM Activities

Table M.17. Total Annual Emissions from Natural Gas Wells - Year 2015 - Alternative B – Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	38	1	10	3	0	4,421	0	0.04	4,436	4,013
Well Completion Flaring	0	0	0	0	0	2	0	0	0	0.00	0	0
Commuting Vehicles - Construction	8	1	0	0	0	0	0	87	0		87	79
Wind Erosion	2	0	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	20	4	39	1	11	5	0	4,508	0	0.04	4,523	4,092
Natural Gas Compression - Operations a	6	6	183	0	92	92	28	73,230	153	0.66	76,650	69,667

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	71	0	0.00	72	65
Dehy-venting and flashing	---	---	---	---	---	11	4	116	7		265	254
Station Visits - Operations	14	1	0	0	1	0	0	48	0		48	44
Well Workover - Operations	0	0	1	0	0	0	0	89	0	0.00	90	81
Well & Pipeline visits for Inspection & Repair - Operations	12	1	0	0	0	0	0	21	0		21	19
Tanks Condensate and Load-out	---	---	---	---	---	8	1	1	1		27	27
Wellhead Fugitives	---	---	---	---	---	179	18	106	1,645		34,643	34,634
Pneumatic Devices	---	---	---	---	---	132	13	78	1,208		25,443	25,436
	14	1	0	0	0	0	0	34	0		34	31
Sub-total: Operations	46	10	185	0	93	422	63	73,793	3,014	0.66	137,292	130,257

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Summary of Emissions for All BLM Activities

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	25	0		25	23
Sub-total: Maintenance	1	0	0	0	0	0	0	25	0	0.00	25	23
Road Reclamation	0	0	0	0	0	0	0	1	0		1	0
Well Reclamation	1	0	0	0	0	0	0	16	0		16	14
Sub-total: Reclamation	1	0	0	0	0	0	0	16	0	0.00	16	15
Total Emissions	68	14	224	1	104	426	64	78,342	3,014	0.70	141,855	134,386
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.18. Total Annual Emissions from Natural Gas Wells - Year 2024 - Alternative B - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	8	1	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	2	2	38	1	10	3	0	4,421	0	0.04	4,436	4,013
Well Completion Flaring	0	0	0	0	0	2	0	0	0	0.00	0	0
Commuting Vehicles - Construction	8	1	0	0	0	0	0	87	0		87	79
Wind Erosion	2	0	---	---	---	---	---	---	---		---	---
Sub-total: Construction	20	4	39	1	11	5	0	4,508	0	0.04	4,523	4,092
Natural Gas Compression - Operations a	6	6	187	0	94	94	28	74,773	156	0.67	78,265	71,136

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydra- tor & Wa- ter Tank Heaters - Operations a	0	0	0	0	0	0	0	73	0	0.00	73	66
Dehy- venting and flashing	---	---	---	---	---	8	3	86	5		196	188
Station Visits - Operations	14	1	0	0	1	0	0	49	0		49	45
Well Workover - Operations	0	0	1	0	0	0	0	89	0	0.00	90	81
Well & Pipeline visits for Inspection & Repair - Operations	12	1	0	0	0	0	0	21	0		21	19
Tanks Con- densate and Load- out	---	---	---	---	---	6	1	0	1		20	20
Wellhead Fugitives	---	---	---	---	---	183	18	108	1,679		35,374	35,364
Pneumatic Devices	---	---	---	---	---	134	13	79	1,233		25,979	25,972
	14	1	0	0	0	0	0	35	0		35	32
Sub-total: Operations	47	11	189	0	95	425	63	75,314	3,075	0.67	140,102	132,922

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	25	0		25	23
Sub-total: Maintenance	1	0	0	0	0	0	0	25	0	0.00	25	23
Road Reclamation	0	0	0	0	0	0	0	1	0		1	0
Well Reclamation	1	0	0	0	0	0	0	16	0		16	14
Sub-total: Reclamation	1	0	0	0	0	0	0	16	0	0.00	16	15
Total Emissions	69	15	227	1	106	430	64	79,864	3,075	0.72	144,667	137,052
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

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Summary of Emissions for All BLM Activities

Table M.19. Total Annual Emissions from Natural Gas Wells - Year 2015 - Alternative C - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	11	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	4	4	78	2	21	6	1	9,017	0	0.09	9,047	8,184
Well Completion Flaring	0	0	0	0	0	4	0	0	0	0.00	0	0
Commuting Vehicles - Construction	16	2	1	0	1	0	0	166	0		166	151
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	36	8	79	2	22	10	1	9,183	0	0.09	9,213	8,335
Natural Gas Compression - Operations a	8	8	224	0	112	112	34	89,569	187	0.81	93,751	85,211

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	87	0	0.00	87	79
Dehy-venting and flashing	---	---	---	---	---	13	5	142	9		324	311
Station Visits - Operations	17	2	0	0	1	0	0	59	0		59	53
Well Workover - Operations	0	0	1	0	0	0	0	184	0	0.00	184	167
Well & Pipeline visits for Inspection & Repair - Operations	15	1	0	0	0	0	0	25	0		25	23
Tanks Condensate and Load-out	---	---	---	---	---	9	1	1	2		33	33
Wellhead Fugitives	---	---	---	---	---	219	22	129	2,012		42,373	42,361
Pneumatic Devices	---	---	---	---	---	161	16	95	1,477		31,120	31,111
	17	2	0	0	0	0	0	42	0		42	38
Sub-total: Operations	56	13	226	1	114	516	78	90,332	3,686	0.81	167,998	159,387

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Summary of Emissions for All BLM Activities

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	31	0		31	28
Sub-total: Maintenance	1	0	0	0	0	0	0	31	0	0.00	31	28
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	17
Sub-total: Reclamation	1	0	0	0	0	0	0	20	0	0.00	20	18
Total Emissions	94	20	305	2	136	526	79	99,565	3,687	0.90	177,262	167,767
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.20. Total Annual Emissions from Natural Gas Wells - Year 2024 - Alternative C - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	11	1	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	4	4	78	2	21	6	1	9,017	0	0.09	9,047	8,184
Well Completion Flaring	0	0	0	0	0	4	0	0	0	0.00	0	0
Commuting Vehicles - Construction	16	2	1	0	1	0	0	166	0		166	151
Wind Erosion	4	1	---	---	---	---	---	---	---		---	---
Sub-total: Construction	36	8	79	2	22	10	1	9,183	0	0.09	9,213	8,335
Natural Gas Compression - Operations a	9	9	269	1	135	135	40	107,451	225	0.97	112,469	102,224

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	105	0	0.00	105	95
Dehy-venting and flashing	---	---	---	---	---	11	4	124	8		282	270
Station Visits - Operations	20	2	0	0	1	0	0	71	0		71	64
Well Workover - Operations	0	0	1	0	0	0	0	184	0	0.00	184	167
Well & Pipeline visits for Inspection & Repair - Operations	17	2	0	0	0	0	0	30	0		30	27
Tanks Condensate and Load-out	---	---	---	---	---	8	1	1	1		29	29
Wellhead Fugitives	---	---	---	---	---	263	26	155	2,413		50,833	50,818
Pneumatic Devices	---	---	---	---	---	193	19	114	1,772		37,333	37,322
	20	2	0	0	0	0	0	50	0		50	46
Sub-total: Operations	67	15	271	1	137	611	91	108,283	4,419	0.97	201,385	191,062

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	37	0		37	33
Sub-total: Maintenance	1	0	0	0	0	0	0	37	0	0.00	37	33
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	23	0		23	21
Sub-total: Reclamation	1	0	0	0	0	0	0	23	0	0.00	24	21
Total Emissions	105	23	350	2	159	621	92	117,526	4,419	1.06	210,659	199,452

^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

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Summary of Emissions for All BLM Activities

Table M.21. Total Annual Emissions from Natural Gas Wells - Year 2015 - Alternative D - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	11	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	4	4	73	2	20	5	1	8,516	0	0.09	8,544	7,729
Well Completion Flaring	0	0	0	0	0	4	0	0	0	0.00	0	0
Commuting Vehicles - Construction	16	2	1	0	1	0	0	157	0		158	143
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	34	7	74	2	21	9	1	8,673	0	0.09	8,702	7,872
Natural Gas Compression - Operations a	8	8	220	0	110	110	33	87,791	184	0.79	91,890	83,520

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	86	0	0.00	86	78
Dehy-venting and flashing	---	---	---	---	---	13	5	139	8		317	304
Station Visits - Operations	17	2	0	0	1	0	0	58	0		58	52
Well Workover - Operations	0	0	1	0	0	0	0	173	0	0.00	174	157
Well & Pipeline visits for Inspection & Repair - Operations	14	1	0	0	0	0	0	25	0		25	22
Tanks Condensate and Load-out	---	---	---	---	---	9	1	1	2		32	32
Wellhead Fugitives	---	---	---	---	---	215	22	127	1,972		41,532	41,520
Pneumatic Devices	---	---	---	---	---	158	16	93	1,448		30,502	30,493
	16	2	0	0	0	0	0	41	0		41	37
Sub-total: Operations	55	12	222	1	112	505	76	88,532	3,613	0.79	164,657	156,217

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Summary of Emissions for All BLM Activities

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	30	0		30	27
Sub-total: Maintenance	1	0	0	0	0	0	0	30	0	0.00	30	27
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	17
Sub-total: Reclamation	1	0	0	0	0	0	0	19	0	0.00	19	18
Total Emissions	91	20	296	2	133	515	77	97,255	3,613	0.88	173,408	164,134
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.22. Total Annual Emissions from Natural Gas Wells - Year 2024 - Alternative D - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	11	1	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	4	4	73	2	20	5	1	8,516	0	0.09	8,544	7,729
Well Completion Flaring	0	0	0	0	0	4	0	0	0	0.00	0	0
Commuting Vehicles - Construction	16	2	1	0	1	0	0	157	0		158	143
Wind Erosion	4	1	---	---	---	---	---	---	---		---	---
Sub-total: Construction	34	7	74	2	21	9	1	8,673	0	0.09	8,702	7,872
Natural Gas Compression - Operations a	9	9	260	1	130	130	39	103,895	217	0.94	108,747	98,841

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	101	0	0.00	101	92
Dehy-venting and flashing	---	---	---	---	---	11	4	119	7		272	261
Station Visits - Operations	20	2	0	0	1	0	0	68	0		68	62
Well Workover - Operations	0	0	1	0	0	0	0	173	0	0.00	174	157
Well & Pipeline visits for Inspection & Repair - Operations	17	2	0	0	0	0	0	29	0		29	27
Tanks Condensate and Load-out	---	---	---	---	---	8	1	1	1		28	28
Wellhead Fugitives	---	---	---	---	---	254	25	150	2,333		49,151	49,137
Pneumatic Devices	---	---	---	---	---	187	19	110	1,714		36,097	36,087
	19	2	0	0	0	0	0	49	0		49	44
Sub-total: Operations	65	15	262	1	132	591	88	104,696	4,273	0.94	194,717	184,736

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Road Maintenance	1	0	0	0	0	0	0	35	0		35	32
Sub-total: Maintenance	1	0	0	0	0	0	0	35	0	0.00	35	32
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	22	0		22	20
Sub-total: Reclamation	1	0	0	0	0	0	0	23	0	0.00	23	21
Total Emissions	101	22	337	2	154	600	89	113,427	4,273	1.02	203,477	192,661

^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

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Summary of Emissions for All BLM Activities

Table M.23. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2005 - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	9	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	9	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	15	0	7	1	0	1,791	0	0.01	1,794	1,628
Commuting Vehicles - Construction	8	1	0	0	0	0	0	45	0		45	41
Sub-total: Construction	27	4	15	0	7	2	0	1,836	0	0.01	1,839	1,669
Natural Gas Compression - Operations a	2	2	44	0	22	22	7	17,752	37	0.16	18,581	16,861
Dehydrators	0	0	0	0	0	43	22	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	62	6	793	21,346		449,062	407,497

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Pneumat- ics	---	---	---	---	---	8	1	107	1,667		35,123	31,872
Station Visits - Operations	55	6	1	0	1	1	0	96	0		96	87
Well Workover - Operations	1	0	1	0	0	0	0	108	0	0.00	108	98
Well & Pipeline visits for Inspection & Repair - Operations	289	29	2	0	6	3	0	414	0		414	376
Sub-total: Operations	346	36	48	0	30	139	36	19,269	23,051	0.16	503,384	456,791
Road Mainte- nance	16	2	5	0	2	1	0	596	0		596	541
	---	---	---	---	---	10,547	1,055		2,207		46,337	42,048
Sub-total: Mainte- nance	16	2	5	0	2	10,547	1,055	596	2,207	0.00	46,933	42,589
Road Reclama- tion	1	0	0	0	0	0	0	12	0		12	11
Well Reclama- tion	12	1	3	0	3	0	0	366	0		366	332
Sub-total: Reclama- tion	13	2	3	0	3	0	0	378	0	0.00	378	343

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Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Total Emissions	402	44	72	1	42	10,688	1,090	22,079	25,257	0.17	552,534	501,392
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.24. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2015 - Alternative A - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	9	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	12	0	5	1	0	1,554	0	0.01	1,556	1,412
Commuting Vehicles - Construction	7	1	0	0	0	0	0	42	0		42	39
Sub-total: Construction	22	4	13	0	5	1	0	1,596	0	0.01	1,599	1,451
Natural Gas Compression - Operations	1	1	24	0	12	12	4	9,443	20	0.08	9,885	8,970
Dehydrators	0	0	0	0	0	8	4	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	33	3	422	11,356		238,889	216,778
Pneumatics	---	---	---	---	---	4	0	57	887		18,685	16,955

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Station Visits - Operations	30	3	0	0	1	0	0	51	0		51	46
Well Workover - Operations	1	0	1	0	0	0	0	108	0	0.00	108	98
Well & Pipeline visits for Inspection & Repair - Operations	154	15	1	0	3	1	0	220	0		220	200
Sub-total: Operations	185	19	26	0	16	59	12	10,301	12,262	0.09	267,837	243,047
Road Maintenance	9	1	1	0	1	0	0	320	0		320	291
Evaporative Ponds	---	---	---	---	---	5,611	561		1,174		24,650	22,368
Sub-total: Maintenance	9	1	1	0	1	5,611	561	320	1,174	0.00	24,970	22,659
Road Reclamation	0	0	0	0	0	0	0	7	0		7	6
Well Reclamation	7	1	1	0	1	0	0	196	0		196	178
Sub-total: Reclamation	7	1	1	0	1	0	0	203	0	0.00	203	184

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Total Emissions	223	24	40	0	23	5,671	573	12,420	13,436	0.09	294,609	267,340
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

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Table M.25. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2024 - Alternative A - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	9	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	12	0	5	1	0	1,554	0	0.01	1,556	1,412
Commuting Vehicles - Construction	7	1	0	0	0	0	0	42	0		42	39
Sub-total: Construction	22	4	13	0	5	1	0	1,596	0	0.01	1,599	1,451
Natural Gas Compression - Operations a	0	0	3	0	1	1	0	1,135	2	0.01	1,188	1,078
Dehydrators	0	0	0	0	0	1	1	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	4	0	51	1,365		28,715	26,058

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Pneumat- ics	---	---	---	---	---	1	0	7	107		2,246	2,038
Station Visits - Operations	4	0	0	0	0	0	0	7	0		7	6
Well Workover - Operations	1	0	1	0	0	0	0	108	0	0.00	108	98
Well & Pipeline visits for Inspection & Repair - Operations	18	2	0	0	0	0	0	26	0		26	24
Sub-total: Operations	23	2	4	0	2	8	2	1,333	1,474	0.01	32,291	29,302
Road Mainte- nance	1	0	0	0	0	0	0	39	0		39	35
	---	---	---	---	---	674	67		141		2,963	2,689
Sub-total: Mainte- nance	1	0	0	0	0	674	67	39	141	0.00	3,002	2,724
Road Reclama- tion	0	0	0	0	0	0	0	1	0		1	1
Well Reclama- tion	1	0	0	0	0	0	0	24	0		24	21
Sub-total: Reclama- tion	1	0	0	0	0	0	0	24	0	0.00	24	22

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Summary of Emissions for All BLM Activities

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Total Emissions	47	6	16	0	8	683	69	2,992	1,615	0.02	36,915	33,498
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.26. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2015 - Alternative B - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	4	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	0	0	3	0	2	0	0	398	0	0.00	399	362
Commuting Vehicles - Construction	1	0	0	0	0	0	0	7	0		7	7
Sub-total: Construction	7	1	3	0	2	0	0	406	0	0.00	406	368
Natural Gas Compression - Operations	1	1	22	0	11	11	3	8,939	19	0.08	9,357	8,491
Dehydrators	0	0	0	0	0	8	4	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	31	3	400	10,750		226,140	205,209
Pneumatics	---	---	---	---	---	4	0	54	840		17,687	16,050

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Station Visits - Operations	28	3	0	0	1	0	0	48	0		48	43
Well Workover - Operations	0	0	0	0	0	0	0	12	0	0.00	12	11
Well & Pipeline visits for Inspection & Repair - Operations	145	15	1	0	3	1	0	209	0		209	189
Sub-total: Operations	174	18	24	0	15	56	11	9,661	11,608	0.08	253,453	229,994
Road Maintenance	8	1	1	0	0	0	0	303	0		303	275
Evaporative Ponds	---	---	---	---	---	5,311	531		1,111		23,335	21,175
Sub-total: Maintenance	8	1	1	0	0	5,311	531	303	1,111	0.00	23,638	21,450
Road Reclamation	0	0	0	0	0	0	0	6	0		6	6
Well Reclamation	6	1	1	0	1	0	0	185	0		186	168
Sub-total: Reclamation	6	1	1	0	1	0	0	192	0	0.00	192	174

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} - metricT- onnes
Total Emissions	195	21	29	0	18	5,368	542	10,562	12,719	0.08	277,689	251,986
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

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Table M.27. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2024 - Alternative B - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	4	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	3	0	2	0	0	398	0	0.00	399	362
Commuting Vehicles - Construction	1	0	0	0	0	0	0	7	0		7	7
Sub-total: Construction	7	1	3	0	2	0	0	406	0	0.00	406	368
Natural Gas Compression - Operations a	0	0	0	0	0	0	0	127	0	0.00	133	121
Dehydrators	0	0	0	0	0	0	0	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	0	0	6	153		3,218	2,920

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Pneumat- ics	---	---	---	---	---	0	0	1	12		252	228
Station Visits - Operations	0	0	0	0	0	0	0	1	0		1	1
Well Workover - Operations	0	0	0	0	0	0	0	12	0	0.00	12	11
Well & Pipeline visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	3	0		3	3
Sub-total: Operations	3	0	0	0	0	1	0	149	165	0.00	3,618	3,283
Road Mainte- nance	0	0	0	0	0	0	0	4	0		4	4
	---	---	---	---	---	76	8		16		332	301
Sub-total: Mainte- nance	0	0	0	0	0	76	8	4	16	0.00	336	305
Road Reclama- tion	0	0	0	0	0	0	0	0	0		0	0
Well Reclama- tion	0	0	0	0	0	0	0	3	0		3	2
Sub-total: Reclama- tion	0	0	0	0	0	0	0	3	0	0.00	3	2

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Summary of Emissions for All BLM Activities

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Total Emissions	9	1	4	0	2	77	8	562	181	0.00	4,363	3,960
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.28. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2015 - Alternative C - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	16	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	52	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	4	5	62	2	24	5	1	7,842	0	0.04	7,857	7,130
Commuting Vehicles - Construction	36	4	1	0	1	1	0	233	0		233	211
Sub-total: Construction	109	18	63	2	25	6	1	8,075	0	0.04	8,090	7,341
Natural Gas Compression - Operations	1	1	31	0	15	15	5	12,194	26	0.11	12,764	11,583
Dehydrators	0	0	0	0	0	11	5	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	42	4	545	14,664		308,483	279,931
Pneumatics	---	---	---	---	---	6	1	73	1,145		24,128	21,895

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Station Visits - Operations	38	4	0	0	1	0	0	66	0		66	60
Well Workover - Operations	3	0	4	0	1	0	0	629	0	0.01	631	572
Well & Pipeline visits for Inspection & Repair - Operations	198	20	2	0	4	2	0	284	0		285	258
Sub-total: Operations	241	25	37	0	22	77	15	13,792	15,835	0.12	346,357	314,298
Road Maintenance	11	1	1	0	1	0	0	414	0		414	375
Evaporative Ponds	---	---	---	---	---	7,245	725		1,516		31,831	28,885
Sub-total: Maintenance	11	1	1	0	1	7,245	725	414	1,516	0.00	32,245	29,260
Road Reclamation	0	0	0	0	0	0	0	9	0		9	8
Well Reclamation	8	1	1	0	1	0	0	253	0		253	230
Sub-total: Reclamation	9	1	1	0	1	0	0	262	0	0.00	262	238

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Total Emissions	369	45	102	2	49	7,328	740	22,543	17,351	0.16	386,954	351,138
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

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Table M.29. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2024 - Alternative C - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eqme- tricTonnes
Well Pad & Station Construction - Fugitive Dust	16	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	52	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	4	5	62	2	24	5	1	7,842	0	0.04	7,857	7,130
Commuting Vehicles - Construction	36	4	1	0	1	1	0	233	0		233	211
Sub-total: Construction	109	18	63	2	25	6	1	8,075	0	0.04	8,090	7,341
Natural Gas Compression - Operations a	1	1	17	0	8	8	2	6,637	14	0.06	6,947	6,304
Dehydrators	0	0	0	0	0	9	4	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	23	2	297	7,981		167,905	152,364
Pneumatics	---	---	---	---	---	3	0	40	623		13,133	11,917

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eqme- tricTonnes
Station Visits - Operations	21	2	0	0	1	0	0	36	0		36	33
Well Workover - Operations	3	0	4	0	1	0	0	629	0	0.01	631	572
Well & Pipeline visits for Inspection & Repair - Operations	108	11	1	0	2	1	0	155	0		155	141
Sub-total: Operations	133	14	22	0	12	45	10	7,794	8,619	0.07	188,807	171,331
Road Maintenance	6	1	0	0	0	0	0	225	0		225	204
Sub-total: Maintenance	6	1	0	0	0	3,944	394	225	825	0.00	17,551	15,926
Road Reclamation	0	0	0	0	0	0	0	5	0		5	4
Well Reclamation	5	1	0	0	0	0	0	138	0		138	125
Sub-total: Reclamation	5	1	0	0	0	0	0	142	0	0.00	142	129
Total Emissions	252	33	85	2	38	3,994	405	16,237	9,444	0.11	214,590	194,728

^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table M.30. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2015 - Alternative D - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	27	4	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	3	33	1	13	3	0	4,164	0	0.02	4,171	3,785
Commuting Vehicles - Construction	19	2	0	0	1	0	0	121	0		122	110
Sub-total: Construction	58	9	33	1	14	3	0	4,285	0	0.02	4,293	3,895
Natural Gas Compression - Operations	1	1	27	0	13	13	4	10,586	22	0.10	11,081	10,055
Dehydrators	0	0	0	0	0	9	5	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	37	4	473	12,730		267,799	243,012
Pneumatics	---	---	---	---	---	5	0	64	994		20,946	19,007

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Station Visits - Operations	33	3	0	0	1	0	0	57	0		57	52
Well Workover - Operations	2	0	2	0	1	0	0	324	0	0.00	325	295
Well & Pipeline visits for Inspection & Repair - Operations	172	17	1	0	4	2	0	247	0		247	224
Sub-total: Operations	208	22	30	0	19	66	13	11,751	13,746	0.10	300,455	272,645
Road Maintenance	10	1	1	0	1	0	0	359	0		359	326
Evaporative Ponds	---	---	---	---	---	6,290	629		1,316		27,633	25,075
Sub-total: Maintenance	10	1	1	0	1	6,290	629	359	1,316	0.00	27,992	25,401
Road Reclamation	0	0	0	0	0	0	0	7	0		7	7
Well Reclamation	7	1	1	0	1	0	0	220	0		220	199
Sub-total: Reclamation	8	1	1	0	1	0	0	227	0	0.00	227	206

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Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Total Emissions	283	33	66	1	34	6,359	642	16,622	15,062	0.12	332,967	302,148
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table M.31. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2024 - Alternative D - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	27	4	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	3	33	1	13	3	0	4,164	0	0.02	4,171	3,785
Commuting Vehicles - Construction	19	2	0	0	1	0	0	121	0		122	110
Sub-total: Construction	58	9	33	1	14	3	0	4,285	0	0.02	4,293	3,895
Natural Gas Compression - Operations a	0	0	9	0	4	4	1	3,421	7	0.03	3,581	3,249
Dehydrators	0	0	0	0	0	5	2	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	12	1	153	4,113		86,536	78,527

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Pneumatics	---	---	---	---	---	2	0	21	321		6,768	6,142
Station Visits - Operations	11	1	0	0	0	0	0	19	0		19	17
Well Workover - Operations	2	0	2	0	1	0	0	324	0	0.00	325	295
Well & Pipeline visits for Inspection & Repair - Operations	56	6	0	0	1	1	0	80	0		80	72
Sub-total: Operations	69	7	11	0	6	23	5	4,017	4,442	0.03	97,309	88,302
Road Maintenance	3	0	0	0	0	0	0	116	0		116	105
	---	---	---	---	---	2,032	203		425		8,929	8,103
Sub-total: Maintenance	3	0	0	0	0	2,032	203	116	425	0.00	9,045	8,208
Road Reclamation	0	0	0	0	0	0	0	2	0		2	2
Well Reclamation	2	0	0	0	0	0	0	71	0		71	64
Sub-total: Reclamation	2	0	0	0	0	0	0	73	0	0.00	73	67

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Total Emissions	132	17	45	1	20	2,059	209	8,492	4,867	0.06	110,721	100,473
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.32. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2005 - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	33	3	---	---	---	---	---	---	---	---	---	---
Wind Erosion	57	9	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	6	6	78	2	32	7	1	9,789	0	0.05	9,806	8,898
Commuting Vehicles - Construction	44	4	1	0	2	1	0	272	0		273	247
Sub-total: Construction	140	23	79	2	34	8	1	10,061	0	0.05	10,078	9,146
Natural Gas Compression - Operations a	4	4	126	0	63	63	19	50,231	105	0.45	52,578	47,711
Dehydrators	0	0	0	0	0	122	61	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	174	17	2,245	60,402		1,270,693	1,153,079

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Pneumat- ics	---	---	---	---	---	23	2	302	4,718		99,387	90,187
Station Visits - Operations	156	16	2	0	4	2	0	269	0		269	244
Well Workover - Operations	4	0	5	0	1	0	0	701	0	0.01	704	639
Well & Pipeline visits for Inspection & Repair - Operations	817	82	7	0	18	8	1	1,172	0		1,172	1,063
Sub-total: Operations	981	102	139	0	86	392	101	54,920	65,226	0.46	1,424,803	1,292,924
Road Mainte- nance	46	5	15	0	6	1	0	1,686	0		1,686	1,530
Evapora- tive Ponds	---	---	---	---	---	29,844	2,984		6,244		131,118	118,982
Sub-total: Mainte- nance	46	5	15	0	6	29,845	2,985	1,686	6,244	0.00	132,804	120,512
Road Reclama- tion	1	0	0	0	0	0	0	35	0		35	32
Well Reclama- tion	35	4	9	0	7	1	0	1,035	0		1,036	940

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Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Sub-total: Reclama- tion	37	4	10	0	8	1	0	1,070	0	0.00	1,070	971
Total Emissions	1,204	134	243	3	133	30,247	3,086	67,738	71,470	0.51	1,568,756	1,423,553
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table M.33. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2015 - Alternative A - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	24	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	57	9	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	5	6	73	2	29	7	1	9,178	0	0.05	9,195	8,344
Commuting Vehicles - Construction	42	4	1	0	2	1	0	265	0		265	241
Sub-total: Construction	129	21	74	2	30	7	1	9,443	0	0.05	9,460	8,584
Natural Gas Compression - Operations	2	2	72	0	36	36	11	28,818	60	0.26	30,164	27,372
Dehydrators	0	0	0	0	0	25	13	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	100	10	1,288	34,653		729,001	661,525
Pneumatics	---	---	---	---	---	13	1	173	2,707		57,018	51,741

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Station Visits - Operations	89	9	1	0	2	1	0	154	0		154	140
Well Workover - Operations	4	0	5	0	1	0	0	701	0	0.01	704	639
Well & Pipeline visits for Inspection & Repair - Operations	469	47	4	0	10	5	0	672	0		672	610
Sub-total: Operations	564	59	82	0	50	180	35	31,807	37,420	0.27	817,714	742,027
Road Maintenance	26	3	3	0	2	0	0	978	0		978	887
Evaporative Ponds	---	---	---	---	---	17,122	1,712		3,582		75,223	68,260
Sub-total: Maintenance	26	3	3	0	2	17,122	1,712	978	3,582	0.00	76,201	69,148
Road Reclamation	1	0	0	0	0	0	0	20	0		20	19
Well Reclamation	20	2	2	0	2	0	0	598	0		598	543
Sub-total: Reclamation	21	2	2	0	2	0	0	618	0	0.00	619	561

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Total Emissions	740	85	161	2	84	17,310	1,748	42,846	41,002	0.31	903,993	820,320
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

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Table M.34. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2024 - Alternative A - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	24	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	57	9	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	5	6	73	2	29	7	1	9,178	0	0.05	9,195	8,344
Commuting Vehicles - Construction	42	4	1	0	2	1	0	265	0		265	241
Sub-total: Construction	129	21	74	2	30	7	1	9,443	0	0.05	9,460	8,584
Natural Gas Compression - Operations a	1	1	19	0	9	9	3	7,404	15	0.07	7,750	7,033
Dehydrators	0	0	0	0	0	10	5	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	26	3	331	8,904		187,308	169,971

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Pneumat- ics	---	---	---	---	---	3	0	45	696		14,650	13,294
Station Visits - Operations	23	2	0	0	1	0	0	40	0		40	37
Well Workover - Operations	4	0	5	0	1	0	0	701	0	0.01	704	639
Well & Pipeline visits for Inspection & Repair - Operations	120	12	1	0	3	1	0	173	0		173	157
Sub-total: Operations	148	15	24	0	14	50	11	8,694	9,615	0.07	210,626	191,131
Road Mainte- nance	7	1	0	0	0	0	0	251	0		251	228
Evapora- tive Ponds	---	---	---	---	---	4,399	440		920		19,328	17,539
Sub-total: Mainte- nance	7	1	0	0	0	4,399	440	251	920	0.00	19,579	17,767
Road Reclama- tion	0	0	0	0	0	0	0	5	0		5	5
Well Reclama- tion	5	1	0	0	0	0	0	154	0		154	139

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Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Sub-total: Reclama- tion	5	1	0	0	0	0	0	159	0	0.00	159	144
Total Emissions	285	38	99	2	45	4,456	451	18,548	10,535	0.12	239,824	217,626
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table M.35. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2015 - Alternative B - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	20	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	49	7	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	5	5	63	2	25	6	1	7,899	0	0.04	7,914	7,181
Commuting Vehicles - Construction	36	4	1	0	1	0	0	226	0		226	205
Sub-total: Construction	111	18	64	2	26	6	1	8,126	0	0.04	8,140	7,387
Natural Gas Compression - Operations	2	2	71	0	35	35	11	28,314	59	0.25	29,636	26,893
Dehydrators	0	0	0	0	0	25	12	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	98	10	1,266	34,047		716,252	649,956
Pneumatics	---	---	---	---	---	13	1	170	2,660		56,021	50,836

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Station Visits - Operations	88	9	1	0	2	1	0	152	0		152	138
Well Workover - Operations	3	0	4	0	1	0	0	595	0	0.01	597	542
Well & Pipeline visits for Inspection & Repair - Operations	461	46	4	0	10	4	0	661	0		661	599
Sub-total: Operations	554	58	80	0	49	177	35	31,157	36,766	0.26	803,319	728,965
Road Maintenance	26	3	3	0	2	0	0	961	0		961	872
Evaporative Ponds	---	---	---	---	---	16,822	1,682		3,519		73,907	67,067
Sub-total: Maintenance	26	3	3	0	2	16,823	1,682	961	3,519	0.00	74,868	67,938
Road Reclamation	1	0	0	0	0	0	0	20	0		20	18
Well Reclamation	20	2	2	0	2	0	0	587	0		588	533
Sub-total: Reclamation	20	2	2	0	2	0	0	608	0	0.00	608	551

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Total Emissions	712	81	149	2	79	17,006	1,718	40,851	40,285	0.30	886,935	804,841
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

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Table M.36. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2024 - Alternative B - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	22	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	49	7	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	5	5	63	2	25	6	1	7,899	0	0.04	7,914	7,181
Commuting Vehicles - Construction	36	4	1	0	1	0	0	226	0		226	205
Sub-total: Construction	111	18	64	2	26	6	1	8,126	0	0.04	8,140	7,387
Natural Gas Compression - Operations a	1	1	16	0	8	8	2	6,396	13	0.06	6,695	6,076
Dehydrators	0	0	0	0	0	8	4	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	22	2	286	7,692		161,811	146,834

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Pneumatics	---	---	---	---	---	3	0	38	601		12,656	11,485
Station Visits - Operations	20	2	0	0	1	0	0	35	0		35	31
Well Workover - Operations	3	0	4	0	1	0	0	595	0	0.01	597	542
Well & Pipeline visits for Inspection & Repair - Operations	104	10	1	0	2	1	0	149	0		149	135
Sub-total: Operations	128	13	21	0	12	43	9	7,500	8,306	0.06	181,943	165,102
Road Maintenance	6	1	0	0	0	0	0	217	0		217	197
Evaporative Ponds	---	---	---	---	---	3,800	380		795		16,697	15,151
Sub-total: Maintenance	6	1	0	0	0	3,800	380	217	795	0.00	16,914	15,348
Road Reclamation	0	0	0	0	0	0	0	4	0		4	4
Well Reclamation	4	1	0	0	0	0	0	133	0		133	120

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Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Sub-total: Reclama- tion	5	1	0	0	0	0	0	137	0	0.00	137	125
Total Emissions	250	33	85	2	39	3,850	390	15,980	9,101	0.10	207,134	187,962
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table M.37. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2015 - Alternative C - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	35	3	---	---	---	---	---	---	---	---	---	---
Wind Erosion	99	15	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	9	9	121	3	47	11	1	15,339	0	0.08	15,368	13,945
Commuting Vehicles - Construction	71	7	2	0	3	1	0	452	0		452	410
Sub-total: Construction	213	35	123	3	49	12	1	15,791	0	0.08	15,820	14,355
Natural Gas Compression - Operations	3	3	79	0	40	40	12	31,569	66	0.28	33,044	29,985
Dehydrators	0	0	0	0	0	28	14	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	109	11	1,411	37,961		798,596	724,678
Pneumatics	---	---	---	---	---	15	1	190	2,965		62,462	56,680

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Station Visits - Operations	98	10	1	0	3	1	0	169	0		169	154
Well Workover - Operations	6	1	8	0	2	1	0	1,212	0	0.01	1,216	1,103
Well & Pipeline visits for Inspection & Repair - Operations	514	51	4	0	11	5	0	736	0		737	668
Sub-total: Operations	621	65	92	0	56	198	39	35,287	40,993	0.30	896,223	813,269
Road Maintenance	29	3	4	0	2	1	0	1,071	0		1,071	972
Evaporative Ponds	---	---	---	---	---	18,756	1,876		3,924		82,404	74,777
Sub-total: Maintenance	29	3	4	0	2	18,757	1,876	1,071	3,924	0.00	83,475	75,749
Road Reclamation	1	0	0	0	0	0	0	22	0		22	20
Well Reclamation	22	2	3	0	3	0	0	655	0		655	595
Sub-total: Reclamation	23	2	3	0	3	0	0	677	0	0.00	678	615

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Total Emissions	885	105	222	4	110	18,967	1,916	52,826	44,917	0.38	996,195	903,988
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

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Table M.38. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2024 - Alternative C - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	35	3	---	---	---	---	---	---	---	---	---	---
Wind Erosion	99	15	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	9	9	121	3	47	11	1	15,339	0	0.08	15,638	13,945
Commuting Vehicles - Construction	71	7	2	0	3	1	0	452	0		452	410
Sub-total: Construction	213	35	123	3	49	12	1	15,791	0	0.08	15,820	14,355
Natural Gas Compression - Operations a	1	1	32	0	16	16	5	12,907	27	0.12	13,509	12,259
Dehydrators	0	0	0	0	0	17	9	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	45	4	577	15,520		326,498	296,277

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Pneumat- ics	---	---	---	---	---	6	1	78	1,212		25,537	23,173
Station Visits - Operations	40	4	0	0	1	0	0	69	0		69	63
Well Workover - Operations	6	1	8	0	2	1	0	1,212	0	0.01	1,216	1,103
Well & Pipeline visits for Inspection & Repair - Operations	210	21	2	0	5	2	0	301	0		301	273
Sub-total: Operations	257	27	43	0	24	87	19	15,143	16,759	0.13	367,130	333,149
Road Mainte- nance	12	1	0	0	0	0	0	438	0		438	398
Evapora- tive Ponds	---	---	---	---	---	7,668	767		1,604		33,690	30,572
Sub-total: Mainte- nance	12	1	0	0	0	7,668	767	438	1,604	0.00	34,128	30,969
Road Reclama- tion	0	0	0	0	0	0	0	9	0		9	8
Well Reclama- tion	9	1	0	0	0	0	0	268	0		268	243

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Summary of Emissions for All BLM Activities

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Sub-total: Reclama- tion	9	1	0	0	0	0	0	277	0	0.00	277	251
Total Emissions	492	64	166	4	74	7,767	787	31,649	18,364	0.21	417,355	378,725
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table M.39. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2015 - Alternative D - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	29	3	---	---	---	---	---	---	---	---	---	---
Wind Erosion	75	11	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	7	7	93	2	36	8	1	11,792	0	0.06	11,814	10,721
Commuting Vehicles - Construction	54	5	1	0	2	1	0	344	0		344	312
Sub-total: Construction	165	27	95	2	38	9	1	12,137	0	0.06	12,159	11,033
Natural Gas Compression - Operations	3	3	75	0	38	38	11	29,960	63	0.27	31,360	28,457
Dehydrators	0	0	0	0	0	26	13	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	104	10	1,339	36,027		757,911	687,760
Pneumatics	---	---	---	---	---	14	1	180	2,814		59,280	53,793

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Station Visits - Operations	93	9	1	0	2	1	0	161	0		161	146
Well Workover - Operations	5	1	6	0	2	0	0	918	0	0.01	921	836
Well & Pipeline visits for Inspection & Repair - Operations	487	49	4	0	11	5	0	699	0		699	634
Sub-total: Operations	588	61	86	0	52	188	37	33,257	38,904	0.28	850,332	771,626
Road Maintenance	28	3	3	0	2	0	0	1,017	0		1,017	923
Evaporative Ponds	---	---	---	---	---	17,801	1,780		3,724		78,206	70,967
Sub-total: Maintenance	28	3	3	0	2	17,801	1,780	1,017	3,724	0.00	79,223	71,890
Road Reclamation	1	0	0	0	0	0	0	21	0		21	19
Well Reclamation	21	2	2	0	2	0	0	622	0		622	564
Sub-total: Reclamation	22	2	3	0	3	0	0	643	0	0.00	643	584

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Total Emissions	802	93	187	3	95	17,998	1,818	47,053	42,628	0.34	942,356	855,133
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

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Table M.40. Total Annual Emissions from Coalbed Natural Gas Wells - Year 2024 - Alternative D - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad & Station Construction - Fugitive Dust	29	3	---	---	---	---	---	---	---	---	---	---
Wind Erosion	75	11	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	7	7	93	2	36	8	1	11,792	0	0.06	11,814	10,721
Commuting Vehicles - Construction	54	5	1	0	2	1	0	344	0		344	312
Sub-total: Construction	165	27	95	2	38	9	1	12,137	0	0.06	12,159	11,033
Natural Gas Compression - Operations a	1	1	24	0	12	12	4	9,690	20	0.09	10,143	9,204
Dehydrators	0	0	0	0	0	13	6	0	0	0.00	0	0
Central Processing Heaters	0	0	0	0	0	0	0	0	0	0.00	0	0
Wellhead fugitives	---	---	---	---	---	34	3	433	11,652		245,129	222,440

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Pneumat- ics	---	---	---	---	---	5	0	58	910		19,173	17,398
Station Visits - Operations	30	3	0	0	1	0	0	52	0		52	47
Well Workover - Operations	5	1	6	0	2	0	0	918	0	0.01	921	836
Well & Pipeline visits for Inspection & Repair - Operations	158	16	1	0	3	2	0	226	0		226	205
Sub-total: Operations	193	20	32	0	18	65	14	11,377	12,583	0.10	275,644	250,130
Road Mainte- nance	9	1	0	0	0	0	0	329	0		329	298
Evapora- tive Ponds	---	---	---	---	---	5,757	576		1,204		25,294	22,953
Sub-total: Mainte- nance	9	1	0	0	0	5,757	576	329	1,204	0.00	25,623	23,251
Road Reclama- tion	0	0	0	0	0	0	0	7	0		7	6
Well Reclama- tion	7	1	0	0	0	0	0	201	0		201	183

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Summary of Emissions for All BLM Activities

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Sub-total: Reclama- tion	7	1	0	0	0	0	0	208	0	0.00	208	189
Total Emissions	374	49	127	3	57	5,832	591	24,051	13,787	0.16	313,633	284,603
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table M.41. Total Annual Emissions from Oil Wells - Year 2005 - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad Construction - Fugitive Dust	0.00	0.00	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Commuting Vehicles - Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Sub-total: Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9,646.70
Well Workover Operations - Fugitive Dust	0.00	0.00	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	473.97	0.00	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Well Visits for Inspection & Repair - Operations	24.10	2.40	0.12	0.00	2.53	0.11	0.01	50.26	0.01	0.02	55	50
Oil - hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Sub-total: Operations	24.10	2.40	0.12	0.00	2.53	0.11	0.01	524.23	0.01	0.02	529.29	480.30
Road Maintenance	14.12	1.58	4.21	0.11	1.60	0.34	0.03	511.57	0.01	0.01	514	466
Sub-total: Maintenance	14.12	1.58	4.21	0.11	1.60	0.34	0.03	511.57	0.01	0.01	513.77	466.22
Total Emissions	38.22	3.98	4.33	0.11	4.13	0.45	0.05	1,035.80	0.01	0.02	1,043.06	10,593.21
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.42. Total Annual Emissions from Oil Wells - Year 2015 - Alternative A - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	4.76	0.71	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring	29.13	29.09	766.72	91.88	174.01	30.36	3.04	35,364.22	1.81	0.39	35,522	32,235
Commuting Vehicles - Construction	12.46	1.25	0.19	0.00	0.69	0.05	0.00	58.90	0.67	0.67	280	255
Sub-total: Construction	46.35	31.06	766.91	91.88	174.70	30.41	3.04	35,423.12	2.48	1.06	35,802.96	32,489.08
Well Workover Operations - Fugitive Dust	0.20	0.02	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	1.65	1.65	23.21	1.53	5.00	1.90	0.19	473.97	0.01	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.73	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Well Visits for Inspection & Repair - Operations	28.80	2.87	0.14	0.00	3.02	0.13	0.01	60.07	0.01	0.02	66	60
Oil - hauling	110.59	11.03	0.93	0.00	0.59	0.12	0.01	270.11	0.01	0.00	271	246
Sub-total: Operations	141.23	15.57	24.28	1.54	8.62	2.16	0.22	804.87	0.03	0.02	812.15	736.98
Road Maintenance	16.87	1.89	5.03	0.14	1.91	0.41	0.04	4.38	607.35	0.01	12,761	11,580
Sub-total: Maintenance	16.87	1.89	5.03	0.14	1.91	0.41	0.04	4.38	607.35	0.01	12,761.22	11,580.05
Total Emissions	204.45	48.51	796.21	93.55	185.23	32.98	3.30	36,232.37	609.86	1.09	49,376.33	44,806.11
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.43. Total Annual Emissions from Oil Wells - Year 2024 - Alternative A - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	4.76	0.71	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring a	29.13	29.09	766.72	91.88	174.01	30.36	3.04	35,364.22	1.81	0.39	35,522	32,235
Commuting Vehicles - Construction	12.46	1.25	0.19	0.00	0.69	0.05	0.00	58.90	0.67	0.67	280	255
Sub-total: Construction	46.35	31.06	766.91	91.88	174.70	30.41	3.04	35,423.12	2.48	1.06	35,802.96	32,489.08
Well Workover Operations - Fugitive Dust	0.20	0.02	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	1.65	1.65	23.21	1.53	5.00	1.90	0.19	473.97	0.01	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.73	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Visits for Inspection & Repair - Operations	33.50	3.34	0.17	0.00	3.51	0.16	0.02	69.87	0.01	0.02	77	70
Oil - hauling	128.36	12.83	0.78	0.00	0.49	0.10	0.01	226.02	0.01	0.00	227	206
Sub-total: Operations	163.70	17.83	24.15	1.54	9.02	2.16	0.22	770.58	0.03	0.02	778.70	706.63
Road Maintenance	19.63	2.19	5.85	0.158	2.23	0.47	0.05	5.09	706.48	0.01	14,844	13,470
Sub-total: Maintenance	19.63	2.19	5.85	0.16	2.23	0.47	0.05	5.09	706.48	0.01	14,844.18	13,470.22
Total Emissions	229.68	51.09	796.91	93.58	185.94	33.04	3.30	36,198.80	709.00	1.09	51,425.85	46,665.92
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.44. Total Annual Emissions from Oil Wells - Year 2015 - Alternative B - Federal

Activity	Annual Emissions (Tons)							CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metric T- onnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa					
Well Pad Construction - Fugitive Dust	0.02	0.00	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring	0.11	0.11	2.94	0.35	0.67	0.12	0.01	135.42	0.01	0.00	136	123
Commuting Vehicles - Construction	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	1	1
Sub-total: Construction	0.18	0.12	2.94	0.35	0.67	0.12	0.01	135.65	0.01	0.00	137.10	124.41
Well Workover Operations - Fugitive Dust	0.00	0.00	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	0.01	0.01	0.09	0.01	0.02	0.01	0.00	473.97	0.00	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0

Activity	Annual Emissions (Tons)							CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a					
Well Visits for Inspection & Repair - Operations	19.28	1.92	0.10	0.00	2.02	0.09	0.01	40.21	0.01	0.01	44	40
Oil - hauling	74.13	7.38	0.62	0.00	0.39	0.08	0.01	180.79	0.01	0.00	181	165
Sub-total: Operations	93.41	9.31	0.81	0.01	2.43	0.18	0.02	694.97	0.02	0.01	699.63	634.87
Road Maintenance	11.29	1.26	3.37	0.09	1.28	0.27	0.03	2.93	406.52	0.01	8,542	7,751
Sub-total: Maintenance	11.29	1.26	3.37	0.09	1.28	0.27	0.03	2.93	406.52	0.01	8,541.62	7,751.02
Total Emissions	104.88	10.69	7.11	0.45	4.38	0.57	0.06	833.55	406.55	0.02	9,378.36	8,510.30
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.45. Total Annual Emissions from Oil Wells - Year 2024 - Alternative B - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	0.02	0.00	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring a	0.11	0.11	2.94	0.35	0.67	0.12	0.01	135.42	0.01	0.00	136	123
Commuting Vehicles - Construction	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	1	1
Sub-total: Construction	0.18	0.12	2.94	0.35	0.67	0.12	0.01	135.65	0.01	0.00	137.10	124.41
Well Workover Operations - Fugitive Dust	0.00	0.00	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	0.01	0.01	0.09	0.01	0.02	0.01	0.00	473.97	0.00	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Visits for Inspection & Repair - Operations	14.46	1.44	0.07	0.00	1.52	0.07	0.01	30.15	0.00	0.01	33	30
Oil - hauling	55.41	5.54	0.78	0.00	0.49	0.10	0.01	226.02	0.01	0.00	227	206
Sub-total: Operations	69.87	6.98	0.94	0.01	2.03	0.17	0.02	730.14	0.02	0.01	733.94	666.01
Road Maintenance	8.47	0.95	2.53	0.068	0.96	0.20	0.02	2.20	304.84	0.00	6,405	5,812
Sub-total: Maintenance	8.47	0.95	2.53	0.07	0.96	0.20	0.02	2.20	304.84	0.00	6,405.00	5,812.16
Total Emissions	78.52	8.05	6.40	0.43	3.65	0.49	0.05	867.98	304.86	0.02	7,276.02	6,602.58
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.46. Total Annual Emissions from Oil Wells - Year 2015 - Alternative C - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	5.18	0.78	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring	31.72	31.67	834.66	100.02	189.43	33.05	3.31	38,498.24	1.97	0.42	38,671	35,091
Commuting Vehicles - Construction	13.56	1.36	0.21	0.00	0.75	0.05	0.01	64.12	0.73	0.73	305	277
Sub-total: Construction	50.46	33.81	834.87	100.02	190.18	33.11	3.31	38,562.37	2.70	1.15	38,975.87	35,368.31
Well Workover Operations - Fugitive Dust	0.22	0.02	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	1.79	1.79	25.26	1.67	5.44	2.07	0.21	473.97	0.01	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.79	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Visits for Inspection & Repair - Operations	29.65	2.95	0.15	0.00	3.11	0.14	0.01	61.84	0.01	0.02	68	62
Oil - hauling	113.83	11.36	0.96	0.00	0.60	0.12	0.01	278.06	0.01	0.00	279	253
Sub-total: Operations	145.49	16.12	26.37	1.68	9.17	2.34	0.23	814.65	0.04	0.02	822.15	746.05
Road Maintenance	17.37	1.94	5.18	0.14	1.97	0.42	0.04	4.51	625.23	0.01	13,137	11,921
Sub-total: Maintenance	17.37	1.94	5.18	0.14	1.97	0.42	0.04	4.51	625.23	0.01	13,136.83	11,920.90
Total Emissions	213.31	51.87	866.41	101.84	201.32	35.86	3.59	39,381.52	627.96	1.18	52,934.87	48,035.28
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.47. Total Annual Emissions from Oil Wells - Year 2024 - Alternative C - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad Construction - Fugitive Dust	5.18	0.78	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring a	31.72	31.67	834.66	100.02	189.43	33.05	3.31	38,498.24	1.97	0.42	38,671	35,091
Commuting Vehicles - Construction	13.56	1.36	0.21	0.00	0.75	0.05	0.00	64.12	0.73	0.73	305	277
Sub-total: Construction	50.46	33.81	834.87	100.02	190.18	33.11	3.31	38,562.37	2.70	1.15	38,975.87	35,368.31
Well Workover Operations - Fugitive Dust	0.22	0.02	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	1.79	1.79	25.26	1.67	5.44	2.07	0.21	473.97	0.01	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.79	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Visits for Inspection & Repair - Operations	35.20	3.50	0.17	0.00	3.69	0.16	0.02	73.41	0.01	0.02	81	73
Oil - hauling	134.85	13.48	0.78	0.00	0.49	0.10	0.01	226.02	0.01	0.00	227	206
Sub-total: Operations	172.06	18.80	26.21	1.67	9.64	2.34	0.23	774.18	0.04	0.03	782.69	710.24
Road Maintenance	20.62	2.30	6.15	0.166	2.34	0.50	0.05	5.35	742.24	0.01	15,595	14,152
Sub-total: Maintenance	20.62	2.30	6.15	0.17	2.34	0.50	0.05	5.35	742.24	0.01	15,595.42	14,151.92
Total Emissions	243.13	54.91	867.23	101.86	202.16	35.94	3.59	39,341.90	744.97	1.19	55,353.98	50,230.47
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.48. Total Annual Emissions from Oil Wells - Year 2015 - Alternative D - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	4.61	0.69	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring	28.26	28.22	743.65	89.11	168.77	29.45	2.95	34,300.19	1.75	0.38	34,454	31,265
Commuting Vehicles - Construction	12.08	1.21	0.18	0.00	0.67	0.05	0.00	57.13	0.65	0.65	272	247
Sub-total: Construction	44.95	30.12	743.83	89.11	169.44	29.50	2.95	34,357.33	2.40	1.03	34,725.74	31,511.56
Well Workover Operations - Fugitive Dust	0.19	0.02	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	1.60	1.60	22.51	1.49	4.85	1.85	0.18	473.97	0.01	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.70	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Visits for Inspection & Repair - Operations	28.52	2.84	0.14	0.00	2.99	0.13	0.01	59.48	0.01	0.02	65	59
Oil - hauling	109.51	10.92	0.92	0.00	0.58	0.12	0.01	267.47	0.01	0.00	268	244
Sub-total: Operations	139.82	15.38	23.57	1.49	8.43	2.10	0.21	801.63	0.03	0.02	808.83	733.97
Road Maintenance	16.71	1.87	4.98	0.13	1.89	0.40	0.04	4.34	601.43	0.01	12,637	11,467
Sub-total: Maintenance	16.71	1.87	4.98	0.13	1.89	0.40	0.04	4.34	601.43	0.01	12,636.82	11,467.17
Total Emissions	201.48	47.37	772.38	90.74	179.77	32.00	3.20	35,163.29	603.87	1.05	48,171.40	43,712.70
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.49. Total Annual Emissions from Oil Wells - Year 2024 - Alternative D - Federal

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	4.61	0.69	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring a	28.26	28.22	743.65	89.11	168.77	29.45	2.95	34,300.19	1.63	0.37	34,448	31,260
Commuting Vehicles - Construction	12.08	1.21	0.18	0.00	0.67	0.05	0.00	57.13	0.65	0.65	272	247
Sub-total: Construction	44.95	30.12	743.83	89.11	169.44	29.50	2.95	34,357.33	2.40	1.03	34,725.74	31,511.56
Well Workover Operations - Fugitive Dust	0.19	0.02	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	1.60	1.60	22.51	1.49	4.85	1.85	0.18	473.97	0.01	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.70	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Well Visits for Inspection & Repair - Operations	32.94	3.28	0.16	0.00	3.45	0.15	0.02	68.70	0.01	0.02	76	69
Oil - hauling	126.21	12.62	0.78	0.00	0.49	0.10	0.01	226.02	0.01	0.00	227	206
Sub-total: Operations	160.94	17.51	23.45	1.49	8.81	2.10	0.21	769.39	0.03	0.02	777.38	705.43
Road Maintenance	19.30	2.16	5.75	0.156	2.19	0.46	0.05	5.01	694.64	0.01	14,595	13,244
Sub-total: Maintenance	19.30	2.16	5.75	0.16	2.19	0.46	0.05	5.01	694.64	0.01	14,595.40	13,244.46
Total Emissions	225.19	49.79	773.03	90.76	180.44	32.06	3.20	35,131.72	697.08	1.06	50,098.52	45,461.45
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.50. Total Annual Emissions from Oil Wells - Year 2005 - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	0.00	0.00	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Commuting Vehicles - Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Sub-total: Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9,646.70
Well Workover Operations - Fugitive Dust	0.00	0.00	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	473.97	0.00	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Well Visits for Inspection & Repair - Operations	50.00	4.98	0.25	0.00	5.24	0.23	0.02	104.29	0.02	0.03	115	104
Oil - hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Sub-total: Operations	50.00	4.98	0.25	0.00	5.24	0.23	0.02	578.25	0.02	0.03	588.74	534.25
Road Maintenance	29.30	3.27	8.74	0.24	3.32	0.70	0.07	1,061.40	0.01	0.01	1,066	967
Sub-total: Maintenance	29.30	3.27	8.74	0.24	3.32	0.70	0.07	1,061.40	0.01	0.01	1,065.98	967.31
Total Emissions	79.30	8.25	8.98	0.24	8.56	0.94	0.09	1,639.65	0.03	0.05	1,654.72	11,148.26
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.51. Total Annual Emissions from Oil Wells - Year 2015 - Alternative A - Cumulative

Activity	Annual Emissions (Tons)											
	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eqm- etricTon- nes	CO ₂ eqm- etricTo- nnes
Well Pad Construc- tion - Fugi- tive Dust	9.64	1.45	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring	59.02	58.93	1,553.14	186.12	352.49	61.51	6.15	71,637.69	3.66	0.79	71,958	65,298
Commuting Vehicles - Construction	25.23	2.54	0.38	0.00	1.40	0.10	0.01	119.32	1.36	1.36	568	516
Sub-total: Construction	93.89	62.91	1,550.53	186.12	353.89	61.60	6.16	71,757.01	5.02	2.14	72,526.46	65,813.48
Well Workover Operations - Fugitive Dust	0.40	0.04	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	3.34	3.34	47.01	3.11	10.13	3.86	0.39	473.97	0.03	0.00	475	431
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.03	0.00	0.00	1.47	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eqm- etricTon- nes	CO ₂ eqm- etricTo- nnes
Well Visits for Inspection & Repair - Operations	56.00	5.58	0.28	0.00	5.87	0.26	0.03	116.81	0.02	0.04	129	117
Oil - hauling	214.74	21.45	1.80	0.01	1.14	0.23	0.02	525.24	0.03	0.00	527	478
Sub-total: Operations	274.48	30.40	49.09	3.12	17.17	4.35	0.44	1,117.48	0.07	0.04	1,131.68	1,026.93
Road Maintenance	32.81	3.67	9.78	0.26	3.72	0.79	0.08	8.51	1,181.03	0.02	24,815	22,518
Sub-total: Maintenance	32.81	3.67	9.78	0.26	3.72	0.79	0.08	8.51	1,181.03	0.02	24,815.10	22,518.24
Total Emissions	401.18	96.98	1,612.40	189.50	374.78	66.75	6.67	72,883.01	1,186.12	2.20	98,473.24	89,358.66
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.52. Total Annual Emissions from Oil Wells - Year 2024 - Alternative A - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	9.64	1.45	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring a	59.02	58.93	1,553.14	186.12	352.49	61.51	6.15	71,637.69	3.66	0.79	71,958	65,298
Commuting Vehicles - Construction	25.23	2.54	0.38	0.00	1.40	0.10	0.00	119.32	1.36	1.36	568	516
Sub-total: Construction	93.89	62.91	1,553.53	186.12	353.89	61.60	6.15	71,757.01	5.02	2.14	72,526.46	65,813.48
Well Workover Operations - Fugitive Dust	0.40	0.04	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	3.34	3.34	47.01	3.11	10.13	3.86	0.39	473.97	0.03	0.00	475	431
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.03	0.00	0.00	1.47	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Visits for Inspection & Repair - Operations	66.51	6.62	0.33	0.00	6.97	0.31	0.03	138.71	0.02	0.04	153	139
Oil - hauling	254.81	25.48	1.61	0.01	1.02	0.21	0.02	468.94	0.02	0.00	471	427
Sub-total: Operations	325.06	35.47	48.95	3.12	18.15	4.38	0.44	1,083.09	0.07	0.05	1,099.30	997.55
Road Maintenance	38.97	4.35	11.62	0.314	4.42	0.94	0.09	10.11	1,402.52	0.02	29,469	26,741
Sub-total: Maintenance	38.97	4.35	11.62	0.31	4.42	0.94	0.09	10.11	1,402.52	0.02	29,468.85	26,741.24
Total Emissions	457.91	102.74	1,614.10	189.55	376.46	66.92	6.68	72,850.21	1,407.61	2.21	103,094.61	93,552.27
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.53. Total Annual Emissions from Oil Wells - Year 2015 - Alternative B - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	4.90	0.73	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring	29.99	29.95	789.36	94.59	179.15	31.26	3.13	36,408.89	1.86	0.40	36,572	33,187
Commuting Vehicles - Construction	12.82	1.29	0.20	0.00	0.71	0.05	0.00	60.64	0.69	0.69	289	262
Sub-total: Construction	47.72	31.97	789.56	94.59	179.86	31.31	3.13	36,469.54	2.55	1.09	36,860.60	33,448.82
Well Workover Operations - Fugitive Dust	0.20	0.02	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	1.70	1.70	23.89	1.58	5.15	1.96	0.20	473.97	0.01	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.75	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Well Visits for Inspection & Repair - Operations	46.48	4.63	0.23	0.00	4.87	0.22	0.02	96.94	0.01	0.03	107	97
Oil - hauling	178.28	17.80	1.50	0.01	0.95	0.19	0.02	435.93	0.02	0.00	437	397
Sub-total: Operations	226.66	24.15	25.62	1.59	10.98	2.37	0.24	1,007.59	0.05	0.03	1,019.16	924.82
Road Maintenance	27.23	3.04	8.12	0.22	3.09	0.65	0.07	7.07	980.21	0.01	20,596	18,689
Sub-total: Maintenance	27.23	3.04	8.12	0.22	3.09	0.65	0.07	7.07	980.21	0.01	20,595.51	18,689.21
Total Emissions	301.61	59.17	823.30	96.40	193.93	34.34	3.43	37,484.19	982.81	1.14	58,475.27	53,062.85
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.54. Total Annual Emissions from Oil Wells - Year 2024 - Alternative B - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	4.90	0.73	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring	29.99	29.95	789.36	94.59	179.15	31.26	3.13	36,408.89	1.86	0.40	36,572	33,187
Commuting Vehicles - Construction	12.82	1.29	0.20	0.00	0.71	0.05	0.00	60.64	0.69	0.69	289	262
Sub-total: Construction	47.72	31.97	789.56	94.59	179.86	31.31	3.13	36,469.54	2.55	1.09	36,860.60	33,448.82
Well Workover Operations - Fugitive Dust	0.20	0.02	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	1.70	1.70	23.89	1.58	5.15	1.96	0.20	473.97	0.01	0.00	474	430
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.75	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Well Visits for Inspection & Repair - Operations	47.46	4.73	0.23	0.00	4.98	0.22	0.02	98.99	0.01	0.03	109	99
Oil - hauling	181.86	18.18	1.61	0.01	1.02	0.21	0.02	468.94	0.02	0.00	471	427
Sub-total: Operations	231.22	24.62	25.74	1.59	11.16	2.39	0.24	1,042.65	0.05	0.03	1,054.53	956.93
Road Maintenance	27.81	3.11	8.29	0.224	3.15	0.67	0.07	7.22	1,000.87	0.01	21,030	19,083
Sub-total: Maintenance	27.81	3.11	8.29	0.22	3.15	0.67	0.07	7.22	1,000.87	0.01	21,029.66	19,083.18
Total Emissions	306.75	59.70	823.59	96.40	194.17	34.37	3.43	37,519.40	1,003.47	1.14	58,946.80	53,488.93
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.55. Total Annual Emissions from Oil Wells - Year 2015 - Alternative C - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	10.06	1.51	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring	61.60	61.51	1,621.09	194.26	367.91	64.20	6.42	74,771.72	3.84	0.82	75,106	68,155
Commuting Vehicles - Construction	26.34	2.65	0.40	0.00	1.46	0.10	0.01	124.54	1.42	1.42	593	538
Sub-total: Construction	98.00	65.67	1,621.49	194.26	369.37	64.30	6.43	74,896.26	5.24	2.24	75,699.37	68,692.71
Well Workover Operations - Fugitive Dust	0.42	0.04	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	3.48	3.48	49.06	3.24	10.57	4.03	0.40	473.97	0.03	0.00	475	431
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.03	0.00	0.00	1.53	0.00	0.00	2	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Visits for Inspection & Repair - Operations	56.85	5.66	0.28	0.00	5.96	0.27	0.03	118.58	0.02	0.04	131	118
Oil - hauling	217.98	21.78	1.83	0.01	1.16	0.24	0.02	533.19	0.03	0.00	535	485
Sub-total: Operations	278.74	30.96	51.18	3.25	17.72	4.53	0.45	1,127.27	0.07	0.04	1,141.69	1,036.02
Road Maintenance	33.31	3.72	9.93	0.27	3.78	0.80	0.08	8.64	1,198.91	0.02	25,191	22,859
Sub-total: Maintenance	33.31	3.72	9.93	0.27	3.78	0.80	0.08	8.64	1,198.91	0.02	25,190.72	22,859.09
Total Emissions	410.04	100.35	1,682.61	197.78	390.87	69.63	6.96	76,032.17	1,204.22	2.29	102,031.78	92,587.82
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.56. Total Annual Emissions from Oil Wells - Year 2024 - Alternative C - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad Construction - Fugitive Dust	10.06	1.51	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring	61.60	61.51	1,621.09	194.26	367.91	64.20	6.42	74,771.72	3.82	0.82	75,106	68,155
Commuting Vehicles - Construction	26.34	2.65	0.40	0.00	1.46	0.10	0.00	124.54	1.42	1.42	593	538
Sub-total: Construction	98.00	65.67	1,621.49	194.26	369.37	64.30	6.42	74,896.26	5.24	2.24	75,699.37	68,692.71
Well Workover Operations - Fugitive Dust	0.42	0.04	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	3.48	3.48	49.06	3.24	10.57	4.03	0.40	473.97	0.03	0.00	475	431
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.03	0.00	0.00	1.53	0.00	0.00	2	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Visits for Inspection & Repair - Operations	68.20	6.79	0.34	0.00	7.15	0.32	0.03	142.25	0.02	0.04	157	142
Oil - hauling	261.31	26.12	1.61	0.01	1.02	0.21	0.02	468.94	0.02	0.00	471	427
Sub-total: Operations	333.41	36.44	51.02	3.25	18.77	4.55	0.46	1,086.69	0.07	0.05	1,103.28	1,001.16
Road Maintenance	39.96	4.46	11.91	0.322	4.53	0.96	0.10	10.37	1,438.28	0.02	30,220	27,423
Sub-total: Maintenance	39.96	4.46	11.91	0.32	4.53	0.96	0.10	10.37	1,438.28	0.02	30,220.08	27,422.94
Total Emissions	471.37	106.57	1,684.42	197.84	392.67	69.81	6.97	75,993.32	1,443.58	2.30	107,022.73	97,116.82
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.57. Total Annual Emissions from Oil Wells - Year 2015 - Alternative D - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	9.49	1.42	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring	58.14	58.06	1,5230.08	183.35	347.25	60.59	6.06	70,573.67	3.60	0.77	70,889	64,328
Commuting Vehicles - Construction	24.86	2.50	0.38	0.00	1.38	0.09	0.01	117.55	1.34	1.34	560	508
Sub-total: Construction	92.49	61.98	1,530.45	183.36	348.63	60.69	6.07	70,691.22	4.94	2.11	71,449.24	64,835.97
Well Workover Operations - Fugitive Dust	0.40	0.04	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	3.29	3.29	46.31	3.06	9.98	3.80	0.38	473.97	0.02	0.00	475	431
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.03	0.00	0.00	1.45	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Visits for Inspection & Repair - Operations	55.72	5.55	0.28	0.00	5.84	0.26	0.03	116.22	0.02	0.04	128	116
Oil - hauling	213.66	21.34	1.80	0.01	1.14	0.23	0.02	522.61	0.03	0.00	524	476
Sub-total: Operations	273.07	30.22	48.38	3.07	16.98	4.29	0.43	1,114.24	0.07	0.04	1,128.36	1,023.92
Road Maintenance	32.65	3.65	9.73	0.26	3.70	0.79	0.08	8.47	1,175.11	0.02	24,691	22,405
Sub-total: Maintenance	32.65	3.65	9.73	0.26	3.70	0.79	0.08	8.47	1,175.11	0.02	24,690.71	22,405.36
Total Emissions	398.21	95.85	1,588.57	186.69	369.32	65.77	6.58	71,813.93	1,180.13	2.17	97,268.31	88,265.25
^a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.58. Total Annual Emissions from Oil Wells - Year 2024 - Alternative D - Cumulative

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	9.49	1.42	---	---	---	---	---					
Heavy Equipment Combustive Emissions & Flaring	58.14	58.06	1,530.08	183.35	347.25	60.59	6.06	70,573.67	3.60	0.77	70,889	64,328
Commuting Vehicles - Construction	24.86	2.50	0.38	0.00	1.38	0.09	0.00	117.55	1.34	1.34	560	508
Sub-total: Construction	92.49	61.98	1,530.45	183.36	348.63	60.69	6.06	70,691.22	4.94	2.11	71,449.24	64,835.97
Well Workover Operations - Fugitive Dust	0.40	0.04	---	---	---	---	---					
Well Workover Operations - On-site Exhaust	3.29	3.29	46.31	3.06	9.98	3.80	0.38	473.97	0.02	0.00	475	431
Well Workover Operations - On-road Exhaust	0.00	0.00	0.00	0.00	0.03	0.00	0.00	1.45	0.00	0.00	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Visits for Inspection & Repair - Operations	65.94	6.57	0.33	0.00	6.91	0.31	0.03	137.54	0.02	0.04	151	137
Oil - hauling	252.66	25.26	1.61	0.01	1.02	0.21	0.02	468.94	0.02	0.00	471	427
Sub-total: Operations	322.29	35.15	48.25	3.07	17.94	4.32	0.43	1,081.90	0.07	0.05	1,097.98	996.35
Road Maintenance	38.64	4.32	11.52	0.312	4.38	0.93	0.09	10.03	1,390.68	0.02	29,220	26,515
Sub-total: Maintenance	38.64	4.32	11.52	0.31	4.38	0.93	0.09	10.03	1,390.68	0.02	29,220.06	26,515.48
Total Emissions	453.42	101.45	1,590.22	186.74	370.95	65.94	6.58	71,783.14	1,395.69	2.18	101,767.28	92,347.80
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1												

Table M.59. Projected Emissions from Coal Production (tpy) for Campbell and Sheridan Counties.

Year	Campbell County	Sheridan County	Total
2005	509	0	509
2015	618	12	630
2024	655	17	672
SO₂			
Year	Campbell County	Sheridan County	Total
2005	19	0	19
2015	23	0.4	23.4
2024	24	0.6	24.6
CO			
Year	Campbell County	Sheridan County	Total
2005	1222	0	1222
2015	1478	29	1507
2024	1568	42	1610
PM₁₀			
Year	Campbell County	Sheridan County	Total
2005	4621	0	4621
2015	5591	109	5700
2024	5930	158	6088
PM_{2.5}			
Year	Campbell County	Sheridan County	Total
2005	1426	0	1426
2015	1725	34	1759
2024	1830	49	1879
CH₄			
Year	Campbell County	Sheridan County	Total
2005	322545.11	52430.34	374975.4
2015	390271.118	63442.43	453713.5
2024	413975.22	67306.03	481281.2

Table M.60. Annual Emissions Estimation for Bentonite - Locatable Minerals Equipment Usage - Year 2005

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Ex-ploratory operations	16	2	0	0	0	0	0	35	0	0	35	32
Product Handling, Transfer, and Storage	797	92	---	---	---	---	---	---	---		---	---
Unpaved Roads	12	1	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	4	0	0	323	0		324	294
Heavy Equipment - Dust	3	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	7	0	2	1	0	743	0		743	674
Total	828	96	8	0	7	1	0	1,101	0	0	1,102	1,000

^a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.61. Annual Emissions Estimation for Bentonite - Locatable Minerals Equipment Usage - Year 2015 - Alternative A

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Ex-ploratory operations	16	2	0	0	0	0	0	10	0	0	10	9
Product Handling, Transfer, and Storage	1,576	174	---	---	---	---	---	---	---		---	---
Unpaved Roads	12	1	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	4	0	0	323	0		324	294
Heavy Equipment - Dust	4	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	3	0	1	0	0	797	0		797	723
Total	1,608	177	4	0	5	1	0	1,130	0	0	1,130	1,026

^a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.62. Annual Emissions Estimation for Bentonite - Locatable Minerals Equipment Usage - Year 2024 - Alternative A

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Ex-ploratory operations	16	2	0	0	0	0	0	10	0	0	10	9
Product Handling, Transfer, and Storage	1,576	174	---	---	---	---	---	---	---		---	---
Unpaved Roads	12	1	---	---	---	---	---	---	---		---	---
Commut-ing - Ex-haust	0	0	1	0	4	0	0	323	0		324	294
Heavy Equipment - Dust	4	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	1	0	0	0	0	797	0		797	723
Total	1,608	177	2	0	5	1	0	1,130	0	0	1,130	1,026

^a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.63. Annual Emissions Estimation for Bentonite - Locatable Minerals Equipment Usage - Year 2015 - Alternative B

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Ex-ploratory operations	8	1	0	0	0	0	0	5	0	0	5	4
Product Handling, Transfer, and Storage	788	87	---	---	---	---	---	---	---		---	---
Unpaved Roads	6	1	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	2	0	0	161	0		161	146
Heavy Equipment - Dust	2	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	1	0	0	0	0	397	0		397	361
Total	804	89	2	0	3	0	0	563	0	0	564	511

^a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.64. Annual Emissions Estimation for Bentonite - Locatable Minerals Equipment Usage - Year 2024 - Alternative B

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Ex-ploratory operations	8	1	0	0	0	0	0	5	0	0	5	4
Product Handling, Transfer, and Storage	788	87	---	---	---	---	---	---	---		---	---
Unpaved Roads	6	1	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	2	0	0	161	0		161	146
Heavy Equipment - Dust	2	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	0	0	0	0	0	397	0		398	361
Total	804	89	1	0	2	0	0	563	0	0	564	512

^a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.65. Annual Emissions Estimation for Bentonite - Locatable Minerals Equipment Usage - Year 2015 - Alternative C

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Ex-ploratory operations	42	5	0	0	0	0	0	25	0	0	25	23
Product Handling, Transfer, and Storage	2,893	411	---	---	---	---	---	---	---		---	---
Unpaved Roads	163	16	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	1	1	14	0	57	4	0	4,281	0		4,287	3,891
Heavy Equipment - Dust	8	1	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	4	4	33	2	13	4	0	10,561	0		10,562	9,584
Total	3,111	438	47	2	70	8	1	14,867	0	0	14,875	13,498

^a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

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Appendix M Technical Support Document
for Air Quality
Summary of Emissions for All BLM Activities

Table M.66. Annual Emissions Estimation for Bentonite - Locatable Minerals Equipment Usage - Year 2024 - Alternative C

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Ex-ploratory operations	42	5	0	0	0	0	0	25	0	0	25	23
Product Handling, Transfer, and Storage	2,893	411	---	---	---	---	---	---	---		---	---
Unpaved Roads	163	16	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	1	1	14	0	57	4	0	4,281	0		4,287	3,891
Heavy Equipment - Dust	8	1	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	3	3	10	2	4	3	0	10,562	0		10,563	9,585
Total	3,109	437	23	2	61	7	1	14,869	0	0	14,876	13,499

^a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.67. Annual Emissions Estimation for Bentonite - Locatable Minerals Equipment Usage - Year 2015 - Alternative D

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Ex-ploratory operations	36	4	0	0	0	0	0	22	0	0	22	20
Product Handling, Transfer, and Storage	1,288	212	---	---	---	---	---	---	---		---	---
Unpaved Roads	116	12	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	1	1	10	0	40	3	0	3,032	0		3,036	2,755
Heavy Equipment - Dust	5	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	3	3	24	1	9	3	0	7,479	0		7,480	6,788
Total	1,448	231	33	1	50	6	1	10,533	0	0	10,539	9,563
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.68. Annual Emissions Estimation for Bentonite - Locatable Minerals Equipment Usage - Year 2024 - Alternative D

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Ex-ploratory operations	36	4	0	0	0	0	0	22	0	0	22	20
Product Handling, Transfer, and Storage	1,288	212	---	---	---	---	---	---	---		---	---
Unpaved Roads	116	12	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	1	1	10	0	40	3	0	3,032	0		3,036	2,755
Heavy Equipment - Dust	5	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	2	2	7	1	3	2	0	7,481	0		7,481	6,789
Total	1,448	230	17	1	43	5	0	10,534	0	0	10,540	9,564

^a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.69. Total Annual Emissions from Uranium ISL - Year 2005

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	17	0	7	2	0	382	0	0	385	349
Wind Erosion	2	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	5	1	0	0	1	0	0	0	0	---	---	---
Sub-total: Construction	10	2	17	0	7	2	0	382	0	0	385	349
Transport of Ion Exchange Resin	18	2	0	0	0	0	0	0	0		0	0
Well Workover - Operations	7	1	8	0	2	0	0	835	0	0	838	760
Well & Pipeline visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	4	0		4	4

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Sub-total: Operations	26	3	8	0	3	0	0	839	0	0	842	764
Road Maintenance	0	0	0	0	0	0	0	4	0		4	4
Sub-total: Maintenance	0	0	0	0	0	0	0	4	0	0	4	4
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	1	0	0	0	0	0	0	31	0		31	28
Sub-total: Reclamation	1	0	0	0	0	0	0	31	0	0	31	28
Total Emissions	38	5	26	1	10	2	0	1,256	0	0	1,262	1,145
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.70. Total Annual Emissions from Uranium ISL - Year 2015 - Alternative A

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad Construction - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	21	1	8	2	0	473	0	0	475	431
Wind Erosion	3	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	6	1	0	0	1	0	0	0	0	---	---	---
Sub-total: Construction	13	3	21	1	9	2	0	473	0	0	475	431
Transport of Ion Exchange Resin	22	2	0	0	0	0	0	185	0		185	168
Well Workover - Operations	7	1	4	0	1	0	0	1,027	0	0	1,031	935
Well & Pipeline visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	5	0		5	5

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Sub-total: Operations	31	3	4	0	1	0	0	1,217	0	0	1,221	1,108
Road Mainte- nance	0	0	0	0	0	0	0	5	0		5	5
Sub-total: Mainte- nance	0	0	0	0	0	0	0	5	0	0	5	5
Road Reclama- tion	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclama- tion	1	0	0	0	0	0	0	39	0		39	35
Sub-total: Reclama- tion	1	0	0	0	0	0	0	39	0	0	39	35
Total Emissions	45	6	25	1	10	2	0	1,734	0	0	1,740	1,579
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.71. Total Annual Emissions from Uranium ISL - Year 2024 - Alternative A

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	21	1	8	2	0	473	0	0	475	431
Wind Erosion	3	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	6	1	0	0	1	0	0	0	0	---	---	---
Sub-total: Construction	13	3	21	1	9	2	0	473	0	0	475	431
Transport of Ion Exchange Resin	11	1	0	0	0	0	0	185	0		185	168
Well Workover - Operations	4	1	0	0	0	0	0	514	0	0	515	468
Well & Pipeline visits for Inspection & Repair - Operations	1	0	0	0	0	0	0	3	0		3	2

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Sub-total: Operations	16	2	1	0	0	0	0	701	0	0	703	638
Road Maintenance	0	0	0	0	0	0	0	3	0		3	2
Sub-total: Maintenance	0	0	0	0	0	0	0	3	0	0	3	2
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	1	0	0	0	0	0	0	19	0		19	17
Sub-total: Reclamation	1	0	0	0	0	0	0	19	0	0	19	18
Total Emissions	30	5	22	1	9	2	0	1,196	0	0	1,200	1,089
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.72. Total Annual Emissions from Uranium ISL - Year 2015 - Alternative B

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Well Pad Construction - Fugitive Dust	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	11	0	4	1	0	236	0	0	239	217
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	3	0	0	0	0	0	0	0	0	---	---	---
Sub-total: Construction	6	1	11	0	4	1	0	236	0	0	239	217
Transport of Ion Exchange Resin	11	1	0	0	0	0	0	92	0		92	84
Well Workover - Operations	3	0	2	0	1	0	0	513	0	0	515	467
Well & Pipeline visits for Inspection & Repair - Operations	1	0	0	0	0	0	0	3	0		3	2

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Sub-total: Operations	16	2	2	0	1	0	0	608	0	0	610	554
Road Mainte- nance	0	0	0	0	0	0	0	3	0		3	2
Sub-total: Mainte- nance	0	0	0	0	0	0	0	3	0	0	3	2
Road Reclama- tion	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclama- tion	1	0	0	0	0	0	0	19	0		19	18
Sub-total: Reclama- tion	1	0	0	0	0	0	0	19	0	0	19	18
Total Emissions	23	3	13	0	5	1	0	867	0	0	871	790

^a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.73. Total Annual Emissions from Uranium ISL - Year 2024 - Alternative B

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	11	0	4	1	0	236	0	0	239	217
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	3	0	0	0	0	0	0	0	0	---	---	---
Sub-total: Construction	6	1	11	0	4	1	0	236	0	0	239	217
Transport of Ion Exchange Resin	6	1	0	0	0	0	0	92	0		92	84
Well Workover - Operations	2	0	0	0	0	0	0	257	0	0	258	234
Well & Pipeline visits for Inspection & Repair - Operations	1	0	0	0	0	0	0	1	0		1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Sub-total: Operations	8	1	0	0	0	0	0	350	0	0	351	319
Road Mainte- nance	0	0	0	0	0	0	0	1	0		1	1
Sub-total: Mainte- nance	0	0	0	0	0	0	0	1	0	0	1	1
Road Reclama- tion	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclama- tion	0	0	0	0	0	0	0	10	0		10	9
Sub-total: Reclama- tion	0	0	0	0	0	0	0	10	0	0	10	9
Total Emissions	15	2	11	0	5	1	0	598	0	0	601	545
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.74. Total Annual Emissions from Uranium ISL - Year 2015 - Alternative C

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad Construction - Fugitive Dust	5	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	3	3	37	1	14	3	0	830	0	0	833	756
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	11	1	0	0	1	0	0	0	0	---	---	---
Sub-total: Construction	23	5	37	1	16	3	0	830	0	0	833	756
Transport of Ion Exchange Resin	39	4	0	0	0	0	0	323	0		323	293
Well Workover - Operations	12	2	7	0	2	1	0	1,797	0	0	1,804	1,637
Well & Pipeline visits for Inspection & Repair - Operations	4	0	0	0	0	0	0	9	0		9	8

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Sub-total: Operations	54	6	7	0	2	1	0	2,129	0	0	2,136	1,938
Road Mainte- nance	0	0	0	0	0	0	0	9	0		9	8
Sub-total: Mainte- nance	0	0	0	0	0	0	0	9	0	0	9	8
Road Reclama- tion	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclama- tion	2	0	0	0	0	0	0	68	0		68	62
Sub-total: Reclama- tion	2	0	0	0	0	0	0	68	0	0	68	62
Total Emissions	80	11	44	1	18	4	0	3,036	0	0	3,046	2,764

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.75. Total Annual Emissions from Uranium ISL - Year 2024 - Alternative C

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	5	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	3	3	37	1	14	3	0	830	0	0	833	756
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	11	1	0	0	1	0	0	0	0	---	---	---
Sub-total: Construction	23	5	37	1	16	3	0	830	0	0	833	756
Transport of Ion Exchange Resin	19	2	0	0	0	0	0	323	0		323	293
Well Workover - Operations	7	1	1	0	0	0	0	899	0	0	902	818
Well & Pipeline visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	5	0		5	4

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Sub-total: Operations	28	3	1	0	1	0	0	1,226	0	0	1,230	1,116
Road Maintenance	0	0	0	0	0	0	0	4	0		4	4
Sub-total: Maintenance	0	0	0	0	0	0	0	4	0	0	4	4
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	1	0	0	0	0	0	0	34	0		34	31
Sub-total: Reclamation	1	0	0	0	0	0	0	34	0	0	34	31
Total Emissions	52	8	38	1	16	4	0	2,094	0	0	2,101	1,907
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.76. Total Annual Emissions from Uranium ISL - Year 2015 - Alternative D

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Well Pad Construction - Fugitive Dust	4	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	32	1	12	3	0	714	0	0	717	651
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	9	1	0	0	1	0	0	0	0	---	---	---
Sub-total: Construction	20	4	32	1	13	3	0	714	0	0	717	651
Transport of Ion Exchange Resin	33	3	0	0	0	0	0	277	0		277	251
Well Workover - Operations	10	1	6	0	2	0	0	1,541	0	0	1,546	1,403
Well & Pipeline visits for Inspection & Repair - Operations	3	0	0	0	0	0	0	8	0		8	7

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Sub-total: Operations	47	5	6	0	2	1	0	1,825	0	0	1,831	1,661
Road Mainte- nance	0	0	0	0	0	0	0	8	0		8	7
Sub-total: Mainte- nance	0	0	0	0	0	0	0	8	0	0	8	7
Road Reclama- tion	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclama- tion	2	0	0	0	0	0	0	58	0		58	53
Sub-total: Reclama- tion	2	0	0	0	0	0	0	58	0	0	58	53
Total Emissions	68	10	38	1	16	4	0	2,605	0	0	2,614	2,372

^a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.77. Total Annual Emissions from Uranium ISL - Year 2024 - Alternative D

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricTonnes
Well Pad & Station Construction - Fugitive Dust	4	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	32	1	12	3	0	714	0	0	717	651
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	9	1	0	0	1	0	0	0	0	---	---	---
Sub-total: Construction	20	4	32	1	13	3	0	714	0	0	717	651
Transport of Ion Exchange Resin	17	2	0	0	0	0	0	277	0		277	251
Well Workover - Operations	6	1	1	0	0	0	0	770	0	0	773	702
Well & Pipeline visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	4	0		4	4

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Sub-total: Operations	24	3	1	0	1	0	0	1,051	0	0	1,054	957
Road Maintenance	0	0	0	0	0	0	0	4	0		4	3
Sub-total: Maintenance	0	0	0	0	0	0	0	4	0	0	4	3
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	1	0	0	0	0	0	0	29	0		29	26
Sub-total: Reclamation	1	0	0	0	0	0	0	29	0	0	29	26
Total Emissions	45	7	33	1	14	3	0	1,798	0	0	1,804	1,637
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.78. Annual Emissions Estimation for Locatable Minerals Equipment Usage - Year 2005

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5a}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqmetric tonnes
Product Handling, Transfer, and Storage	15	2	---	---	---	---	---	---	---	---	---
Unpaved Roads	662	66	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	2	0	5	2	0	466	0	467	423
Heavy Equipment - Dust	22	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	11	10	170	4	76	11	1	17,704	0	17,707	16,068
Wind Erosion	53	8	---	---	---	---	---	---	---	---	---
Total	763	89	172	4	80	13	1	18,170	0	18,174	16,492
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.79. Annual Emissions Estimation for Locatable Minerals Equipment Usage - Year 2015 - Alternative A

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqmetric tonnes
Product Handling, Transfer, and Storage	16	2	---	---	---	---	---	---	---	---	---
Unpaved Roads	662	66	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	2	0	5	2	0	466	0	467	423
Heavy Equipment - Dust	44	4	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	6	6	63	3	28	6	1	17,968	0	17,970	16,307
Wind Erosion	106	16	---	---	---	---	---	---	---	---	---
Total	835	95	65	3	33	8	1	18,435	0	18,437	16,731

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.80. Annual Emissions Estimation for Locatable Minerals Equipment Usage - Year 2024 - Alternative A

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqmetric tonnes
Product Handling, Transfer, and Storage	15	2	---	---	---	---	---	---	---	---	---
Unpaved Roads	662	66	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	2	0	5	2	0	466	0	467	423
Heavy Equipment - Dust	44	4	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	5	5	19	3	10	5	0	17,972	0	17,974	16,310
Wind Erosion	89	13	---	---	---	---	---	---	---	---	---
Total	816	91	21	3	14	7	1	18,439	0	18,441	16,734
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.81. Annual Emissions Estimation for Locatable Minerals Equipment Usage - Year 2015 - Alternative B

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqmetric tonnes
Product Handling, Transfer, and Storage	5	1	---	---	---	---	---	---	---	---	---
Unpaved Roads	208	21	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	1	0	1	1	0	147	0	147	133
Heavy Equipment - Dust	5	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	2	2	20	1	9	2	0	5,646	0	5,647	5,124
Wind Erosion	11	2	---	---	---	---	---	---	---	---	---
Total	231	26	21	1	10	3	0	5,793	0	5,793	5,257

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.82. Annual Emissions Estimation for Locatable Minerals Equipment Usage - Year 2024 - Alternative B

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqmetric tonnes
Product Handling, Transfer, and Storage	5	1	---	---	---	---	---	---	---	---	---
Unpaved Roads	208	21	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	1	0	1	1	0	147	0	147	133
Heavy Equipment - Dust	5	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	1	1	6	1	3	2	0	5,647	0	5,648	5,125
Wind Erosion	10	1	---	---	---	---	---	---	---	---	---
Total	229	25	7	1	4	2	0	5,794	0	5,794	5,258
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.83. Annual Emissions Estimation for Locatable Minerals Equipment Usage - Year 2015 - Alternative C

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqmetric tonnes
Product Handling, Transfer, and Storage	63	9	---	---	---	---	---	---	---	---	---
Unpaved Roads	2,642	264	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	1	0	9	0	18	8	1	1,861	0	1,862	1,690
Heavy Equipment - Dust	87	9	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	25	24	252	13	113	25	2	71,695	0	71,703	65,066
Wind Erosion	209	31	---	---	---	---	---	---	---	---	---
Total	3,027	339	261	13	131	32	3	73,556	0	73,565	66,756

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.84. Annual Emissions Estimation for Locatable Minerals Equipment Usage - Year 2024 - Alternative C

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqmetric tonnes
Product Handling, Transfer, and Storage	61	9	---	---	---	---	---	---	---	---	---
Unpaved Roads	2,642	264	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	1	0	9	0	18	8	1	1,861	0	1,862	1,690
Heavy Equipment - Dust	87	9	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	19	18	76	11	38	20	2	71,710	0	71,716	65,078
Wind Erosion	176	26	---	---	---	---	---	---	---	---	---
Total	2,986	327	85	11	56	27	3	73,571	0	73,578	66,768
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.85. Annual Emissions Estimation for Locatable Minerals Equipment Usage - Year 2015 - Alternative D

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqmetric tonnes
Product Handling, Transfer, and Storage	32	5	---	---	---	---	---	---	---	---	---
Unpaved Roads	1,358	136	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	9	4	0	956	0	957	868
Heavy Equipment - Dust	50	5	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	13	13	130	7	58	13	1	36,833	0	36,837	33,428
Wind Erosion	119	18	---	---	---	---	---	---	---	---	---
Total	1,572	176	134	7	67	17	2	37,789	0	37,794	34,296

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.86. Annual Emissions Estimation for Locatable Minerals Equipment Usage - Year 2024 - Alternative D

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqmetric tonnes
Product Handling, Transfer, and Storage	31	5	---	---	---	---	---	---	---	---	---
Unpaved Roads	1,358	136	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	9	4	0	956	0	957	868
Heavy Equipment - Dust	50	5	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	10	9	39	6	20	10	1	36,841	0	36,844	33,434
Wind Erosion	100	15	---	---	---	---	---	---	---	---	---
Total	1,549	170	44	6	29	14	1	37,797	0	37,801	34,302
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.87. Total Annual Emissions from Fire Management Projects - Year 2005

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Fugitive Dust and Smoke	71	60	20	6	685	36	4	0	37	2	1,488	1,351
Heavy Equipment Exhaust	0	0	0	0	0	0	0	6	0		6	6
Commuting Vehicles - Fugitive Dust	2	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	7	0		7	7
Total	73	60	20	6	685	36	4	13	37	2	1,502	1,363
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.88. Total Annual Emissions from Fire Management Projects - Year 2015 - Alternative A

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Fugitive Dust and Smoke	150	126	43	12	1,448	75	8	0	79	5	3,148	2,856
Heavy Equipment Exhaust	0	0	0	0	0	0	0	4	0		4	4
Commuting Vehicles - Fugitive Dust	1	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	5	0		5	4
Total	151	126	43	12	1,448	75	8	9	79	5	3,157	2,865
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.89. Total Annual Emissions from Fire Management Projects - Year 2024 - Alternative A

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Fugitive Dust and Smoke	150	126	43	12	1,448	75	8	0	79	5	3,148	2,856
Heavy Equipment Exhaust	0	0	0	0	0	0	0	4	0		4	4
Commuting Vehicles - Fugitive Dust	1	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	5	0		5	4
Total	151	126	43	12	1,448	75	8	9	79	5	3,157	2,865
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.90. Total Annual Emissions from Fire Management Projects - Year 2015 - Alternative B

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT-onnes
Fugitive Dust and Smoke	37	32	11	3	362	19	2	0	20	1	787	714
Heavy Equipment Exhaust	0	0	0	0	0	0	0	1	0		1	0
Commuting Vehicles - Fugitive Dust	0	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	1	0		1	1
Total	38	32	11	3	362	19	2	1	20	1	788	715
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.91. Total Annual Emissions from Fire Management Projects - Year 2024 - Alternative B

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Fugitive Dust and Smoke	37	32	11	3	362	19	2	0	20	1	787	714
Heavy Equipment Exhaust	0	0	0	0	0	0	0	1	0		1	0
Commuting Vehicles - Fugitive Dust	0	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	1	0		1	1
Total	38	32	11	3	362	19	2	1	20	1	788	715
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.92. Total Annual Emissions from Fire Management Projects - Year 2015 - Alternative C

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Fugitive Dust and Smoke	450	379	128	35	4,343	225	23	0	236	14	9,443	8,569
Heavy Equipment Exhaust	0	0	0	0	1	0	0	12	0		12	11
Commuting Vehicles - Fugitive Dust	4	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	14	0		14	13
Total	453	379	128	35	4,343	225	23	27	236	14	9,470	8,594
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.93. Total Annual Emissions from Fire Management Projects - Year 2024 - Alternative C

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Fugitive Dust and Smoke	450	379	128	35	4,343	225	23	0	236	14	9,443	8,569
Heavy Equipment Exhaust	0	0	0	0	1	0	0	12	0		12	11
Commuting Vehicles - Fugitive Dust	4	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	14	0		14	13
Total	453	379	128	35	4,343	225	23	27	236	14	9,470	8,594
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.94. Total Annual Emissions from Fire Management Projects - Year 2015 - Alternative D

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Fugitive Dust and Smoke	150	126	43	12	1,448	75	8	0	79	5	3,148	2,856
Heavy Equipment Exhaust	0	0	0	0	0	0	0	4	0		4	4
Commuting Vehicles - Fugitive Dust	1	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	5	0		5	4
Total	151	126	43	12	1,448	75	8	9	79	5	3,157	2,865
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.95. Total Annual Emissions from Fire Management Projects - Year 2024 - Alternative D

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq-metricT- onnes
Fugitive Dust and Smoke	150	126	43	12	1,448	75	8	0	79	5	3,148	2,856
Heavy Equipment Exhaust	0	0	0	0	0	0	0	4	0		4	4
Commuting Vehicles - Fugitive Dust	1	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	5	0		5	4
Total	151	126	43	12	1,448	75	8	9	79	5	3,157	2,865
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table M.96. Total Annual Emissions from Forest and Woodlands Projects - Year 2005

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	CO ₂ eqtons	CO ₂ eqmetric tonnes
Heavy Equipment - Fugitive Dust	32	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	2	0	0	10	0	10	9
Sub-total: Heavy Equipment	32	3	0	0	2	0	0	10	0	10	9
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	19	0	19	17
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	19	0	19	17
Total	37	4	0	0	2	1	0	29	0	29	27
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.97. Total Annual Emissions from Forest and Woodlands Projects - Year 2015 - Alternative A

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eqtons	CO ₂ eqmetric tonnes
Heavy Equipment - Fugitive Dust	29	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	2	0	0	10	0	10	9
Sub-total: Heavy Equipment	29	3	0	0	2	0	0	10	0	10	9
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	19	0	19	17
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	19	0	19	17
Total	35	4	0	0	2	1	0	29	0	29	27

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.98. Total Annual Emissions from Forest and Woodlands Projects - Year 2024 - Alternative A

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eqtons	CO ₂ eqmetric tonnes
Heavy Equipment - Fugitive Dust	29	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	2	0	0	10	0	10	9
Sub-total: Heavy Equipment	29	3	0	0	2	0	0	10	0	10	9
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	19	0	19	17
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	19	0	19	17
Total	35	4	0	0	2	1	0	29	0	29	27
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.99. Total Annual Emissions from Forest and Woodlands Projects - Year 2015 - Alternative B

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eqtons	CO ₂ eqmetric tonnes
Heavy Equipment - Fugitive Dust	25	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	2	0	0	10	0	10	9
Sub-total: Heavy Equipment	25	3	0	0	2	0	0	10	0	10	9
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	19	0	19	17
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	19	0	19	17
Total	30	3	0	0	2	1	0	29	0	29	27

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.100. Total Annual Emissions from Forest and Woodlands Projects - Year 2024 - Alternative B

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eqtons	CO ₂ eqmetric tonnes
Heavy Equipment - Fugitive Dust	25	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	2	0	0	10	0	10	9
Sub-total: Heavy Equipment	25	3	0	0	2	0	0	10	0	10	9
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	19	0	19	17
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	19	0	19	17
Total	30	3	0	0	2	1	0	29	0	29	27
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.101. Total Annual Emissions from Forest and Woodlands Projects - Year 2015 - Alternative C

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eqtons	CO ₂ eqmetric tonnes
Heavy Equipment - Fugitive Dust	188	19	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	2	0	0	10	0	10	9
Sub-total: Heavy Equipment	189	19	0	0	2	0	0	10	0	10	9
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	19	0	19	17
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	19	0	19	17
Total	194	19	0	0	2	1	0	29	0	29	27

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.102. Total Annual Emissions from Forest and Woodlands Projects - Year 2024 - Alternative C

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eqtons	CO ₂ eqmetric tonnes
Heavy Equipment - Fugitive Dust	188	19	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	2	0	0	10	0	10	9
Sub-total: Heavy Equipment	189	19	0	0	2	0	0	10	0	10	9
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	19	0	19	17
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	19	0	19	17
Total	194	20	0	0	2	1	0	29	0	29	27
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.103. Total Annual Emissions from Forest and Woodlands Projects - Year 2015 - Alternative D

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eqtons	CO ₂ eqmetric tonnes
Heavy Equipment - Fugitive Dust	79	8	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	2	0	0	10	0	10	9
Sub-total: Heavy Equipment	79	8	0	0	2	0	0	10	0	10	9
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	19	0	19	17
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	19	0	19	17
Total	85	9	0	0	2	1	0	29	0	29	27

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.104. Total Annual Emissions from Forest and Woodlands Projects - Year 2024 - Alternative D

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eqtons	CO ₂ eqmetric tonnes
Heavy Equipment - Fugitive Dust	79	8	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	2	0	0	10	0	10	9
Sub-total: Heavy Equipment	79	8	0	0	2	0	0	10	0	10	9
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	19	0	19	17
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	19	0	19	17
Total	85	9	0	0	2	1	0	29	0	29	27
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.105. Total Annual Emissions from Renewable Energy Development - Year 2005

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Fugitive Dust	20	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	1	1	14	0	6	1	0	1,427	0	1,427	1,295
Sub-total: Heavy Equipment	21	3	14	0	6	1	0	1,427	0	1,427	1,295
Commuting Vehicles - Fugitive Dust	18	2	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	1	0	0	81	0	81	74
Sub-total: Commuting Vehicles	18	2	0	0	1	0	0	81	0	81	74
Total	39	5	14	0	7	1	0	1,508	0	1,508	1,369

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.106. Total Annual Emissions from Renewable Energy Development - Year 2015 - Alternative A

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	0	4	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	504	0	504	457
Sub-total: Heavy Equipment	37	4	2	0	1	0	0	504	0	504	457
Commuting Vehicles - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	39	0	39	36
Sub-total: Commuting Vehicles	8	1	0	0	0	0	0	39	0	39	36
Total	45	5	2	0	1	0	0	543	0	543	493

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.107. Total Annual Emissions from Renewable Energy Development - Year 2024 - Alternative A

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Fugitive Dust	90	9	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	1,561	0	1,561	1,417
Sub-total: Heavy Equipment	90	9	2	0	1	0	0	1,561	0	1,561	1,417
Commuting Vehicles - Fugitive Dust	21	2	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	1	0	0	97	0	97	88
Sub-total: Commuting Vehicles	21	2	0	0	1	0	0	97	0	97	88
Total	111	11	2	0	2	1	0	1,658	0	1,658	1,505

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.108. Total Annual Emissions from Renewable Energy Development - Year 2015 - Alternative B

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	25	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	477	0	477	433
Sub-total: Heavy Equipment	25	3	2	0	1	0	0	477	0	477	433
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	31	0	31	28
Sub-total: Commuting Vehicles	7	1	0	0	0	0	0	31	0	31	28
Total	32	3	2	0	1	0	0	508	0	508	461
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.109. Total Annual Emissions from Renewable Energy Development - Year 2024 - Alternative B

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqmetricTonnes
Fugitive Dust	25	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	1	0	0	0	0	533	0	533	484
Sub-total: Heavy Equipment	25	3	1	0	0	0	0	533	0	533	484
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	31	0	31	28
Sub-total: Commuting Vehicles	7	1	0	0	0	0	0	31	0	31	28
Total	32	3	1	0	1	0	0	564	0	564	512

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.110. Total Annual Emissions from Renewable Energy Development - Year 2015 - Alternative C

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _s ^a	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	166	17	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	1	1	8	0	3	1	0	1955	0	1955	1774
Sub-total: Heavy Equipment	167	17	8	0	3	1	0	1955	0	1955	1774
Commuting Vehicles - Fugitive Dust	30	3	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	1	1	0	139	0	139	126
Sub-total: Commuting Vehicles	30	3	0	0	1	1	0	139	0	139	126
Total	196	20	8	0	4	1	0	2094	0	2094	1900

^a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.111. Total Annual Emissions from Renewable Energy Development - Year 2024 - Alternative C

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Fugitive Dust	166	17	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	1	1	2	0	1	1	0	2128	0	2128	1931
Sub-total: Heavy Equipment	166	17	2	0	1	1	0	2128	0	2128	1931
Commuting Vehicles - Fugitive Dust	30	3	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	1	1	0	139	0	139	126
Sub-total: Commuting Vehicles	30	3	0	0	1	1	0	139	0	139	126
Total	196	20	3	0	2	1	0	2267	0	2268	2058

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.112. Total Annual Emissions from Renewable Energy Development - Year 2015 - Alternative D

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAP _{sa}	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	282	28	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	1	1	7	0	3	1	0	1731	0	1731	1571
Sub-total: Heavy Equipment	283	29	7	0	3	1	0	1731	0	1731	1571
Commuting Vehicles - Fugitive Dust	28	3	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	1	0	0	140	0	140	127
Sub-total: Commuting Vehicles	28	3	0	0	1	0	0	140	0	140	127
Total	311	32	7	0	4	1	0	1871	0	1871	1698

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.113. Total Annual Emissions from Renewable Energy Development - Year 2024 - Alternative D

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqmetricTonnes
Fugitive Dust	282	28	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	1	0	2	0	1	1	0	1899	0	1899	1723
Sub-total: Heavy Equipment	283	29	2	0	1	1	0	1899	0	1899	1723
Commuting Vehicles - Fugitive Dust	28	3	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	1	0	0	140	0	140	127
Sub-total: Commuting Vehicles	28	3	0	0	1	0	0	140	0	140	127
Total	311	32	3	0	2	1	0	2039	0	2039	1850

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.114. Total Annual Emissions from Road Maintenance Projects - Year 2005

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Road Main- tenance	0	0	0	0	0	0	0	4	0	4	4
Motorized Recreation	18	17	11	2	1,331	638	64	7,961	8	8,128	7,376
Total	18	17	11	2	1,331	638	64	7,965	8	8,132	7,379
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.115. Total Annual Emissions from Road Maintenance Projects - Year 2015 - Alternative A

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Road Main- tenance	0	0	0	0	0	0	0	4	0	4	4
Motorized Recreation	16	15	22	2	1,559	548	55	11,795	7	11,948	10,842
Total	17	15	22	2	1,559	548	55	11,799	7	11,952	10,846
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.116. Total Annual Emissions from Road Maintenance Projects - Year 2024 - Alternative A

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Road Main- tenance	0	0	0	0	0	0	0	4	0	4	4
Motorized Recreation	11	10	30	3	1,463	371	37	13,127	6	13,243	12,017
Total	11	10	30	3	1,463	371	37	13,131	6	13,247	12,021
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.117. Total Annual Emissions from Road Maintenance Projects - Year 2015 - Alternative B

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Road Main- tenance	0	0	0	0	0	0	0	4	0	4	4
Motorized Recreation	16	15	22	2	1,559	548	55	11,795	7	11,948	10,842
Total	17	15	22	2	1,559	548	55	11,799	7	11,952	10,846
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.118. Total Annual Emissions from Road Maintenance Projects - Year 2024 - Alternative B

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Road Main- tenance	0	0	0	0	0	0	0	4	0	4	4
Motorized Recreation	11	10	30	3	1,463	371	37	13,127	6	13,243	12,017
Total	11	10	30	3	1,463	371	37	13,131	6	13,247	12,021
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.119. Total Annual Emissions from Road Maintenance Projects - Year 2015 - Alternative C

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Road Main- tenance	0	0	0	0	0	0	0	5	0	5	4
Motorized Recreation	16	15	22	2	1,559	548	55	11,795	7	11,948	10,842
Total	17	15	22	2	1,559	548	55	11,800	7	11,953	10,847
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.120. Total Annual Emissions from Road Maintenance Projects - Year 2024 - Alternative C

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Road Main- tenance	0	0	0	0	0	0	0	5	0	5	4
Motorized Recreation	11	10	30	3	1,463	371	37	13,127	6	13,243	12,017
Total	11	10	30	3	1,463	371	37	13,132	6	13,248	12,022
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.121. Total Annual Emissions from Road Maintenance Projects - Year 2015 - Alternative D

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Road Main- tenance	0	0	0	0	0	0	0	5	0	5	4
Motorized Recreation	16	15	22	2	1,559	548	55	11,795	7	11,948	10,842
Total	17	15	22	2	1,559	548	55	11,800	7	11,953	10,847
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.122. Total Annual Emissions from Road Maintenance Projects - Year 2024 - Alternative D

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPsa	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Road Main- tenance	0	0	0	0	0	0	0	5	0	5	4
Motorized Recreation	11	10	30	3	1,463	371	37	13,127	6	13,243	12,017
Total	11	10	30	3	1,463	371	37	13,132	6	13,248	12,022
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.123. Total Annual Emissions from Livestock Grazing Projects - Year 2005

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	7	0	7	6
Sub-total: Construc- tion	0	0	0	0	0	0	0	7	0	7	6
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	3	0	0	68	0	68	62
Enteric Fermentation and Manure	---	---	---	---	---	---	---		389	8,178	7,421
Sub-total: Operations and Main- tenance	3	0	0	0	3	0	0	68	389	8,246	7,483
Total	3	0	0	0	3	0	0	75	389	8,253	7,489

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.124. Total Annual Emissions from Livestock Grazing Projects - Year 2015 - Alternative A

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	7	0	7	6
Sub-total: Construc- tion	0	0	0	0	0	0	0	7	0	7	6
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	3	0	0	68	0	68	62
Enteric Fermentation and Manure	---	---	---	---	---	---	---		389	8,178	7,421
Sub-total: Operations and Main- tenance	3	0	0	0	3	0	0	68	389	8,246	7,483
Total	3	0	0	0	3	0	0	75	389	8,253	7,490
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.125. Total Annual Emissions from Livestock Grazing Projects - Year 2024 - Alternative A

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	0	0	0	0	0	0	0	7	0	7	6
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	7	0	7	6
Sub-total: Construc- tion	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Fugitive Dust	0	0	0	0	3	0	0	68	0	68	62
Commuting Vehicles - Vehicle Exhaust	---	---	---	---	---	---	---		389	8,178	7,421
Enteric Fermentation and Manure	3	0	0	0	3	0	0	68	389	8,246	7,483
Sub-total: Operations and Main- tenance	3	0	0	0	3	0	0	75	389	8,253	7,490
Total	80	8	4	0	86	4	0	1,818	1,187	26,742	24,267
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.126. Total Annual Emissions from Livestock Grazing Projects - Year 2015 - Alternative B

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	8	0	8	7
Sub-total: Construc- tion	0	0	0	0	0	0	0	8	0	8	7
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	3	0	0	68	0	68	62
Enteric Fermentation and Manure	---	---	---	---	---	---	---		389	8,178	7,421
Sub-total: Operations and Main-tenance	3	0	0	0	3	0	0	68	389	8,247	7,483
Total	3	0	0	0	3	0	0	76	389	8,254	7,490
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.127. Total Annual Emissions from Livestock Grazing Projects - Year 2024 - Alternative B

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	8	0	8	7
Sub-total: Construc- tion	0	0	0	0	0	0	0	8	0	8	7
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	3	0	0	68	0	68	62
Enteric Fermentation and Manure	---	---	---	---	---	---	---		389	8,178	7,421
Sub-total: Operations and Main- tenance	3	0	0	0	3	0	0	68	389	8,247	7,483
Total	3	0	0	0	3	0	0	76	389	8,254	7,490

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.128. Total Annual Emissions from Livestock Grazing Projects - Year 2015 - Alternative C

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	8	0	8	7
Sub-total: Construc- tion	0	0	0	0	0	0	0	8	0	8	7
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	3	0	0	68	0	68	62
Enteric Fer- mentation and Manure	---	---	---	---	---	---	---		389	8,178	7,421
Sub-total: Operations and Main- tenance	3	0	0	0	3	0	0	68	389	8,247	7,483
Total	3	0	0	0	3	0	0	76	389	8,254	7,490
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.129. Total Annual Emissions from Livestock Grazing Projects - Year 2024 - Alternative C

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	8	0	8	7
Sub-total: Construc- tion	0	0	0	0	0	0	0	8	0	8	7
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	3	0	0	68	0	68	62
Enteric Fermentation and Manure	---	---	---	---	---	---	---		389	8,178	7,421
Sub-total: Operations and Main- tenance	3	0	0	0	3	0	0	68	389	8,247	7,483
Total	3	0	0	0	3	0	0	76	389	8,254	7,490

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table M.130. Total Annual Emissions from Livestock Grazing Projects - Year 2015 - Alternative D

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	8	0	8	7
Sub-total: Construc- tion	0	0	0	0	0	0	0	8	0	8	7
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	3	0	0	71	0	71	64
Enteric Fermentation and Manure	---	---	---	---	---	---	---		389	8,178	7,421
Sub-total: Operations and Main- tenance	3	0	0	0	3	0	0	71	389	8,249	7,486
Total	3	0	0	0	3	0	0	78	389	8,257	7,493
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table M.131. Total Annual Emissions from Livestock Grazing Projects - Year 2024 - Alternative D

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO ₂ eq	CO ₂ eqme- tricTonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	8	0	8	7
Sub-total: Construc- tion	0	0	0	0	0	0	0	8	0	8	7
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	3	0	0	71	0	71	64
Enteric Fermentation and Manure	---	---	---	---	---	---	---		389	8,178	7,421
Sub-total: Operations and Main- tenance	3	0	0	0	3	0	0	71	389	8,249	7,486
Total	3	0	0	0	3	0	0	78	389	8,257	7,493
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Appendix N. Buffalo Air Resource Management Plan

N.1. Introduction

N.1.1. Purpose

1. The purpose of this Air Resource Management Plan (RMP) is to further clarify air quality goals, objectives, and management actions set forth in Table 2.7, “1000 PHYSICAL RESOURCES (PR) – AIR QUALITY (AQ)” (p. 127) of the Proposed RMP and Final Environmental Impact Statement (EIS). This Air RMP describes air resources management and outlines specific requirements for proponents of projects that have the potential to generate air emissions and impact air resources within the planning area.
2. This Air RMP may be modified as necessary to comply with applicable laws, regulations, and policies and to address new information and changing circumstances.

N.1.2. Authority for Air Resource Management

1. **Federal Land Policy and Management Act of 1976.** The Federal Land Policy and Management Act (FLPMA) provides the Bureau of Land Management’s (BLM) basic operating authority. It establishes a unified, comprehensive, and systematic approach to managing and preserving public lands in a way that protects “the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values.” The BLM Air Resource Management Program, part of the BLM Soil, Water, and Air Program, coordinates and supports the BLM’s efforts to manage air resources within its “multiple use” and “sustained yield” mission, as provided by FLPMA. FLPMA directs that in developing and revising its RMPs, the BLM shall provide for compliance with applicable air pollution control laws, including state and federal pollution standards or implementation plans.
2. **Clean Air Act of 1970.** The Clean Air Act (CAA) is the comprehensive federal law that provides for regulation of air emissions from stationary and mobile sources, national ambient air quality standards (NAAQS) to protect public health and public welfare, and protection of visibility in relatively pristine areas such as Class I national parks and wilderness areas. Class I is a CAA designation that affords certain areas the strictest air quality protection. Areas include some wilderness areas, national parks, and Native American reservations. See the *Planning Process* section, in Chapter 1 paragraph 5, for additional information. The CAA prescribes the measures that the United States (U.S.) Environmental Protection Agency (EPA) and other federal agencies and state, local, and tribal governments must take in order to regulate air pollution and achieve air quality that meets the NAAQS. In its RMPs and implementing authorizations, the BLM provides for compliance with the CAA and other pollution control laws. The CAA also requires that federal land managers responsible for lands within Class I areas protect the air quality related values of those areas.

The Wyoming Department of Environmental Quality (DEQ) Air Quality Division (AQD) has been delegated authority by the EPA to implement federal programs of the CAA. The

Wyoming DEQ AQD is responsible for managing air quality through the Wyoming Air Quality Standards and Regulations and the Wyoming State Implementation Plan.

3. **Wilderness Act of 1964.** The Wilderness Act is the general legal authority for Congress to designate and for agencies to manage wilderness. Today, wilderness is designated for a variety of benefits, including clean air. The uses of wilderness include protection of air and watersheds; maintenance of soil and water quality, ecological stability, plant and animal gene pools, protection of archaeological and historical sites, habitat for wildlife; and livestock grazing. Wilderness provides opportunities for outdoor recreation and also provides for the exercise of valid existing rights such as water rights, mining claims, mineral leases, and rights-of-way. The majority of BLM Wilderness Areas allow some degradation of air quality associated with moderate industrial and population growth. The CAA allows States to require that Wilderness Areas meet a more stringent air quality standard using normal state processes.

Minerals in wilderness are withdrawn from all forms of appropriation under the mining laws and from disposition under mineral leasing laws. Prior existing claims or leases with valid existing rights may be developed, though mineral development within wilderness is rare. The BLM as a Federal Land Manager analyzes potential impacts to designated Class II wilderness areas, national parks and monuments. Essentially, all areas that are not designated as Class I are designated as Class II. Moderate incremental increases in pollutant concentrations are allowed, although the concentrations are not allowed to reach the concentrations set by Wyoming and federal standards (Wyoming Ambient Air Quality Standards [WAAQS] and NAAQS). See the *Background* section, paragraph 5 for additional information.

4. **National Environmental Policy Act.** The National Environmental Policy Act (NEPA) establishes a public, interdisciplinary framework for federal decision-making and ensures that the BLM and other federal agencies take environmental factors into account when considering federal actions. The BLM uses the NEPA process to analyze potential impacts of its proposed actions on air and other resources and to consider appropriate measures to mitigate adverse impacts.
5. **Air Quality Memorandum of Understanding.** In June 2011, the U.S. Department of Agriculture, U.S. Department of the Interior (DOI), and the EPA signed the Memorandum of Understanding (MOU) Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions Through the NEPA Process. This MOU outlines an approach to the analysis of impacts to air quality and air quality related values, such as visibility in Class I and sensitive Class II areas, in connection with oil and gas development on federal lands, and identifies a path to protect air quality while allowing for oil and gas development on federally managed lands.

N.1.3. Background

1. Preparation of the Analysis of the Management Situation in 2009 disclosed that extensive energy development within the planning area, especially coal and fluid minerals, leads to dust, emissions, and other air quality impacts.
2. Monitoring air quality and establishing background concentrations can help to characterize changes over time. Table N.1, “National and State Primary Air Quality Standards for Criteria Pollutants and Representative Concentrations for the Planning Area” (p. 2481) displays the applicable primary NAAQS and WAAQS and representative

maximum pollutant concentrations for the planning area, based on monitoring data. Figure N.1, “Representative Maximum Pollutant Concentrations in the Planning Area as Percentage of NAAQS” (p. 2482) displays the representative maximum pollutant concentrations values from Table N.1, “National and State Primary Air Quality Standards for Criteria Pollutants and Representative Concentrations for the Planning Area” (p. 2481) as percentages of the NAAQS. These representative concentrations indicate the status of air quality conditions within the planning area relative to the standards. These data indicate that ozone concentrations are at least 75 percent of the NAAQS; therefore, ozone is the primary pollutant of concern in the planning area.

Existing visibility from Interagency Monitoring of Protected Visual Environments (IMPROVE) stations in the planning area are shown in the *Air Quality* section of Chapter 3 for the Thunder Basin site (Figure 3.14, “Annual Visibility (SVR) for the Thunder Basin IMPROVE Site” (p. 310)) and the Cloud Peak site (Figure 3.15, “Annual Visibility (SVR) for the Cloud Peak IMPROVE Site” (p. 311)). Visibility data from the Badlands IMPROVE site outside the planning area are also included (Figure 3.18, “Annual Visibility (SVR) for the Badlands National Park IMPROVE Site” (p. 314)). Data from these sites indicate good visibility in the planning area.

Table N.1. National and State Primary Air Quality Standards for Criteria Pollutants and Representative Concentrations for the Planning Area

Pollutant	Averaging Time	NAAQS			WAAQS			Representative Concentrations		
		(ppm)	(ppb)	($\mu\text{g}/\text{m}^3$)	(ppm)	(ppb)	($\mu\text{g}/\text{m}^3$)	(ppm)	(ppb)	($\mu\text{g}/\text{m}^3$)
Carbon Monoxide	1 hour ¹	35	35,000	40,000	35	35,000	40,000	0.8	800	914
	8 hour ¹	9	9,000	10,000	9	9,000	10,000	0.3	300	333
Nitrogen Dioxide	1 hour ²	0.10	100	188	0.10	100	188	0.011	11	21
	Annual ³ (Arithmetic Mean)	0.053	53	100	0.053	53	100	0.002	2.0	4
Ozone	8 hour ⁴	0.075	75	147	0.075	75	147	0.065	65	127
PM ₁₀	24 hour ⁵	N/A	N/A	150	N/A	N/A	150	N/A	N/A	96
PM _{2.5}	24 hour ⁶	N/A	N/A	35	N/A	N/A	35	N/A	N/A	23
	Annual ⁷	N/A	N/A	12	N/A	N/A	15	N/A	N/A	8.2

Pollutant	Averaging Time	NAAQS			WAAQS			Representative Concentrations		
		(ppm)	(ppb)	(µg/m ³)	(ppm)	(ppb)	(µg/m ³)	(ppm)	(ppb)	(µg/m ³)
Sulfur Dioxide	1 hour ⁸	0.075	75	195	0.075	75	195	0.043	43	112

Source: EPA 2013a; Wyoming DEQ 2013c

¹ Not to be exceeded more than once per year. Data (2nd high) collected at Yellowstone National Park (AQS ID: 560391012) during 2012.

² To attain this standard, the 3-year average of the 98th percentile of 1-hour concentrations at each monitor within an area must not exceed 100 ppb. 3-year average of the 98th percentile 1-hour concentrations for Thunder Basin (AQS ID: 560050123) for 2010–2012.

³ To attain this standard, the annual average concentration in the calendar year must be less than or equal to 53 ppb. Thunder Basin (AQS ID: 560050123) annual average concentration for 2012.

⁴ To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 75 ppb. Design value (2010–2012) for the Thunder Basin (AQS ID: 560050123) site.

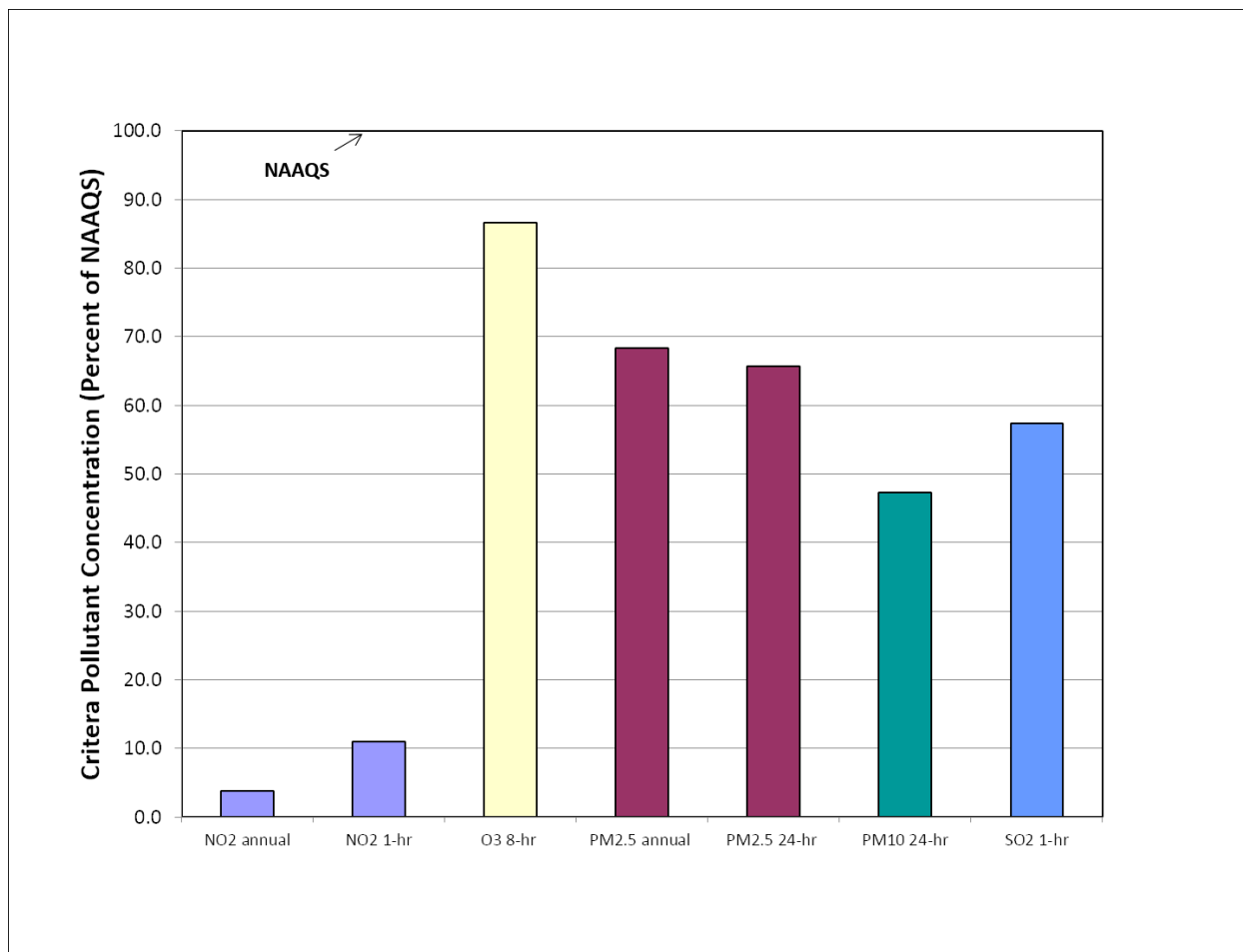
⁵ Not to be exceeded more than once per year on average over 3 years. 2010–2012 maximum PM₁₀ concentration at Sheridan Police Station Monitoring Site (AQS ID: 56–033–0002).

⁶ To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor in an area must not exceed 35 µg/m³. 3-year (2010–2012) average of the 98th percentiles of 24-hour average PM_{2.5} concentration at Sheridan Police Station Monitoring Site (AQS ID: 56–033–0002).

⁷ To attain this standard, the 3-year average of the weighted annual mean concentrations from single or multiple community-oriented monitors must not exceed 12.0 µg/m³. 3-year (2010–2012) average of the annual mean PM_{2.5} concentration at Sheridan Police Station Monitoring Site (AQS ID: 56–033–0002).

⁸ To attain this standard, the 3-year average of the 99th percentile of 1-hour concentrations at each monitor within an area must not exceed 100 ppb. 3-year (2010–2012) average of the 99th percentile 1-hour concentrations for Wyodak Site 4 (AQS ID: 56–005–0857).

µg/m³ micrograms per cubic meter
 EPA Environmental Protection Agency
 N/A not applicable
 NAAQS National Ambient Air Quality Standards
 PM_{2.5} particulate matter with an aerodynamic diameter equal to or less than 2.5 microns
 PM₁₀ particulate matter with an aerodynamic diameter equal to or less than 10 microns
 ppm parts per million
 ppb parts per billion
 WAAQS Wyoming Ambient Air Quality Standards
 WARMS Wyoming Air Resource Monitoring System



Source: EPA 2013a

Note: The representative maximum pollutant concentrations as a percentage of the NAAQS were calculated using the values in Table N.1, “National and State Primary Air Quality Standards for Criteria Pollutants and Representative Concentrations for the Planning Area” (p. 2481), which also provides the location and time period associated with monitoring data.

NAAQS National Ambient Air Quality Standards

Figure N.1. Representative Maximum Pollutant Concentrations in the Planning Area as Percentage of NAAQS

- Consistent with the monitoring strategy of Management Action AQ-1002, the BLM Wyoming operates the Wyoming Air Resource Monitoring System (WARMS), a network of six air quality monitoring sites located throughout the state. Four of these sites are located in the planning area and two sites are located near the planning area – these sites are listed in Table N.2, “WARMS Network in and Near the Planning Area” (p. 2484) along with location, parameters monitored, and monitored particulate matter less than 2.5 microns (PM_{2.5}) concentrations. These sites also monitor hourly meteorological conditions including wind speed, wind direction, temperature, relative humidity, solar radiation, precipitation, and barometric pressure. The purpose of the WARMS network is to provide a general indicator of existing air quality and long term trends in air quality; it is not intended for use in determining NAAQS compliance. As shown in Table N.2, “WARMS Network in and Near the Planning

Area” (p. 2484), annual mean PM_{2.5} values are below the NAAQS of 12 micrograms per cubic meter (µg/m³) and the 98th percentile 24-hour average concentrations for any given year are below the NAAQS of 35 µg/m³. The only WARMS monitor in Table N.2, “WARMS Network in and Near the Planning Area” (p. 2484) for which ozone data are available is the Basin monitor, which recorded a maximum 8-hour average of 0.061 parts per million (ppm) in 2011 and 0.065 ppm in 2012, both of which are below the NAAQS of 0.075 ppm.

4. Two WARMS sites outside the planning area include the Basin site located approximately 40 miles west of the planning area and the Newcastle site located approximately 43 miles east of the planning area (Table N.2, “WARMS Network in and Near the Planning Area” (p. 2484)). These sites were upgraded in 2012 to be fully compliant with, and part of, the Clean Air Status and Trends Network (CASTNET) system supported by the EPA (Sheridan and Buffalo sites are also part of the CASTNET system). CASTNET provides long-term monitoring of air quality in rural areas to determine trends in regional atmospheric nitrogen, sulfur, and ozone concentrations and dry deposition fluxes of sulfur and nitrogen pollutants in order to evaluate the effectiveness of national and regional air pollution control programs.

Table N.2. WARMS Network in and Near the Planning Area

Site	Approximate Location	Parameters Monitored			PM _{2.5} Concentrations (ug/m ³)					
					2010		2011		2012	
		Speciated Aerosol (weekly)	PM _{2.5} (1-hour)	Ozone (1-hour)	Annual Mean	24-hour 98th Per-centile	Annual Mean	24-hour 98th Per-centile	Annual Mean	24-hour 98th Per-centile
In Planning Area										
Buffalo	30 miles SE of Buffalo	x	x		3.0	9	2.5	9	3.3	11
Fortification Creek	10 miles N of Gillette	x	x		-- ¹	--	--	--	--	--
Sheridan	In Sheridan	x	x	x ²	1.5	9	1.5	11	3.0	16
South Coal	50 miles NNW of Gillette		x		0.8	6	0.8	10	1.8	14
Outside Planning Area										
Basin	40 miles W of Planning Area	x	x	x	-- ³	--	--	--	1.0	10

Site	Approximate Location	Parameters Monitored			PM _{2.5} Concentrations (ug/m ³)					
		Speciated Aerosol (weekly)	PM _{2.5} (1-hour)	Ozone (1-hour)	2010		2011		2012	
					Annual Mean	24-hour 98th Percentile	Annual Mean	24-hour 98th Percentile	Annual Mean	24-hour 98th Percentile
Newcastle	43 miles E of Planning Area	x	x	x ⁴	0.3	4	0.5	4	4.0/0.8 ⁵	8/8 ⁵

Source: WARMS 2013

¹ Fortification Creek is scheduled for installation Spring 2013; thus historic data not available.

² Sheridan did not start ozone monitoring until January 2013; thus historic ozone data not available.

³ Basin did not monitor for PM_{2.5} until upgraded to CASTNET status in late 2012; thus historic data not available.

⁴ Newcastle did not start ozone monitoring until late 2012; thus historic ozone data not available.

⁵ In 2012, an E-BAM replaced an e-sampler; data are provided from both monitors.

CASTNET Clean Air Status and Trends Network

E East

N North

NNW North northwest

PM_{2.5} particulate matter with an aerodynamic diameter equal to or less than 2.5 microns

ug/m³ micrograms per cubic meter

SE Southeast

W West

5. The CAA Prevention of Significant Deterioration (PSD) program protects air quality in areas where the air is clean and the area is in attainment or unclassifiable with respect to NAAQS. The PSD program is a permitting program that, in Wyoming, is implemented by the Wyoming DEQ AQD. PSD is designed to protect clean air so it does not significantly deteriorate, while a margin for future industrial growth is maintained. Under the PSD program, each area in the United States is classified according to the following system:

- **PSD Class I Areas** – Areas with pristine air quality, such as wilderness areas, national parks, and some Native American reservations, are accorded the strictest protection. Only very small incremental increases in pollutant concentrations are allowed in order to maintain the very clean air quality in these areas. Wilderness areas greater than 5,000 acres (and national parks greater than 6,000 acres) that had been established before August 7, 1977 were designated by the CAA as mandatory class I areas.
- **PSD Class II Areas** – Essentially, all areas that are not designated as Class I are designated as Class II. Moderate incremental increases in pollutant concentrations are allowed, although the concentrations are not allowed to reach the concentrations set by Wyoming and federal standards (WAAQS and NAAQS). Some Class II areas are federally-managed Class II wilderness areas, which are afforded additional air quality protection under the Wilderness Act beyond that provided by CAA.
- **PSD Class III Areas** – No areas have been designated yet as Class III. A larger incremental increase in pollutant concentrations would be allowed, up to the applicable WAAQS and NAAQS.

Class I areas near the planning area include: the Northern Cheyenne Indian Reservation (25 miles north), the North Absaroka Wilderness Area (75 miles west), the Washakie Wilderness Area (96 miles west), Yellowstone National Park (97 miles west), Wind Cave National Park (80 miles east), and Badlands National Park (110 miles east). The Northern Cheyenne Indian

Reservation received EPA redesignation approval on August 5, 1977, to become a Class I area under the PSD program (40 Code of Federal Regulations 52.1382(c)(2)).

N.1.4. Characterization of Air Resources in the Environmental Impact Statement

1. Emissions Inventory for Land Use Planning

- a. An air emissions inventory was compiled for the planning area to determine the relative magnitude of total air pollutant emissions and to compare emissions between alternatives. This emissions inventory is summarized in Appendix M (p. 2239). Emissions were calculated using assumptions about the likelihood of potential future activities occurring under each alternative. As a result, the compiled air emissions inventory represents a comparison of emissions of air pollutants based on best available information for future development projections. The methods and assumptions used in compiling the emissions inventory are provided in Chapter 4, *Air Quality* section, as well as Appendix M (p. 2239) which lists emissions generating activities and includes additional details on the computational methods.
- b. The emissions inventory is valuable for contrasting the impact of land use allocations on air resources among alternatives and useful for identifying those activities that are likely to be major contributors of emissions.
- c. The air emissions inventory supports two major conclusions: (1) for the majority of the pollutants examined, emissions are estimated to increase compared to baseline levels for all alternatives except Alternative B, and (2) oil and gas development activities and mining (primarily coal) are the largest contributors to total emissions compared to other managed activities in the planning area.

2. Class I Areas

- a. There are no Class I areas within the planning area. The nearest Class I areas include the Northern Cheyenne Indian Reservation (25 miles north), the North Absaroka Wilderness Area (75 miles west), the Washakie Wilderness Area (96 miles west), Yellowstone National Park (97 miles west), Wind Cave National Park (80 miles east), and Badlands National Park (110 miles east). See Table 3.4, “Class I and Class II Areas in or near the Buffalo Planning Area” (p. 309) in Chapter 3 for a list of Class I and federally-managed Class II areas in or near the planning area.

Though not located in Class I areas, there are two IMPROVE sites in the planning area: Cloud Peak (western region of the planning area) and Thunder Basin (eastern region of the planning area). A third IMPROVE site is located in the Northern Cheyenne Indian Reservation Class I area, approximately 45 miles from the northern boundary of the planning area. Visibility estimates for these locations, as well as the Badlands, are shown in Chapter 3.

N.2. Air Resource Management Plan

N.2.1. Coal Lease by Application

1. The Wyoming DEQ and DOI Office of Surface Mining Reclamation and Enforcement (OSM) have the permitting oversight and authority to mitigate air quality or land quality issues for a coal mining operation. The BLM does not stipulate any specific air quality or land quality permitting requirement for a coal lease, but requires lessees to comply with all applicable state and federal laws. A BLM EIS for a coal mining operation will analyze the potential effects to air quality, but any mitigation will be a requirement of the Wyoming DEQ through its permitting process.
2. The Wyoming DEQ AQD administers a permitting program to assist in managing the state's air resources. Under this program, anyone planning to construct, modify, or use a facility capable of emitting designated pollutants into the atmosphere must obtain an air quality permit to construct. Coal mines fall into this category.
3. A new coal mine, or a modification to an existing mine, must be permitted by Wyoming DEQ AQD, pursuant to the provisions of Wyoming Air Quality Standards and Regulations Chapter 6, Section 2. Under these provisions, a permittee must compile detailed emissions inventories and demonstrate compliance with all applicable aspects of Wyoming Air Quality Standards and Regulations, including compliance with WAAQS and NAAQS, before either a permit or amendment is granted.
4. A Best Available Control Technology (BACT) analysis is required to demonstrate the use of an appropriate level of emissions controls. Per Wyoming Air Quality Standards and Regulations Chapter 6, Section 2, BACT at large mining operations typically includes, but is not limited to: the paving of access roads; the treating of major haul roads with a suitable dust suppressant; the treatment of temporary haul roads; the use of silos, trough barns, or similar enclosed containers for the storage of large volumes of material awaiting load out and shipment; and the treatment of active work areas.

N.2.2. Mineral and Energy Development Authorizations

1. The BLM manages the location, density, and/or rate of development to protect air resources.
2. When reviewing a proposed project, the BLM will consider the magnitude of potential air emissions from the project, existing air quality conditions, proximity to Class I and sensitive Class II areas, and issues identified during project scoping to identify pollutants of concern and to determine the appropriate level of air analysis to be conducted for the project.
3. The BLM will require an emissions inventory, as set forth in the MOU, for proposed oil and gas development projects that are analyzed through an EIS. The BLM may require an emissions inventory for proposed oil and gas or mineral development projects that are analyzed through an Environmental Assessment, and may require project specific air quality modeling (see Management Action AQ-1006) depending on project characteristics, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified

during project scoping. The emissions inventory will quantify emissions of regulated air pollutants from all sources related to the proposed project, and emissions impacting Class I areas, including fugitive emissions and greenhouse gas emissions. Emissions will be estimated for each year for the life of the project. The BLM will use this estimated emissions inventory to identify pollutants of concern and to determine the appropriate level of air analysis to be conducted for the proposed project. This information will inform monitoring (see Section N.2.3 Monitoring), modeling (see Section N.2.4 Modeling) and mitigation (see Section N.2.5 Mitigation).

4. The BLM has the responsibility to implement the decisions of the RMP in a manner that protects air quality. The BLM also must recognize valid and existing leasing rights. At the project approval stage, the BLM can require specific actions and measures to protect air quality based on expected impacts (Management Actions AQ-1003 and AQ-1005). The BLM may require additional mitigation measures within its authority for emissions sources not otherwise regulated by Wyoming DEQ (see Section N.2.5 paragraph 2).
5. The proponent of a mineral and/or energy development project will be required to provide a detailed description of operator committed measures to reduce project related air pollutant emissions including greenhouse gases and fugitive dust. Project proponents for oil and gas development projects should refer to Table N.3, “Sample Emission Reduction Strategies for Oil and Gas Development Projects” (p. 2490) as a reference for potential mitigation technologies and strategies. The list is not intended to preclude the use of other effective air pollution control technologies that may be proposed. Details of the mitigation measure would be submitted by the applicant and enforced as a condition of the BLM-issued authorization.
6. The BLM, in determining the suitability of the operator committed measures required in Section 2.2 paragraph 5, will take into account proximity to a federally mandated Class I area, sensitive Class II area, or population centers, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

N.2.3. Monitoring

1. As part of a comprehensive Air RMP for the planning area, the BLM will continue to work cooperatively with federal and state agencies responsible for managing air resources to determine, characterize, and track air resource conditions (Management Action AQ-1002 and AQ-1004). BLM will cooperate with efforts of the Wyoming DEQ to evaluate monitored exceedances. Wyoming DEQ has authority and primacy for regulating and monitoring air quality within the state, including determining causes of monitored exceedances of NAAQS and WAAQS.
2. The BLM will support and participate in regional monitoring efforts to meet Management Action AQ-1002.

N.2.4. Modeling

1. Air dispersion and photochemical grid models are useful tools for predicting project specific impacts to air quality, predicting the potential effectiveness of control measures and strategies, and for predicting trends in regional concentrations of some air pollutants.

2. BLM may require project proponents to conduct air quality modeling based on the absence of sufficient data to ensure compliance with laws and regulations or to determine the effectiveness of mitigation options. The BLM will decide whether far-field modeling is required to support the NEPA analysis for an oil and gas project in accordance with the MOU, based on existing air quality conditions; magnitude of potential air emissions from the project or activity; magnitude of existing emission sources in the area; proximity to a federally mandated Class I area, sensitive Class II area, an area expected to exceed a NAAQS or PSD increment or population center; location within a non-attainment or maintenance area; meteorologic or geographic conditions; project duration; or issues identified during project scoping (Management Action AQ-1006). BLM will require project-specific near field modeling or apply a similar analysis completed for a nearby project, if, after reviewing a proposed project's emission inventory, BLM determines that the project may cause significant near field impacts.
3. BLM will leverage data from current and future modeling efforts being conducted in the region (such as Converse County, Moneta Divide, and other proposed projects that will analyze cumulative impacts with a photochemical grid model) to assess the air quality and air quality related values within the Buffalo Field Office. When results from these types of modeling analyses are used to evaluate impacts within the planning area, BLM will ensure that direct emissions from BLM's management actions within the Buffalo planning area are included in the particular analysis. Pending completion of these modeling analyses, the BLM, in cooperation with an interagency review team, will evaluate impacts from proposed federal actions within the planning area and identify and evaluate, in cooperation with Wyoming DEQ to whom EPA has delegated authority for regulating air quality in Wyoming, the need for additional emission mitigation measures or the need for a more refined modeling analysis.
4. Consistent with Management Action AQ-1004, the BLM will support and participate in regional modeling efforts through multi-state and/or multi-agency organizations such as Western Governors' Association – Western Regional Air Partnership, and the Federal Leadership Forum. If results from an interagency, regional modeling study are used to evaluate impacts within the planning area, the BLM will ensure that direct emissions from BLM's management actions within the region are included in the study.
5. The use of modeling to identify appropriate protection measures is more effective at the project approval stage rather than the leasing stage because the proposed action has been defined in terms of temporal and spatial characteristics as well as development processes and procedures. This better defined information allows more precise identification of impacts to air quality and appropriate level of mitigation.

N.2.5. Mitigation

1. Many of the activities that BLM authorizes, permits, or allows generate air pollutant emissions that have the potential to impact air quality. The primary mechanisms to reduce air quality impacts are to reduce emissions through strategies such as controlling the rate of development, or by implementation of mitigations such as use of emissions control technology.
2. The proponent of a project will be required to reduce air pollutant emissions by complying with all applicable state and federal regulations (including application of BACT) and may be required to apply additional mitigation and other control technologies or strategies.

3. BLM will ensure implementation of additional air emission control measures and strategies within its regulatory authority and in consultation with federal and state agencies responsible for managing air resources, if:
 - a. proposed or committed measures are insufficient to achieve air quality goal PR:1 and objectives PR:1.1, PR:1.2, PR:1.3, and PR:1.4 and Management Action AQ-1003; or
 - b. an air quality impact analysis shows that future impacts likely will be above acceptable levels; or
 - c. a BLM-authorized source caused or contributed to a monitored exceedance of the NAAQS as determined by Wyoming DEQ, in consultation with BLM.

Mitigation may include reduction in the number of locations, density, and/or rate of development, or other measures. Example mitigation strategies for oil and gas development activities are presented in Table N.3, “Sample Emission Reduction Strategies for Oil and Gas Development Projects” (p. 2490).

Table N.3. Sample Emission Reduction Strategies for Oil and Gas Development Projects

Emission Reduction Measure	Advantages and Disadvantages
Control Strategies for Drilling and Compression	
Directional or Horizontal Drilling	<p>May reduce construction related emissions (dust and vehicle and construction equipment emissions). Decreases surface disturbance and vegetation impacts (dust and carbon dioxide and nitrogen flux). Reduces habitat fragmentation. Applicability depends on geologic strata.</p> <p>May result in higher air impacts in one area with longer sustained drilling times.</p>
Improved engine technology (Tier 2 or better) for diesel drill rig engines.	Can reduce oxides of nitrogen (NO _x), particulate matter (PM), carbon monoxide (CO), and volatile organic compounds (VOC) emissions. Use depends on availability of technology from engine manufacturers.
Selective Catalytic Reduction (SCR) for drill rig engines and/or compressors.	<p>NO_x emissions reduction, potential decreased formation of visibility impairing compounds and ozone. NO_x control efficiency of 95% achieved on drill rig engines. NO_x emission rate of 0.1 (grams per horsepower per hour (g/hp-hour) achieved for compressors.</p> <p>Potential ammonia (NH₃) emissions and formation of visibility impairing ammonium sulfate. Regeneration/disposal of catalyst can produce hazardous waste. Not applicable to 2-stroke engines.</p>
Non-selective catalytic reduction (NSCR) for drill rig engines and/or compressors.	<p>NO_x emissions reduction, potential decreased formation of visibility impairing compounds and ozone. NO_x control efficiency of 80-90% achieved for drill rig engines. NO_x emission rate of 0.7 g/hp-hour achieved for compressor engines greater than 100 hp.</p> <p>Regeneration/disposal of catalysts can produce hazardous waste. Not applicable to lean burn or 2-stroke engines.</p>

Emission Reduction Measure	Advantages and Disadvantages
Natural gas fired drill rig engines and/or compressors.	NO _x emissions reduction, potential decreased formation of visibility impairing compounds and ozone. Requires onsite processing of field gas.
Improved engine technology (Tier 2 or better) for all mobile and non-road diesel engines.	Reduced NO _x , PM, CO, and VOC emissions. Dependent on availability of technology from engine manufacturers.
Green (a.k.a. closed loop or flareless) completions and green workovers.	Reduction in VOC and methane emissions. Reduces or eliminates flaring and venting and associated emissions. Reduces or eliminates open pits and associated evaporative emissions. Increased recovery of gas to pipeline rather than atmosphere. Temporary increase in truck traffic and associated emissions. Need adequate pressure and flow. Need onsite infrastructure (tanks/dehydrator). Sales line must be available. Green completion permits required by Wyoming best available control technology (BACT) in some areas.
Minimize/eliminate venting and/or use closed loop process where possible during "blow downs." Utilize plunger lift systems with smart automation.	Same as above. Best Management Practices required by Wyoming BACT.
Reclaim/remediate existing open pits, no new open pits.	Reduces VOC and greenhouse gas (GHG) emissions. Reduces potential for soil and water contamination. Reduces odors. Requires tank and/or pipeline infrastructure. May increase truck traffic and associated emissions.
Electrification of wellhead compression/pumping	Reduces local emissions of fossil fuel combustion and transfers to more easily controlled source. Depends on availability of power and transmission lines. Displaces emissions to Electric Generating Unit (EGU).
Seasonally reducing or ceasing drilling during specified periods, or using only lower-emitting drill and completion rig engines during specified time periods. Restrict drilling and/or blowdown activity based on meteorological conditions.	Reduces emissions during periods when emissions are more likely to have impact in local area or at sensitive receptors.
Control Strategies Utilizing Centralized Systems	
Centralization (or consolidation) of gas processing facilities (separation, dehydration, sweetening, etc.).	Reduces vehicle miles traveled (truck traffic) and associated emissions. Reduced VOC and GHG emissions from individual dehy/separator units. Requires pipeline infrastructure. Temporary increase in construction associated emissions. Higher potential for pipe leaks/groundwater impacts.
Liquids gathering systems (for condensate and produced water).	Reduces vehicle miles traveled and associated emissions. Reduced VOC and GHG emissions from tanks, truck loading/unloading, and multiple production facilities. Requires pipeline infrastructure. Temporary increase in construction associated emissions. Higher potential for pipe leaks/groundwater impacts.
Water and/or fracturing liquids delivery system, including centralized ("hub and spoke") hydraulic fracturing.	Reduced long term truck traffic and associated emissions. Requires pipeline infrastructure. Not feasible for some terrain. Temporary increase in construction associated emissions. Higher potential for pipe leaks/groundwater impacts.

Emission Reduction Measure	Advantages and Disadvantages
Control Strategies for Tanks, Separators, and Dehydrators	
Capture and control of flashing emissions from all storage tanks and separation vessels with vapor recovery and/or thermal combustion units.	Reduces VOC and GHG emissions. 98% VOC control if greater than or equal to 10 tons per year required statewide by Wyoming BACT. Pressure build up on older tanks can lead to uncontrolled rupture.
Capture and control of produced water tank emissions.	Reduces VOC and GHG emissions. 98% VOC control and no open top tanks required by Wyoming Department of Environmental Quality in some areas.
Capture and control of dehydration equipment emissions with condensers, vapor recovery, and/or thermal combustion.	Reduces VOC, HAP, and GHG emissions. Still vent condensers required and 98% VOC control if greater than or equal to 8 tons per year required statewide and in concentrated development area by Wyoming BACT. All dehy emissions controlled at 98% in Jonah Pinedale Anticline Development (no 8 tons per year threshold).
Control Strategies for Misc. Fugitive VOC Emissions	
Install and maintain low VOC emitting seals, valves, hatches on production equipment.	Reduces VOC and GHG emissions.
Initiate an equipment leak detection and repair program (including use of Forward Looking Infrared Radiometer cameras, grab samples, organic vapor detection devices, visual inspection, etc.), such as an enhanced direct inspection and maintenance program.	Reduction in VOC and GHG emissions.
Install or convert gas operated pneumatic devices and pumps to electric, solar, or instrument (or compressed) air driven devices/controllers.	Reduces VOC and GHG emissions. Required statewide by Wyoming BACT if no thermal combustion used. Electric or compressed air driven operations can displace or increase combustion emissions. Increase in noise due to compressor.
Use "low" or "no bleed" gas operated pneumatic devices/controllers.	Reduces VOC and GHG emissions. Closed loop required statewide by Wyoming BACT.
Use closed loop system or thermal combustion for gas operated pneumatic pump emissions.	Reduces VOC and GHG emissions. Required statewide by Wyoming BACT (98% VOC control or closed loop).
Install vapor recovery on truck loading/unloading operations at tanks.	Reduces emissions of VOC and GHG emissions. Wyoming BACT analysis required if VOC greater than or equal to 8 tons per year or HAP greater than or equal to 5 tons per year. Pressure build up on older tanks can lead to uncontrolled rupture.
Control Strategies for Fugitive Dust and Vehicle Emissions	
Unpaved surface treatments including watering, chemical suppressants, and gravel.	20% - 80% control of fugitive dust (particulates) from vehicle traffic. Potential impacts to water and vegetation from runoff of suppressants.
Use remote telemetry and automation of wellhead equipment.	Reduces vehicle traffic and associated emissions.
Speed limit control and enforcement on unpaved roads, and design of roads to reduce speed.	Reduction of fugitive dust emissions.
Reduce commuter vehicle trips through car pools, commuter vans or buses, innovative work schedules, or work camps.	Reduced combustion emissions, reduced fugitive dust emissions, reduced <u>ozone</u> formation, reduced impacts to visibility.
Miscellaneous Control Strategies	

Emission Reduction Measure	Advantages and Disadvantages
Use of ultra-low sulfur diesel in engines, compressors, construction equipment, etc.	Reduces emissions of particulates and sulfates. Fuel not readily available in some areas.
Reduce vehicle idling.	<p>Reduced combustion emissions, reduced ozone formation, reduced impacts to visibility, reduced fuel consumption.</p> <p>May not be feasible in remote locations where leaving vehicle in operation is a safety precaution.</p>
Reduced density or rate of development.	<p>Peak emissions of all pollutants reduced. May not be economically viable or feasible if multiple mineral interests.</p> <p>Emissions generated at a lower rate but for a longer period. Limited operating period, duration of impacts is longer.</p>
Restrict construction activity based on meteorological conditions.	Reduces emissions during periods when emissions are more likely to have impact in local area or at sensitive receptors.
<p>BACT Best Available Control Technology</p> <p>CO Carbon monoxide</p> <p>EGU Electric Generating Unit</p> <p>G/HP-hour Grams per Horsepower per Hour</p> <p>GHG Greenhouse Gas</p> <p>NH₃ Ammonia</p> <p>NO_x Nitrogen oxide</p> <p>NSCR Non-Selective Catalytic Reduction</p> <p>PM Particulate Matter</p> <p>SCR Selective Catalytic Reduction</p> <p>VOC Volatile Organic Compound</p>	

N.2.6. Contingency Plans

1. If observed effects (e.g., monitored exceedances of the NAAQS) or modeled impacts show state or federal regulatory standards or applicable thresholds for air quality related values may be exceeded, BLM may require mitigation measures within BLM's authority to ensure conformance with RMP air quality goals and objectives. For example, the BLM may manage the location, density and rate of development, or require smaller-emission projects to demonstrate compliance with standards or applicable thresholds.

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Appendix O. Reclamation Policy for the Buffalo Field Office

Introduction

Reclamation is required for any surface-disturbing activity occurring as part of a federal action. A reclamation plan appropriate in detail and complexity and tailored to a specific surface-disturbing activity will be required for each activity. The level of detail for the reclamation plan shall reflect the complexity of the project, the environmental concerns, the reclamation potential for the site, and the reclamation strategy. These plans shall also incorporate any program or regulatory specific requirements for reclamation. The reclamation plan shall address initial disturbance and stabilization, short-term and long term reclamation goals to achieve final restoration. Reclamation plans must set reasonable, achievable, and measurable reclamation goals which are consistent with the established land use plans. This appendix details the reclamation objectives and standards necessary to achieve a timely and proper recovery according to management objects of the disturbed site.

Wyoming Bureau of Land Management (BLM) Reclamation Policy, Instruction Memorandum (IM), No. WY-2012-032 (BLM 2012i) states “A reclamation plan shall be developed for all surface disturbing activities and will become part of the proposed action in the National Environmental Policy Act document.” This policy was developed by the Buffalo BLM (hereafter referred to as BLM) to ensure the following: uniform application of exploration, development, and reclamation standards; ensure prompt reclamation of lands to productive uses consistent with land management policies; shall integrate appropriate disciplines in the natural sciences, engineering and design arts in establishing criteria for reclaiming disturbed land, reviewing reclamation plans, and monitoring reclamation activities; shall assist in the identification of information needs that can be provided by research and encourage research projects to provide such information; utilize the best available information in developing and reviewing reclamation plans.

In preparing and reviewing reclamation plans, the BLM and the project proponent will adhere to Wyoming Reclamation Policy for all surface disturbing activities. In addition, *BLM's Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* “*The Gold Book*” (BLM 2006f) specially pertain to oil and gas related surface disturbing activities.

Background

The reclamation plan will provide a framework to develop project level and site-specific reclamation actions and guide land management efforts toward a planned future condition for any surface disturbance. Sensitive areas may require site-specific reclamation measures; Alternatives considered should include: avoidance and/or unconventional site specific reclamation requirements. Early coordination between the BLM and project proponent is necessary to produce a comprehensive plan. The approved reclamation plan will serve as a binding agreement between the project proponent and the BLM for the expected reclamation condition of the disturbed lands and must be periodically reviewed and modified as necessary. The proponent will develop the reclamation plan, with appropriate BLM involvement in preplanning, data inventory, and approval. This is essential to develop the optimum reclamation proposal. Changes to an approved reclamation plan are allowed only with concurrence of the BLM authorized officer.

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Introduction*

Site selection for the proposed action prior to disturbance activities is key to reclamation success and is an integral part of the operational plan. Every attempt should be made to develop and implement new ideas and technologies that limit or reduce the amount of land surface disturbance and its impacts. Such planning efforts are necessary for successful reclamation.

Some items to be included in reclamation planning should consider, in part, vegetative succession patterns and processes appropriate for restoration of the project area, salvaging and reusing all available topsoil, site stabilization/erosion control, controlling invasive non-native plants and noxious weeds, and maintenance and health of soils. Monitoring and reporting is the best way to track success and implement adaptive management strategies.

Goals and Objectives

The reclamation plan is designed to meet the following objectives for reclamation of areas disturbed by the Project. On split estate the BLM will consider the views of private surface owner (Onshore Order No.1.XII.B.4).

Initial Construction and Stabilization

- Immediately stabilizing the disturbed areas.
- Controlling and minimizing surface runoff, erosion, and sedimentation.

Interim Reclamation

The objective of interim reclamation is to restore desirable vegetative cover and a portion of the landform sufficient to maintain healthy, biologically active topsoil; control erosion; minimize habitat loss, reduce visual impact, and reduce forage loss during the life of the disturbance. Emphasis should be to reduce the footprint of the disturbed area to that which is necessary for not essential for operational function while minimizing the area to be redisturbed at the time of final reclamation. Items to be addressed under interim reclamation include, in part:

- Stabilizing the disturbed soil surface, controlling runoff and erosion, and establishing new vegetation.
- Ensuring adequate surface roughness to reduce runoff and to capture rainfall and snow.
- Controlling and minimizing surface runoff, erosion, and sedimentation using diversion and water treatment structures.
- Restoring primary productivity of the site and establishing vegetation that will provide for natural plant and community succession.
- Establishing a vigorous stand of desirable plant species that will limit or preclude the invasion of undesirable species, including noxious/invasive species.
- Reseeding the disturbed areas with native plant species beneficial to wildlife and livestock.

Final Reclamation and Restoration

The long-term objective of final reclamation is to return the land to an approximate condition and/or function of that which existed prior to disturbance. This includes restoration of the landform and natural vegetative community, soil health, hydrologic systems, visual resources, and wildlife habitats. To ensure that the long-term objective will be reached through human and natural processes, action will be taken to ensure requirements are met for site stability, visual quality, hydrological functioning and vegetative productivity. In addition to achieving the interim reclamation objectives, items to be addressed under final reclamation include, in part:

- Re-contouring to approximate pre-construction grade;

- Enhancing aesthetic values; in the long-term, reclaimed landscapes would have characteristics that approximate the visual quality of adjacent areas, including location, scale, shape, color, and orientation of undisturbed major landscape features.

Reclamation Plan

Reclamation plans provide detailed guidelines for the reclamation process and fulfill federal, state, county, and other local agencies requirements. They can be used by regulatory agencies to ensure that the reclamation measures are implemented, are appropriate for the site. Reclamation plans will be used by the project proponent throughout the operational period of the project and subsequent to cessation of surface-disturbing activities. In turn, responsible agencies, including the BLM, will use the reclamation plan as a basis to review and evaluate the success of the reclamation program. Reclamation plans should provide methods to assist in monitoring and compliance evaluations.

A reclamation plan is a planning document which will provide comprehensive as well as detailed reclamation procedures, methods and actions to successfully meet the final objective. The following items are emphasized to achieve reclamation goals:

1. Properly locate site prior to disturbance;
2. Minimize disturbance of the existing environment;
3. Conduct preliminary baseline surveys to allow for proper planning and timely implementation of planned activities. Such surveys may include existing plant communities, composition, structure, (e.g., Ecological Site Description [ESD]) and successional pathway are appropriate for restoration of the project area;
4. Establish desired native vegetation that fits in with the successional stage of the identified (ESD) or an alternate vegetative regime in consultation with the BLM;
5. Identify and map areas of Limited Reclamation Potential;
6. Identify and map soils with Poor Reclamation Suitability, Severe Erosion Potential, Slopes in Excess of 25%;
7. Identify and map hydrologic features;
8. Additional detailed information would include:
 - a. ESDs, referenced plant communities, and soil map unit(s);
 - b. Methods planned to conserve suitable topsoil for use in reclamation;
 - c. Identify topsoil depth, and proposed location of stockpiled subsoil and topsoil;
 - d. Identify limiting soil factors through soil analysis;
 - e. Predisturbance photo or current photo documenting the condition of the site;
 - f. A statement of acreage of initial disturbance, acreage of disturbance for interim reclamation, and acreage that will be re-disturbed preparing the surface for final reclamation.

The level of detail for the reclamation plan shall reflect: the complexity of the project, the environmental concerns, and the reclamation potential for the site. The reclamation plan is considered complete when all the reclamation requirements in Wyoming Reclamation Policy IM 2010-022 have been addressed, the techniques to meet the reclamation requirements are described in detail, and the BLM concurs with the reclamation plan during the project planning process, as well as subsequent revisions.

The RMP indicates and identifies soils in the planning area that are severely erosive or otherwise sensitive to physical disturbance (see the Soils section in Chapter 3 and Maps 3–6). Table O.1,

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Reclamation Plan*

“Sensitive Soil Areas on BLM-administered Surface in the Planning Area” (p. 2498), (p. 3) shows the approximate acres and sensitive soils in the planning area. Surface disturbance in areas listed in Table O.1, “Sensitive Soil Areas on BLM-administered Surface in the Planning Area” (p. 2498), (p. 3) will be strictly controlled or, if necessary, prohibited.

Table O.1. Sensitive Soil Areas on BLM-administered Surface in the Planning Area

Relative Erosion Potential	Acres	Percent of Planning Area
Limited Reclamation Potential	218,928	28
Severe Erosion Potential	215,496	28
Slopes in Excess of 25%	170,590	22
Source: NRCS 2010a *For analysis purposes, sensitive soils and sites, NRCS SSURGO data were evaluated and displayed with GIS tools. The areas identified as sensitive could be substantially less due to the generalization in the applicable GIS shape file polygons. Soil mapping units may have cumulative sensitive features. GIS Geographic Information System NRCS Natural Resources Conservation Service SSURGO Soil Survey Geographic Database		

Where surface disturbance is proposed in areas identified in Table, “Sensitive Soils on BLM-administered Surface in the Planning Area” (p. 3) or in areas where there are other resource concerns such as habitat fragmentation, a more detailed reclamation plan may be required. These more detailed reclamation plans must be appropriate for the site and may include any or all of the following, in addition to those listed above:

1. Disturbance specific stabilization efforts and reclamation plans described by surveyed station number, latitude/longitude or by erosive feature;
2. Engineered diagrams layered on topographical maps showing cut/fills and limits of disturbance;
3. Additional information may be required at the discretion of the authorized officer; for example but not limited to a geotechnical analysis, and/or reclamation bonding depending upon specific site characteristics.

A qualified soil specialist will make all topsoil salvage recommendations prior to land disturbance. These recommendations will be based on review of soil mapping units of specific well sites and soil sampling within common soil mapping units and vegetation communities, as needed.

Wyoming Department of Environmental Quality’s Guideline 1 Topsoil and Overburden will be used as a reference to rank soils as good, fair, or poor for topsoil salvage. In no case will soils rated poor for topsoil salvage be used unless properly amended, as determined by a qualified soil specialist.

Re-vegetation:

Every effort should be made to use state of the art knowledge for successful reclamation of disturbed sites some applicable references may include: BLM Manual 5714 for seeding methods Refer to BLM Handbook 1740-2 for native seed and plant materials selection.

Success Criteria

The BLM will evaluate reclamation success using the requirements set forth in the BLM Reclamation Policy IM WY-2012-032 (BLM 2012i) with emphasis on soil stabilization and revegetation. Soil stabilization or erosion control is generally sufficient when water naturally

infiltrates into the soil and no evidence of accelerated erosion on or adjacent to the reclaimed site. Reclamation can generally be judged successful when a self-sustaining, vigorous, diverse, native (or otherwise approved) plant community is established on the site with a density sufficient to control erosion and re-establish wildlife habitat or forage. Private surface owner rights will be respected when considering desired objectives, vegetation methods, including specific seed mix(s), and soil amendments.

Soil stability would be measured using an erosion condition class/soil surface factor rating method to numerically rate soil movement, surface litter, surface rock, pedestalling, flow patterns, and rill or gully formation. Information obtained through this rating system represents an expression of current erosion activity and can be used to reflect revegetation success as a function of soil stability. These methods are described in BLM Technical Note 346, Erosion Condition Classification System (SSF).

Baseline vegetation communities should be described prior to disturbance. Methods to gather such data should be discussed with the BLM. ESD may be more suitable than baseline conditions because baseline or current plant communities may not represent the ideal or most desirable plant communities for a given area. ESDs are useful for making decisions for plant communities under some type of disturbance, such as fire. In addition, they describe potential, suitable plants for reclamation under a wide range of adverse soil and climatic conditions.

Revegetation success will be determined by the BLM. In general, reclamation success would include the following qualitative and quantitative vegetation parameters:

- Percent of vegetation cover,
- Percent of total ground cover,
- Density of shrub and sub-shrub species,
- Aerial extent of shrub mosaics, and
- Species diversity and species composition.

When ascertaining if reclamation success criteria have been met, the Buffalo Field Office BLM will evaluate basal cover, canopy cover, species diversity, and soil stability to make their determination. The operator may use any BLM approved monitoring method to examine reclamation success.

Interim reclamation success criteria:

1. Disturbed areas not essential for operational function will be re-contoured to allow for restoration of the original landform; soil compaction is relieved and topsoil is respread;
2. The disturbance has been seeded with the approved seed mix;
3. Native, perennial vegetation is becoming established with desirable species and trending towards long-term goal(s) through qualitative or quantitative documentation;
4. Litter, bare ground and desirable vegetation trending to reflect the desired vegetative state and transition of the site as described in the appropriate ESD reference sheet for the site and field verified;
5. Reference areas selection and comparison methodology should be discussed with the BLM and approved by the authorized officer prior to data gathering.
6. Site should be free of all listed species on county, State of Wyoming, or federal noxious weed list;
7. Plants must be resilient as evidenced by well-developed root systems, flowers, and seed heads.

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Success Criteria*

8. The operator has ensured that the site is in stable condition.
9. BLM will make the determination above by evaluating erosional features described in the Erosion Control Classification System (Clark 1980).
10. Erosion control measures are in place to prevent erosion.
11. Such criteria could be measured after a minimum of one growing season, as needed.

Final reclamation success criteria:

In addition to the success criteria listed under interim reclamation the following shall be evaluated:

1. Native Perennial Grasses: Reclaimed sites must have a minimum of 3 native perennial grass species within the overall data summary established in the disturbance area, 1 of which must be a bunchgrass species.
2. Native Perennial Forbs: Reclaimed sites must have a minimum of 3 native perennial forb species within the overall data summary established in the disturbance area.
3. Native Shrubs: Reclaimed sites must have a minimum of 2 native shrub species within the overall data summary established in the disturbance area. Some sub-shrubs may be substituted based on approval by the BLM.
4. Weeds: Sites must be free from all species listed on the county, Wyoming or Federal noxious weed list. All state and federal laws regarding noxious weeds must be followed. Other highly competitive invasive species such as cheatgrass will not exceed 25% of background of an approved BLM reference site and maintains soil surface integrity.
5. Plant Vigor: Plants must be resilient as evidenced by well-developed root systems, lowers, and seed heads. All sites must exhibit the sustainability of the above desired attributes after the removal of external influences .
6. Plant cover and litter is each at 80%, respectively, of the ESD reference sheet or greater of soil surface or background of an approved BLM reference site and maintains soil surface integrity.
7. Bare Ground: Bare ground will not exceed 80% of the ESD reference sheet or background of an approved BLM reference site.
8. Such criteria could be measured after a minimum of two growing seasons.

Monitoring Protocol

Monitoring of reclaimed areas will ensure reclamation success criteria have been met. Reclamation monitoring protocol will be included in the reclamation plan. The authorized officer will be notified by the project proponent when reclamation operations have been completed, meet the success criteria, and are ready for final inspection. For final release BLM will utilize an approved monitoring methodology. Approved monitoring methods are described in BLM Technical Reference 4400-4, 1996 and can be located on the web at: <http://www.blm.gov/nstc/library/pdf/samplveg.pdf>. Alternative methodologies should be discussed with the BLM.

Appendix P. Wyoming Standards for Healthy Rangelands

P.1. Introduction

According to the Department of the Interior's final rule for grazing administration, effective August 21, 1995, the Wyoming Bureau of Land Management (BLM) State Director is responsible for the development of standards for healthy rangelands and guidelines for livestock grazing management on 18 million acres of Wyoming's public rangelands. The development and application of these standards and guidelines are to achieve the four fundamentals of rangeland health outlined in the grazing regulations (43 Code of Federal Regulations [CFR] 4180.1). Those four fundamentals are: (1) watersheds are functioning properly; (2) water, nutrients, and energy are cycling properly; (3) water quality meets State standards; and (4) habitat for special status species is protected.

Standards address the health, productivity, and sustainability of the BLM-administered public rangelands and represent the minimum acceptable conditions for the public rangelands. The standards apply to all resource uses on public lands. Their application will be determined as use-specific guidelines are developed. Standards are synonymous with goals and are observed on a landscape scale. They describe healthy rangelands rather than important rangeland by-products. The achievement of a standard is determined by measuring appropriate indicators. An indicator is a component of a system whose characteristics (e.g., presence, absence, quantity, and distribution) can be measured based on sound scientific principles.

Guidelines provide for, and guide the development and implementation of, reasonable, responsible, and cost-effective management practices at the grazing allotment and watershed level. The guidelines in this document apply specifically to livestock grazing management practices on the BLM-administered public lands. These management practices will either maintain existing desirable conditions or move rangelands toward statewide standards within reasonable timeframes. Appropriate guidelines will ensure that the resultant management practices reflect the potential for the watershed, consider other uses and natural influences, and balance resource goals with social, cultural/historic, and economic opportunities to sustain viable local communities. Guidelines, like standards, apply statewide.

Implementation of the Wyoming standards and guidelines will generally be done in the following manner. Grazing allotments or groups of allotments in a watershed will be reviewed based on the BLM's current allotment categorization and prioritization process. Allotments with existing management plans and high-priority allotments will be reviewed first. Lower priority allotments will then be reviewed as time allows. The permittees and interested public will be notified when allotments are scheduled for review and are encouraged to participate in the review. The review will first determine if an allotment meets each of the six standards. If it does, no further action will be necessary. If any of the standards aren't being met, rationale explaining the contributing factors will be prepared. If livestock grazing practices are found to be among the contributing factors, corrective actions consistent with the guidelines will be developed and implemented. If a lack of data prohibits the reviewers from determining if a standard is being met, a strategy will be developed to acquire the data in a timely manner.

Quantifiable resource objectives and specific management practices to achieve the standards will be developed at the BLM Field Office level and will consider all reasonable and practical options available to achieve desired results on a watershed or grazing allotment scale. The objectives shall be reflected in site-specific activity or implementation plans as well as in livestock grazing permits/leases for the public lands. Interdisciplinary activity or implementation plans will be used to maintain or achieve the Wyoming standards for healthy rangelands. These plans may be developed formally or informally through mechanisms available and suited to local needs (such as Coordinated Resource Management [CRM] efforts).

On a continuing basis, the Standards for Healthy Rangelands will direct on-the-ground management on public lands. They will serve to focus the ongoing development and implementation of activity plans toward the maintenance or attainment of healthy rangelands.

The development and implementation of standards and guidelines will enable on-the-ground management of the public rangelands to maintain a clear and responsible focus on both the health of the land and its dependent natural and human communities. This development and implementation will ensure that any mechanisms currently being employed or that may be developed in the future will maintain a consistent focus on these essential concerns.

These standards and guidelines are compatible with BLM's three-tiered land use planning process. The first tier includes the laws, regulations, and policies governing BLM's administration and management of the public lands and their uses. The previously mentioned fundamentals of rangeland health specified in 43 CFR 4180.1, the requirement for BLM to develop these state (or regional) standards and guidelines, and the standards and guidelines themselves, are part of this first tier. Also part of this first tier are the specific requirements of various federal laws and the objectives of 43 CFR 4100.2 that require BLM to consider the social and economic well-being of the local communities in its management process.

These standards and guidelines will provide for statewide consistency and guidance in the preparation, amendment, and maintenance of BLM land use plans, which represent the second tier of the planning process. The BLM land use plans provide general allocation decisions concerning the kinds of resource and land uses that can occur on the BLM administered public lands, where they can occur, and the types of conditional requirements under which they can occur. In general, the standards will be the basis for development of planning area-specific management objectives concerning rangeland health and productivity, and the guidelines will direct development of livestock grazing management actions to help accomplish those objectives.

The third tier of the BLM planning process, activity or implementation planning, is directed by the applicable land use plan and, therefore, by the standards and guidelines. The standards and guidelines, as BLM statewide policy, will also directly guide development of the site-specific objectives and the methods and practices used to implement the land use plan decisions. Activity or implementation plans contain objectives which describe the site-specific conditions desired. Grazing permits/leases for the public lands contain terms and conditions which describe specific actions required to attain or maintain the desired conditions. Through monitoring and evaluation, the BLM authorized officer, in consultation with, grazing permittees, and other interested parties determine if progress is being made to achieve activity plan objectives.

Wyoming rangelands support a variety of uses which are of significant economic importance to the state and its communities. These uses include oil and gas production, mining, recreation and tourism, fishing, hunting, wildlife viewing, and livestock grazing. Rangelands also provide amenities which contribute to the quality of life in Wyoming such as open spaces, solitude, and

opportunities for personal renewal. Wyoming's rangelands should be managed with consideration of the state's historical, cultural, and social development and in a manner which contributes to a diverse, balanced, competitive, and resilient economy in order to provide opportunity for economic development. Healthy rangelands can best sustain these uses.

To varying degrees, BLM management of the public lands and resources plays a role in the social and economic well-being of Wyoming communities. The National Environmental Policy Act (part of the above-mentioned first planning tier) and various other laws and regulations mandate the BLM to analyze the socioeconomic impacts of actions occurring on public rangelands. These analyses occur during the environmental analysis process of land use planning (second planning tier), where resource allocations are made, and during the environmental analysis process of activity or implementation planning (third planning tier). In many situations, factors that affect the social and economic well-being of local communities extend far beyond the scope of BLM management or individual public land users' responsibilities. In addition, since standards relate primarily to physical and biological features of the landscape, it is very difficult to provide measurable socioeconomic indicators that relate to the health of rangelands. It is important that standards be realistic and within the control of the land manager and users to achieve.

P.2. Standards for Healthy Public Rangelands

P.2.1. Standard #1

Within the potential of the ecological site (soil type, landform, climate, and geology), soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff.

This Means That:

The hydrologic cycle will be supported by providing for water capture, storage, and sustained release. Adequate energy flow and nutrient cycling through the system will be achieved as optimal plant growth occurs. Plant communities are highly varied within Wyoming.

Indicators May Include But Are Not Limited To:

- Water infiltration rates
- Soil compaction
- Erosion (rills, gullies, pedestals, capping)
- Soil micro-organisms
- Vegetative cover (gully bottoms and slopes)
- Bare ground and litter

The above indicators are applied as appropriate to the potential of the ecological site.

P.2.2. Standard #2

Riparian and wetland vegetation has structural, age, and species diversity characteristic of the stage of channel succession and is resilient and capable of recovering from natural and human disturbance in order to provide forage and cover, capture sediment, dissipate energy, and provide for groundwater recharge.

This Means That:

Wyoming has highly varied riparian and wetland systems on public lands. These systems vary from large rivers to small streams and from springs to large wet meadows. These systems are in various stages of natural cycles and may also reflect other disturbance that is either localized or widespread throughout the watershed. Riparian vegetation captures sediments and associated materials, thus enhancing the nutrient cycle by capturing and utilizing nutrients that would otherwise move through a system unused.

Indicators May Include But Are Not Limited To:

- Erosion and deposition rate
- Channel morphology and floodplain function
- Channel succession and erosion cycle
- Vegetative cover
- Plant composition and diversity (species, age class, structure, successional stages, desired plant community, etc.)
- Bank stability
- Woody debris and instream cover
- Bare ground and litter

The above indicators are applied as appropriate to the potential of the ecological site.

P.2.3. Standard #3

Upland vegetation on each ecological site consists of plant communities appropriate to the site which are resilient, diverse, and able to recover from natural and human disturbance.

This Means That:

In order to maintain desirable conditions and/or recover from disturbance within acceptable timeframes, plant communities must have the components present to support the nutrient cycle and adequate energy flow. Plants depend on nutrients in the soil and energy derived from sunlight. Nutrients stored in the soil are used over and over by plants, animals, and microorganisms. The amount of nutrients available and the speed with which they cycle among plants, animals, and the soil are fundamental components of rangeland health. The amount, timing, and distribution of energy captured through photosynthesis are fundamental to the function of rangeland ecosystems.

Indicators May Include But Are Not Limited To:

- Vegetative cover
- Plant composition and diversity (species, age class, structure, successional stages, desired plant community, etc.)
- Bare ground and litter
- Erosion (rills, gullies, pedestals, capping)
- Water infiltration rates

The above indicators are applied as appropriate to the potential of the ecological site.

P.2.4. Standard #4

Rangelands are capable of sustaining viable populations and a diversity of native plant and animal species appropriate to the habitat. Habitats that support or could support Threatened, Endangered, species of special concern, or sensitive species will be maintained or enhanced.

This Means That:

The management of Wyoming rangelands will achieve or maintain adequate habitat conditions that support diverse plant and animal species. These may include listed Threatened or Endangered species (U.S. Fish and Wildlife-designated), species of special concern (BLM-designated), and other sensitive species (State of Wyoming-designated). The intent of this standard is to allow the listed species to recover and be delisted.

Indicators May Include But Are Not Limited To:

- Noxious weeds
- Species diversity
- Age class distribution
- All indicators associated with the upland and riparian standards
- Population trends
- Habitat fragmentation

The above indicators are applied as appropriate to the potential of the ecological site.

P.2.5. Standard #5

Water quality meets State standards.

This Means That:

The State of Wyoming is authorized to administer the Clean Water Act. BLM management actions or use authorizations will comply with all federal and state water quality laws, rules and regulations to address water quality issues that originate on public lands. Provisions for the establishment of water quality standards are included in the Clean Water Act, as amended, and the Wyoming Environmental Quality Act, as amended. Regulations are found in Part 40 of the CFR and in Wyoming's Water Quality Rules and Regulations. The latter regulations contain Quality Standards for Wyoming Surface Waters.

Natural processes and human actions influence the chemical, physical, and biological characteristics of water. Water quality varies from place to place with the seasons, the climate, and the kind substrate through which water moves. Therefore, the assessment of water quality takes these factors into account.

Indicators May Include But Are Not Limited To:

- Chemical characteristics (e.g., pH, conductivity, dissolved oxygen)
- Physical characteristics (e.g., sediment, temperature, color)
- Biological characteristics (e.g., macro- and micro-invertebrates, fecal coliform, and plant and animal species)

P.2.6. Standard #6

Air quality meets State standards.

This Means That:

The State of Wyoming is authorized to administer the Clean Air Act. BLM management actions or use authorizations will comply with all federal and state air quality laws, rules, regulations and standards. Provisions for the establishment of air quality standards are included in the Clean Air Act, as amended, and the Wyoming Environmental Quality Act, as amended. Regulations are found in Part 40 of the CFR and in Wyoming Air Quality Standards and Regulations.

Indicators May Include But Are Not Limited To:

- Particulate matter
- Sulfur dioxide
- Photochemical oxidants (ozone)
- Volatile organic compounds (hydrocarbons)
- Nitrogen oxides
- Carbon monoxide
- Odors
- Visibility

P.3. BLM Wyoming Guidelines for Livestock Grazing Management

1. Timing, duration, and levels of authorized grazing will ensure that adequate amounts of vegetative ground cover, including standing plant material and litter, remain after authorized use to support infiltration, maintain soil moisture storage, stabilize soils, allow the release of sufficient water to maintain system function, and to maintain subsurface soil conditions that support permeability rates and other processes appropriate to the site.
2. Grazing management practices should restore, maintain, or improve riparian plant communities. Grazing management strategies consider hydrology, physical attributes, and potential for the watershed and the ecological site. Grazing management should maintain adequate residual plant cover to provide for plant recovery, residual forage, sediment capture, energy dissipation, and groundwater recharge.
3. Range improvement practices (instream structures, fences, water troughs, etc.) in and adjacent to riparian areas will ensure that stream channel morphology (e.g., gradient, width/depth ratio, channel roughness and sinuosity) and functions appropriate to climate and landform are maintained or enhanced. The development of springs, seeps, or other projects affecting water and associated resources shall be designed to protect the ecological and hydrological functions, wildlife habitat, and significant cultural, historical, and archaeological values associated with the water source. Range improvements will be located away from riparian areas if they conflict with achieving or maintaining riparian function.
4. Grazing practices that consider the biotic communities as more than just a forage base will be designed in order to ensure that the appropriate kinds and amounts of soil organisms, plants, and animals to support the hydrologic cycle, nutrient cycle, and energy flow are maintained or enhanced.
5. Continuous season-long or other grazing management practices that hinder the completion of plants' life-sustaining reproductive and/or nutrient cycling processes will be modified to

ensure adequate periods of rest at the appropriate times. The rest periods will provide for seedling establishment or other necessary processes at levels sufficient to move the ecological site condition toward the resource objective and subsequent achievement of the standard.

6. Grazing management practices and range improvements will adequately protect vegetative cover and physical conditions and maintain, restore, or enhance water quality to meet resource objectives. The effects of new range improvements (water developments, fences, etc.) on the health and function of rangelands will be carefully considered prior to their implementation.
7. Grazing management practices will incorporate the kinds and amounts of use that will restore, maintain, or enhance habitats to assist in the recovery of federal Threatened and Endangered species or the conservation of federally-listed species of concern and other state-designated special status species. Grazing management practices will maintain existing habitat or facilitate vegetation change toward desired habitats. Grazing management will consider Threatened and Endangered species and their habitats.
8. Grazing management practices and range improvements will be designed to maintain or promote the physical and biological conditions necessary to sustain native animal populations and plant communities. This will involve emphasizing native plant species in the support of ecological function and incorporating the use of nonnative species only in those situations in which native plant species are not available in sufficient quantities or are incapable of maintaining or achieving properly functioning conditions and biological health.
9. Grazing management practices on uplands will maintain desired plant communities or facilitate change toward desired plant communities.

P.3.1. Definitions

Activity Plans – Allotment Management Plans (AMPs), Habitat Management Plans (HMPs), Watershed Management Plans, Wild Horse Management Plans, and other plans developed at the local level to address specific concerns and accomplish specific objectives.

Coordinated Resource Management (CRM) – A group of people working together to develop common resource goals and resolve natural resource concerns. CRM is a people process that strives for win-win situations through consensus-based decision making.

Desired Plant Community – A plant community which produces the kind, proportion, and amount of vegetation necessary for meeting or exceeding the land use plan/activity plan objectives established for an ecological site(s). The desired plant community must be consistent with the site's capability to produce the desired vegetation through management, land treatment, or a combination of the two.

Ecological Site – An area of land with specific physical characteristics that differs from other areas both in its ability to produce distinctive kinds and amounts of vegetation and in its response to management.

Erosion – (v.) Detachment and movement of soil or rock fragments by water, wind, ice, or gravity. (n.) The land surface worn away by running water, wind, ice, or other geological agents, including such processes as gravitational creep.

Grazing Management Practices – Grazing management practices include such things as grazing systems (rest-rotation, deferred rotation, etc.), timing and duration of grazing, herding, salting, etc. They do not include physical range improvements.

Guidelines (For Grazing Management) – Guidelines provide for, and guide the development and implementation of, reasonable, responsible, and cost-effective management actions at the allotment and watershed level which move rangelands toward statewide standards or maintain existing desirable conditions. Appropriate guidelines will ensure that the resultant management actions reflect the potential for the watershed, consider other uses and natural influences, and balance resource goals with social, cultural/historic, and economic opportunities to sustain viable local communities. Guidelines, and, therefore, the management actions they engender, are based on sound science, past and present management experience, and public input.

Indicator – An indicator is a component of a system whose characteristics (e.g., presence, absence, quantity, and distribution) can be measured based on sound scientific principles. An indicator can be measured (monitored and evaluated) at a site- or species-specific level. Measurement of an indicator must be able to show change within timeframes acceptable to management and be capable of showing how the health of the ecosystem is changing in response to specific management actions. Selection of the appropriate indicators to be monitored in a particular allotment is a critical aspect of early communication among the interests involved on the ground. The most useful indicators are those for which change or trend can be easily quantified and for which agreement as to the significance of the indicator is broad based.

Litter – The uppermost layer of organic debris on the soil surface, essentially the freshly fallen or slightly decomposed vegetal material.

Management Actions – Management actions are the specific actions prescribed by the BLM to achieve resource objectives, land use allocations, or other program or multiple use goals. Management actions include both grazing management practices and range improvements.

Objective – An objective is a site-specific statement of a desired rangeland condition. It may contain qualitative (subjective) elements, but it must have quantitative (objective) elements so that it can be measured. Objectives frequently speak to change. They may measure the avoidance of negative changes or the accomplishment of positive changes. They are the focus of monitoring and evaluation activities at the local level. Objectives may measure the products of an area rather than its ability to produce them, but if they do so, it must be kept in mind that the lack of a product may not mean that the standards have not been met. Instead, the lack of a particular product may reflect other factors such as political or social constraints. Objectives often focus on indicators of greatest interest for the area in question.

Range Improvements – Range improvements include such things as corrals, fences, water developments (reservoirs, spring developments, pipelines, wells, etc.) and land treatments (prescribed fire, herbicide treatments, mechanical treatments, etc.).

Rangeland – Land on which the native vegetation (climax or natural potential) is predominantly grasses, grass-like plants, forbs, or shrubs. This includes lands revegetated naturally or artificially when routine management of that vegetation is accomplished mainly through manipulation of grazing. Rangelands include natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows.

Rangeland Health – The degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained.

Riparian – An area of land directly influenced by permanent water. It has visible vegetation or physical characteristics reflective of permanent water influence. Lakeshores and streambanks are

typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not have vegetation dependent on free water in the soil.

Standards – Standards are synonymous with goals and are observed on a landscape scale. Standards apply to rangeland health and not to the important by-products of healthy rangelands. Standards relate to the current capability or realistic potential of a specific site to produce these by-products, not to the presence or absence of the products themselves. It is the sustainability of the processes, or rangeland health, that produces these by-products.

Terms and Conditions – Terms and conditions are very specific land use requirements that are made a part of the land use authorization in order to assure maintenance or attainment of the standard. Terms and conditions may incorporate or reference the appropriate portions of activity plans (e.g., AMPs). In other words, where an activity plan exists that contains objectives focused on meeting the standards, compliance with the plan may be the only term and condition necessary in that allotment.

Upland – Those portions of the landscape which do not receive additional moisture for plant growth from run-off, streamflow, etc. Typically these are hills, ridgetops, valley slopes, and rolling plains.

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Appendix Q. Fire and Fuels Management

Q.1. Emergency Stabilization and Rehabilitation

Introduction

Emergency stabilization plans and/or rehabilitation plans are prepared after a wildland fire to minimize threats to life or property and stabilize and prevent unacceptable degradation to natural and cultural resources resulting from the effects of the fire. Not all fires need emergency stabilization and/or rehabilitation.

Wyoming Bureau of Land Management's (BLM) Reclamation policy identifies certain requirements which must be addressed when developing reclamation plans or proposals for surface-disturbing activities. For information about reclamation requirements, please refer to Appendix O (p. 2495).

The Burned Area Emergency Stabilization and Rehabilitation Handbook (BLM 2007c) provides detailed information specific to BLM policies, standards, and procedures used in the Burned Area Emergency Stabilization and Rehabilitation (ES&R) programs. The Handbook is intended to be the primary guidance to BLM ES&R activities. ES&R activities and treatment undertaken in the Buffalo Field Office will follow the Handbook guidance. As updates and revisions to the departmental manuals are completed, conformance to the new direction will supersede the criteria included herein.

Emergency stabilization is defined as "Planned actions to stabilize and prevent unacceptable degradation to natural and cultural resources, to minimize threats to life and property resulting from the effects of a fire, or to repair/replace/construct physical improvements necessary to prevent degradation of land or resources. Emergency stabilization actions must be taken within one year following containment of a wildland fire" (DOI 2004).

Rehabilitation is defined as "Efforts undertaken within three years of containment of a wildland fire to repair or improve fire-damaged lands unlikely to recover naturally to management approved conditions, or to repair or replace minor facilities damaged by fire" (DOI 2004).

ES&R funds are not used for rehabilitation of wildland fire suppression efforts; this includes rehabilitating firelines, helispots, fire camp, etc. Costs for rehabilitating wildland fire suppression efforts will be funded by the wildland fire project code.

Emergency Stabilization and Rehabilitation Protocols

Emergency stabilization protection priorities are: (1) human life and safety; and (2) property and unique biological resources (designated critical habitat for federal and state listed, proposed or candidate Threatened and Endangered species) and significant heritage sites (DOI 2004). Burned area rehabilitation protection priorities are: (1) to repair or improve lands damaged directly by a wildland fire; and (2) to rehabilitate or establish healthy, stable ecosystems in the burned area (DOI 2004).

Emergency Stabilization

The objective of emergency stabilization is “To determine the need for and to prescribe and implement emergency treatments to minimize threats to life or property or to stabilize and prevent unacceptable degradation to natural and cultural resources resulting from the effects of a fire” (DOI 2004).

Emergency stabilization plans are prepared by an interdisciplinary team, immediately following a wildland fire and specify emergency treatments and activities to be carried out within one year following containment of the wildfire. Generally, activities are only prescribed within the perimeter of a burned area.

Allowable emergency stabilization actions are limited to the following items, grouped by issue topic:

Human Life and Safety

- Replacing or repairing minor facilities essential to public health and safety when no other protection options are available.

Soil/Water Stabilization

- Placing structures to slow soil and water movement.
- Stabilizing soil to prevent loss of degradation or productivity.
- Increasing road drainage frequency and/or capacity to handle additional post-fire runoff.
- Installing protective fences or barriers to protect treated or recovering areas.

Designated Critical Habitat for Federal/State Listed, Proposed, or Candidate Species

- Conducting assessments of critical habitat in those areas affected by emergency stabilization treatments.
- Seeding or planting to prevent permanent impairment of designated critical habitat for federal and state listed, proposed or candidate Threatened and Endangered species.

Critical Heritage Resources

- Conducting assessments of significant heritage sites in those areas affected by emergency stabilization treatments.
- Stabilizing critical heritage resources.
- Patrolling, camouflaging, burying significant heritage sites to prevent looting.

Invasive Plants

- Seeding to prevent establishment of invasive plants, and direct treatment of invasive plants. Such actions will be specified in the emergency stabilization plan only when immediate action is required and when standard treatments are used that have been validated by monitoring data from previous projects, or when there is documented research establishing the effectiveness of such actions.

- Using integrated pest management techniques to minimize the establishment of non-native invasive species within the burned area. When there is an existing approved management plan that addresses non-native invasive species, emergency stabilization treatments may be used to stabilize the invasive species

Monitoring

- Monitoring of treatments and activities for up to three years from date of fire containment.

Burned Area Rehabilitation

The objectives of rehabilitation are: (1) to evaluate actual and potential long-term post-fire impacts to critical cultural and natural resources and identify those areas unlikely to recover naturally from severe wildland fire damage; (2) to develop and implement cost-effective plans to emulate historical or pre-fire ecosystem structure, function, diversity, and dynamics consistent with approved land management plans, or if that is infeasible, then to restore or establish a healthy, stable ecosystem in which native species are well represented; and (3) to repair or replace minor facilities damaged by wildland fire (DOI 2004).

Rehabilitation plans are prepared by an interdisciplinary team as a separate plan, independent of an emergency stabilization plan. The rehabilitation plan specifies non-emergency treatments and activities to be carried out within three years following containment of a wildfire. Generally, rehabilitation activities are prescribed only within the perimeter of a burned area.

Allowable rehabilitation actions are limited to the following items, grouped by issue topic:

Lands Unlikely to Recover Naturally

- Repair or improve lands unlikely to recover naturally from wildland fire damage by emulating historical or pre-fire ecosystem structure, function, diversity, and dynamics consistent with existing land management plans.

Weed Treatments

- Chemical, manual, and mechanical removal of invasive species, and planting of native and non-native species, restore or establish a healthy, stable ecosystem even if this ecosystem cannot fully emulate historical or pre-fire conditions.

Tree Planting

- Tree planting to reestablish burned habitat, reestablish native tree species lost in fire, prevent establishment of invasive plants.

Repair/Replace Fire Damage to Minor Facilities

- Repair or replace fire damage to minor operating facilities (e.g., fences, campgrounds, interpretive signs and exhibits, shade shelters, wildlife guzzlers, etc.) Rehabilitation may not include the planning or replacement of major infrastructure, such as visitor centers, residential

structures, administration offices, work centers and similar facilities. Rehabilitation does not include the construction of new facilities that did not exist before the fire, except for temporary and minor facilities necessary to implement burned area rehabilitation efforts.

Monitoring

- Monitoring of treatments and activities for up to three years from date of fire containment.

Policies on timeframes for ES&R planning funding, and implementation are very specific. ES&R treatments must be implemented, to the extent possible, before additional damage occurs to the burned area, immediately down slope of the burned area, or before undesirable vegetation becomes established. Treatments must be implemented at a time that will ensure a high or maximum probability of success. The ES&R Program timeframes in relations to tasks and responsibilities are shown in Table Q.1, “Emergency Stabilization and Rehabilitation Program Timeframes, Tasks, and Responsibilities” (p. 2514).

Table Q.1. Emergency Stabilization and Rehabilitation Program Timeframes, Tasks, and Responsibilities

Event	Timeframes	Task
Wildfire occurs	Immediately, prior to fire containment	Manager assigns a Resource Advisor. While the fire is still burning, the Resource Advisor, in consultation with resource specialists and the appropriate Manager, decides if ES&R is warranted based on Values-at-Risk/Resources-at-Risk.
Initial Emergency Stabilization Plan needed. Submit Form 1310-2 plus supplemental attachments (Both 2822 and 2881 may be indicated on Form, though funding under 2881 may not occur until the following fiscal year)	Within 7 days of fire containment	Concurrently to State ES&R Program Lead, National ES&R Program Lead, and Denver Budget Office (BC-612).
Complete Emergency Stabilization Plan needed. Prepare/Submit complete Emergency Stabilization Plan	Within 21 days of fire containment	Less than \$100,000 submit to State ES&R Program Lead. Greater than or equal to \$100,000 submit to State ES&R Program Lead (for review) and concurrently to National ES&R Program Lead.
Receive approval/disapproval of Emergency Stabilization Plan	Within 6 working days of receipt by Approval Office	Requesting Office receives memo approving funding, or need for revision on a plan by plan basis. State Director or acting has funding approval authority for plans less than \$100,000. Bureau of Land Management Budget Officer, after concurrence with Assistant Director WO-200 or their designee, has funding approval authority for plans greater than or equal to \$100,000.
Receive notification of Emergency Stabilization funding approval	Immediately	Local fire office enters project data into NFPORS.

Event	Timeframes	Task
BAR Plan needed. Prepare/Submit BAR Plan	Timely, ideally soon after submitting Emergency Stabilization Plan, but no later than September 5 annually	To State ES&R Program Lead and National ES&R Program Lead. Field Office. Local fire office enters project data into NFORS.
Receive approval/disapproval of BAR Plan funding	Before October 31 annually	Funding for BAR Plans is approved via the Annual Work Plan.
Accomplishment Report and Funding Request Form for next Fiscal Year 2881 funds	Early September	To State ES&R Program Lead for review and submission to National ES&R Program Lead for concurrence. Funding for years 2 and 3 is approved via the Annual Work Plan.
Close-out Report	Early September of 3rd year	To State ES&R Program Lead for review and submission to National ES&R Program Lead.
BAR Burned Area Rehabilitation ES&R Emergency Stabilization and Rehabilitation NFORS National Fire Plan Operations and Reporting System WO Washington Office		

Due to the broad spectrum of situations encountered in emergency stabilization and/or rehabilitation, several options of possible treatments, either separately or in combination, must be considered. The ES&R Handbook list several treatments under the Treatment Guidance section.

Emergency Stabilization and Rehabilitation Guidelines for Wilderness Study Areas

Emergency stabilization and/or rehabilitation following wildland fire in a Wilderness Study Area (WSA) will comply with [Manual 6330 - Management of Wilderness Study Areas \(BLM 2012c\)](#). The following italicized text condenses excerpts from [the manual](#):

Emergency stabilization, rehabilitation, and restoration of the wilderness resource created by impacts from wildfires must satisfy the non-impairment criteria unless an exception applies. These activities will be more intensive: where the effects of the fire were greater than would occur in an area where fire already plays its natural role on the landscape; in ecosystems that evolved without broad-scale fire; and for fires whose effects (even within the natural range) pose an unacceptable risk to life, property, or resources outside the WSA. Where wildfires have been managed for resource benefits, most stabilization, rehabilitation, and restoration activities are expected to be limited to the impacts caused by direct management actions or to prevent the spread of exotic vegetation. These activities will not be used to establish, or re-establish, conditions not provided for in sections 1.6.D.8 or 1.6.D.11 of this manual.

Any emergency stabilization and/or rehabilitation actions must maintain an area's suitability for preservation as wilderness and should be accomplished using methods and equipment that causes the least damage to wilderness resources. The use of motorized vehicles and mechanical equipment will be minimized to the extent possible.

When seeding is considered, the appropriate species and methods for seeding will be considered on a case-by-case basis to determine if the proposed method meets the policy and guidelines for WSAs. Seed and planting will utilize native species, and will minimize cross-country use of motorized equipment. Seedings and plantings will be staggered or irregular so as to avoid a straight-line plantation appearance. Seed will be applied aerially unless the area to be stabilized

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and/or rehabilitated is small, or ground application will not impair wilderness characteristics. Because the covering of seed greatly affects its successful germination, mechanized equipment may be considered to cover the seed after aerial application. If the burned area is determined to be crucial wildlife habitat, and shrub seed is not applied aerially, then seedlings may be hand planted.

When a proposed emergency stabilization and/or rehabilitation project addresses a WSA, interested parties will be allowed a 30-day comment period on the proposed treatment, unless it is not possible to do so because of emergency conditions (i.e., the 30-day comment period would result in missing the optimum period for treatment). If a full 30-day period would result in missing the optimum period for emergency stabilization and/or rehabilitation, key contacts would be notified for immediate comment, and a follow up copy of the treatment prescription would be forwarded.

If it is determined that wilderness suitability is affected by damages from fire suppression actions, the disturbance must be repaired by fire suppression resources. ES&R funds may not be used to repair suppression damages.

Q.2. Fire Management Policy for Wilderness Study Areas

The following paragraphs are condensed excerpts from [Manual 6330 - Management of Wilderness Study Areas \(BLM 2012c\)](#). For complete policy and guidance regarding WSAs, refer to [the manual](#).

Policies for Specific Activities — Vegetation

Whenever possible, natural processes will be relied on to maintain native vegetation and to influence natural fluctuations in populations. Natural disturbance processes, including fire, insect outbreaks, and droughts, are important functions of the ecosystem. Manipulation of vegetation through management-ignited fire, chemical application, mechanical treatment, or human controlled biological means is allowed only where it meets the non-impairment standard or one of the exceptions. Exceptions that may pertain to vegetative treatment include emergencies, the protection or enhancement of wilderness characteristics, grandfathered uses, valid existing rights, and actions taken to recover a federally listed Threatened, Endangered, or Candidate species. Establishing non-native plants is an example of vegetation management that may impair and therefore may not be permitted within a WSA.

Emergencies:

As an exception to the non-impairment standard, vegetative manipulation in emergency situations may be allowed, e.g., there is no effective alternative for controlling insect and disease outbreaks or fires that threaten lands outside of a WSA. Reseeding or planting of native species may be undertaken following fire or other natural disaster if natural seed sources are not adequate to compete with non-native vegetation or substantial soil loss is expected.

Insect and Disease Control:

Native insect and disease control activities on vegetation will be allowed only to the extent that they meet the non-impairment criteria or one of the exceptions. When specific insects and diseases are documented to be non-native or introduced organisms, then it may be reasonable to consider whether the protection and enhancement of wilderness characteristics exception to the non-impairment standard applies.

Restoration:

Where it meets the non-impairment standard or one of the exceptions, management action may be taken to restore vegetation to characteristic conditions of the ecological zone in which the area is situated where:

- natural successional processes have been disrupted by past human activity, to the extent that intervention is necessary in order to return the ecosystem to a condition where natural process can function;
- restoration through natural processes would require lengthy periods of time during which the impacted area would receive unwanted human use or be susceptible to substantial soil loss without intervention, or further ecological departure would occur; or,
- it is necessary to maintain fire-dependent ecosystems when adjacent land uses do not allow for natural fire occurrence. (see section 1.6.D.2.c).

Manipulation should only occur when restoration by natural forces is no longer attainable, and only to restore or maintain vegetative communities to the closest approximation of the natural range of conditions.

Restoration treatments should use the least disruptive techniques that have the best likelihood for success. Patient, incremental treatments should be favored over aggressive attempts to restore long-term changes all at once, unless repeated treatments would pose greater impairment risk to wilderness characteristics.

Policies for Specific Activities — Fire

The overall goal of managing fire in WSAs is to allow the frequency and intensity of the natural fire regime to play its inherent role in the ecosystem. This means both allowing fire where ecosystems evolved in the presence of fire, and preventing unnatural spread of fire in ecosystems that evolved without broad-scale fires.

Wildfires can be considered emergencies and, as such, management response to a wildfire falls under one of the exceptions to the non-impairment criteria. Nevertheless, the non-impairment criteria will be met to the extent practical. This means using "minimum impact suppression tactics" or "light hand on the land" suppression techniques wherever possible, while providing for the safety of firefighters and the public and meeting fire management objectives. Fire managers should inform suppression personnel during dispatch that the [wild]fire is in a WSA and that special constraints may apply to prevent impairment of wilderness characteristics. A fire resource advisor with experience in WSA management should be assigned to all fires in WSAs to assist in the protection of wilderness characteristics.

The goal of prescribed fire is to make conditions possible for natural fire to return to the WSA. In some instances, the goal may be to mimic a natural fire regime where reliance on wildfire is not feasible. Use of prescribed fires in WSAs is limited to instances where this use meets the non-impairment standard or one of the exceptions, such as to clearly protect or enhance the land's wilderness characteristics. The BLM may utilize prescribed fire in WSAs where the natural role of fire cannot be returned solely by reliance on wildfire or where relying on wildfires might create unacceptable risks to life, property, or natural resources outside the WSA.

Fuel treatments include thinning or removing vegetation, either mechanically or chemically, in advance of, or as a replacement for, wildland fire (either wildfire or prescribed fire). The goal of fuel treatment is to make conditions possible for natural wildfire to return to the WSA. In some

instances, fuel treatment may be necessary to protect site-specific resources in advance of a prescribed fire to prevent the loss of those resources. This necessity must be clearly demonstrated in the prescribed fire plan. Pre-fire treatment used to replace either type of wildland fire...is only allowed in WSAs where it meets the non-impairment standard or one of the exceptions. Due to their controversial nature and the complexities of analyzing the effects of these treatments on the non-impairment criteria, more extensive National Environmental Policy Act (NEPA) analysis (e.g., an Environmental Impact Statement) including public involvement may be required when fuel treatments are proposed for use as a replacement for wildland fire. The policy in 1.6.D.8.b.iii [vegetation restoration] must be satisfied. Fuel treatments *may* be permitted under the restoration or public safety exceptions to the non-impairment standard when:

- A. prescribed fire in the WSA will inevitably cause unacceptable risks to life, property, or natural resources outside the WSA; or
- B. natural successional processes have been disrupted by past human activity to the extent that intervention is necessary in order to return the ecosystem to a condition where natural process can function; or
- C. non-native species have altered the fire regime so that wildland fires pose an undue risk to the native ecosystem.

Conclusive documentation of A, B, or C, above, must be included in the NEPA analysis of the proposed action. When fuel treatment is allowed, the BLM must strive to achieve the desired conditions through the least impacting method. Fuel treatments should not be authorized in a WSA if the same objectives can be accomplished by the BLM through fuel treatments on public lands outside of the WSA.

Appendix R. Travel and Transportation Management

The Bureau of Land Management's (BLM) present transportation network has been largely created from past resource uses and public access patterns. In order to effectively manage for a complete and comprehensive transportation network throughout the BLM-administered public lands within the Buffalo Field Office (BFO), the BLM must assess present and future access needs; evaluate existing trails, primitive roads, and roads; and determine an appropriate travel and transportation system.

As required by Executive Order (EO) 11644 (as amended by EO 11989) and regulation (43 Code of Federal Regulations [CFR] 8340), and in conformance with the BLM Washington Office Instruction Memorandum (IM) No. 2008-014 (BLM 2007e) and Manual 1626 - Travel and Transportation Management (BLM 2011a), BLM-administered lands within the BFO are identified as "Limited to Designated Roads and Trails," "Closed," or "Open" (Map 65). Those areas that are designated "Limited" may have seasonal restrictions or travel limitations to designated roads and vehicle routes. A travel management plan designating roads Open for motorized and nonmotorized use throughout the BFO will be completed for each Travel Management Area (TMA). A conscientious effort, subject to financial and resource availability, will be made to complete these plans within five years of the signing of the Resource Management Plan (RMP) Record of Decision (ROD). TMA planning will be accomplished through a community-based process by involving cooperating agencies, community groups, and special interest groups. Modifications to the transportation network (new routes, reroutes, or closures) in "Limited" areas may be made through activity level planning or with site-specific National Environmental Policy Act (NEPA) analysis. Modifications to off-highway vehicle (OHV) designations (Open, Closed, or Limited) require an RMP amendment.

Developing a Travel and Transportation Management Network

During the development of a travel management plan, the BLM will seek to balance access needs of motorized and nonmotorized users while sustaining the natural and cultural resources. Through site-specific planning, roads and trails will be inventoried, mapped, and analyzed as necessary to evaluate and designate the roads and trails as "Open," "Seasonally Open," or "Closed" to various types of use (foot, equestrian, bicycle, motorized, and others). Site-specific planning includes identifying opportunities for trail construction or improvement of specific areas where intensive use may be appropriate. Intensive use areas may be identified with use restricted to designated trails under the Limited designation.

Off-Highway Vehicle Designations

Specific criteria for "Open," "Limited," and "Closed" OHV designations are provided in definitions outlined in 43 CFR 8340.0-5 (f), (g), and (h) and 43 CFR 8342.1, Designation Criteria. Generally, the BLM will designate Limited areas where use is limited to identified existing roads and trails (Limited to existing) or emphasize the designation of travel networks (Limited to designated). The following further clarifies these designations:

- **Open:** Areas designated as Open are intended for intensive OHV or other transportation use areas where all types of vehicle use is permitted at all times, anywhere in the area subject to the operating regulations and vehicle standards set forth in 43 CFR 8341 and 8342.
- **Closed:** Areas where OHV use is prohibited. Areas, roads, and/or trails are designated Closed if closure to all OHV use is necessary to protect resources, promote visitor safety, or reduce user conflicts. Administrative use of motor vehicles may be allowed within these areas.
- **Limited:** Areas where transportation use must be restricted to meet specific objectives. For areas classified as Limited, the BLM must consider a full range of possibilities, including travel that will be limited to types or modes of travel; limited to identified roads and trails; limited to time or season of use; limited to certain types of vehicles (i.e., OHVs, motorcycles, all-terrain vehicles, high clearance, etc.); limited to authorized or permitted vehicles or users; limited to BLM administrative use only; or other types of limitations. In addition, the BLM must provide specific guidance about the process for managing motorized vehicle access for authorized, permitted, or otherwise approved vehicles for those specific categories of motorized vehicle uses that are exempt from a Limited OHV designation.

Travel and Transportation Planning Process

Motorized travel in areas to be managed as designated roads and trails will be limited to existing roads, primitive roads, and trails prior to the formal designation of routes. In areas where the travel network has been inventoried and travel routes have been defined, only designated routes will be open for travel prior to the completion of a new travel management plan. Areas currently limited to designated routes include Burnt Hollow, Middle Fork, Welch Ranch and Weston Hills Management Areas.

Travel Management Area Delineation

TMAAs will be delineated for the entire field office. TMAAs will often consist of other designated management areas (i.e., Special Recreation Management Areas [SRMAAs], Wildlife Management Areas, etc.). Topography, land tenure and ecosystem types will also assist in delineation of TMAAs. Initial TMAAs include individual SRMAAs, Wilderness Study Areas (WSAAs), and the Powder River Basin. Modifications to TMAAs will occur through interdisciplinary team review prior to beginning subsequent NEPA documentation for travel planning.

For areas managed as “Limited to designated roads and trails” (Map 65), a travel management plan will be developed that defines designated motorized and nonmotorized transportation networks. These travel management plans will be developed to address site-specific, geographical areas identified as TMAAs. The TMAAs will be prioritized in response to current issues such as current OHV use, areas with sensitive resources, areas with special or specific designations (i.e., Areas of Critical Environmental Concern, SRMAAs, Wildlife Habitat Management Areas, etc.), public health and safety, use and user conflicts, and resource protection.

Travel and Transportation Management (TTM) planning guidance (H-1601-Land Use Planning Handbook) (BLM 2005b), Appendix C; Manual 1626 - Travel and Transportation Management (BLM 2011a) requires a completed travel and transportation network upon completion of the Land Use plan to the extent possible. If this is not possible, a preliminary network must be identified and a process established to select a final travel management network. Determination of the final travel and transportation network for the BFO has been deferred until the completion of

the Buffalo RMP because of the complexity of the road network and land tenure pattern, and the need to verify the roads and trails inventory for the planning area.

In general, TTM for designated roads and trails includes the following:

- During the planning process, teams made up of BLM, cooperating agencies, and members of the public will be used to ensure resource concerns and OHV user needs are properly addressed. Maps will be available to the teams that include all known roads to aid identification of roads and vehicle routes to be considered for designation as Open to OHV use.
- From inventory data, complete a map of the TMA, and identify the baseline of roads, primitive roads, and trails. The BFO travel network is only partially inventoried. Map 60 illustrates the preliminary transportation network for the BFO. Aerial photos and satellite imagery will be used to establish which routes existed at the time of the ROD. The final travel and transportation network will not be designated until the inventory is completed.

The following steps outline the process in completing a travel and transportation inventory:

1. Acquire funding to be used to inventory data in each TMA for those areas known to have an incomplete route inventory.
2. Analyze aerial photos, satellite imagery and Geographic Information Systems data to collect route data.
3. Data collected from aerial photos and satellite imagery will be ground truthed.
4. Existing routes will be assigned a definition, interim route category, and interim maintenance level and a map will be prepared for each TMA. (Note: Final designations will not take place until the completion of the travel management plan.)

A travel management plan will be prepared for each TMA using an interdisciplinary approach. Goals and objectives will be defined for each TMA. Each travel management plan will include a clear and concise purpose and need statement and alternatives for the designated road network will be prepared.

Route Designation Criteria

The following factors are considered when developing route designations:

- Are resource conflicts present?
- Are critical resources such as Threatened and Endangered or WSAs present?
- Are high-priority resources such as crucial wildlife habitat, cultural or paleontological sites present?
- What are management objectives for the area?
- What are the travel and transportation needs in the area?
- Is there evidence of OHV- related problems?
- Are needs and desires of public land users being met?
- Is visitor use high or low?
- How would OHV proposals affect activity and experience opportunities in the area?
- What benefits or outcomes would accrue from various options?
- Are other issues or problems present (noxious weeds, etc.)?
- Are sufficient data sources available to support the decision?
- Are budget and manpower resources sufficient to implement this designation?

All route designations shall be based on protecting public land resources, the promotion of user safety, and the minimization of conflicts amongst the various public land uses; and in accordance with the following criteria:

- Routes shall be located to minimize damage to soil, watershed, vegetation, air, cultural or other public land resources, and to prevent impairment of wilderness suitability in relevant areas.
- Routes shall be located to minimize harassment of wildlife or major disruption of wildlife habitats. Special attention will be given to protect Threatened or Endangered species and their habitats.
- Routes shall be located to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account visibility, noise and other factors.
- Motorized areas and routes shall not be located in officially designated wilderness areas or primitive areas. Motorized areas and routes shall be located in natural areas only if the authorized officer determines that off-road vehicle use in such locations will not adversely affect their natural, aesthetic, scenic, or other values for which such areas are established.

A subsequent NEPA document will be developed with an array of alternatives that will identify the travel routes open for motorized use. The document must address all modes of transportation and primary use for the TMA. Additionally, the plan should identify maintenance intensities and legal access needs and indicate changes in the status of existing routes and areas. The plan will also address necessary improvements, trailheads, staging areas and signs, where applicable.

The public will be notified of the objective of the proposed travel management plan and of scoping meetings through local media, as appropriate, to reach the potentially affected user groups. Resource Advisory Councils, local government, state and federal agencies, gateway communities, and local organizations, as applicable, will be invited. Maps of the planning area will be prepared and available to facilitate discussion in identifying public issues, concerns, and access needs.

Substantive public comments will be incorporated into the travel management plan, the NEPA document will be completed and the signed Finding Of No Signification Impact and Decision Record made available for public review. Completion of the travel management plan for a TMA will establish a transportation network for a particular TMA through the identification of roads, primitive roads, and trails as “Open,” “Limited,” or “Closed” for a particular use.

The travel management plan will be implemented on the ground which will include corresponding public information, education, and signing efforts. Please refer to the TTM Implementation section for further information.

Upon completion of the travel management plan and subsequent NEPA document, the final travel and transportation network will be published in the Federal Register notice, where required.

Definitions, route categories, and maintenance levels of all of the designated routes will be entered into the Facility Asset Management System (FAMS).

A map will be produced and made available to the public depicting the designated roads, primitive roads, trails and permitted uses.

As per 43 CFR 8342.3, the BLM will monitor effects of the off-road vehicle use within TMAs. The BLM may amend, revise, or revoke designated routes, or take other actions to address any issues identified through monitoring. Additionally, where off-road vehicles are causing or will

cause considerable adverse effects upon soil, vegetation, wildlife, wildlife habitat, cultural resources, historical resources, threatened or endangered species, wilderness suitability, other authorized uses, or other resources, the affected areas shall be immediately closed to the type(s) of vehicle causing the adverse effect until the adverse effects are eliminated and measures implemented to prevent recurrence (43 CFR 8341.2).

Provisions for route decommission and rehabilitation of closed or illegal routes include the following:

- OHV use is causing, or will cause, considerable adverse effects.
- A road or vehicle route poses a threat to public safety.
- Road density is adversely affecting resources.
- Closure is necessary for desired future conditions for access.
- Closure is necessary for visual resource protection.
- Closure is necessary for sensitive habitat management.

Travel and Transportation Management Implementation

The BLM uses several means to implement travel management designations. A major component of travel management is a series of well-designed maps and/or brochures that clearly portray TMA designations. Another component is the BLM sign program. Signing in the field must be sufficient to ensure that the public understands the regulations for any given area. Law enforcement and public education provide further assistance in implementation. The final step in the process is monitoring and evaluation, which may lead to adaptive management.

1. OHV Signs

- Signs are designed to notify the public of travel management designations in the field. They should be simple to understand, inexpensive, durable, and easy to install and replace.
- Signs will be standardized. OHV signs must be standardized within the BLM, especially among neighboring field offices. The message on the sign may vary according to the nature of the individual OHV designation but the size, type of substrate, layout and design should be the same. Efforts will be made to use alternative materials deemed as effective as being “vandal-proof,” or made of environmentally-friendly products.
- Signs will indicate places where access roads leave public roads and enter TMAs, where appropriate. Due to the land tenure patterns within the planning area, signs may not be available at all access points. Portal signs will explain the travel management designation for the TMA.
- For areas designated as “Limited to Designated Roads,” all designated roads may be identified with numbers on travel management maps, consistent with statewide road & trail signing efforts. Every effort will be made to number routes with on-the-ground signs, but land tenure and the scope of the planning area may prevent the numbering of all routes.
- Until travel management plans are completed, areas designated as “Limited to Designated Roads” will be managed as “Limited to Existing Roads.” In such areas, only portal signs are necessary. Individual roads and vehicle routes need not be signed.
- For road closures and closed areas, documentation stating the rationale for the closure must be made available to the public.

2. Maps and Brochures

Maps will provide detailed information to the public regarding travel management designations. A site-specific map will be published for each TMA following completion of the travel management

plan. travel management plan decisions may eventually be reflected on 1:100,000-scale Surface Management Status maps. However, given the scope of the Surface Management Status maps and the cost and timeframe for updating such maps, the public must not rely on 1:100,000-scale maps for travel management plan decisions. Brochures for specific areas may also be published.

3. Education

Educational programs will be included in travel management implementation planning. The BFO will initiate programs for the public that emphasize responsible OHV-use, respect for the land, resources, and private property rights. Information about regulations, penalties, consequences for irresponsible behavior, and potential impacts to resources from inappropriate use will be incorporated into the outreach program.

4. Enforcement

Law Enforcement is essential for successful OHV implementation and management. All federal and state laws that apply to motor vehicle use (including the Wyoming Off-Road Recreational Vehicles Act) are subject to enforcement. The BLM may also enter into cooperative law enforcement agreements with other federal, state and local agencies.

When OHV designations (which may include closures or restrictions) are developed through RMPs, publication of the Federal Register Notice for ROD, is required and is sufficient for legal enforcement. When the BLM issues an order that closes or restricts the use of public lands, adequate public notification is required. For those orders to be legally enforceable and upheld in court the requirements found in 43 CFR Subpart 8364, Closures and Restrictions, must be followed.

5. Monitoring and Evaluation

Monitoring is an integral component of OHV management (BLM 2012a). The BLM will monitor the effectiveness and appropriateness of the OHV designations.

Items to monitor include, but are not limited to the following:

- Resource damage resulting from OHV use
- Unauthorized route development
- Effects of OHV use on wildlife
- Effects of OHV use on other recreation or resource uses
- OHV user conflicts and complaints
- Trends in the number of OHV violations and incident reports
- OHV associated private land conflicts
- Identification of maintenance needs
- Fence and barrier conditions

Other Travel and Transportation Management Elements

Authorized and Permitted Uses

Use of OHVs may be administratively authorized or permitted for non-casual activities, such as accessing range improvements, exploration for energy or minerals, and access to inholdings. Temporary excursions leaving existing vehicular routes are permitted only to accomplish necessary tasks. Necessary tasks are actions that support commercial or industrial uses of public

lands which need to be accomplished by a person or organization seeking or holding authorization from the BLM to build, maintain, or place infrastructure necessary to achieve planning goals and objectives, or exercise valid existing rights.

Necessary tasks that support commercial or industrial uses of public lands may be allowed under permit in areas managed under limited designations (motorized use limited to designated roads and trails), and should not be authorized in areas closed to motorized use, such as WSAs or in areas with seasonal limitations unless exercising valid existing rights.

Authorizations or permits that include OHV activities will address the use of OHVs as part of the authorization or permit. Authorized OHV activities require an appropriate level of NEPA environmental analysis, should be compatible with the land use plan goals, and may have use stipulations associated with the authorization or permit. Relevant NEPA documents should analyze whether any new roads would remain open to the public, open solely for administrative access, or reclaimed following completion of the original proposed action. Mitigation measures pertaining to motor vehicle use or the necessary task exemption will be included in the terms and conditions, conditions of approval, and/or stipulations.

Sometimes necessary tasks are and will be accomplished without formal written approval or in advance of receiving an authorization in accordance with Onshore Order 1. Another example is mineral activities defined as casual use (except in areas designated as Closed to OHV use) by 43 CFR 3809 – Surface Management Regulations. Cross-country or off-road vehicle travel in these cases is authorized so long as resource damage does not occur. In these cases actions proposed by the proponent leads to the issuance of a permit or authorization and may be authorized after initial contact with the field office.

It is recognized that in many cases cross-country or off-road motorized vehicle use is the most efficient tool for operators and industry to achieve BLM objectives and requirements. Livestock herding, scientific studies, habitat treatments, etc. all are examples of actions that may require cross-country or off-road motorized vehicle travel. The BLM may grant administrative use authorizations on a case-by-case basis with written approval from the authorized officer or as part of the permitted use.

Authorizations will be conditional upon consistency with Land Use and Activity level planning decisions and other BLM objectives. The project proponent is encouraged to be as detailed as possible in the application for authorization. The BLM will consider an application complete when the information provided is sufficient to facilitate impact analysis, enforcement, monitoring, and evaluation. Project proponents are encouraged to submit the waiver request in tandem with other applications, renewals, or proposals, but the agency will accept the applications at all times. Waiver applications may not be accepted for individuals that are being actively investigated for violation of an OHV rule. Waivers and authorizations may not be granted to individuals who have been convicted of an OHV violation. Additionally, individuals conducting off-road travel under an authorization must carry a copy of the authorization and any relevant stipulations and conditions.

Limited cross-country vehicle travel is allowed for the purpose of maintaining existing range improvements or animal husbandry efforts if established access routes do not exist, so long as resource damage does not occur. Travel on wet or muddy soils should be avoided to prevent rutting and erosion. In these cases the project proponent is expected to submit a request for exemption from travel management regulations.

Recreational Use to Accommodate Necessary Tasks

In areas with Limited travel designations, the public is allowed to pursue certain recreational activities up to 300 feet from designated roads and trails as long as such activity does not cause resource damage, create new roads or extend existing roads. Valid reasons for pursuing recreational activities include direct access for big game carcass retrieval or to dispersed campsites. Additionally, parking alongside a route to remove the vehicle from the traffic lane is considered a necessary task. Any motorized travel outside of these parameters or that causes resource damage is a violation of the RMP decisions and is subject to enforcement action including citation and fine.

Off-Highway Vehicle Access for Persons with Disabilities

Section 504 of the Rehabilitation Act (Public Law 93-112 as amended) requires federal land managing agencies to provide reasonable opportunities for access for persons with disabilities. Accordingly, during hunting seasons, individuals possessing a valid Wyoming Game & Fish Department "Permit for Hunters with Qualifying Disabilities" will be allowed to use an OHV to retrieve big game carcasses in areas designated as "Limited to designated" routes beyond the 300 foot travel zone without any additional authorization, provided that resource damage or the creation of new roads does not occur. *Note: Personal mobility devices (such as wheelchairs, mobility scooters, etc.) utilized for medical purposes are exempt from travel management restrictions.*

In addition, Field Managers will consider requests by persons with disabilities for authorization for cross-country travel for the purposes of gaining access to the public lands for recreational purposes. These requests will be considered on case-by-case basis. Decisions will be based on a combination of factors including need, other available opportunities, resource management considerations, and the assurance that the activity can be carried out without causing resource damage. If OHV use authorizations are granted, the above criteria will be included in the written authorization.

BLM Administrative Use

Off-road travel by BLM employees conducting official business is allowed only for necessary tasks and only if such travel does not cause resource damage or create unauthorized or unplanned roads and trails. Such travel by BLM employees must meet the same standard required of permit holders who are performing necessary tasks in conjunction with their permit or authorization. Administrative use of motor vehicles may be allowed within closed areas outside of WSAs, however, written approval from the authorizing officer must be obtained prior to off-road use in closed areas unless an emergency situation exists. Additionally, emergency operations such as firefighting will use existing roads whenever feasible.

Over-Snow Travel

Over-snow travel is restricted in closed areas and during relevant seasonal closures. However, the BLM recognizes that snowmobiles may not cause resource damage when operated off-route in an appropriate manner. Historically there have been few places within the planning area that receive sufficient snow cover (4 inches - 6 inches) for the safe and sustainable operation of snowmobiles. However, should snow cover be sufficient to prevent resource damage, snowmobiles may operate off of designated routes in areas "Limited to designated routes," provided that no seasonal restrictions or temporary closures exist and resource damage does not occur.

Temporary Closures and Restrictions

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The purpose of a temporary closure and restriction is to protect public health and safety, or prevent undue or unnecessary resource degradation due to unforeseen circumstances. Where OHVs are causing or will cause considerable adverse effects upon soil, vegetation, wildlife, wildlife habitat, cultural resources, historical resources, Threatened or Endangered species, wilderness suitability, other authorized uses, or other resources, the affected areas shall be immediately closed to the type(s) of vehicle causing the adverse effect until the adverse effects are eliminated and measures implemented to prevent recurrence.

Wilderness Study Areas

OHV designations for lands in WSAs must conform to Manual 6330 - Management of Wilderness Study Areas (BLM 2012c). Cross-country travel by motor vehicle is strictly prohibited in WSAs. Signs, maps, publications, outreach and enforcement will be used to inform the public aware of motorized restrictions. Exceptions will be allowed in accordance with Manual 6330 (BLM 2012c). The 300 foot travel exception which applies to the "Limited" category does not apply in WSAs as these areas are closed entirely to motorized use. In addition, the exemption for retrieving harvested big and trophy game animals within 300 feet of an existing road or trail is not allowed in WSAs, nor is any exemption for cross-country travel for hunters with qualifying disabilities.

Known existing routes within WSAs were documented and mapped during the original wilderness inventory process (BLM 1979) and updated during this RMP revision. This route inventory data is the baseline for the travel and transportation network for the following WSAs: Fortification Creek, Gardner Mountain, and North Fork.

In WSAs, motorized and mechanized use may be permitted to continue along existing routes identified in the wilderness inventory conducted in support of Sections 603 and 202 of FLPMA. None of the WSAs within the planning area contain documented ways in the original inventory that meet exception criteria for motorized travel. Therefore, no motorized use is allowed in WSAs except as defined for valid and existing rights in Manual 6330 (BLM 2012c).

Resource Damage

While generally defined (see glossary) the determination of whether resource damage has occurred is left to the discretion of Field Managers and law enforcement personnel. Project proponents are encouraged to contact their local field offices prior to using any vehicle off of established routes, so as to ensure that they will not cause resource damage. In addition project proponents must notify the BLM in writing when and where off-road travel has occurred prior to an authorization. This may be done at the application phase, but must occur prior to final authorization.

Revised Statute 2477 Assertions

A travel management plan is not intended to provide evidence bearing on or addressing the validity of any Revised Statute 2477 assertions. Revised Statute 2477 rights are adjudicated through a separate, judicial and administrative process that is entirely independent of the BLM's planning process. Consequently, travel management planning should not take into consideration Revised Statute 2477 assertions or evidence. Travel management planning should be founded on an independently determined purpose and need that is based on resource uses and associated access to public lands and waters. At such time as a decision is made on Revised Statute 2477 assertions, the BLM will adjust its travel routes accordingly.

Route Definitions, Route Management Categories, Maintenance Levels

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Other Travel and Transportation Management Elements*

Road maintenance, construction, and any other related TTM is mandated by BLM Manual 9113 (BLM 1985b). BLM Manual 9113 (BLM 1985b) provides for “best management practices” to be used in evaluating, maintaining, and constructing BLM travel and transportation routes. As guided in Manual 9113 (BLM 1985b), “Bureau roads must be designed to an appropriate standard no higher than necessary to accommodate their intended functions adequately (timber hauling administrative access, public travel); and design, construction, and maintenance activities must be consistent with national policies for safety, esthetics, protection and preservation of cultural, historic, and scenic values, and accessibility for the physically handicapped.”

Route Definitions

IM 2006-173 (BLM 2006d), “Implementation of the Roads and Trails Terminology Report,” dated June 16, 2006, established BLM definitions for road, primitive road (which was added as a new transportation asset category), and trail, and required transportation assets to be classified as such. As part of this BLM-wide classification process, existing FAMS transportation assets were reviewed and reclassified to accurately reflect the new definitions.

- **Road:** A linear route declared a road by the owner, managed for use by low clearance vehicles having four or more wheels, and maintained for regular and continuous use.
- **Primitive Road:** A linear route managed for use by four-wheel drive or high-clearance vehicles. Primitive roads do not normally meet any BLM road design standards.
- **Trail:** A linear route managed for human-powered, stock, or OHV forms of transportation or for historical or heritage values. Trails are not generally managed for use by four-wheel drive or high clearance vehicles.

Primitive roads shall not be designated within a WSA or within lands that have been identified as having wilderness characteristics for which a land use plan has determined that wilderness characteristics are to be protected. Any linear feature located within areas that have been identified as WSAs and/or those lands outside of WSAs with wilderness characteristics will be identified in a transportation inventory as a "route." Except for nonmotorized and nonmechanized trails, these routes will not be classified as a transportation asset and will not be entered into FAMS unless one of the following conditions is met:

- Congress designates the area as Wilderness (then nonmotorized and nonmechanized trails only), or
- RMP decision is made to not protect the area for wilderness characteristics, or
- Congress releases the area from Wilderness consideration.

Route Management Categories

Route Management Categories describe the primary purposes and uses for the routes. Many routes fall under more than one management category. Much use by private landowners, grazing permittees, and the public occurs on Collector Roads and is provided under casual use; therefore, a formal use authorization is not required. Maintenance levels outline the degree of maintenance to be performed, dependent on funding levels. Maintenance of routes with limited or no public access may be the responsibility of the landowner.

Private landowner maintenance of routes on BLM-administered land will be supervised by the BLM. Route maintenance is generally prioritized, based on safety concerns and degree of use. Inadequate funding may preclude the BLM from maintaining routes at levels assigned in this travel management plan. Route Management Categories and Maintenance Levels are monitored and may be modified as needs and conditions change.

Items A through C of this list conform to BLM guidelines included in the Pocket Field Guide: Road Standards, Excerpts from BLM Manual Section 9113. The types of roads that exist on the public lands are as follows:

- **Collector Road:** These roads normally provide primary access to large blocks of public land, and connect with or are extensions of a public road system. Collector roads accommodate mixed traffic and serve many uses. They are generally capable of handling high traffic volumes. Collector roads usually require application of the highest engineering standards used by the BLM. Collector roads receive routine maintenance.
- **Local Roads:** These BLM roads normally serve a smaller area than collectors, and connect to collectors or the public road system. Local roads receive lower volumes of traffic, carry fewer traffic types, and generally serve fewer users. Low volume local roads in mountainous terrain, where speeds are reduced, may be single lane roads with turnouts, and may be maintained to a lower standard than collector roads.
- **Resource Roads:** These are normally spur roads that provide point access and may connect to local or collector roads. They carry low traffic volumes and accommodate few uses.

Maintenance Levels

Route management categories and route maintenance levels on roads, primitive roads, and trails designated Open to motorized or nonmotorized use within the BFO will be stored in a FAMS database. Guidance directs the BLM that upon approval of the RMP ROD, designated travel routes must be entered into FAMS. The FAMS data will serve as the current information on the BLM's transportation system. There are five maintenance levels assigned to a travel route ranging from low maintenance priority to high priority. The following further details the maintenance levels:

- **Level 1:** This level is assigned to roads where maintenance is limited to protecting adjacent land and resource values. These roads are no longer needed and are closed to traffic. The objective is to remove these roads from the transportation system. At a minimum, drainage and runoff patterns will be maintained as needed to protect adjacent land. Grading, brushing, or slide removal will not be performed unless roadbed drainage is being adversely affected or is causing erosion. Closure and traffic restrictive devices will be maintained.
- **Level 2:** This level is assigned to roads open seasonally or year-round and uses may include commercial, recreation, private property access, and administration purposes. Typically, these roads are passable by high clearance vehicles and are maintained, as needed, depending on funding levels. Seasonal closures or other restrictions may be needed to meet resource objectives or because of snow levels or other weather conditions. At a minimum, drainage structures will be inspected within a 3-year period and maintained as needed. Grading will be conducted as necessary to correct drainage problems. Brushing will be conducted as needed and slides may be left in place provided they do not adversely affect drainage.
- **Level 3:** This level is assigned to roads open seasonally or year-round and uses may include commercial, recreation, private property access, and administrative purposes. Typically, these roads are natural or have an aggregate surface, but may include bituminous surface roads. These roads have a defined cross section with drainage structures such as rolling dips, culverts or ditches and may normally be negotiated by passenger cars driven cautiously. User comfort and convenience are not considered a high priority. At a minimum, drainage structures will be inspected annually and maintained as needed. Grading will be conducted to provide a reasonable level of riding comfort at prudent speeds for the road conditions. Brushing will be conducted as needed to improve sight distance. Slides adversely affecting drainage will receive high priority for removal and other slides will be removed on a scheduled basis.

- **Level 4:** This level is assigned to roads open seasonally or year-round. Uses include commercial, recreation, private property access, and administrative purposes. Typically, these roads are single or double lane and have an aggregate or bituminous surface. This maintenance level provides access for passenger cars driven at prudent speeds. At a minimum, the entire roadway will be maintained at least annually, although a preventive maintenance program may be established. Major problems will be repaired as discovered.
- **Level 5:** This level is assigned to roads open seasonally or year-round that carry the highest traffic volume of the transportation system. Uses include commercial, recreation, private property access, and administrative purposes. Typically, these roads are single or double lane and have an aggregate or bituminous surface. This maintenance level provides access for passenger cars traveling at prudent speeds. The entire roadway will be maintained at least annually and a preventive maintenance program will be established. Problems will be repaired as discovered.

Routes (ways) within WSAs are not maintained other than by the passage of vehicles, with certain exceptions. Exceptions are limited to the minimum mechanical maintenance necessary under Manual 6330 (BLM 2012c).

Appendix S. Areas of Critical Environmental Concern

S.1. Proposed Areas of Critical Environmental Concern Designated by Alternative D

S.1.1. Pumpkin Buttes

SUPPORTING INFORMATION

The boundary of Pumpkin Buttes Areas of Critical Environmental Concern (ACEC) includes all portions of the Pumpkin Buttes Traditional Cultural Property that are Bureau of Land Management (BLM)-administered surface (1,731 acres). The Pumpkin Buttes are approximately 45 miles southwest of Gillette, rising approximately 800 feet above the surrounding landscape. The buttes consist of five flat topped mesas referred to as North Butte, North Middle Butte, South Middle Butte, South Butte and Indian Butte. The top of North Middle Butte is 6049 feet, which is the highest elevation in Campbell County. All of South Middle Butte and roughly one third of North Middle Butte are BLM-administered surface. The majority of the mineral estate under the buttes was reserved by the government. There is no public access to the BLM-administered surface on either butte, although, BLM purchased an administrative easement to South Middle Butte. South Middle Butte is currently used as a communication site and includes six transmission towers. There are several uranium claims on and near the buttes, with one proposed uranium mining operation on BLM-administered surface on North Middle Butte. Nearly all the fluid minerals under the buttes are currently leased. There is extensive coalbed natural gas development around the buttes, and an existing oil field within three miles. A proposed 200 turbine wind-energy development is located on fee surface within two miles of the east side of the buttes.

Recent consultations with several Native American tribes revealed that the buttes have been used for many types of traditional, religious and ceremonial purposes. Numerous past indications of traditional and religious uses (stone circles, eagle traps, cairns, etc.) remain on most of the buttes. Numerous lithic scatters and prehistoric camps are recorded on and near the buttes, indicating occupational use dating back to at least 10,000 years. There are stone circle sites on top of and around the base of the buttes. Although most archeologists interpret stone circles to be the remains of tepee locations, many tribes indicate that they represent ceremonial use and are more accurately interpreted as effigies. Numerous cairns have also been recorded on and around the buttes. Tribes have indicated to the BLM that cairns can mark the location of ceremonial areas such as fasting locations or may represent burials. The buttes contain many eroded cliff faces with deep crevasses, which were often utilized as burial locations. One eagle trap location is documented on top of one of the buttes. The tribes indicated to BLM that eagle traps are significant religious and cultural sites. In 2007 the BLM determined in consultation with fifteen tribes that the Pumpkin Buttes in their entirety is a traditional cultural property and that the area has an ongoing connection to traditional beliefs and practices of several Native American tribes. During the consultation process, some tribes expressed an interest in using the buttes for ceremonial or educational purposes.

The Pumpkin Buttes are also a prominent landmark associated with several historic events. All of the explorers of the Powder River Basin in the early and mid 19th century mention the buttes in their journals. The name "Pumpkin Buttes" was credited to the unique geographic features by Jim Bridger in the 1850s. They are also often mentioned as a landmark in several emigrant diaries from travelers on the Bozeman Trail in the 1860s. The buttes had a secondary role in the Red Cloud War and Great Sioux War, documented as a lookout for the U.S. Army and Native American tribes.

There are active golden eagle and prairie falcon nests on top of the buttes. Wildlife common to the area include mule deer, pronghorn, Greater Sage-Grouse, coyote, bobcat, raptors and numerous song birds. Bald eagles frequent the buttes in the winter. There are no Threatened or Endangered species on the buttes. Sensitive species in the area that may occur include: Greater Sage-Grouse, loggerhead shrike, Brewer's sparrow, sage sparrow.

The site meets the relevance criteria since it contains several a rare and sensitive archeological resources, and is a significant religious and cultural resource important to several Native American tribes. The site meets the importance criteria since it retains has qualities which give it special worth and distinctiveness. The area also has qualities that make it fragile, sensitive, irreplaceable and vulnerable to adverse change. The area also meets the importance criteria because it warrants protection in order to carry out the mandates of Federal Land Policy and Management Act.

Appendix S Areas of Critical Environmental Concern

Current and proposed management is insufficient to protect the relevance and importance criteria. In compliance with the National Historic Preservation Act, any impacts to the site as a result of a federal undertaking must be considered and adverse effects must either be avoided or mitigated. If Alternative D (specifically Cultural 005, 006, 007) is selected, the creation of a Cultural Resource Project Plan, surface disturbance restrictions, and application of no surface occupancy (NSO) and controlled surface use stipulations to fluid minerals leases will result in a degree of protection for the area. The existence of fluid mineral leases under the majority of the area, numerous uranium claims and proposed mining operations, nearby wind-energy development and the existence of multiple communications towers on the buttes creates a difficult management condition in which it is exceedingly difficult to effectively balance resource concerns. Additionally, there are intangible significant aspects of the area, such as cultural and religious significance to the tribes that standard surface occupancy management decisions cannot adequately address. Since the area may be an important part of several tribes' ongoing cultural identity, special management is necessitated. Federal agencies are mandated by the American Indian Religious Freedom Act to provide access for tribes to sites with cultural significance on federal surface.

Development of existing minerals leases, locatable minerals development, wind-energy projects and the existence of communications towers on the Pumpkin Buttes directly conflict with the legal rights of Native American tribes to utilize the area for traditional cultural rights and practices. Because of these factors, the site should be designated as an ACEC.

ACEC OBJECTIVE(S) DECISIONS

Objective Statement: Management of the Pumpkin Buttes ACEC is consistent with Native American religious practices. The Pumpkin Buttes are preserved and protected as a nationally significant cultural resource.

MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS

Mineral Resources:

The area will be recommended for withdrawal from mineral entry and closed to disposal of mineral materials. An NSO on fluid leasable minerals will be applied to all lands within the ACEC.

Fire and Fuels Management:

Fire suppression activity should avoid the use of heavy equipment unless there is a direct and measurable risk to life or property.

Biological Resources:

Do not allow non-native plant species for initial reclamation activities.

Heritage and Visual Resources:

Establish tribal access and allow for traditional cultural rights and practices.

Develop a Cultural Resource Project Plan (CRPP) in cooperation with stakeholders.

Manage as Visual Resource Management Class II.

Land Resources:

ACEC will be managed as a rights-of-way exclusion area that is also closed to renewable energy development.

Travel is limited to designated routes.

New surface-disturbing activities will be prohibited in the ACEC.

Special Designations:

No other Special Designations exist within the proposed boundaries of the ACEC.

IMPLEMENTATION DECISIONS

Implementation Decisions: (e.g., The land use plan decision may be to designate motorized travel areas while the supporting implementation decisions would address specific route designations)

Marketing: The area will not be marketed for recreational use. There is no public access to the ACEC.

Monitoring:

Management: A management plan will be created for the ACEC which includes input from Native American tribes and all other stakeholders.

Administrative:

Travel Management: The area will be managed as Limited to designated routes. Designated routes will be primarily for provision of access to communication sites and for administrative use.

Special Recreation Permits: Commercial guiding will not be allowed.

Agreements:

Partners:

Other administration:

S.1.2. Welch Ranch

SUPPORTING INFORMATION
<p>The Welch Management Area is a 1,748-acre parcel, located approximately 10 miles north of Sheridan, Wyoming. The Welch area is accessible from Sheridan via Wyoming State Highway 338 (Decker Road). Two developed parking areas exist at the junction of Highway 338 and the Tongue River with directional signs identifying the area. Several unimproved primitive roads totaling 6.1 miles facilitate administrative use and livestock operations on the property both from Highway 338 and from the Ash Creek Road located just north of the property.</p>
<p>The Welch Ranch was acquired in 2004 as part of a land exchange (BLM 2005f). As a new acquisition, the Bureau of Land Management (BLM) must evaluate the area as a potential Area of Critical Environmental Concern (ACEC). The Welch area is located in the Powder River Basin, a part of the Northern Great Plains, which includes most of northeastern Wyoming and a portion of southeastern Montana. The Welch property occupies a portion of the Tongue River valley floor and the adjacent dissected uplands between Ash Creek and Hidden Water Creek. At least two homesteads were present on the property, including the Tryor homestead and the Evans homestead, which included a post office. There is also evidence of prehistoric use, including lithic scatters and quarries. Approximately 1.5 miles of the Tongue River runs through the Welch Ranch. A coal seam fire exists on a ridge in the southwestern corner of the parcel. The Big Horn Mountains are visible from the majority of the Welch Ranch.</p>
<p>The coal fire origin is not certain, but historical records indicate that it began or reached the Welch Ranch boundary between 1911 and 1940, and is related to an abandoned coal mine fire at the Acme mine. While the origin is unclear, the fire is now considered to be part of the natural process. The Office of Surface Mining has expressed concerns regarding human health and safety in relation to the coal fire and has suggested that special management may be necessary to prevent unsafe exposure to this hazard. The coal fire on the north side of the river is an important resource because it represents a potential threat to health and safety, influences plant and animal distribution and form, and represents historical mining operations (BLM 2003b). To date no known injuries have resulted from public interaction with the fire vents.</p>
<p>The riparian corridor is important for migratory birds and boasts excellent habitat for mule deer and other big game. The Tongue River is a free-flowing prairie river with easy public access from a major population center in Wyoming as well as a red ribbon fishery identified as having regional importance. The State of Wyoming's 305(b) Report for 2012 lists water-bodies with impairments to water quality in the Tongue River Basin for temperature, turbidity and fecal coliform (Wyoming DEQ 2012). Without special designation and management, there is a strong possibility that visitation will degrade the importance and relevance criteria. Increased public awareness of riparian health will assist in improving the habitat and subsequently increasing the species diversity and numbers of birds to the point that the area will be acknowledged as an Important Bird Area.</p>
<p>The Welch Ranch offers nonmotorized dispersed recreation including camping, mountain bicycling, freshwater fishing, hiking, small and big game hunting, upland bird hunting, picnicking, wildlife viewing, bird watching and float trips. Motorized use is prohibited within the management area. Prohibitions within the developed parking area include overnight camping, open fires and discharge or use of fireworks, firearms, or weapons.</p>
<p>The area meets the relevance criteria for significant scenic values, fish and wildlife resources, and presence of a natural hazard (coal fire). The Welch Ranch meets the importance criteria in that it has more than locally significant qualities which give it special worth and which warrant special management for safety or public welfare. Welch constitutes one of very few riparian areas managed by the BLM and one of the few areas in Sheridan County with public river access for fishing and boating. Prairie riparian habitats represent less than 1% of the planning area. The combination of the rarity of the habitat type, the accessibility of the location in close proximity to a population center, and the high recreational use underscore the need for special management at the Welch Ranch. The ACEC boundary in the proposed RMP encompasses 1,116 acres and include BLM-administered surface in T57N, R84W Sections 1, 2 and a portion of Section 3. This boundary includes the entirety of the riparian area and the coal seam fire. Special management attention is necessary to protect human health and safety and address documented issues within the river corridor and riparian area and an ACEC should be designated.</p>
ACEC OBJECTIVE(S) DECISIONS
<p><i>Objective Statement:</i> The Welch Ranch ACEC will be sustained or enhanced for nonmotorized and wildlife based recreational opportunities, preservation of outstanding scenic values and for the safety of visitors.</p>
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS

Physical Resources:

Prohibit surface disturbance resulting in impacts to physical resources (soil, water resources) unless those activities can be demonstrated to protect the relevance and importance criteria.

Mineral Resources:

The area will be recommended for withdrawal from mineral entry and closed to disposal of mineral materials. The area is closed to leasing of fluid minerals. Note: A portion of the fluid leasable minerals are not administered by the BLM.

Fire and Fuels Management:

Fire suppression activity should avoid the use of heavy equipment unless there is a direct and measurable risk to life or property.

Biological Resources:

Prohibit the use of non-native plant species for all reclamation activities.

Prohibit the introduction of desirable non-native wildlife species.

Heritage and Visual Resources:

Manage as Visual Resource Management Class II.

Land Resources:

This ACEC will be managed as a right-of-way (ROW) exclusion area that is also closed to renewable energy development. The burying of low voltage powerlines is preferred in ROW that have been authorized but not developed.

Travel is limited to administrative use on designated routes.

The area will be managed as a Special Recreation Management Area (Appendix T (p. 2543)).

Livestock grazing will be managed in concert with other resource values under a site-specific allotment management plan.

Special Designations:

No other Special Designations (WSA, WSR, BCB) exist within the proposed boundaries of the ACEC.

Socioeconomic Resources:

Mitigation of coalbed fires at Welch Ranch will be in concert with other resource values and should result in the least disruptive and surface disturbance possible.

IMPLEMENTATION DECISIONS

Implementation Decisions: (e.g., The land use plan decision may be to designate motorized travel areas while the supporting implementation decisions would address specific route designations)

Marketing: Provide maps and information at the field office. Directional signage present from Highway 339. Develop interpretive signs at trailhead/parking area on general location, history, geology, and wildlife resources. Provide stewardship information to help preserve the special landscape character. Make available for outreach programs such as Conservation and Outdoor Recreation Education, Take It Outside, International Migratory Bird Day, National Public Land Day, etc.

Monitoring: Vehicle counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows. Riparian and upland range monitoring began in 2010. A green-line based riparian monitoring regime will be used to document changes in the riparian system through time. Upland transects were also established in 2010 to monitor changes in native v. non-native grass cover as well as rangeland health and will be monitored on at least a biennial basis. Riparian bird surveys (4 times per year) began in 2009 and will continue on at least a biennial basis.

Management: Signs present at key access points. Additional signage may be necessary to apprise public of coal seam fire hazards. Develop trailheads for foot, horse and bicycle travel. Increase river corridor accessibility for boaters and anglers.

Administrative:

Travel Management: The area will be managed as Limited to designated routes, with very few routes designated. Designated routes will be primarily to provide egress for administrative use.

Special Recreation Permits: Allowed with general stipulations.

Agreements: Maintain cooperative agreements with Wyoming Department of Game and Fish and Wyoming Department of Environmental Quality.

Partners: University of Wyoming, Sheridan Community Land Trust, Sheridan Public Land User Committee, Wyoming State Land Board and Wyoming Department of Game and Fish.

Other administration: Closed to recreational target shooting. The parking lots and trailheads are closed to camping. Dispersed camping is otherwise allowed.

S.2. Proposed Areas of Environmental Concern not Designated by Alternative D

S.2.1. Burnt Hollow

Background:

Burnt Hollow encompasses about 17,280 acres of public land 20 miles north of Gillette, Wyoming. The land was acquired by the Bureau of Land Management (BLM) through a land exchange completed in 2002 (BLM 2005f). The area is composed of gently rolling sagebrush/grasslands, scoria buttes and clayey escarpments. There are numerous cottonwood ephemeral drainages, with juniper and ponderosa pine covered slopes. Several areas contain steep terrain and unstable soils.

The area meets relevance criteria for scenic value, and natural hazards due to steep erosive soils and flooding potential. Increased erosion could subsequently increase the potential for flooding at lower elevations. The area meets the importance criteria for local significant qualities (recreational access); warrants protection to satisfy national priority concerns; and public or management concerns about safety and property.

*Appendix S Areas of Critical Environmental Concern
Proposed Areas of Environmental Concern not
Designated by Alternative D*

May 2015

The varied topography and diversity of vegetation communities provide habitat for numerous wildlife species including trophy class mule deer (*Odocoileus hemionus*). A few of the ephemeral drainages support ecologically important cottonwood (*Populus* spp.) riparian communities. The lands are presently used for livestock grazing and wildlife habitat; mineral development is limited to a few abandoned drill holes.

Cultural resources are also present in the area. Twenty-three cultural properties have been recorded in the vicinity. These sites include: 12 lithic scatters, 10 campsites or occupations, and one historic road, now the roadbed of Highway 59, and the Texas Trail. One occupation site has been determined Eligible to the National Register of Historic Places; another is of unknown eligibility. Other prehistoric and historic era sites are known to exist within Burnt Hollow, but have not yet been recorded.

Most importantly, the area is one of the largest blocks of contiguous public land in Campbell County, and one of the few parcels that are not highly developed or heavily roaded. The area is easily accessible to Gillette, approximately 20 miles to the south on Wyoming Highway 59.

Justification:

The area meets the relevance criteria for significant scenic value and presence of a natural hazard due to steep erosive soils and flooding potential. Burnt Hollow meets the importance criteria in that it has more than locally significant qualities (recreational access) which give it special worth and public or management concerns about safety and property.

Such a large block of accessible public land is rare in the Powder River Basin (PRB). The size and naturalness of Burnt Hollow accommodate primitive and unconfined nonmotorized recreational opportunities, discussed in Appendix T (p. 2543). The designation of a Special Recreation Management Area (SRMA) and travel management planning, including route designations, would be sufficient to prevent undue and unnecessary degradation from visitor use in the management area. There is no potential for commercial forestry actions in the area. If Alternative D is selected, the designation of Visual Resource Management (VRM) Class II would protect scenic values. Surface disturbance restrictions and closing the area to fluid minerals leases would result in adequate protection from mineral or Right-of-Way (ROW) development and associated surface disturbance which would reduce the risk of flooding. Due to the intermittent potential for floods, signs at key access points warning visitors of flood potential should be sufficient to protect the relevant and importance criteria and human health and safety.

S.2.2. Cantonment Reno

Background:

The proposed Area of Critical Environmental Concern (ACEC) is the BLM-administered surface around Cantonment Reno (523 acres). Cantonment Reno was constructed as a military supply fort on the Bozeman Trail in October 1876. The fort measured 475 feet by 520 feet and contained quarters, kitchens, mess houses, a hospital, and storage buildings. It could hold more than 350 soldiers and had specialized facilities for cavalry, including three large stables. Most buildings were hastily constructed dugouts built with cottonwood logs and sod roofs. It was used as a supply depot for military campaigns, primarily against the Northern Cheyenne during the winter of 1876-1877. Due to the poor condition of the buildings and a lack of wood, the U.S. Army abandoned the cantonment in 1878.

The site retains well defined features (foundations), but no buildings remain standing. The site contains numerous buried artifacts and is noteworthy for the high amount of intact archeological information it contains. Hundreds of documents relating to the fort are on file at the National Archives, presenting numerous opportunities to answer research questions through site excavation. Although there is no public access, unauthorized excavation and collection have occurred at the site. The location is on a floodplain of the Powder River and might soon be exposed to erosion from an encroaching oxbow bend. The fluid minerals under the site have been leased, but a “no surface occupancy” stipulation exists for the entirety of the proposed ACEC.

Justification:

Cantonment Reno is the only military fort from the period of the Great Sioux Wars on BLM-administered surface in the nation. The site meets the relevance criteria since it is a rare and sensitive archeological resource. The site also meets the importance criteria since it is directly associated with nationally significant historic events (the Great Sioux War), has qualities which give it significant special worth and distinctiveness, and has qualities that make it fragile and vulnerable to adverse change.

Proposed management is sufficient to protect the relevance and importance criteria. In compliance with the National Historic Preservation Act, any impacts to the site as a result of a federal undertaking must be considered and adverse effects must either be avoided or mitigated. If Alternative D (specifically Cultural 005, 006, and 007) is selected, the creation of a Cultural Resource Project Plan, surface disturbance restrictions, and application of no surface occupancy (NSO) and controlled surface use (CSU) stipulations to fluid minerals leases will result in adequate protection. If any or all these specific management actions are not selected, the site should be considered for designation as an ACEC.

S.2.3. Dry Creek Petrified Tree

Background:

The Dry Creek Petrified Tree area consists of a 2,567 acre parcel of BLM-administered surface and an environmental education site, located about 8 miles east of Buffalo, Wyoming. A small portion of the Dry Creek Petrified Tree area, approximately 40 acres, features petrified specimens of early Eocene Metasequoia trees. A 0.8 mile interpretive loop trail winds its way past remnants of petrified trees. The area has public access, interpretive trail, outhouse, and a picnic shelter and tables. The area is popular with tourists, local schools, and hunters alike.

The area meets relevance criteria for unique geologic feature, and the importance criteria for local significance (used as an educational and tourist attraction). Currently, a 0.5-mile NSO buffer of the site prevents fluid mineral development; there has been no recorded interest expressed in mineral development within this buffer.

Justification:

The 40 acres containing the interpretive trail and developments remain closed to livestock grazing and motorized use in all alternatives. In Alternative D, the designation of an SRMA would include a recommendation for withdrawal from mineral entry, a designation of VRM Class II, closure to fluid mineral leasing, and restrictions on surface disturbance. There is no potential for commercial forestry actions in the area. The area is closed to collection of petrified wood. If Alternative D is selected, adequate protection will be provided for the relevant and important criteria at the site and Dry Creek Petrified Tree would not be designated as an ACEC.

S.2.4. Fortification Creek Elk Area

The Fortification Creek evaluation area encompasses the crucial seasonal ranges occupied by a locally and regionally important geographically isolated elk herd (71,755 acres). The BLM-administered surface totals 32,602 acres and the mineral estate is 61,481 acres. The area is composed of rough prairie break topography bisected by several drainages. Typical vegetation is sagebrush/grassland intermixed with juniper. Elk historically occurred in the area but were extirpated in the late 1800s. Today, a herd of approximately 200 elk resides yearlong in the area, as a result of reintroductions from Yellowstone National Park in the 1950s. The elk herd and their habitat is threatened by encroaching coalbed natural gas (CBNG) development. The Fortification Creek area also contains a Wilderness Study Area (WSA), scenic values, and steep slopes with highly erodible soils.

BLM determined in the PRB Final Environmental Impact Statement (BLM 2003c, Appendix R) that the Fortification Creek area meets relevance criteria for scenic value and a wildlife resource. It also meets the importance criteria for local significant qualities (wilderness characteristics), has circumstances that make it fragile, and unique (plains inhabiting elk herd, and minimal impacts from man), and has been recognized as warranting protection to satisfy national priority concerns.

Justification:

A Fortification Creek RMP Amendment was signed in 2011 (BLM 2011c) and decisions from this document will be carried forward in the current RMP revision. Impacts to the relevance criteria are mitigated under soil and wildlife action alternatives (WL-4016 through WL-4024) proposed for elk crucial winter range and calving areas, including Fortification Creek. The wilderness characteristics in the Fortification Creek evaluation area are limited to the WSA. WSA management is sufficient to protect this importance criteria. The Fortification Creek area would be managed under VRM Class III objectives (VRM-5007), offering moderate protection of scenic values while accommodating development of valid existing rights.

S.2.5. Hole-in-the-Wall

Background:

The proposed ACEC includes 11,952 acres of BLM-administered surface around the Hole-in-the-Wall and the Red Wall in southern Johnson County. The Hole-in-the-Wall is approximately 40 miles southwest of Kaycee, Wyoming. It is a colorful and scenic red sandstone escarpment that is rich in legend of outlaw activity from the late 1800s, most notably Butch Cassidy and the Wild Bunch Gang. The "hole" is a gap in the Red Wall that, legend has it, was used by outlaws to move horses and cattle through. The area is primitive in nature, with no visitor services.

Justification:

Hole-in-the-Wall meets the relevance criteria for significant historical, cultural or scenic value. The site also meets the importance criteria for having more than locally significant qualities which give it special worth and distinctiveness, and has qualities that make it unique and the site warrants protection to meet national priority concerns. The BLM has not identified or documented any historic sites on BLM-administered surface. Many of the historic features are located on private lands and several key artifacts have been removed and placed in regional museums. However, the area remains a popular destination for travelers from outside the region and for commercial tours due to the recognizable name, notoriety, and relevance in western lore.

The most difficult aspects of management at Hole-in-the-Wall are related to visitor and travel management. The designation of a SRMA and route designations would be sufficient to prevent undue and unnecessary degradation from visitor use in the management area. If Alternative D is selected, the designation of VRM Class II, surface disturbance restrictions, and application of CSU stipulations to fluid minerals leases would result in adequate protection from mineral development. There is little potential for forestry actions. There is potential for commercial wind energy in the Red Wall area which would threaten the important scenic values. Alternative D proposes to exclude renewable energy development within the southern Big Horn Mountains including the Hole-in-the-Wall area, which would be sufficient to protect the relevant and importance criteria.

S.2.6. Sagebrush Ecosystems

Background:

The Notice of Intent for BLM's National Greater Sage-Grouse Planning Strategy invited the public to nominate or recommend areas on public lands for Greater Sage-Grouse and their habitat to be considered as ACECs. Through the scoping process, numerous nominations were presented, including a nomination for all Priority Habitat to be included.

Greater Sage-Grouse are a management indicator species for sagebrush ecosystem health, meaning that they are dependent upon sagebrush ecosystems at a landscape scale for their survival and managing Greater Sage-Grouse habitat would conserve other sagebrush dependent species. Greater Sage-Grouse populations have the greatest chance of persisting when landscapes are dominated by sagebrush and natural or human disturbances are minimal (Aldridge et al. 2008; Knick and Hanser 2011; Wisdom et al. 2011).

The Buffalo Field Office (BFO) identified for ACEC consideration all public lands within four miles of Greater Sage-Grouse leks (occupied or undetermined) or winter concentration areas. Management within four miles of crucial habitat features is consistent with the National Technical Team recommendations (Taylor et al. 2012) for Greater Sage-Grouse conservation. Greater Sage-Grouse Priority Habitat was considered but eliminated from detailed analysis as the *Viability Analysis for Conservation of Sage-Grouse Populations: Buffalo Field Office, Wyoming* (Taylor et al. 2012) concluded that the northeastern Wyoming Core Population Area may not be sufficient to conserve long-term Greater Sage-Grouse population viability.

A sagebrush ecosystem ACEC meets relevance characteristics for conserving wildlife resource values and natural systems. Sagebrush ecosystems provide essential habitat that support several BLM special status species including the Greater Sage-Grouse, an Endangered Species Act Candidate species. Additional BLM sensitive species dependent upon sagebrush ecosystems, and present within the planning area, include: Brewer's sparrow, sage sparrow, and sage thrasher. Sagebrush ecosystems are terrestrial plant communities that support multiple resources (soil, water, native vegetation, biodiversity, rare and sensitive species, etc.) and land uses (recreation, livestock grazing, etc.) for which BLM is responsible for sustainable management.

A sagebrush ecosystem ACEC meets importance characteristics for protecting a natural system and for meeting national priorities. Sagebrush ecosystems are fragile and sensitive systems that provide essential habitat for several special status or rare species. Sagebrush ecosystems and the rare and sensitive species that they support are vulnerable to adverse change. Sagebrush ecosystems have been fragmented in the planning area by energy development, particularly CBNG. Greater Sage-Grouse conservation is a national priority, and the proposed ACEC has been

recognized as appropriate to maintaining sustainable Greater Sage-Grouse populations. The PRB provides important genetic linkage between population strong holds in Montana (Management Zone I) and the Wyoming basins (Management Zone II).

Justification:

Alternative D would implement the State of Wyoming's Greater Sage-Grouse Core Population Area Strategy (Wyoming Executive Order (EO) 2011-05). The BLM approach to Greater Sage-Grouse conservation in Wyoming is representative of the proactive planning and implementation of science-based conservation measures for long-term conservation of Greater Sage-Grouse and their habitats in Wyoming. Priority Habitat in Wyoming represent 15 million acres of Greater Sage-Grouse habitats and approximately half those surface acres are on BLM public lands and approximately 10 million acres of Wyoming Priority Habitat are federal mineral estate. The balanced management of BLM public lands and resources, including habitat for conservation of Greater Sage-Grouse and other resource uses represents the combined efforts of the State of Wyoming, the BLM, U.S. Forest Service (USFS), Natural Resources Conservation Service (NRCS), U.S. Fish and Wildlife Service (USFWS), and many other important local stakeholders and local governments to support multiple-use objectives and management of Greater Sage-Grouse within Wyoming.

Wyoming's Core Population Areas support approximately 80 percent of the statewide Greater Sage-Grouse population. The conservation strategy limits disturbance density and intensity within the Core Population Area. Management actions from various resources, including soil, water, vegetation and wildlife resources also conserve Greater Sage-Grouse habitat by limiting disturbance on BLM surface and mineral estate. Surface disturbance from all regulated activities is limited to no more than 5 percent of the sagebrush habitat and mineral activity is limited to one disturbance location per 640 acres. There is a standardized calculation (Disturbance Density Calculation Tool) for estimating the area of disturbance. Management actions also address: surface occupancy, disruptive activities, seasonal use, transportation, transmission lines, noise, vegetation treatments, monitoring, and reclamation.

Greater Sage-Grouse and the sagebrush ecosystem upon which they depend would be adequately conserved across the State of Wyoming under Alternative D. If any or all the specific management actions within the Wyoming Core Population Area Strategy are not selected, the sagebrush ecosystem should be considered for designation as an ACEC.

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Appendix T. Recreation Management Areas

Special Recreation Management Areas

Special Recreation Management Areas (SRMAs) are administrative units where a commitment has been made to prioritize recreation by managing for specific recreation opportunities and settings on a sustained or enhanced, long-term basis. For each SRMA the Bureau of Land Management (BLM) Buffalo Field Office (BFO) has identified supporting information, established objective decisions, described recreation setting characteristics (RSCs), identified management actions and allowable use decisions and, as necessary, identified implementation decisions.

Land use plan level recreation and visitor services objective decisions define intended activities and specific recreation opportunities to be offered. Objectives describe the intended recreation activities, experiences and benefits derived from those experiences. SRMAs may be subdivided into recreation management zones with discrete objectives.

SRMAs are managed:

- (1) For their unique value, importance, and/or distinctiveness, especially as compared to other areas used for recreation.
- (2) To protect and enhance a targeted set of activities, experiences, benefits, and desired recreation setting characteristics.
- (3) As the predominant land use plan focus.
- (4) To protect specific recreation opportunities and RSCs on a long-term basis.

T.1. Burnt Hollow Management Area

Supporting Information and Rationale

The Burnt Hollow SRMA is necessary to accommodate national visitor demand for semi-primitive nonmotorized recreational opportunities in semiarid sagebrush steppe ecoregions; this demand has been identified by local organizations, community involvement workshops, and through visitor use data. Burnt Hollow is one of the largest contiguous parcels of BLM-administered land with public access in northeastern Wyoming. The area has abundant prairie wildlife, a nearly pristine Powder River Basin viewshed, and a high probability for solitude. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.

BURNT HOLLOW SPECIAL RECREATION MANAGEMENT AREA (SRMA) OBJECTIVES & DECISIONS

Objective Statement: Within the Burnt Hollow SRMA, by the year 2016 and thereafter, participants in recreation assessments will report an average 4.0 realization of the targeted experiences and benefits (4.0 on a probability scale, where 1.0 equals not realized and 5.0 equals totally realized) listed below. The Burnt Hollow SRMA will offer opportunities for nonmotorized recreationists to engage in horseback riding, hiking, hunting, mountain biking, environmental education, and nature viewing. Within the management area, the existing natural and physical character of the landscape will be modified only by primitive trail developments.

Activities: Hunting, horseback riding, hiking, mountain biking, environmental education, camping, backpacking; user conflicts between horseback riding and mountain biking opportunities would be mitigated through travel management allocations on designated trails if demand increases and recreation assessments indicate the necessity to separate conflicting uses.

Experiences: Developing skills and abilities, testing endurance, enjoying having access to hands-on environmental learning, enjoying having access to close-to-home outdoor amenities, savoring the total sensory experience of a landscape.

Benefits: Greater freedom from urban living, improved understanding of this community's dependence and impact on public lands, greater retention of distinctive natural landscape features, improved physical fitness/better health maintenance.

RECREATION SETTING CHARACTERISTIC (RSC) DESCRIPTIONS

Physical Characteristics: Within a 0.5 mile of paved/primary roads and highways. The character of the natural landscape within the Highway 59 viewshed is partially maintained, with infrastructure and several ranch facilities visible. In the interior of the Burnt Hollow Management Area (BHMA), the character of the natural landscape is retained with few modifications contrasting (fences, two-tracks, etc.). Desired future conditions will include maintained and marked trails, simple trailhead developments and basic toilets.

Social Characteristics: From 2006 to 2010, the average annual estimated visitation was 729 visits and 1116 visitor days. During the peak use season (Sept. through Nov.) contacts are characterized by 3-6 encounters off travel routes and 7-15 encounters per day on travel routes. Outside of peak season, contacts are rare. Most groups consist of less than 3 people. Small areas of terrain alteration are present near major roads. The sounds of other people are rarely heard once out of the Highway 59 viewshed.

Operational Characteristics: Foot and horse travel and mechanized use (mountain bikes) are allowed; all public use must be nonmotorized. Basic maps provided on trailhead kiosks, staff infrequently present to provide onsite assistance. Some regulatory and ethics signing is present in parking lots. Moderate use restrictions apply at trailheads and staging areas.

MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program: Standard 14-day camping limit applies; currently not eligible for Federal Lands Recreation Enhancement Act but may be evaluated if future investments in visitor services meet eligibility requirements. Recreational target shooting is prohibited within developed recreation sites. Dispersed camping is allowed outside of the developed parking lots.

Oil & Gas Leasing/Minerals: Closed to leasing. Recommended for withdrawal from mineral entry. Salable mineral development for administrative use only.

VRM: Class II

Renewable Energy: Renewable energy exclusion area

Lands and Realty: ROW exclusion area

Travel Management: The area will be managed as limited to designated routes, with very few routes designated for administrative motorized use only. Identify routes to close and reclaim. Modify appropriate routes into nonmotorized trails. Designated routes will be primarily for provision of access to inholdings within BHMA and to provide egress for administrative use.

Special Recreation Permits (SRPs): SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Recreation area management plan will include criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.

IMPLEMENTATION DECISIONS

Marketing: Provide maps and information at the field office. Directional signage present from both Highway 59 and Cow Creek Road. Develop interpretive signs at trailhead/parking area on general location, history, geology, and wildlife resources. Provide stewardship information to help preserve the special landscape character. Make available for outreach programs such as Conservation and Outdoor Recreation Education, Take It Outside, National Public Lands Day, etc.

Monitoring: Vehicle counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.

Management: Signs present at key access points; additional informational signs present along trails.

Administrative:

Agreements: Establish cooperative agreements with Wyoming State Land Board and Wyoming Department of Game and Fish.

Partners: Burnt Hollow Coordinated Resource Management Working Group. Pursue partnerships with Campbell County School Districts and Gillette College to establish an outdoor classroom.

COW CREEK BREAKS RECREATION MANAGEMENT ZONE (RMZ)**Outcome Objective**

The Cow Creek Breaks RMZ of the Burnt Hollow Special Recreation Management Area (SRMA) will be sustained or enhanced for visitors to engage in hiking, horseback riding, and hunting (fall) so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in Back Country and Middle Country settings.

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits
<ul style="list-style-type: none"> • Horse riding/packing • Hiking/backpacking • Mountain Biking • Hunting (fall season) • Nature Viewing 	<ul style="list-style-type: none"> • Enjoying the sensory experience of a natural landscape • Enjoying ability to frequently participate in desired activities in preferred settings • Testing endurance • Being isolated and independent • Enjoying exploring on my own or in small groups • Enjoying nature • Feeling good about solitude • Developing skills and abilities • Escaping everyday responsibilities 	<p>Personal:</p> <ul style="list-style-type: none"> • Enhanced awareness and understanding of nature • Closer relationship with the natural world • Improved opportunity to view wildlife close-up • Improved mental health • Improved physical health • Greater appreciation of the outdoor environment <p>Community/Social:</p> <ul style="list-style-type: none"> • Feeling good about how natural resources and facilities are being managed <p>Environmental:</p> <ul style="list-style-type: none"> • Greater retention of distinctive natural landscape features • Increased sense of stewardship for the resource <p>Economic:</p> <ul style="list-style-type: none"> • Enhanced ability for visitors and resident to find areas providing desired recreation experiences and benefits • Enhanced ability for visitors to find areas providing wanted recreation experiences and benefits • Greater protection of fish, wildlife, and plant habitat from growth, development, and public use impacts

DESIRED FUTURE RECREATION SETTING CHARACTER

Physical	Social	Operational
<p><i>Remoteness:</i> On or near mechanized routes but at least one mile from improved roads, though they may be visible.</p> <p><i>Naturalness:</i> Natural setting may have modifications that would be noticed but not draw the attention of an observer wandering through the area.</p> <p><i>Facilities:</i> Developed trails made mostly of native materials. Structures are rare and isolated.</p>	<p><i>Contacts With Others:</i> Average encounters per day during peak hunting use season (September - November) should not exceed 5 encounters per day at staging areas, and 3 encounters per day on travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 3 people per group).</p> <p><i>Evidence of use:</i> Areas of alteration uncommon. Little surface vegetation wear observed. Sounds of people infrequent.</p>	<p><i>Mechanized Use:</i> Nonmotorized, mechanized use is allowed on trails. Should conflicts arise between mechanized use and other nonmotorized recreationists, the recreation area management plan will be adapted via a public comment period.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
SUPPORT ACTIONS		
Recreation Management Actions	<p>Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</p> <p>Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.</p> <p>Continue to enhance the availability of dependable non-potable water sources for recreationists.</p>	
Information and Education (including promotion and interpretation)	<p>Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</p> <p>Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</p>	
Administration	<p>Consider the use of a Memorandum of Understanding or other cooperative agreement between the Bureau of Land Management (BLM) and pertinent partners to maintain and enhance the area.</p>	
Monitoring (and Evaluation)	<ul style="list-style-type: none"> • Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies. • Monitor recreation setting condition through onsite patrols during the high use season (August-November). 	
Interdisciplinary Support Actions	<p>Visual Resource Management Class II; closed to public motorized use.</p>	

BURNT HOLLOW FRONT COUNTRY RECREATION MANAGEMENT ZONE (RMZ)

Outcome Objective

The Burnt Hollow Front Country RMZ will be sustained or enhanced for individuals or small groups of nonmotorized recreationists, to engage in nature and wildlife viewing, horseback riding, hiking, hunting and mountain biking. The Front Country RMZ will be promoted for environmental education opportunities. The Front Country RMZ of the Burnt Hollow Special Recreation Management Area (SRMA) will be sustained or enhanced for visitors to engage in hiking, hunting (fall), mountain biking and horseback riding, so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in these Front Country and Middle Country settings.

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits

<ul style="list-style-type: none"> • Horse riding/packing • Hiking/backpacking • Mountain biking • Nature Viewing • Environmental Education • Hunting 	<ul style="list-style-type: none"> • Enjoying the sensory experience of a natural landscape • Enjoying nature • Developing skills and abilities • Enjoying learning outdoor social skills 	<p>Personal:</p> <ul style="list-style-type: none"> • Enjoying easy access to natural landscapes • Improved mental health • Improved physical health <p>Community/Social:</p> <ul style="list-style-type: none"> • More informed citizenry about where to go for different kinds of recreation experiences and benefits <p>Environmental:</p> <ul style="list-style-type: none"> • Greater retention of distinctive natural landscape features • Increased sense of stewardship for the resource <p>Economic:</p> <ul style="list-style-type: none"> • Enhanced ability for visitors and resident to find areas providing desired recreation experiences and benefits
DESIRED FUTURE RECREATION SETTING CHARACTER		
Physical	Social	Operational
<p><i>Remoteness:</i> Within one mile of paved/primary roads and highways.</p> <p><i>Naturalness:</i> Character of the natural landscape considerably modified.</p> <p><i>Facilities:</i> Rustic facilities such as basic toilets, kiosks and interpretive displays.</p>	<p><i>Contacts With Others:</i> Contact with others unlikely outside of peak season, except for cars passing on highway. During peak season, 3-6 encounters in parking lots are possible.</p> <p><i>Group Size:</i> Group sizes are expected to be between 2-6 people per group.</p> <p><i>Evidence of use:</i> Small areas of alteration prevalent. Surface vegetation gone with compacted soils. Sounds of people regularly heard.</p>	<p><i>Mechanized Use:</i> Nonmotorized, mechanized use is allowed on trails. Should conflicts arise between mechanized use and other nonmotorized recreationists, the recreation area management plan will be adapted via a public comment period.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
SUPPORT ACTIONS		
Recreation Management Actions	<p>Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</p> <p>Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.</p> <p>Continue to enhance the availability of dependable non-potable water sources for recreationists.</p>	
Information and Education (including promotion and interpretation)	<p>Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</p> <p>Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</p>	
Administration	<p>Consider the use of a Memorandum of Understanding (MOU) or other cooperative agreement between the Bureau of Land Management (BLM) and pertinent partners to maintain and enhance the area.</p> <p>Place notification of target shooting restriction on sections containing and adjacent to developed recreation facilities.</p>	

Monitoring (and Evaluation)	<ul style="list-style-type: none"> • Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies. • Monitor recreation setting condition through onsite patrols during the environmental education high use season (early fall and late spring).
Interdisciplinary Support Actions	Visual Resource Management Class II; closed to public motorized use.

T.2. Dry Creek Petrified Tree Management Area

Supporting Information and Rationale

The Dry Creek Petrified Tree SRMA is necessary to accommodate national visitor demand for nonmotorized recreational opportunities in semiarid sagebrush steppe ecoregions; this demand has been identified through focus groups, community involvement workshops, and through visitor use data. Dry Creek Petrified Tree is a unique parcel of BLM-administered land in respect to its abundant paleontological resources. This parcel provides seamless recreational opportunities as it connects with additional public lands. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand. The area has abundant prairie wildlife, a nearly pristine Powder River Basin viewshed, and a high probability for solitude. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.

DRY CREEK/PETRIFIED TREE SPECIAL RECREATION MANAGEMENT AREA (SRMA)	
OBJECTIVES & DECISIONS	
<p><i>Objective Statement:</i> Within the Dry Creek Petrified Tree SRMA, by the year 2015 and thereafter, participants in recreation assessments will report an average 4.0 realization of the targeted experiences and benefits (4.0 on a probability scale, where 1.0 equals not realized and 5.0 equals totally realized) listed below. The Dry Creek Petrified Tree SRMA will offer opportunities for recreationists to engage in picnicking, walking, nature viewing, and other forms of nonmotorized dispersed recreation in a partially modified physical recreation setting with predominantly nonmotorized public use. Within the management area, the existing natural and physical character of the landscape will be modified by recreational trail developments and associated recreation and interpretive facilities.</p>	
<p><i>Activities:</i> Picnicking, walking, nature viewing, environmental education, hunting</p>	
<p><i>Experiences:</i> Enjoying having access to hands-on environmental learning, enjoying having access to close-to-home outdoor amenities, enjoying the closeness of friends and family</p>	
<p><i>Benefits:</i> Greater retention of distinctive natural landscape features, increased appreciation of the area's geologic history.</p>	
RECREATION SETTING CHARACTERISTIC (RSC) DESCRIPTIONS	
<p><i>Physical Characteristics:</i> Within a 0.5 mile of passenger vehicle routes. The character of the natural landscape within the Tipperary Road viewshed is partially maintained, with infrastructure and several ranch facilities visible. Desired future conditions will include maintained and marked trails, simple trailhead developments, a basic toilet and an interpretive display.</p>	
<p><i>Social Characteristics:</i> From 2006 to 2010, the average annual estimated visitation was 956 visits and 110 visitor days (RMIS). Contacts with other groups are rare. Most groups consist of 2-5 people. Small areas of terrain alteration are present near the trailhead roads. The sounds of other people are rarely heard.</p>	
<p><i>Operational Characteristics:</i> Foot travel is allowed; all use must be nonmotorized. Basic maps provided on trailhead kiosks, staff infrequently present to provide onsite assistance. Some regulatory and ethics signing is present in parking lots.</p>	
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS	

Recreation and Visitor Services Program: Standard 14-day camping limit applies; developed site closed to recreational target shooting; currently not eligible for Federal Lands Recreation Enhancement Act but may be evaluated if future investments in visitor services meet eligibility requirements.

Oil & Gas Leasing/Minerals: Closed to leasing. Recommended for withdrawal from mineral entry. Salable mineral development for administrative use only.

VRM: Class II

Renewable Energy: Renewable energy exclusion area

Lands and Realty: Right-of-way (ROW) exclusion area

Travel Management: The interpretive trail area is closed to motorized use (~20 acres). Travel is limited to designated routes throughout the remainder of the SRMA. Identify routes to close and reclaim.

Special Recreation Permits (SRPs): Commercial guiding for hunting and competitive events will be prohibited within the 22 acre enclosure. Elsewhere, SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.

Livestock Grazing: The 22-acre enclosure around the interpretive site is closed to grazing.

IMPLEMENTATION DECISIONS

Marketing: Provide maps and information at the field office. Directional signage present from both TW Road and Tipperary Road at I-90. Develop interpretive signs at trailhead/parking area on general location, history, paleontology, geology, and wildlife resources. Provide stewardship information to help preserve the special landscape character. Make available for outreach programs such as Conservation and Outdoor Recreation Education, Take It Outside, National Public Lands Day, etc.

Monitoring: Vehicle counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.

Management: Signs present at key access points; additional informational signs present along interpretive trail. Update interpretive trail signs as time and funding allow.

Administrative:

Recreation: Modify appropriate routes into nonmotorized trails.

Agreements: Establish cooperative agreements with Wyoming State Land Board and Wyoming Department of Game and Fish.

Partners: Pursue partnerships with Johnson County School Districts to establish an outdoor classroom.

Other administration: Recreational target shooting is prohibited within the developed site. Standard 14-day camping limit applies.

INTERPRETIVE TRAIL RECREATION MANAGEMENT ZONE (RMZ)

Outcome Objective

The Interpretive Trail RMZ will be sustained or enhanced for individuals or small groups of visitors to engage in nature and wildlife viewing, picnicking, environmental education and walking the interpretive trail so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in these Front Country settings:

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits

<ul style="list-style-type: none"> ● Environmental Education ● Picnicking ● Walking ● Nature Viewing 	<ul style="list-style-type: none"> ● Enjoying the sensory experience of a natural landscape ● Enjoying having access to hands-on environmental learning ● Learning more about this specific area ● Enjoying having access to close-to-home outdoor amenities ● Enjoying the closeness of friends and family 	<p>Personal:</p> <ul style="list-style-type: none"> ● Enhanced awareness and understanding of nature ● Closer relationship with the natural world ● Greater retention of distinctive natural landscape features ● Increased appreciation of the area's geologic history ● Improved mental health ● Improved physical health ● Greater appreciation of the outdoor environment <p>Community/Social:</p> <ul style="list-style-type: none"> ● Feeling good about how natural resources and facilities are being managed <p>Environmental:</p> <ul style="list-style-type: none"> ● Greater retention of distinctive natural landscape features. ● Increased sense of stewardship for the resource ● Greater protection of paleontological sites ● Reduced looting and vandalism of historic/prehistoric sites ● Reduced negative human impacts such as litter, vegetative trampling, and unplanned trails <p>Economic:</p> <ul style="list-style-type: none"> ● Enhanced ability for visitors and resident to find areas providing desired recreation experiences and benefits
DESIRED FUTURE RECREATION SETTING CHARACTER		
Physical	Social	Operational
<p><i>Remoteness:</i> Within a 0.5 mile of passenger vehicle routes.</p> <p><i>Naturalness:</i> Natural setting may have modifications that would be noticed but not draw the attention of an observer wandering through the area.</p> <p><i>Facilities:</i> Maintained and marked trails, simple trailhead developments and basic toilets. Interpretive displays may also be incorporated.</p>	<p><i>Contacts With Others:</i> Encounters with other groups are rare for visiting members of the general public.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 5 people per group), unless an organized school or community groups visits as part of a field trip.</p> <p><i>Evidence of use:</i> Areas of alteration uncommon. Little surface vegetation wear observed. Sounds of people infrequent.</p>	<p><i>Mechanized Use:</i> Foot travel is allowed on trails. Mechanized and motorized use are prohibited within the interpretive site.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
SUPPORT ACTIONS		
Recreation Management Actions	Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.	
Information and Education (including promotion and interpretation)	<p>Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</p> <p>Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</p>	
Administration	Consider the use of a Memorandum of Understanding or other cooperative agreement between the Bureau of Land Management and pertinent partners to maintain and enhance the area.	

Monitoring (and Evaluation)	Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies.
Interdisciplinary Support Actions	Visual Resource Management Class II. Limit travel to designated routes; close interpretive site to motorized and mechanized use.

RED HORSE ACCESS RECREATION MANAGEMENT ZONE (RMZ)		
<p>Outcome Objective</p> <p>The Red Horse Access RMZ will be sustained or enhanced for individuals or small groups of nonmotorized recreationists, to engage in nature and wildlife viewing, mountain biking and hiking so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in these Middle Country settings:</p>		
TARGETED OPPORTUNITIES & OUTCOMES		
Activity Opportunities	Outcomes	
	Experiences	Benefits
<ul style="list-style-type: none"> • Hiking • Mountain Biking • Hunting 	<ul style="list-style-type: none"> • Enjoying the sensory experience of a natural landscape • Enjoying having access to close-to-home outdoor amenities • Enjoying the closeness of friends and family 	<p>Personal:</p> <ul style="list-style-type: none"> • Enhanced awareness and understanding of nature • Greater understanding of the importance of recreation and tourism in our community • Increased appreciation of the area's geologic history • Improved mental health • Improved physical health • Greater appreciation of the outdoor environment • Greater sense of responsibility for own quality of life • Greater appreciation for my public lands and how managers care for it <p>Community/Social:</p> <ul style="list-style-type: none"> • More informed citizenry about where to go for different kinds of recreation experiences and benefits <p>Environmental:</p> <ul style="list-style-type: none"> • Greater retention of distinctive natural landscape features • Increased sense of stewardship for the resource <p>Economic:</p> <ul style="list-style-type: none"> • Enhanced ability for visitors and resident to find areas providing desired recreation experiences and benefits
DESIRED FUTURE RECREATION SETTING CHARACTER		
Physical	Social	Operational
<p><i>Remoteness:</i> Within a 0.5 mile of four-wheel drive vehicle routes.</p> <p><i>Naturalness:</i> Natural setting may have modifications that would be noticed but not draw the attention of an observer wandering through the area.</p> <p><i>Facilities:</i> Maintained and marked trails, simple trailhead developments and basic toilets.</p>	<p><i>Contacts With Others:</i> Encounters with other groups are rare.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 3 people per group)</p> <p><i>Evidence of use:</i> Areas of alteration uncommon. Little surface vegetation wear observed. Sounds of people infrequent.</p>	<p><i>Mechanized Use:</i> Mechanized travel is allowed on designated trails.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
SUPPORT ACTIONS		

Recreation Management Actions	Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions. Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.
Information and Education (including promotion and interpretation)	Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information. Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.
Administration	Consider the use of a Memorandum of Understanding or other cooperative agreement between the Bureau of Land Management and pertinent partners to maintain and enhance the area.
Monitoring (and Evaluation)	Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies.
Interdisciplinary Support Actions	Visual Resource Management Class II; travel limited to designated routes.

T.3. Hole-in-the-Wall Management Area

Supporting Information and Rationale

The Hole-in-the-Wall SRMA is necessary to accommodate national visitor demand for semi-primitive nonmotorized recreational opportunities in the Red Wall/southern Big Horns region; this demand has been identified by local organizations, community involvement workshops, and through visitor use data. The area has abundant wildlife, a nearly pristine Red Wall viewshed, and a moderate probability for solitude. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.

HOLE-IN-THE-WALL SPECIAL RECREATION MANAGEMENT AREA (SRMA) OBJECTIVES & DECISIONS
<i>Objective Statement:</i> Within the Hole-in-the-Wall SRMA, by the year 2017 and thereafter, participants in recreation assessments will report an average 4.0 realization of the targeted experiences and benefits (4.0 on a probability scale, where 1.0 equals not realized and 5.0 equals totally realized) listed below. The Hole-in-the-Wall SRMA will offer opportunities for nonmotorized recreationists to engage in hiking, horseback riding, and nature viewing and other forms of nonmotorized dispersed recreation. Within the management area, the existing natural and physical character of the landscape will be modified only by primitive trail developments and minimal associated recreation and interpretive facilities.
<i>Activities:</i> Hiking, horseback riding, nature viewing, interpretation of natural and cultural resources, hunting, camping
<i>Experiences:</i> Developing skills and abilities, testing endurance, savoring the total sensory experience of a landscape
<i>Benefits:</i> Greater retention of distinctive natural landscape features; greater protection of area archaeological sites
RECREATION SETTING CHARACTERISTIC (RSC) DESCRIPTIONS

Physical Characteristics: Within a 0.5 mile of four-wheel drive routes. The character of the natural landscape within the viewshed is maintained, with a few modifications, such as ranch facilities visible. Desired future conditions will include maintained and marked trails, and simple trailhead developments, including interpretive panels.

Social Characteristics: Quantitative data related specifically to Hole-in-the-Wall does not yet exist. The majority of use is associated with commercially guided activities through neighboring ranches. During the peak visitation season (May, through Oct.) contacts are characterized by less than 3 encounters off travel routes and 3–6 encounters per day on travel routes. Outside of peak season, contacts are rare. Most groups consist of less than 3 people. Small areas of terrain alteration are present near major roads. The sounds of other people are rarely heard.

Operational Characteristics: Foot and horse travel are allowed cross-country; mechanized and motorized use is limited to designated routes. Basic maps provided on trailhead kiosks, staff infrequently present to provide onsite assistance. Some regulatory and ethics signing is present in parking lots. Moderate use restrictions apply at trailheads and staging areas.

MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program: Standard 14-day camping limit applies; prioritized for education efforts to mitigate recreational target shooting; currently not eligible for Federal Lands Recreation Enhancement Act but may be evaluated if future investments in visitor services meet eligibility requirements.

VRM: Class II

Travel Management: The area will be managed as limited to designated routes, with very few routes designated. Identify routes to close and reclaim. Modify appropriate routes into nonmotorized trails. Designated routes will be primarily for provision of public access to Hole-in-the-Wall trailhead and to provide egress for administrative use.

Renewable Energy: Renewable energy exclusion area

Lands and Realty: ROW exclusion area

Oil & Gas Leasing/Minerals: Closed to Leasing. Recommended for withdrawal from mineral entry. Salable mineral development for administrative use only.

Special Recreation Permits (SRPs): SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.

IMPLEMENTATION DECISIONS

Marketing: Provide maps and information at the field office. Directional signage necessary from TTT Road, Willow Creek Road, and NC 105. Develop interpretive signs at trailhead/parking area on general location, history, geology, cultural and wildlife resources. Provide stewardship information to help preserve the special landscape character. Make available for outreach programs such as Conservation and Outdoor Recreation Education, Take It Outside, National Public Lands Day, etc.

Monitoring: Vehicle counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.

Management: Signs present at key access points; additional directional signs present along trails. High priority area for development of interpretive signs.

Administrative:

Agreements: Maintain cooperative agreements with Wyoming State Land Board and Wyoming Department of Game and Fish.

HOLE-IN-THE-WALL RECREATION MANAGEMENT ZONE (RMZ)		
Outcome Objective The Hole-in-the-Wall RMZ will be sustained or enhanced for visitors to engage in hiking, camping, horseback riding, and hunting (fall) so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in Back Country and Middle Country settings.		
TARGETED OPPORTUNITIES & OUTCOMES		
Activity Opportunities	Outcomes	
	Experiences	Benefits
<ul style="list-style-type: none"> • Hiking/backpacking • Camping • Hunting (fall season) • Horse riding/packing • Nature Viewing 	<ul style="list-style-type: none"> • Enjoying the sensory experience of a natural landscape • Developing skills and abilities • Testing endurance • Being isolated and independent • Enjoying exploring on my own or in small groups • Enjoying nature • Feeling good about solitude 	<p>Personal:</p> <ul style="list-style-type: none"> • Enhanced awareness and understanding of nature • Closer relationship with the natural world • Improved opportunity to view wildlife close-up • Improved mental health • Improved physical health • Greater appreciation of the outdoor environment • Feeling good about how this attraction is being used and enjoyed <p>Community/Social: none identified</p> <p>Environmental:</p> <ul style="list-style-type: none"> • Greater retention of distinctive natural landscape features • Increased sense of stewardship for the resource • Reduced negative human impacts such as litter, vegetative trampling, and unplanned trails <p>Economic:</p> <ul style="list-style-type: none"> • Maintenance of community's distinctive recreation/tourism market niche or character
DESIRED FUTURE RECREATION SETTING CHARACTER		
Physical	Social	Operational
<p><i>Remoteness:</i> Within a 0.5 mile of four-wheel drive routes.</p> <p><i>Naturalness:</i> Natural setting may have modifications that would be noticed but not draw the attention of an observer wandering through the area.</p> <p><i>Facilities:</i> Rustic facilities such as campsites, a basic toilet, small kiosks, basic trailheads and marked trails.</p>	<p><i>Contacts With Others:</i> Average encounters per day during peak hunting use season (September - November) would be fewer than 3 encounters off travel routes and 3–6 encounters on travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 3 people per group).</p> <p><i>Evidence of use:</i> Areas of alteration uncommon. Little surface vegetation wear observed. Sounds of people infrequent.</p>	<p><i>Mechanized Use:</i> Nonmotorized, mechanized use is allowed on designated trails. Due to the steep topography, mechanized recreation is prohibited within the canyon. Should conflicts arise between mechanized use and other nonmotorized recreationists, the recreation area management plan will be adapted via a public comment period.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
SUPPORT ACTIONS		

Recreation Management Actions	<p>Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</p> <p>Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.</p> <p>Continue to enhance the availability of dependable non-potable water sources for recreationists.</p>
Information and Education (including promotion and interpretation)	<p>Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</p> <p>Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</p>
Administration	Consider the use of a Memorandum of Understanding or other cooperative agreement between the Bureau of Land Management and pertinent partners to maintain and enhance the area.
Monitoring (and Evaluation)	<ul style="list-style-type: none"> • Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies. • Monitor recreation setting condition through onsite patrols during the high use season (August-November).
Interdisciplinary Support Actions	Visual Resource Management Class II; travel limited to designated routes.

BUFFALO CREEK RECREATION MANAGEMENT ZONE (RMZ)
Outcome Objective

The Buffalo Creek RMZ of the Hole-in-the-Wall Special Recreation Management Area (SRMA) will be sustained or enhanced for visitors to engage in camping, hiking, horseback riding, hunting (fall) and fishing so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in Back Country and Middle Country settings.

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits
<ul style="list-style-type: none"> • Camping • Fishing • Hiking/backpacking • Hunting (fall season) • Horse riding/packing • Nature Viewing 	<ul style="list-style-type: none"> • Enjoying the sensory experience of a natural landscape • Developing skills and abilities • Testing endurance • Enjoying exploring on my own or in small groups • Enjoying nature • Feeling good about solitude, isolation, and independence 	<p>Personal:</p> <ul style="list-style-type: none"> • Enhanced awareness and understanding of nature • Closer relationship with the natural world • Improved opportunity to view wildlife close-up • Improved mental health • Improved physical health • Greater appreciation of the outdoor environment • Enlarged sense of personal accountability for acting responsibly on public lands <p>Community/Social: none identified</p> <p>Environmental:</p> <ul style="list-style-type: none"> • Greater retention of distinctive natural landscape features • Increased sense of stewardship for the resource • Reduced wildlife disturbance from recreation facility development <p>Economic:</p> <ul style="list-style-type: none"> • Enhanced ability for visitors and resident to find areas providing desired recreation experiences and benefits

DESIRED FUTURE RECREATION SETTING CHARACTER

Physical	Social	Operational
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<p><i>Remoteness:</i> Within 0.5 mile of four-wheel drive routes.</p> <p><i>Naturalness:</i> Natural setting may have modifications that would be noticed but not draw the attention of an observer wandering through the area.</p> <p><i>Facilities:</i> Rustic facilities such as campsites, a basic toilet, small kiosks, basic trailheads and marked trails.</p>	<p><i>Contacts With Others:</i> Average encounters per day during peak hunting use season (September - November) would be less than 3 encounters off travel routes and 3–6 encounters on travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 3 people per group).</p> <p><i>Evidence of use:</i> Areas of alteration uncommon. Little surface vegetation wear observed. Sounds of people infrequent.</p>	<p><i>Mechanized Use:</i> Nonmotorized, mechanized use is allowed on designated trails. Due to the steep topography, mechanized recreation is prohibited within the canyon. Should conflicts arise between mechanized use and other nonmotorized recreationists, the recreation area management plan will be adapted via a public comment period.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
SUPPORT ACTIONS		
Recreation Management Actions	<p>Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</p> <p>Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.</p> <p>Continue to enhance the availability of dependable non-potable water sources for recreationists.</p>	
Information and Education (including promotion and interpretation)	<p>Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</p> <p>Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</p>	
Administration	<p>Consider the use of a Memorandum of Understanding or other cooperative agreement between the Bureau of Land Management and pertinent partners to maintain and enhance the area.</p>	
Monitoring (and Evaluation)	<ul style="list-style-type: none"> • Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies. • Monitor recreation setting condition through onsite patrols during the high use season (August-November). 	
Interdisciplinary Support Actions	<p>Visual Resource Management Class II; travel limited to designated routes.</p>	

T.4. Middle Fork Powder River Management Area

Supporting Information and Rationale

This SRMA is necessary to accommodate national visitor demand for semi-primitive nonmotorized recreational opportunities in the Red Wall/southern Big Horns region; this demand has been identified by local organizations, community involvement workshops, and through visitor use data. The area has abundant wildlife, a nearly pristine Red Wall viewshed, and a moderate probability for solitude. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.

MIDDLE FORK POWDER RIVER SPECIAL RECREATION MANAGEMENT AREA (SRMA)
OBJECTIVES & DECISIONS
<p><i>Objective Statement:</i> Within the Middle Fork Powder River SRMA, by the year 2016 and thereafter, participants in recreation assessments will report an average 4.0 realization of the targeted experiences and benefits (4.0 on a probability scale, where 1.0 equals not realized and 5.0 equals totally realized) listed below. The Middle Fork Powder River SRMA will offer opportunities for nonmotorized recreationists to engage in fishing, hunting, horseback riding, hiking, mountain biking, nature viewing and appropriate related off-highway vehicle (OHV) use. Within the management area, the existing natural and physical character of the landscape will be modified only by primitive trail developments and minimal associated recreation and interpretive facilities.</p>
<p><i>Activities:</i> Fishing, camping, hunting, horseback riding, hiking, mountain biking, interpretation of natural and cultural resources, backpacking, OHV use in conjunction with aforementioned activities</p>
<p><i>Experiences:</i> Developing skills and abilities, testing endurance, enjoying having a wide variety of environments within a single recreation area, savoring the total sensory experience of a landscape</p>
<p><i>Benefits:</i> Greater sense of adventure, greater retention of distinctive natural landscape features; improved skills for outdoor enjoyment</p>
RECREATION SETTING CHARACTERISTIC (RSC) DESCRIPTIONS
<p><i>Physical Characteristics:</i> Within a 0.5 mile of four-wheel drive routes in most of the region. The character of the natural landscape within the Middle Fork viewshed is largely maintained, with primitive routes and several ranch facilities visible. In the interior of the Middle Fork region, modification to the natural landscape is in harmony with surroundings. Desired future conditions will include maintained and marked trails, simple trailhead developments in the Ed O. Taylor Recreation Management Zone (RMZ) and rustic facilities such as campsites, basic toilets and interpretive displays in the Outlaw Cave RMZ.</p>
<p><i>Social Characteristics:</i> From 2006 to 2010, the average annual estimated visitation to the Middle Fork Region was 4701 visits and 4871 visitor days. During the peak use season (July through Oct.) contacts are characterized by 3-6 encounters off travel routes and 7-15 encounters per day on travel routes. Outside of peak season, contacts are rare. Most groups consist of less than 4-6 people. Small areas of terrain alteration are present near major roads. The sounds of other people are rarely heard.</p>
<p><i>Operational Characteristics:</i> Foot and horse travel and mechanized use (mountain bikes) are allowed; motorized use is limited to designated routes. Basic maps provided on trailhead kiosks, staff infrequently present to provide onsite assistance. Some regulatory and ethics signing is present in parking lots.</p>
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program: Standard 14-day camping limit applies; prioritized for education efforts to mitigate impacts from recreational target shooting; currently not eligible for Federal Lands Recreation Enhancement Act but may be evaluated if future investments in visitor services meet eligibility requirements.

Oil & Gas Leasing/Minerals: Closed to leasing. Recommended for withdrawal from mineral entry. Salable mineral development for administrative use only.

VRM: Class II

Renewable Energy: Renewable energy exclusion area

Lands and Realty: ROW exclusion area

Travel Management: The area will be managed as limited to designated routes. Identify routes to close and reclaim. Modify appropriate routes into nonmotorized trails.

Special Recreation Permits (SRPs): SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.

Livestock Grazing: Middle Fork Canyon is deemed unsuitable for grazing due to steep slopes.

WSRs: The canyon within 0.25 mile of the Middle Fork Powder River is managed under Manual 6400 – Wild and Scenic Rivers and the Middle Fork Powder River Interim Management Plan to protect outstandingly remarkable values.

IMPLEMENTATION DECISIONS

Marketing: Provide maps and information at the field office. Directional signage present from Highway 191 and Barnum Road. Develop interpretive signs at entrance to management area and at Outlaw Cave Campground on general location, history, geology, and wildlife resources. Provide stewardship information to help preserve the special landscape character. Make available for outreach programs such as Conservation and Outdoor Recreation Education, Take It Outside, National Public Lands Day, etc.

Monitoring: Vehicle counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.

Management: Signs present at key access points; additional directional signs present along trails. High priority area for development of interpretive signs.

Administrative:

Agreements: Maintain cooperative agreements with Wyoming State Land Board and Wyoming Department of Game and Fish.

OUTLAW CAVE RECREATION MANAGEMENT ZONE (RMZ)

Outcome Objective

The Outlaw Cave RMZ of the Middle Fork Canyon Special Recreation Management Area (SRMA) will be sustained or enhanced for visitors to engage in fishing, camping, hiking, horseback riding, hunting (fall) and appropriate off-highway vehicle (OHV) use so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in Back Country and Middle Country settings.

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits

<ul style="list-style-type: none"> ● Camping ● Fishing ● Hiking/backpacking ● Hunting (fall season) ● Horse riding/packing ● Nature Viewing ● OHV Use 	<ul style="list-style-type: none"> ● Enjoying the sensory experience of a natural landscape ● Developing skills and abilities ● Testing endurance ● Being isolated and independent ● Enjoying exploring on my own or in small groups ● Enjoying nature ● Feeling good about solitude 	<p>Personal:</p> <ul style="list-style-type: none"> ● Enhanced awareness and understanding of nature ● Closer relationship with the natural world ● Improved opportunity to view wildlife close-up ● Improved mental health ● Improved physical health ● Greater appreciation of the outdoor environment ● Increased appreciation of area's cultural history <p>Community/Social: none identified</p> <p>Environmental:</p> <ul style="list-style-type: none"> ● Greater retention of distinctive natural landscape features ● Increased sense of stewardship for the resource <p>Economic:</p> <ul style="list-style-type: none"> ● Enhanced ability for visitors and resident to find areas providing desired recreation experiences and benefits
DESIRED FUTURE RECREATION SETTING CHARACTER		
Physical	Social	Operational
<p><i>Remoteness:</i> Within 0.5 mile of four-wheel drive routes.</p> <p><i>Naturalness:</i> Natural setting may have modifications that would be noticed but not draw the attention of an observer wandering through the area.</p> <p><i>Facilities:</i> Rustic facilities such as campsites, a basic toilet, small kiosks, basic trailheads and marked trails.</p>	<p><i>Contacts With Others:</i> Average encounters per day during peak hunting use season (September - November) would be approximately 3–6 encounters off travel routes and 7–15 encounters on travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (4–6 people per group).</p> <p><i>Evidence of use:</i> Small areas of alteration present. Surface vegetation showing wear with some bare soils. Sounds of people infrequent.</p>	<p><i>Mechanized Use:</i> Nonmotorized, mechanized use is allowed on designated trails. Due to the steep topography, mechanized recreation is prohibited within the canyon. Should conflicts arise between mechanized use and other nonmotorized recreationists, the recreation area management plan will be adapted via a public comment period.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
SUPPORT ACTIONS		
Recreation Management Actions	<p>Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</p> <p>Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.</p> <p>Enhance the availability of dependable both potable and non-potable water sources for recreationists and packstock.</p>	
Information and Education (including promotion and interpretation)	<p>Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</p> <p>Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</p>	
Administration	<p>Consider the use of a Memorandum of Understanding or other cooperative agreement between the Bureau of Land Management and pertinent partners to maintain and enhance the area.</p>	

Monitoring (and Evaluation)	<ul style="list-style-type: none"> • Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies. • Monitor recreation setting condition through onsite patrols during the high use season (August-November).
Interdisciplinary Support Actions	Visual Resource Management Class II; travel limited to designated routes.

ED O. TAYLOR RECREATION MANAGEMENT ZONE (RMZ)

Outcome Objective

The Ed O. Taylor RMZ of the Middle Fork Canyon Special Recreation Management Area (SRMA) will be managed in cooperation with Wyoming Game and Fish Department for visitors to engage in fishing, camping, hiking, horseback riding, hunting (fall) and appropriate related off-highway vehicle (OHV) use so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in Back Country and Middle Country settings.

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits
<ul style="list-style-type: none"> • Camping • Fishing • Hiking/backpacking • Hunting (fall season) • Horse riding/packing • Nature Viewing • OHV Use 	<ul style="list-style-type: none"> • Enjoying the sensory experience of a natural landscape • Developing skills and abilities • Testing endurance • Feeling good about solitude, isolation and independence 	<p>Personal:</p> <ul style="list-style-type: none"> • Enhanced awareness and understanding of nature • Closer relationship with the natural world • Improved opportunity to view wildlife close-up • Improved mental health • Improved physical health • Greater appreciation of the outdoor environment • Better understanding of wildlife's contribution to own quality of life <p>Community/Social: none identified</p> <p>Environmental:</p> <ul style="list-style-type: none"> • Greater retention of distinctive natural landscape features • Increased sense of stewardship for the resource • Reduced wildlife harassment by recreation users • Reduced wildlife disturbance from recreation facility development <p>Economic:</p> <ul style="list-style-type: none"> • Enhanced ability for visitors and resident to find areas providing desired recreation experiences and benefits

DESIRED FUTURE RECREATION SETTING CHARACTER

Physical	Social	Operational
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<p><i>Remoteness:</i> Within 0.5 mile of four-wheel drive routes.</p> <p><i>Naturalness:</i> Natural setting may have modifications that would be noticed but not draw the attention of an observer wandering through the area.</p> <p><i>Facilities:</i> Rustic facilities such as campsites, a basic toilet, small kiosks, basic trailheads and marked trails.</p>	<p><i>Contacts With Others:</i> Average encounters per day during peak hunting use season (September - November) would be approximately 3–6 encounters off travel routes and 7–15 encounters on travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (4–6 people per group).</p> <p><i>Evidence of use:</i> Small areas of alteration present. Surface vegetation showing wear with some bare soils. Sounds of people infrequent.</p>	<p><i>Mechanized Use:</i> Nonmotorized, mechanized use is allowed on designated trails. Due to the steep topography, mechanized recreation is prohibited within the canyon. Should conflicts arise between mechanized use and other nonmotorized recreationists, the recreation area management plan will be adapted via a public comment period.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
SUPPORT ACTIONS		
Recreation Management Actions	<p>Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</p> <p>Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.</p> <p>Continue to enhance the availability of dependable non-potable water sources for recreationists.</p>	
Information and Education (including promotion and interpretation)	<p>Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</p> <p>Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</p>	
Administration	<p>Consider the use of a Memorandum of Understanding or other cooperative agreement between the Bureau of Land Management and pertinent partners to maintain and enhance the area.</p>	
Monitoring (and Evaluation)	<ul style="list-style-type: none"> • Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies. • Monitor recreation setting condition through onsite patrols during the high use season (August-November). 	
Interdisciplinary Support Actions	<p>Visual Resource Management Class II; travel limited to designated routes.</p>	

T.5. Mosier Gulch Management Area

Supporting Information and Rationale

The Mosier Gulch SRMA is necessary to accommodate local visitor demand for nonmotorized recreational opportunities near the City of Buffalo; this demand has been identified through focus groups, community involvement workshops, and through visitor use data. Mosier Gulch is located within 3 miles of the Buffalo City Limits. This parcel provides seamless recreational opportunities as it connects with the Buffalo Greenbelt and additional public lands. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand. The area boasts excellent fishing opportunities and easy access to natural resource based recreational opportunities. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.

MOSIER GULCH SPECIAL RECREATION MANAGEMENT AREA (SRMA) OBJECTIVES & DECISIONS
<p><i>Objective Statement:</i> Within the Mosier Gulch SRMA, by the year 2015 and thereafter, participants in recreation assessments will report an average 4.0 realization of the targeted experiences and benefits (4.0 on a probability scale, where 1.0 equals not realized and 5.0 equals totally realized) listed below. The Mosier Gulch SRMA will offer opportunities for recreationists to engage in jogging, hiking, mountain biking, fishing, hunting and nature viewing and other forms of nonmotorized dispersed recreation in a partially modified physical recreation setting with predominantly nonmotorized public use. Within the management area, the existing natural and physical character of the landscape will be modified by recreational trail developments and associated recreation and interpretive facilities.</p> <p><i>Activities:</i> Trail system access for jogging, walking, hiking, mountain biking, picnicking, and fishing.</p> <p><i>Experiences:</i> Enjoying frequent exercise, enjoying having easy access to natural landscapes, enjoying having access to close-to-home outdoor amenities.</p> <p><i>Benefits:</i> Improved physical fitness and health maintenance, heightened sense of community sense of place, lifestyle improvement, increased desirability as a place to live or retire.</p>
RECREATION SETTING CHARACTERISTIC (RSC) DESCRIPTIONS
<p><i>Physical Characteristics:</i> Within 0.5 mile of paved/primary roads and highways; character of the natural landscape partially modified but none overpower the natural landscape; maintained and marked trails, simple trailhead developments and basic toilet.</p> <p><i>Social Characteristics:</i> From 2006 to 2010, the average annual estimated visitation was 2386 visits and 355 visitor days (RMIS). Approximately 5-8 encounters per day off travel routes (staging areas) and approximately 5 encounters on travel routes. Most groups consist of 2-5 people. Small areas of terrain alteration are prevalent near the trailhead and parking areas. Surface vegetation gone with compacted soils observed. The sounds of other people are regularly heard.</p> <p><i>Operational Characteristics:</i> Foot travel and mountain bikes are predominate, motorized use allowed only on main road. Basic information provided, staff infrequently present. Some regulatory and ethics signing, moderate use restrictions.</p>
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS
<p><i>Recreation and Visitor Services Program:</i> Standard 14-day camping limit applies; developed site closed to camping and recreational target shooting; currently not eligible for Federal Lands Recreation Enhancement Act but may be evaluated if future investments in visitor services meet eligibility requirements.</p> <p><i>Oil & Gas Leasing/Minerals:</i> Closed to leasing. Recommended for withdrawal from mineral entry. Salable mineral development for administrative use only.</p> <p><i>VRM:</i> Class II</p> <p><i>Renewable Energy:</i> Renewable energy exclusion area</p> <p><i>Lands and Realty:</i> Rights-of-Way (ROW) exclusion area</p> <p><i>Special Recreation Permits (SRPs):</i> SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.</p> <p><i>Travel Management:</i> The area will be managed as limited to designated routes, with very few routes designated. Identify routes to close and reclaim. Modify appropriate routes into nonmotorized trails. Designated routes will be primarily for provision of access to provide egress for administrative use.</p> <p><i>Livestock Grazing:</i> The picnic area is closed to grazing. The 120-acre parcel along Clear Creek Trail on Grouse Mountain is deemed unsuitable for grazing due to steep slopes.</p>

IMPLEMENTATION DECISIONS
<p>Marketing: Provide maps and information at the field office. Directional signage present from Highway 16. Develop interpretive signs at trailhead/parking area on general location, history, geology, and wildlife resources. Provide stewardship information to help preserve the special landscape character. Make available for outreach programs such as Conservation and Outdoor Recreation Education, Take It Outside, National Public Lands Day, etc.</p> <p>Monitoring: Vehicle counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.</p> <p>Management: Signs present at key access points. Develop trailheads for foot, horse and bicycle travel.</p> <p>Administrative:</p> <p><i>Agreements:</i> Maintain cooperative agreements with City of Buffalo, U.S. Forest Service and Johnson County.</p> <p><i>Partners:</i> City of Buffalo, Buffalo Trails Board, U.S. Forest Service Powder River Ranger District, Johnson County Recreation District, and Wyoming Department of Game and Fish.</p>

MOSIER PICNIC AREA RECREATION MANAGEMENT ZONE RMZ		
Outcome Objective		
The Mosier Gulch Picnic Area RMZ will be sustained or enhanced for individuals or small groups of nonmotorized recreationists, to engage in nature and wildlife viewing, picnicking and walking the interpretive trail so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in these Front Country settings:		
TARGETED OPPORTUNITIES & OUTCOMES		
Activity Opportunities	Outcomes	
	Experiences	Benefits
<ul style="list-style-type: none">● Picnicking● Fishing● Nature Viewing	<ul style="list-style-type: none">● Increased desirability as a place to live or retire● Enjoying having easy access to natural landscapes● Enjoying having access to close-to-home outdoor amenities● Enjoying the closeness of friends and family	<p>Personal:</p> <ul style="list-style-type: none">● Closer relationship with the natural world● Improved mental health● Improved physical health● Greater appreciation of the outdoor environment● Greater awareness that this community is a special place● Improved sense of personal responsibility for control of domestic pets <p>Community/Social:</p> <ul style="list-style-type: none">● Improved community integration● Lifestyle improvement or maintenance● Heightened sense of community satisfaction <p>Environmental:</p> <ul style="list-style-type: none">● Greater community ownership and stewardship of park, recreation, and natural resources● Reduced negative human impacts such as litter, vegetative trampling, and unplanned trails <p>Economic:</p> <ul style="list-style-type: none">● Increased desirability as a place to live or retire
DESIRED FUTURE RECREATION SETTING CHARACTER		
Physical	Social	Operational

<p><i>Remoteness:</i> Within a 0.5 mile of paved/primary roads and highways.</p> <p><i>Naturalness:</i> Character of natural landscape partially modified but none overpower natural landscape.</p> <p><i>Facilities:</i> Maintained and marked trails, simple trailhead developments and basic toilets. Interpretive displays may also be incorporated.</p>	<p><i>Contacts With Others:</i> Encounters with other groups average 2-4 encounters per day in staging areas and fewer than 5 encounters on travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 5 people per group).</p> <p><i>Evidence of use:</i> Small areas of terrain alteration are prevalent near the trailhead and parking areas. Surface vegetation gone with compacted soils observed. Sounds of other people common.</p>	<p><i>Mechanized Use:</i> Mechanized travel is allowed only on designated trails.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
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SUPPORT ACTIONS

Recreation Management Actions	Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions. Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.
Information and Education (including promotion and interpretation)	Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information. Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.
Administration	Continue Memorandum of Understanding and consider other cooperative agreements between the Bureau of Land Management and pertinent partners to maintain and enhance the area.
Monitoring (and Evaluation)	Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies.
Interdisciplinary Support Actions	Visual Resource Management Class II; travel limited to designated routes.

CLEAR CREEK TRAIL SYSTEM RECREATION MANAGEMENT ZONE (RMZ)

Outcome Objective

The Clear Creek Trail System RMZ will be sustained or enhanced for individuals or small groups of nonmotorized recreationists, to engage in nature and wildlife viewing, walking and hiking the Clear Creek trail so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in these Front Country settings:

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits

<ul style="list-style-type: none"> ● Jogging ● Mountain Biking ● Walking ● Hiking ● Nature Viewing 	<ul style="list-style-type: none"> ● Enjoying frequent exercise ● Enjoying having easy access to natural landscapes ● Enjoying having access to close-to-home outdoor amenities ● Enjoying the closeness of friends and family 	<p>Personal:</p> <ul style="list-style-type: none"> ● Closer relationship with the natural world ● Improved mental health ● Improved physical health ● Greater appreciation of the outdoor environment ● Improved sense of personal responsibility for control of domestic pets <p>Community/Social:</p> <ul style="list-style-type: none"> ● Improved community integration ● Lifestyle improvement or maintenance ● Heightened sense of community satisfaction <p>Environmental:</p> <ul style="list-style-type: none"> ● Greater community ownership and stewardship of park, recreation, and natural resources ● Maintenance of distinctive recreation setting character <p>Economic:</p> <ul style="list-style-type: none"> ● Increased desirability as a place to live or retire
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DESIRED FUTURE RECREATION SETTING CHARACTER

Physical	Social	Operational
<p><i>Remoteness:</i> Within a 0.5 mile of paved/primary roads and highways.</p> <p><i>Naturalness:</i> Character of natural landscape partially modified but none overpower natural landscape.</p> <p><i>Facilities:</i> Maintained and marked trails, simple trailhead developments and basic toilets. Interpretive displays may also be incorporated.</p>	<p><i>Contacts With Others:</i> Encounters with other groups average 2-4 encounters per day in staging areas and fewer than 5 encounters on travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 5 people per group).</p> <p><i>Evidence of use:</i> Small areas of terrain alteration are prevalent near the trailhead and parking areas. Surface vegetation gone with compacted soils observed. Sounds of other people common.</p>	<p><i>Mechanized Use:</i> Mechanized travel is allowed only on designated trails.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>

SUPPORT ACTIONS

Recreation Management Actions	<p>Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</p> <p>Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.</p>
Information and Education (including promotion and interpretation)	<p>Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</p> <p>Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</p>
Administration	Continue Memorandum of Understanding and consider other cooperative agreements between the Bureau of Land Management and pertinent partners to maintain and enhance the area.
Monitoring (and Evaluation)	Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies.
Interdisciplinary Support Actions	Visual Resource Management Class II; travel limited to designated routes.

NORTH RIDGE RECREATION MANAGEMENT ZONE (RMZ)		
Outcome Objective The North Ridge RMZ will be sustained or enhanced for individuals or small groups of nonmotorized recreationists, to engage in nature and wildlife viewing, hunting and fishing so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in these Front Country:		
TARGETED OPPORTUNITIES & OUTCOMES		
Activity Opportunities	Outcomes	
	Experiences	Benefits
<ul style="list-style-type: none"> • Hunting • Nature Viewing 	<ul style="list-style-type: none"> • Enjoying having easy access to natural landscapes • Enjoying maintaining out-of-town country solitude 	Personal: <ul style="list-style-type: none"> • Closer relationship with the natural world • Improved mental health • Improved physical health • Greater appreciation of the outdoor environment Community/Social: <ul style="list-style-type: none"> • Heightened sense of community satisfaction Environmental: <ul style="list-style-type: none"> • Greater community ownership and stewardship of park, recreation, and natural resources • Greater protection of fish, wildlife, and plant habitat from growth, development, and public use impacts Economic: <ul style="list-style-type: none"> • Increased desirability as a place to live or retire
DESIRED FUTURE RECREATION SETTING CHARACTER		
Physical	Social	Operational
<i>Remoteness:</i> Within a 0.5 mile of paved/primary roads and highways. <i>Naturalness:</i> Character of natural landscape retained. A few modifications contrast with character of the landscape (e.g., fences, primitive roads). <i>Facilities:</i> No structures. Foot/horse trails only.	<i>Contacts With Others:</i> Encounters with other groups average fewer than 3 encounters off of travel routes. <i>Group Size:</i> Group sizes are expected to remain small (less than 3 people per group). <i>Evidence of use:</i> Areas of alteration uncommon. Little surface vegetation wear observed. Sounds of people infrequent.	<i>Mechanized Use:</i> Mechanized travel is allowed only on designated trails. <i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.
SUPPORT ACTIONS		
Recreation Management Actions	Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions. Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.	
Information and Education (including promotion and interpretation)	Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information. Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.	
Administration	Continue Memorandum of Understanding and consider other cooperative agreements between the Bureau of Land Management and pertinent partners to maintain and enhance the area.	

Monitoring (and Evaluation)	Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies.
Interdisciplinary Support Actions	Visual Resource Management Class II; travel limited to designated routes.

T.6. Welch Ranch Management Area

SUPPORTING INFORMATION

This SRMA is necessary to accommodate local visitor demand for nonmotorized recreational opportunities near the City of Sheridan; this demand has been identified through focus groups, community involvement workshops, and through visitor use data. The Welch Ranch is located approximately 10 miles from Sheridan city limits. The Welch Ranch parcel offers public access to riparian areas, a unique opportunity for BLM-administered lands in northeastern Wyoming. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand. The area boasts excellent fishing opportunities and easy access to natural resource based recreational opportunities. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.

WELCH RANCH SPECIAL RECREATION MANAGEMENT AREA (SRMA) OBJECTIVES & DECISIONS
<p><i>Objective Statement:</i> Within the Welch Ranch SRMA, by the year 2015 and thereafter, participants in recreation assessments will report an average 4.0 realization of the targeted experiences and benefits (4.0 on a probability scale, where 1.0 equals not realized and 5.0 equals totally realized) listed below. The Welch Ranch SRMA will offer opportunities for recreationists to engage in physical exercise, hiking, mountain biking, fishing, hunting and nature viewing and other forms of nonmotorized dispersed recreation in a partially modified physical recreation setting with predominantly nonmotorized public use. Within the management area, the existing natural and physical character of the landscape will be modified by recreational trail developments and associated recreation and interpretive facilities.</p> <p><i>Activities:</i> Hiking, mountain biking, fishing, hunting, environmental education.</p> <p><i>Experiences:</i> Enjoying frequent exercise, enjoying having easy access to natural landscapes, enjoying having access to close-to-home outdoor amenities.</p> <p><i>Benefits:</i> Improved physical fitness and health maintenance, a heightened sense of community sense of place, lifestyle improvement, greater freedom from urban living.</p>
RECREATION SETTING CHARACTERISTIC (RSC) DESCRIPTIONS
<p><i>Physical Characteristics:</i> Within 0.5 mile of paved/primary roads and highways at east entrance; character of the natural landscape partially modified but none overpower the natural landscape; maintained and marked trails, simple trailhead developments.</p> <p><i>Social Characteristics:</i> From 2006 to 2010, the average annual estimated visitation was 1181 visits and 510 visitor days (RMIS). Contacts with other groups are not uncommon during high use seasons. Most groups consist of 2-4 people. Small areas of terrain alteration are present, but are attributed mostly to cattle operations. The sounds of other people are rarely heard. Approximately 1-2 encounters per day off travel routes (staging areas) and few encounters on travel routes.</p> <p><i>Operational Characteristics:</i> Foot travel and mountain bikes are predominate, motorized use prohibited. Basic information provided, staff infrequently present. Some regulatory and ethics signing, moderate use restrictions.</p>
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program: Campfires prohibited, camping prohibited in the parking areas and at trailheads; standard 14-day camping limit applies outside of parking areas; closed to recreational target shooting; currently not eligible for Federal Lands Recreation Enhancement Act but may be evaluated if future investments in visitor services meet eligibility requirements.

Oil & Gas Leasing/Minerals: Recommended for withdrawal from mineral entry. Salable mineral development for administrative use only. The area is closed to leasing of fluid minerals. Note: A portion of the leasable fluid minerals are not administered by the BLM.

VRM: Class II

Renewable Energy: Renewable energy exclusion area

Lands and Realty: ROW exclusion area

Special Recreation Permits (SRPs): SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.

Travel Management: The area will be managed as limited to designated routes; designated routes will provide egress for administrative use only. Identify routes to close and reclaim.

Areas of Critical Environmental Concern (ACECs): Welch Ranch ACEC relevant and important values will be incorporated into an ACEC and/or Recreation Area Management Plan.

IMPLEMENTATION DECISIONS

Marketing: Provide maps and information at the field office. Directional signage present from Highway 339. Develop interpretive signs at trailhead/parking area on general location, history, geology, and wildlife resources. Provide stewardship information to help preserve the special landscape character. Make available for outreach programs such as Conservation and Outdoor Recreation Education, Take It Outside, National Public Lands Day, etc.

Monitoring: Vehicle counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.

Management: Signs present at key access points. Develop trailheads for foot, horse and bicycle travel.

Administrative:

Agreements: Seek out cooperative agreements with interested organizations.

Partners: Sheridan Community Land Trust, Sheridan Public Land Users, Wyoming State Land Board and Wyoming Department of Game and Fish, Sheridan County Conservation District. Pursue partnerships with Sheridan College, Sheridan County School District, private schools, non-profit organization including the YMCA, Boys and Girls Club and Science Kids to establish an outdoor classroom.

Other administration: Travel limited to designated routes and for administrative use only. Modify appropriate routes into nonmotorized trails. Livestock grazing will be managed in concert with other resource values under a site-specific allotment management plan. Overlaps ACEC (Appendix S (p. 2531)).

TONGUE RIVER RECREATION MANAGEMENT ZONE (RMZ)

Outcome Objective

The Tongue River RMZ will be sustained or enhanced for individuals or small groups of nonmotorized recreationists, to engage in nature and wildlife viewing, fishing, hunting and foot and horse travel so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits

<ul style="list-style-type: none"> ● Boating ● Fishing ● Environmental Education ● Nature Viewing 	<ul style="list-style-type: none"> ● Enjoying frequent exercise ● Enjoying having easy access to natural landscapes ● Enjoying having access to close-to-home outdoor amenities ● Enjoying the closeness of friends and family 	<p>Personal:</p> <ul style="list-style-type: none"> ● Closer relationship with the natural world ● Improved mental health ● Improved physical health ● Greater appreciation of the outdoor environment <p>Community/Social:</p> <ul style="list-style-type: none"> ● Improved community integration ● Lifestyle improvement or maintenance ● Heightened sense of community satisfaction <p>Environmental:</p> <ul style="list-style-type: none"> ● Greater community ownership and stewardship of park, recreation, and natural resources ● Maintenance of distinctive recreation setting character ● Reduced wildlife disturbance from recreation facility development ● Improved soil, water, and air quality ● Greater protection of fish, wildlife, and plant habitat from growth, development, and public use impacts <p>Economic:</p> <ul style="list-style-type: none"> ● Increased desirability as a place to live or retire
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DESIRED FUTURE RECREATION SETTING CHARACTER

Physical	Social	Operational
<p><i>Remoteness:</i> Within a 0.5 mile of paved/primary roads and highways.</p> <p><i>Naturalness:</i> Character of natural landscape partially modified but none overpower natural landscape.</p> <p><i>Facilities:</i> Maintained and marked trails, simple trailhead developments and basic toilets. Interpretive displays may also be incorporated.</p>	<p><i>Contacts With Others:</i> Encounters with other groups average 2-4 encounters per day in staging areas and fewer than 5 encounters on travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 5 people per group).</p> <p><i>Evidence of use:</i> Small areas of terrain alteration are prevalent near the trailhead and parking areas. Surface vegetation gone with compacted soils observed. Sounds of other people common.</p>	<p><i>Mechanized Use:</i> Mechanized travel is allowed only on designated trails.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>

SUPPORT ACTIONS

Recreation Management Actions	<p>Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</p> <p>Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.</p>
Information and Education (including promotion and interpretation)	<p>Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</p> <p>Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</p>
Administration	<p>Consider other cooperative agreements between the Bureau of Land Management and pertinent partners to maintain and enhance the area.</p>

Monitoring (and Evaluation)	Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies.
Interdisciplinary Support Actions	Visual Resource Management Class II. Mechanized and nonmotorized travel on designated trails. Motorized travel for administrative use only. Area of Critical Environmental Concern designation; discussed in Appendix S (p. 2531).

RIVER BOTTOM RECREATION MANAGEMENT ZONE (RMZ)

Outcome Objective

The River Bottom RMZ will be sustained or enhanced for individuals or small groups of nonmotorized recreationists, to engage in nature and wildlife viewing, fishing, hunting and foot and horse travel so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits
<ul style="list-style-type: none"> • Jogging • Walking • Hiking • Environmental Education • Mountain Biking • Horseback Riding • Fishing • Nature Viewing • Hunting 	<ul style="list-style-type: none"> • Enjoying frequent exercise • Enjoying having easy access to natural landscapes • Enjoying having access to close-to-home outdoor amenities • Enjoying the closeness of friends and family 	<p>Personal:</p> <ul style="list-style-type: none"> • Closer relationship with the natural world • Improved mental health • Improved physical health • Greater appreciation of the outdoor environment <p>Community/Social:</p> <ul style="list-style-type: none"> • Improved community integration • Lifestyle improvement or maintenance • Heightened sense of community satisfaction <p>Environmental:</p> <ul style="list-style-type: none"> • Greater community ownership and stewardship of park, recreation, and natural resources • Maintenance of distinctive recreation setting character • Improved soil, water, and air quality • Greater protection of fish, wildlife, and plant habitat from growth, development, and public use impacts <p>Economic:</p> <ul style="list-style-type: none"> • Increased desirability as a place to live or retire

DESIRED FUTURE RECREATION SETTING CHARACTER

Physical	Social	Operational
<p><i>Remoteness:</i> Within a 0.5 mile of mechanized routes.</p> <p><i>Naturalness:</i> Character of natural landscape partially modified but none overpower natural landscape.</p> <p><i>Facilities:</i> Maintained and marked trails, simple trailhead developments and basic toilets. Interpretive displays may also be incorporated.</p>	<p><i>Contacts With Others:</i> Encounters with other groups average 2-4 encounters per day in staging areas and fewer than 5 encounters on travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 5 people per group).</p> <p><i>Evidence of use:</i> Small areas of terrain alteration are prevalent near the trailhead and parking areas. Surface vegetation gone with compacted soils observed. Sounds of other people common.</p>	<p><i>Mechanized Use:</i> Mechanized travel is allowed only on designated trails.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>

SUPPORT ACTIONS

Recreation Management Actions	Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions. Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.
Information and Education (including promotion & interpretation)	Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information. Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.
Administration	Continue Memorandum of Understanding and consider other cooperative agreements between the Bureau of Land Management and pertinent partners to maintain and enhance the area.
Monitoring (and Evaluation)	Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies.
Interdisciplinary Support Actions	Visual Resource Management Class II. Mechanized and nonmotorized travel on designated trails. Motorized travel for administrative use only. Area of Critical Environmental Concern designation; discussed in Appendix S (p. 2531).

UPLAND RECREATION MANAGEMENT ZONE (RMZ)

Outcome Objective

The Upland RMZ will be sustained or enhanced for individuals or small groups of nonmotorized recreationists, to engage in horseback riding, hiking, camping, hunting and nature viewing so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits
<ul style="list-style-type: none"> • Hiking • Camping • Hunting 	<ul style="list-style-type: none"> • Enjoying having easy access to natural landscapes • Enjoying having access to close-to-home outdoor amenities • Enjoying maintaining out-of-town country solitude 	<p>Personal:</p> <ul style="list-style-type: none"> • Closer relationship with the natural world • Improved mental health • Improved physical health • Greater appreciation of the outdoor environment <p>Community/Social:</p> <ul style="list-style-type: none"> • Heightened sense of community satisfaction <p>Environmental:</p> <ul style="list-style-type: none"> • Greater community ownership and stewardship of park, recreation, and natural resources • Maintenance of distinctive recreation setting character <p>Economic:</p> <ul style="list-style-type: none"> • Increased desirability as a place to live or retire

DESIRED FUTURE RECREATION SETTING CHARACTER

Physical	Social	Operational
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<p><i>Remoteness:</i> Within a mile of paved/primary roads and highways.</p> <p><i>Naturalness:</i> Character of natural landscape retained. A few modifications contrast with character of the landscape (e.g., fences, primitive roads).</p> <p><i>Facilities:</i> No structures. Foot/horse trails only.</p>	<p><i>Contacts With Others:</i> Encounters with other groups average fewer than 3 encounters off of travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 3 people per group).</p> <p><i>Evidence of use:</i> Areas of alteration uncommon. Little surface vegetation wear observed. Sounds of people infrequent.</p>	<p><i>Mechanized Use:</i> Mechanized travel is allowed only on designated trails.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
SUPPORT ACTIONS		
Recreation Management Actions	<p>Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</p> <p>Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.</p>	
Information and Education (including promotion and interpretation)	<p>Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</p> <p>Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</p>	
Administration	<p>Continue Memorandum of Understanding and consider other cooperative agreements between the Bureau of Land Management and pertinent partners to maintain and enhance the area.</p>	
Monitoring (and Evaluation)	<p>Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies.</p>	
Interdisciplinary Support Actions	<p>Visual Resource Management Class II. Mechanized and nonmotorized travel on designated trails. Motorized travel for administrative use only. Area of Critical Environmental Concern designation; discussed in Appendix S (p. 2531).</p>	

T.7. Weston Hills Management Area

Supporting Information

This SRMA is necessary to accommodate local visitor demand for motorized recreational opportunities near the City of Gillette; this demand has been identified by community involvement workshops, and through visitor use data. Weston Hills is located within 25 miles of the Gillette city limits. This parcel provides seamless recreational opportunities as it connects with Thunder Basin National Grassland and additional public lands. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.

WESTON HILLS SPECIAL RECREATION MANAGEMENT (SRMA) OBJECTIVES & DECISIONS
<p><i>Objective Statement:</i> Within the Weston Hills SRMA, by the year 2016 and thereafter, participants in recreation assessments will report an average 4.0 realization of the targeted experiences and benefits (4.0 on a probability scale, where 1.0 equals not realized and 5.0 equals totally realized) listed below. The Weston Hills SRMA will offer opportunities for recreationists to engage in off-highway vehicle (OHV) use, camping, hunting and nature viewing and other forms of dispersed recreation in a partially modified physical recreation setting with both motorized and nonmotorized public use. Within the management area, the existing natural and physical character of the landscape will be modified by recreational trail developments and associated recreation facilities.</p>

Activities: OHV use, fishing, hunting, and camping.

Experiences: Enjoying having easy access to natural landscapes, enjoying having access to close-to-home outdoor amenities.

Benefits: Heightened sense of community sense of place, lifestyle improvement.

RECREATION SETTING CHARACTERISTIC (RSC) DESCRIPTIONS

Physical Characteristics: Within 0.5 mile of paved/primary roads and highways; character of the natural landscape partially modified but none overpower the natural landscape; maintained and marked trails, simple trailhead developments and basic toilet.

Social Characteristics: From 2006 to 2010, the average annual estimated visitation was 3,920 visits and 2,167 visitor days (RMIS). Most groups consist of 3-6 people. Approximately 3-6 encounters per day off travel routes (staging areas) and approximately 4-8 encounters on travel routes. Small areas of terrain alteration are prevalent near the trailhead and parking areas. Surface vegetation gone with compacted soils observed. The sounds of other people are regularly heard.

Operational Characteristics: Motorized use predominates, motorized use allowed on designated routes. Basic information provided, staff infrequently present. Some regulatory and ethics signing, moderate use restrictions.

MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program: Campfires prohibited. Not a fee site; not currently suitable for Federal Lands Recreation Enhancement Act (FLREA). The site may be evaluated in conjunction with U.S. Forest Service under FLREA if additional amenities are provided in the future.

Oil & Gas Leasing/Minerals: Lease fluid minerals with a Controlled Surface Use (CSU). Recommended for withdrawal from mineral entry. Salable mineral development for administrative use only.

VRM: Class II

Renewable Energy: Renewable energy exclusion area

Lands and Realty: ROW exclusion area

Travel Management: The area will be managed as limited to designated routes, with several routes designated. Routes will be classified by type of use (public or administrative), vehicle type (i.e., passenger vehicle, four-wheel drive, vehicles 50" or less) and maintenance level. Identify routes to close and reclaim.

Special Recreation Permits (SRPs): SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.

IMPLEMENTATION DECISIONS

Marketing: Provide maps and information at the field office. Directional signage present from Highway 59. Develop interpretive signs at trailhead/parking area on general location, history, geology, and wildlife resources. Provide stewardship information to help preserve the special landscape character. Make available for outreach programs such as Conservation and Outdoor Recreation Education, Take It Outside, National Public Lands Day, etc.

Monitoring: Vehicle counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.

Management: Signs present at key access points. Develop trailheads for foot, horse and bicycle travel.

Administrative:

Agreements: Create and maintain cooperative agreements with U.S. Forest Service and other interested organizations.

Partners: U.S. Forest Service Douglas Ranger District, Campbell County, Wyoming State Land Board and Wyoming Department of Game and Fish.

THE LOOP RECREATION MANAGEMENT ZONE (RMZ)**Outcome Objective**

The Loop RMZ will be sustained or enhanced for individuals or small groups of motorized recreationists, to engage in off-highway vehicle (OHV) use, camping and nature and wildlife viewing so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in these Front Country settings:

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits
<ul style="list-style-type: none"> • OHV use • Camping 	<ul style="list-style-type: none"> • Enjoying having easy access to natural landscapes • Enjoying having access to close-to-home outdoor amenities • Enjoying the closeness of friends and family 	<p>Personal:</p> <ul style="list-style-type: none"> • Improved mental health • Improved physical health <p>Community/Social:</p> <ul style="list-style-type: none"> • Lifestyle improvement or maintenance • Heightened sense of community satisfaction <p>Environmental:</p> <ul style="list-style-type: none"> • Greater community ownership and stewardship of park, recreation, and natural resources • Maintenance of distinctive recreation setting character <p>Economic:</p> <ul style="list-style-type: none"> • Increased desirability as a place to live or retire

DESIRED FUTURE RECREATION SETTING CHARACTER

Physical	Social	Operational
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<p><i>Remoteness:</i> Within a 0.5 mile of passerger roads.</p> <p><i>Naturalness:</i> Character of natural landscape considerably modified.</p> <p><i>Facilities:</i> Maintained and marked routes, simple trailhead developments and basic toilets. Interpretive displays may also be incorporated.</p>	<p><i>Contacts With Others:</i> Encounters with other groups average 2-4 encounters per day in staging areas and fewer than 5 encounters on travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 5 people per group).</p> <p><i>Evidence of use:</i> Large areas of terrain alteration are prevalent near “the Loop” and parking areas. Surface vegetation gone with compacted soils observed. Sounds of other people common.</p>	<p><i>Mechanized Use:</i> Mechanized travel is allowed only on designated trails.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
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SUPPORT ACTIONS

Recreation Management Actions	Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions. Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.
Information and Education (including promotion and interpretation)	Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information. Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.
Administration	Continue Memorandum of Understanding and consider other cooperative agreements between the Bureau of Land Management and pertinent partners to maintain and enhance the area.
Monitoring (and Evaluation)	Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies.
Interdisciplinary Support Actions	Visual Resource Management Class II

DISPERSED USE RECREATION MANAGEMENT ZONE (RMZ)**Outcome Objective**

The Weston Hills Dispersed Use RMZ will be sustained or enhanced for individuals or small groups of motorized recreationists, to engage in off-highway vehicle (OHV) use, camping and nature and wildlife viewing so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below in these Front Country and Middle Country settings:

TARGETED OPPORTUNITIES & OUTCOMES

Activity Opportunities	Outcomes	
	Experiences	Benefits

<ul style="list-style-type: none"> ● Hunting ● Hiking ● Camping 	<ul style="list-style-type: none"> ● Enjoying having easy access to natural landscapes ● Enjoying having access to close-to-home outdoor amenities ● Enjoying the closeness of friends and family 	<p>Personal:</p> <ul style="list-style-type: none"> ● Improved mental health ● Improved physical health <p>Community/Social:</p> <ul style="list-style-type: none"> ● Lifestyle improvement or maintenance ● Heightened sense of community satisfaction <p>Environmental:</p> <ul style="list-style-type: none"> ● Greater community ownership and stewardship of park, recreation, and natural resources ● Maintenance of distinctive recreation setting character <p>Economic:</p> <ul style="list-style-type: none"> ● Increased desirability as a place to live or retire
DESIRED FUTURE RECREATION SETTING CHARACTER		
Physical	Social	Operational
<p><i>Remoteness:</i> Within a 0.5 mile of four-wheel drive roads.</p> <p><i>Naturalness:</i> Character of natural landscape partially modified.</p> <p><i>Facilities:</i> Maintained and marked routes, simple trailhead developments and basic toilets. Interpretive displays may also be incorporated.</p>	<p><i>Contacts With Others:</i> Encounters with other groups average 2-4 encounters per day in staging areas and fewer than 5 encounters on travel routes.</p> <p><i>Group Size:</i> Group sizes are expected to remain small (less than 5 people per group).</p> <p><i>Evidence of use:</i> Large areas of terrain alteration are prevalent near “the Loop” and parking areas. Surface vegetation gone with compacted soils observed. Sounds of other people common.</p>	<p><i>Mechanized Use:</i> Mechanized travel is allowed only on designated trails.</p> <p><i>Management Controls and Visitor Services:</i> On site controls and services are present but subtle. Offsite services and controls provided in the minimum amount necessary to reach management objectives.</p>
SUPPORT ACTIONS		
Recreation Management Actions	<p>Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</p> <p>Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.</p>	
Information and Education (including promotion and interpretation)	<p>Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</p> <p>Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</p>	
Administration	<p>Continue Memorandum of Understanding and consider other cooperative agreements between the Bureau of Land Management and pertinent partners to maintain and enhance the area.</p>	
Monitoring (and Evaluation)	<p>Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through focus group interviews or visitor studies.</p>	
Interdisciplinary Support Actions	<p>Visual Resource Management Class II; travel limited to designated routes.</p>	

T.8. Extensive Recreation Management Areas

Extensive Recreation Management Areas (ERMAs) are administrative units managed:

1. To address recreation use, demand, or existing Recreation and Visitor Services program investments.
2. To support and sustain the principal recreation activities and the associated qualities and conditions.
3. Commensurate with the management of other resources and resource uses.

The Proposed Resource Management Plan does not generally propose any special management restrictions (i.e., rights-of-way avoidance, closures to leasing, etc.) to protect the recreation values within ERMAs. The objectives of the recreation program within ERMAs will be considered commensurate with other resources and resource uses in site-specific analysis. Mitigation of impacts to recreation in ERMAs in subsequent site-specific National Environmental Policy Act documents will be an implementation level decision, subject to consideration of the objectives identified for each ERMA. ERMAs do overlap with management actions proposed for other resources and the “Management Actions and Allowable Uses” sections listed below reflect the management selected in the Proposed Resource Management Plan across all resources.

T.8.1. Cabin Canyon Management Area

Supporting Information and Rationale

This ERMA is necessary to accommodate multiple use mandates through reduction of user conflicts primarily related to user created motorized routes. This ERMA is also necessary to accommodate local visitor demand for motorized recreational opportunities near the City of Gillette; this demand has been identified by onsite customers, community involvement workshops, and through visitor use data. Cabin Canyon is located within 25 miles of the Gillette city limits. ERMA management will accommodate visitor demand, minimize conflicts with other uses (i.e., mineral development) and prevent inadvertent trespass.

CABIN CANYON EXTENSIVE RECREATION MANAGEMENT AREA (ERMA) OBJECTIVES & DECISIONS
<i>Objective Statement:</i> Manage the Cabin Canyon ERMA for motorized recreationists to engage in off-highway vehicle (OHV) use, hunting and nature viewing so that they realize a “moderate” level of the targeted experience and benefit outcomes in the Front and Middle Country settings.
<i>Activities:</i> OHV use, hunting, camping and nature viewing.
<i>Experiences:</i> Enjoying having easy access to natural landscapes, enjoying having access to close-to-home outdoor amenities, improved respect for privately owned lands.
<i>Benefits:</i> Improved understanding of how this community’s rural-urban interface impacts its quality of life; greater respect for private property and local lifestyles.
RECREATION SETTING CHARACTERISTIC (RSC) DESCRIPTIONS
<i>Physical Characteristics:</i> Within 0.5 mile of paved/primary roads and highways; character of the natural landscape partially modified but none overpower the natural landscape; maintained and marked trails, simple trailhead developments.
<i>Social Characteristics:</i> Quantitative visitor use data does not yet exist for the Cabin Canyon area. A few large areas of terrain alteration exist; largely associated with user created routes and campsites. Surface vegetation is absent in places with hardened soils observed. The sounds of other people are occasionally heard.
<i>Operational Characteristics:</i> Motorized use predominates, motorized use allowed on designated routes. Basic information should be provided, staff infrequently present. Some regulatory and ethics signing, moderate use restrictions.
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program: Campfires prohibited, standard 14-day camping limit applies; prioritized for education efforts to mitigate recreational target shooting; currently not eligible for Federal Lands Recreation Enhancement Act but may be evaluated if future investments in visitor services meet eligibility requirements.

Oil & Gas Leasing/Minerals: Lease fluid minerals with a CSU. Salable mineral development for administrative use only.

VRM: Class IV

Lands and Realty: ROW exclusion area

Special Recreation Permits (SRPs): SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.

IMPLEMENTATION DECISIONS

Marketing: Provide maps and information at the field office. Directional signage necessary from Highway 59 and Bishop Road. Provide stewardship information to help preserve the special landscape character. Make available for outreach programs such as National Public Lands Day, etc.

Monitoring: Vehicle counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.

Management: Signs needed at key access points.

Administrative:

Travel Management: The area will be managed as limited to designated routes, with several routes designated. Identify routes to close and reclaim.

Agreements: State of Wyoming

Other administration: Prioritized for education efforts to mitigate recreational target shooting; recreational target shooting would be prohibited within any future developed recreation facilities.

T.8.2. Face of the Bighorns/North Fork Extensive Recreation Management Area

Supporting Information and Rationale

This ERMA is necessary to accommodate multiple use mandates through reduction of user conflicts primarily related to limited legal access and protection of high-quality hunting and wildlife viewing opportunities. The Face of the Bighorns/North Fork ERMA includes lands from the Poison Creek Trail area south along the Face of the Bighorns, the Horn, and the North Fork Wilderness Study Area (WSA). ERMA management will promote development of additional public access and sustain and enhance recreation amenities to accommodate visitor demand while honoring valid existing rights and preventing inadvertent trespass.

FACE OF THE BIGHORNS/NORTH FORK EXTENSIVE RECREATION MANAGEMENT AREA (ERMA) OBJECTIVES & DECISIONS

Objective Statement: By 2020, the Face of the Bighorns/North Fork ERMA will offer recreation opportunities, in a relatively unchanged physical recreation setting, that facilitate the visitor's freedom to participate in a variety of dispersed, nonmotorized/nonmechanized recreation activities.

<p><i>Activities:</i> Hiking, hunting, fishing, camping, wildlife and nature viewing.</p> <p><i>Experiences:</i> Developing skills and abilities, testing endurance, savoring the total sensory experience of a landscape.</p> <p><i>Benefits:</i> Greater sense of adventure, greater retention of distinctive natural landscape features; improved skills for outdoor enjoyment.</p>
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS
<p><i>Recreation and Visitor Services Program:</i> Camping allowed, subject to 14-day limit.</p> <p><i>Oil & Gas Leasing/Minerals:</i> North Fork WSA and lands with wilderness characteristics unit are recommended for withdrawal from mineral entry, closed to oil and gas leasing and closed to salable mineral development.</p> <p><i>VRM:</i> North Fork WSA is VRM Class I; remainder is Class II and III</p> <p><i>Renewable Energy:</i> The entire ERMA falls within a renewable energy exclusion area.</p> <p><i>Lands and Realty:</i> North Fork WSA and lands with wilderness characteristics unit are rights-of-way exclusion areas.</p> <p><i>Special Recreation Permits (SRPs):</i> SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate. Ensure that SRPs include sufficient mitigation to protect WSAs and lands with wilderness characteristics.</p> <p>North Fork WSA and lands with wilderness characteristics unit are closed to motorized travel. Elsewhere, travel is limited to designated routes. Visual Resources Management (VRM) Class I, II, and III.</p>
IMPLEMENTATION DECISIONS
<p>Marketing: Provide maps and information at the field office. Directional signage necessary from Hazelton Road. Provide stewardship information to help preserve the special landscape character.</p> <p>Monitoring: Vehicle and trail counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.</p> <p>Management: Signs needed at key access points.</p> <p>Administrative:</p> <p><i>Travel Management:</i> North Fork WSA and lands with wilderness characteristics unit and a 500-foot buffer of the Poison Creek Trail are closed to motorized travel. Elsewhere, travel is limited to designated routes. A travel management plan will be developed to designate routes open for administrative or public use, to consider seasonal closures, and to identify routes to close and reclaim. North Fork WSA is closed to motorized use.</p> <p><i>WSA:</i> North Fork WSA is managed under Manual 6330 to prevent impairment of wilderness characteristics.</p> <p><i>Agreements:</i> State of Wyoming</p> <p><i>Partners:</i> Wyoming Game and Fish Department</p> <p><i>Other administration:</i> Recreational target shooting is prohibited within developed recreation sites. Currently, the Poison Creek trailhead is the only existing development.</p>

T.8.3. Gardner Mountain Extensive Recreation Management Area

Supporting Information and Rationale

Appendix T Recreation Management Areas
Gardner Mountain Extensive Recreation
Management Area

May 2015

This ERMA is necessary to accommodate multiple use mandates through reduction of user conflicts primarily related to limited legal access and protection of high-quality hunting and wildlife viewing opportunities. The Gardner Mountain ERMA includes lands along and south of the Mayoworth-Slip Road and north of Barnum Mountain Road. The ERMA encompasses the Gardner Mountain Trail and the Gardner Mountain WSA. ERMA management will promote development of additional public access and sustain and enhance recreation amenities to accommodate visitor demand while honoring valid existing rights and preventing inadvertent trespass.

GARDNER MOUNTAIN EXTENSIVE RECREATION MANAGEMENT AREA (ERMA) OBJECTIVES & DECISIONS
<i>Objective Statement:</i> By 2020, the Gardner Mountain ERMA will offer recreation opportunities, in a relatively unchanged physical recreation setting, that facilitate the visitor's freedom to participate in a variety of dispersed, nonmotorized/nonmechanized recreation activities.
<i>Activities:</i> Hiking, hunting, fishing, camping, wildlife and nature viewing.
<i>Experiences:</i> Developing skills and abilities, testing endurance, savoring the total sensory experience of a landscape.
<i>Benefits:</i> Greater sense of adventure, greater retention of distinctive natural landscape features; improved skills for outdoor enjoyment.
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS
<i>Recreation and Visitor Services Program:</i> Campfires prohibited. Camping allowed, subject to 14-day limit.
<i>Oil & Gas Leasing/Minerals:</i> Gardner Mountain WSA is recommended for withdrawal from mineral entry, closed to oil and gas leasing and closed to salable mineral development.
<i>VRM:</i> Gardner Mountain WSA is VRM Class I; remainder is Class II and III
<i>Renewable Energy:</i> The entire ERMA falls within a renewable energy exclusion area.
<i>Lands and Realty:</i> Gardner Mountain WSA is a rights-of-way exclusion area.
<i>Special Recreation Permits (SRPs):</i> SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate. Ensure that SRPs include sufficient mitigation to protect WSA.

IMPLEMENTATION DECISIONS
<p>Marketing: Provide maps and information at the field office. Directional signage necessary from Hazelton, Slip, Mayoworth, Brock and Barnum Roads. Provide stewardship information to help preserve the special landscape character.</p>
<p>Monitoring: Vehicle and trail counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.</p>
<p>Management: Signs needed at key access points.</p>
<p>Administrative:</p>
<p><i>Travel Management:</i> Gardner Mountain WSA and a 500-foot buffer of the Gardner Mountain Trail is closed to motorized travel. Elsewhere, travel is limited to designated routes. A travel management plan will be developed to designate routes open for administrative or public use, to consider seasonal closures, and to identify routes to close and reclaim.</p>
<p><i>WSA:</i> Gardner Mountain WSA is managed under Manual 6330 to prevent impairment of wilderness characteristics.</p>
<p><i>Agreements:</i> State of Wyoming</p>
<p><i>Partners:</i> Wyoming Game and Fish Department</p>
<p><i>Other administration:</i> Recreational target shooting is prohibited within developed recreation sites. Currently, the Gardner Mountain trailhead is the only existing development.</p>

T.8.4. Kaycee Stockrest Extensive Recreation Management Area

Supporting Information and Rationale

This ERMA is necessary to accommodate multiple use mandates through reduction of user conflicts primarily related to motorized use overlapping traditional livestock use. This ERMA is also necessary to accommodate local visitor demand for motorized recreational opportunities and recreational target shooting near the City of Kaycee; this demand has been identified by onsite evaluation and through visitor use data. The Kaycee Stockrest ERMA is located within 1.0 mile of the Kaycee city limits. ERMA management will sustain and enhance recreation amenities to accommodate the visitor demand while honoring valid existing rights and preventing inadvertent trespass.

KAYCEE STOCKREST EXTENSIVE RECREATION MANAGEMENT AREA (ERMA) OBJECTIVES & DECISIONS
<p><i>Objective Statement:</i> By 2018, the Kaycee Stockrest ERMA will provide recreational opportunities that meet the desires of local residents for nearby recreation opportunities while protecting human health and safety and minimizing conflicts between recreation and valid existing rights.</p>
<p><i>Activities:</i> Off-highway vehicle use, hunting, camping and recreational target shooting.</p>
<p><i>Experiences:</i> Enjoying having easy access to natural landscapes, enjoying having access to close-to-home outdoor amenities.</p>
<p><i>Benefits:</i> Heightened sense of community sense of place, lifestyle improvement. Protection of both public and private land resources through boundary marking and active management.</p>
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program: Campfires prohibited. Camping prohibited in 200 acres encompassing stockrest, except under stock trailing permit. Camping allowed on 2,685-acre parcel north of state section, subject to 14-day limit. Pursue agreement with City of Kaycee and local organizations to actively manage recreational target shooting.

VRM: Class II

Renewable Energy: The entire ERMA falls within a renewable energy exclusion area.

Special Recreation Permits (SRPs): SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.

IMPLEMENTATION DECISIONS

Marketing: Provide maps and information at the field office. Directional signage necessary from Highway 59 and Bishop Road. Provide stewardship information to help preserve the special landscape character. Make available for outreach programs such as National Public Lands Day, etc.

Monitoring: Vehicle counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.

Management: Signs needed at key access points.

Administrative:

Travel Management: Travel is limited to designated routes. A travel management plan will be developed to designate routes open for administrative or public use, to consider seasonal closures, and to identify routes to close and reclaim.

Agreements: State of Wyoming

Partners: City of Kaycee, Johnson County

Other administration: Recreational target shooting is prohibited within developed recreation sites. Currently, no developments exist.

T.8.5. North Bighorns Extensive Recreation Management Area

Supporting Information and Rationale

This ERMA is necessary to accommodate multiple use mandates through reduction of user conflicts primarily related to limited legal access and protection of high-quality hunting and wildlife viewing opportunities. The North Bighorns ERMA includes lands along and south of the parcels in Sheridan County adjacent to the Bighorn National Forest.

ERMA management will promote coordination with the U.S. Forest Service and local organizations to meet community-driven recreation proposals and to facilitate seamless recreation opportunities.

NORTH BIGHORNS EXTENSIVE RECREATION MANAGEMENT AREA (ERMA) OBJECTIVES & DECISIONS

Objective Statement: By 2020, the North Bighorns ERMA will provide seamless opportunities for recreation in conjunction with the Bighorn National Forest.

<p><i>Activities:</i> Hiking, hunting, fishing, camping, wildlife and nature viewing.</p> <p><i>Experiences:</i> Developing skills and abilities, testing endurance, savoring the total sensory experience of a landscape.</p> <p><i>Benefits:</i> Greater sense of adventure, greater retention of distinctive natural landscape features; improved skills for outdoor enjoyment.</p>
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS
<p><i>Recreation and Visitor Services Program:</i> Campfires prohibited. Camping allowed, subject to 14-day limit. Not a fee site; not currently suitable for Federal Lands Recreation Enhancement Act (FLREA). The site may be evaluated under FLREA if additional amenities are provided in the future.</p> <p><i>VRM:</i> Class II</p> <p><i>Renewable Energy:</i> The entire ERMA falls within a renewable energy exclusion area.</p> <p><i>Special Recreation Permits (SRPs):</i> SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.</p>
IMPLEMENTATION DECISIONS
<p>Marketing: Provide maps and information at the field office. Directional signage necessary from Hazelton Road. Provide stewardship information to help preserve the special landscape character.</p> <p>Monitoring: Vehicle and trail counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.</p> <p>Management: Signs needed at key access points.</p> <p>Administrative:</p> <p><i>Travel Management:</i> Travel is limited to designated routes. A travel management plan will be developed to designate routes open for administrative or public use, to consider seasonal closures, and to identify routes to close and reclaim.</p> <p><i>Agreements:</i> State of Wyoming</p> <p><i>Partners:</i> U.S. Forest Service Bighorn National Forest, Wyoming Game and Fish Department</p> <p><i>Other administration:</i> Recreational target shooting would prohibited within any future developed recreation sites. Currently, no development exists.</p>

T.8.6. Powder River Basin Extensive Recreation Management Area

Supporting Information and Rationale

This ERMA is necessary to accommodate multiple use mandates through reduction of user conflicts primarily related to limited legal access and protection of high-quality hunting and wildlife viewing opportunities. ERMA management will promote development of additional public access and sustain and enhance recreation amenities to accommodate visitor demand while honoring valid existing rights and preventing inadvertent trespass.

*Appendix T Recreation Management Areas
Powder River Basin Extensive Recreation
Management Area*

POWDER RIVER BASIN EXTENSIVE RECREATION MANAGEMENT AREA (ERMA) OBJECTIVES & DECISIONS
<p><i>Objective Statement:</i> By 2018, the Powder River Basin ERMA will provide opportunities for recreationists to engage in hunting, camping and other dispersed recreational opportunities on accessible public lands while preventing inadvertent trespass onto adjacent private lands.</p>
<p><i>Activities:</i> Hunting, hiking, camping, and nature viewing.</p>
<p><i>Experiences:</i> Enjoying having access to close-to-home outdoor amenities, greater understanding of the importance of recreation and tourism in our community, improved understanding of this/our community's dependence and impact on public lands.</p>
<p><i>Benefits:</i> Heightened sense of community sense of place, lifestyle improvement. Protection of both public and private land resources through boundary marking and active management.</p>
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS
<p><i>Recreation and Visitor Services Program:</i> Campfires subject to Wyoming Interagency Fire Restrictions. Camping allowed, subject to 14-day limit.</p>
<p><i>Oil & Gas Leasing/Minerals:</i> Fortification Creek WSA is recommended for withdrawal from mineral entry, closed to oil and gas leasing and closed to salable mineral development.</p>
<p><i>VRM:</i> Fortification Creek WSA is VRM Class I; remainder is Class II, III, and IV</p>
<p><i>Renewable Energy:</i> The majority of the ERMA falls within a renewable energy exclusion or avoidance area.</p>
<p><i>Lands and Realty:</i> Fortification Creek WSA is a rights-of-way exclusion area.</p>
<p><i>Special Recreation Permits (SRPs):</i> SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate. Ensure that SRPs include sufficient mitigation to protect WSA.</p>
IMPLEMENTATION DECISIONS
<p>Marketing: Provide maps and information at the field office. Directional signage necessary from exits along I-90. Provide stewardship information to help preserve the special landscape character.</p>
<p>Monitoring: Vehicle counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.</p>
<p>Management: Signs needed at key access points.</p>
<p>Administrative:</p>
<p><i>Travel Management:</i> Fortification Creek WSA is closed to motorized travel. Elsewhere, travel is limited to designated routes. A travel management plan will be developed to designate routes open for administrative or public use, to consider seasonal closures, and to identify routes to close and reclaim.</p>
<p><i>ACEC:</i> Fortification Creek ACEC measures to protect elk habitat may include restrictions on access and travel management.</p>
<p><i>WSA:</i> Fortification Creek WSA is managed under Manual 6330 to prevent impairment of wilderness characteristics.</p>
<p><i>Agreements:</i> State of Wyoming</p>
<p><i>Partners:</i> Wyoming Game and Fish Department</p>
<p><i>Other administration:</i> Recreational target shooting would be prohibited within any future developed recreation sites. Currently, no developments exist.</p>

T.8.7. South Bighorns Extensive Recreation Management Area

Supporting Information and Rationale

This ERMA is necessary to accommodate multiple use mandates through reduction of user conflicts primarily related to limited legal access and protection of high-quality hunting and wildlife viewing opportunities. The South Bighorns ERMA includes lands in southwestern Johnson County, south of Barnum Mountain Road, and generally west of Bar C Road that are not part of the Middle Fork Powder River or Hole-in-the-Wall SRMAs.

ERMA management will promote coordination with the Worland and Casper Field Offices, Wyoming Game and Fish Department, State of Wyoming, and local organizations to meet community-driven recreation proposals and to facilitate seamless recreation opportunities. ERMA management will promote development of additional public access and sustain and enhance recreation amenities to accommodate visitor demand while honoring valid existing rights and preventing inadvertent trespass.

SOUTH BIGHORNS EXTENSIVE RECREATION MANAGEMENT AREA (ERMA) OBJECTIVES & DECISIONS
<p><i>Objective Statement:</i> By 2018, the South Bighorns ERMA will offer seamless recreation opportunities, in a relatively unchanged physical recreation setting, that facilitate the visitor's freedom to participate in a variety of dispersed, recreation activities. Motorized access across the region will be accommodated through limited routes and public motorized access between Outlaw Cave, Hole-in-the-Wall, and Hazelton Road will be pursued.</p>
<p><i>Activities:</i> Hiking, hunting, fishing, camping, wildlife and nature viewing.</p>
<p><i>Experiences:</i> Developing skills and abilities, testing endurance, savoring the total sensory experience of a landscape.</p>
<p><i>Benefits:</i> Greater sense of adventure, greater retention of distinctive natural landscape features; improved skills for outdoor enjoyment.</p>
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS
<p><i>Recreation and Visitor Services Program:</i> Camping allowed, subject to 14-day limit. Not a fee site; not currently suitable for Federal Lands Recreation Enhancement Act (FLREA). The site may be evaluated under FLREA if additional amenities are provided in the future.</p>
<p><i>VRM:</i> Class II and III</p>
<p><i>Renewable Energy:</i> The entire ERMA falls within a renewable energy exclusion area.</p>
<p><i>Special Recreation Permits (SRPs):</i> SRPs will be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.</p>

IMPLEMENTATION DECISIONS

Marketing: Provide maps and information at the field office. Directional signage necessary from Hazelton Road. Provide stewardship information to help preserve the special landscape character.

Monitoring: Vehicle and trail counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.

Management: Signs needed at key access points.

Administrative:

Travel Management: Travel is limited to designated routes. A travel management plan will be developed to designate routes open for administrative or public use, to consider seasonal closures, and to identify routes to close and reclaim.

Wild and Scenic Rivers: The canyon within 0.25 mile of Middle Fork Powder River is managed under Manual 6400 – Wild and Scenic Rivers to protect outstandingly remarkable values.

Agreements: State of Wyoming

Partners: Wyoming Game and Fish Department

Other administration: Recreational target shooting would be prohibited within any future developed recreation sites.

T.8.8. Walk-in Area Extensive Recreation Management Area

Supporting Information and Rationale

This ERMA is necessary to accommodate multiple use mandates through reduction of user conflicts primarily related to limited legal access and protection of high-quality hunting and wildlife viewing opportunities. The Walk-in Area ERMA includes BLM-administered lands adjacent to Walk-in Areas with agreements that are negotiated between Wyoming Game and Fish Department (WGFD) and private landowners.

WGFD manages the Private Lands Public Wildlife Access program to improve public access for hunting and fishing opportunities. Walk-in agreements are negotiated between WGFD and private landowners for a specific period of time, usually several years, and thus the status of an access areas can change during the life of this plan. BLM-administered lands adjacent to Walk-in Areas provide additional access and hunting and fishing opportunities for recreationists. While the WGFD and the adjacent private landowner have authority over any lands enrolled in the program, the BLM can support the objectives of the Private Lands Public Wildlife Access program through collaborative management.

Several parcels adjacent to current or historic Walk-in Areas overlap portions of other SRMAs and ERMAs. The objectives of the Walk-in Area ERMA apply to any BLM-administered lands that are adjacent to currently enrolled lands in the Private Lands Public Wildlife Access program and may be concurrently applied to parcels in an ERMA or SRMA.

ERMA management will promote coordination with the WGFD, State of Wyoming, and private landowners to promote public access to public lands and facilitate seamless recreation opportunities. ERMA management will promote development of additional public access and sustain and enhance recreation amenities to accommodate visitor demand while honoring valid existing rights and preventing inadvertent trespass.

WALK-IN AREA EXTENSIVE RECREATION MANAGEMENT AREA (ERMA) OBJECTIVES & DECISIONS
<p><i>Objective Statement:</i> By 2018, Bureau of Land Management-administered lands adjacent to Wyoming Game and Fish Department Walk-In Areas will provide seamless opportunities for the nonmotorized recreation, specifically hunting and fishing. Travel management, camping restrictions and fire restrictions may be negotiated to support additional public access to public lands through the Private Lands Public Wildlife Access program objectives.</p> <p><i>Activities:</i> Hunting, fishing, camping, wildlife and nature viewing.</p> <p><i>Experiences:</i> Greater community ownership and stewardship of recreation, and natural resources, improved understanding of how this community's rural-urban interface impacts its quality of life, improved understanding of this/our community's dependence and impact on public lands.</p> <p><i>Benefits:</i> Greater sense of adventure, greater retention of distinctive natural landscape features; improved skills for outdoor enjoyment.</p>
MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS
<p><i>Recreation and Visitor Services Program:</i> Campfires may be prohibited to facilitate negotiations with private landowners. Wyoming Interagency Fire Restrictions would be posted at access points. Camping may be allowed, subject to 14-day limit. Restrictions on camping would be analyzed on a case-by-case basis and permanent closures would require a land use plan amendment.</p> <p><i>VRM:</i> Currently, Class II-IV</p> <p><i>Special Recreation Permits (SRPs):</i> SRPs may be issued as a discretionary action for a wide variety of uses, consistent with resource/program objectives, and within budgetary/workload constraints. Develop criteria for potential limitations on issuance of SRPs to clarify when noncommercial activities may take place under a letter of agreement or to avoid saturation of commercial or organized use. Develop special stipulations for SRPs to protect the recreation setting as appropriate.</p>
IMPLEMENTATION DECISIONS
<p>Marketing: Provide maps and information at the field office. Provide stewardship information related to outdoor ethics.</p> <p>Monitoring: Vehicle and trail counters with routine surveys and observation. Informal visitor surveys and formal focus groups as funding allows.</p> <p>Management: Signs needed at key access points.</p> <p>Administrative:</p> <p><i>Travel Management:</i> Travel is limited to designated routes. A travel management plan will be developed to designate routes open for administrative or public use, to consider seasonal closures, and to identify routes to close and reclaim.</p> <p><i>Agreements:</i> State of Wyoming</p> <p><i>Partners:</i> Wyoming Game and Fish Department</p> <p><i>Other administration:</i> Recreational target shooting would be prohibited within any future developed recreation sites.</p>

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Appendix U. Economic Impact Analysis Methodology

This appendix describes the methods and data that underlie the economic impact modeling analysis. Input-output models such as the Impact Analysis for Planning (IMPLAN) model, an economic impact analysis model, provide a quantitative representation of the production relationships between individual economic sectors. Thus, the economic modeling analysis uses information about physical production quantities and the prices and costs for goods and services. The inputs required to run the IMPLAN model are described in the following narrative and tables. The resulting estimates from the IMPLAN model, by alternative, can be found in the *Economic Conditions* section in Chapter 4. The first section of this appendix describes general aspects of the IMPLAN model and how it was used to estimate economic impacts. The remaining sections provide additional detailed data used in the analysis for oil and gas, livestock grazing, and recreation.

U.1. The IMPLAN Model

IMPLAN is a regional economic model that provides a mathematical accounting of the flow of money, goods, and services through a region's economy. The model provides estimates of how a specific economic activity translates into jobs and income for the region. It includes the ripple effect (also called the "multiplier effect") of changes in economic sectors that may not be directly impacted by management actions, but are linked to industries that are directly impacted. In IMPLAN, these ripple effects are termed indirect impacts (for changes in industries that sell inputs to the industries that are directly impacted) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

This analysis used IMPLAN 2010; prior to running the model, all cost and price data were converted to a consistent dollar year using regional and sector-specific adjustment factors from the IMPLAN model. The values in this appendix are expressed in year 2011 dollars so that the earnings and employment estimates can be easily compared to the earnings and employment data from the Bureau of Economic Analysis (see Chapter 3). IMPLAN defines employment as the annual average of monthly jobs in an industry. A job can be either full-time or part-time. This definition is equivalent to that used by the Bureau of Economic Analysis (note that this would not typically correspond to full time equivalents).

The current IMPLAN model has 440 economic sectors, of which 184 are represented in the three planning area counties. This analysis involved direct changes in economic activity for 33 IMPLAN economic sectors, as well as changes in all other related sectors due to the ripple effect. The IMPLAN production coefficients were modified to reflect the interaction of producing sectors in the planning area. As a result, the calibrated model generates multipliers and subsequent impacts that more accurately reflect the interaction between and among the sectors in the planning area compared to a model using unadjusted national coefficients. For instance, worker productivity in oil and gas production is higher in Wyoming than the national average. Key variables used in the IMPLAN model were filled in using data specific to Wyoming, including employment estimates, labor earnings, and total industry output.

U.2. Oil and Gas

The economic impacts analysis for oil and gas reflects drilling, completion, and production activities. The number of wells drilled and completed is based on the Reasonable Foreseeable Development (RFD) Scenario for Oil and Gas (Stilwell et al. 2012) and the constraints applied under each alternative. The *Leasable Minerals - Fluids* section in Chapter 4, describes the methods and assumptions used to develop the number of wells drilled, completed and under production under each alternative. Total well numbers for each alternative are presented in Table U.1, “Oil and Gas Well Numbers (BLM-Administered Surface)” (p. 2590). Table U.2, “Projected Oil and Gas Production from New Wells (Federal Surface)” (p. 2591) presents the projected quantity of oil and gas produced on federal surface, and Table U.3, “Projected Oil and Gas Production from New Wells (Federal, State, and Fee Surface)” (p. 2591) presents the projected quantity of oil and gas produced from federal, state, and private (fee) surface.

Table U.1. Oil and Gas Well Numbers (BLM-Administered Surface)

Item	Conventional Infill (Vertical)	Coalbed Natural Gas	Horizontal	Total
Federal Surface				
Alternative A – Wells Drilled	366	903	1,462	2,731
Alternative A – Wells Completed	275	895	1,462	2,632
Alternative B – Wells Drilled	1	101	6	108
Alternative B – Wells Completed	1	100	6	107
Alternative C – Wells Drilled	398	5,280	1,592	7,270
Alternative C – Wells Completed	299	5,234	1,592	7,125
Alternative D – Wells Drilled	355	2,721	1,418	4,494
Alternative D – Wells Completed	266	2,698	1,418	4,382
Federal, State, and Fee Surface				
Alternative A – Wells Drilled	741	5,890	2,962	9,593
Alternative A – Wells Completed	556	5,839	2,962	9,357
Alternative B – Wells Drilled	376	5,088	1,506	6,970
Alternative B – Wells Completed	282	5,044	1,506	6,832
Alternative C – Wells Drilled	773	10,267	3,092	14,132
Alternative C – Wells Completed	580	10,178	3,092	13,850
Alternative D – Wells Drilled	730	7,708	2,918	11,356
Alternative D – Wells Completed	548	7,642	2,918	11,108
Source: Stilwell et al. 2012; Appendix G (p. 1937)				
BLM Bureau of Land Management				

Table U.2. Projected Oil and Gas Production from New Wells (Federal Surface)

Year	Alternative A		Alternative B		Alternative C		Alternative D	
	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)
2009	0.8	0.2	0.0	0.0	2.2	0.2	1.4	0.2
2010	2.5	0.5	0.1	0.0	8.9	0.5	5.1	0.5
2011	5.8	0.9	0.4	0.0	23.6	1.0	13.0	0.9
2012	8.8	1.1	0.7	0.0	39.2	1.2	21.3	1.1
2013	9.5	1.1	0.8	0.0	44.7	1.2	24.0	1.0
2014	10.9	1.5	0.8	0.0	46.8	1.7	25.6	1.5
2015	11.4	1.8	0.8	0.0	47.7	1.9	26.2	1.7
2016	13.4	2.4	0.9	0.0	52.2	2.6	29.2	2.3
2017	14.1	2.4	1.0	0.0	56.4	2.6	31.3	2.3
2018	16.9	3.1	1.1	0.0	64.2	3.4	36.0	3.0
2019	19.0	3.5	1.3	0.0	72.8	3.8	40.8	3.4
2020	21.7	4.0	1.5	0.0	83.9	4.3	47.0	3.8
2021	24.6	4.2	1.7	0.0	98.1	4.6	54.5	4.1
2022	28.4	4.8	2.0	0.0	113.2	5.3	62.9	4.7
2023	31.4	5.2	2.2	0.0	126.8	5.7	70.3	5.1
2024	34.5	5.8	2.4	0.0	138.8	6.3	77.0	5.6
2025	36.1	6.0	2.6	0.0	145.9	6.5	80.8	5.8
2026	37.8	6.5	2.6	0.0	150.2	7.1	83.5	6.3
2027	37.5	6.5	2.6	0.0	148.6	7.1	82.7	6.3
2028	37.1	6.9	2.4	0.0	142.0	7.5	79.6	6.7
Source: Stilwell et al. 2012; BLM 2013h; Appendix G (p. 1937). Includes coalbed and conventional gas.								
BCF billion cubic feet								
MMBO million barrels of oil								

Table U.3. Projected Oil and Gas Production from New Wells (Federal, State, and Fee Surface)

Year	Alternative A		Alternative B		Alternative C		Alternative D	
	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)
2009	2.9	0.4	2.1	0.2	4.3	0.4	3.4	0.4
2010	10.9	1.0	8.5	0.5	17.3	1.0	13.5	1.0
2011	28.0	1.8	22.7	0.9	45.8	1.9	35.3	1.8
2012	45.9	2.3	37.8	1.1	76.3	2.4	58.4	2.2
2013	51.7	2.2	43.0	1.1	86.8	2.3	66.2	2.1
2014	55.1	3.1	45.1	1.6	91.1	3.3	69.8	3.1
2015	56.5	3.6	45.9	1.8	92.8	3.7	71.3	3.5
2016	62.7	4.8	50.2	2.4	101.5	5.0	78.5	4.7
2017	67.3	4.9	54.2	2.5	109.6	5.1	84.5	4.8
2018	77.4	6.3	61.7	3.2	124.7	6.6	96.6	6.2
2019	87.7	7.1	70.0	3.6	141.5	7.4	109.5	7.0
2020	101.0	8.0	80.7	4.1	163.2	8.4	126.2	7.9
2021	117.3	8.5	94.4	4.3	190.8	8.9	147.2	8.4
2022	135.3	9.8	108.9	5.0	220.1	10.2	169.8	9.7
2023	151.2	10.6	122.0	5.4	246.5	11.1	190.0	10.4
2024	165.6	11.7	133.5	6.0	269.8	12.2	208.0	11.6
2025	173.8	12.2	140.3	6.2	283.6	12.7	218.6	12.0
2026	179.5	13.1	144.4	6.7	291.9	13.7	225.3	12.9
2027	177.8	13.2	142.9	6.7	289.0	13.8	223.0	13.0

Year	Alternative A		Alternative B		Alternative C		Alternative D	
	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)
2028	171.2	14.0	136.6	7.1	276.1	14.6	213.8	13.8

Source: Stilwell et al. 2012; BLM 2013h; Appendix G (p. 1937). Includes coalbed and conventional gas.

BCF billion cubic feet
MMBO million barrels of oil

The costs of drilling and completing wells and producing oil and gas are also relevant to the economic impact analysis. Table U.4, “Assumptions for Analysis of Economic Impacts for Oil and Gas Well Drilling and Completion According to Well Type” (p. 2592) provides a summary of the costs of drilling, completion, and production for each well type (conventional infill, horizontal, and coalbed natural gas [CBNG]) used for the economic analysis.

Table U.4. Assumptions for Analysis of Economic Impacts for Oil and Gas Well Drilling and Completion According to Well Type

Assumption	Well Type		
	Conventional Infill	Horizontal	Coalbed Natural Gas
Drilling Impacts			
Drilling Cost (\$/well)	\$957,320	\$2,271,725	\$102,100
Local Drilling Costs ¹	88%	50%	84%
Local Direct Impact (\$/well)	\$841,881	\$1,135,863	\$85,424
Local Total Impact (\$/well) ²	\$1,073,510	\$1,431,518	\$108,357
Multiplier (total impact/direct impact)	1.28	1.26	1.27
Completion Impacts			
Completion Cost (\$/well)	\$797,303	\$6,815,175	\$204,200
Local Completion Costs ¹	61%	50%	55%
Local Direct Impact (\$/well)	\$489,324	\$3,407,588	\$112,341
Local Total Impact (\$/well) ²	\$646,331	\$4,526,294	\$146,408
Multiplier (total impact/direct impact)	1.32	1.33	1.30

Source: Stilwell et al. 2012; BLM 2013i; Taylor 2013. Data are in 2011 dollars and are based on Authorizations For Expenditure provided by exploration and development companies.

¹The local cost shares were based on the percent of total drilling or completion costs that would be spent on goods and services purchased from the local economy.

²Total impacts estimated using Impact Analysis for Planning (IMPLAN) include direct, indirect, and induced impacts.

\$ U.S. dollar

Table U.5, “Assumptions for Analysis of Economic Impacts on Output for Oil and Gas Production” (p. 2592) provides the assumptions used to determine the economic impact associated with the production of oil and gas. For the analysis, the Bureau of Land Management (BLM) estimated a production cost (for gas) of \$1.48 per thousand cubic feet (mcf), based on data from the Energy Information Administration (Taylor 2013).

Table U.5. Assumptions for Analysis of Economic Impacts on Output for Oil and Gas Production

Economic Impact	Oil Production (per million barrels) ²	Gas Production (per billion cubic feet) ³
Direct Economic Impact ¹	\$86,785,000	\$4,186,100
Indirect Economic Impact ⁴	\$7,439,499	\$358,846

Economic Impact	Oil Production (per million barrels)²	Gas Production (per billion cubic feet)³
Induced Economic Impact ⁵	\$2,363,153	\$113,987
Total Economic Impact	\$96,587,652	\$4,658,934
Multiplier (total impact/direct impact)	1.11	1.11
Note: All dollar values are in year 2011 dollars. ¹ Direct economic impact is the market value of output. ² Based on an oil price of \$86.785 per barrel, which is an average of the prices for 2012-2018 projected by the Wyoming Consensus Revenue Estimating Group (2013) and adjusted to 2011 dollars. ³ Based on a gas price of \$4.186 per mcf, which is an average of the prices for 2012-2018 projected by the Wyoming Consensus Revenue Estimating Group (2013) and adjusted to 2011 dollars. ⁴ Indirect impacts from IMPLAN reflect increased demand in sectors that directly or indirectly provide supplies to the oil and gas industry. ⁵ Induced impacts from IMPLAN reflect increased demand in the consumer and government sectors.		
IMPLAN Impact Analysis for Planning		

The forecasted number of wells and production used for estimating employment impacts is the same as for estimating impacts on labor earnings and output. Table U.6, “Assumptions for Employment Impact Analysis for Oil and Gas Well Drilling and Completion According to Well Type” (p. 2593) shows the direct and total employment impacts attributable to drilling and completion.

Table U.6. Assumptions for Employment Impact Analysis for Oil and Gas Well Drilling and Completion According to Well Type

Employment Impact	Well Type		
	Vertical	Horizontal	Coalbed Natural Gas
Drilling Impacts			
Direct Employment (jobs/well)	4.2	5.8	0.6
Total Employment Impact (jobs/well)	6.2	8.5	0.8
Multiplier (Total Impact/Direct Impact)	1.48	1.47	1.41
Average Earnings per Job (2011 dollars)	\$63,318	\$64,983	\$52,278
Completion Impacts			
Direct Employment (jobs/well)	2.9	20.6	0.7
Total Employment Impact (jobs/well)	4.3	30.72	1.0
Multiplier (Total Impact/Direct Impact)	1.47	1.49	1.47
Average Earnings per Job (2011 dollars)	\$59,143	\$58,446	\$53,674
Source: Taylor 2013 Note: Direct and total employment impact and average earnings per job are calculated using Impact Analysis for Planning.			

Table U.7, “Assumptions for Employment Impact Analysis for Oil and Gas Production” (p. 2594) shows the direct and total employment impacts associated with production.

Table U.7. Assumptions for Employment Impact Analysis for Oil and Gas Production

Employment Impact (annual number of jobs)	Oil Production (per million barrels)	Gas Production (per billion cubic feet)
Direct Employment	19.4	0.1
Indirect Employment	32.7	0.2
Induced Employment	16.3	0.1
Total Employment	68.4	0.4
Multiplier (Total Impact/Direct Impact)	3.53	3.53
Average Earnings per Job (2011 dollars)	\$67,276	\$67,276
Source: Taylor 2013		
Note: Direct, indirect, and induced employment impact and average earnings per job are calculated using Impact Analysis for Planning.		

The analysis of potential changes in tax revenues is based on tax rates of 12.5 percent of taxable value for federal mineral royalties, 6 percent of taxable value for state severance taxes (Wyoming Department of Revenue 2001), and 6.5 percent of taxable value for local ad valorem production taxes (based on recent average tax rates for the counties of Campbell [6.0%], Johnson [7.0%], and Sheridan [6.6%]) (Wyoming Department of Revenue 2009; Wyoming Department of Revenue 2011). Taxable value refers to value of sales minus allowable deductions, including certain costs of production and transportation. For purposes of estimating tax revenues, taxable value was estimated based on the average taxable value per unit sold from the counties in the planning area for production year 2010–2011 using data from the Wyoming Department of Revenue (2011). Taxable value was estimated as \$61.60 per barrel for oil, and \$3.02 per mcf for natural gas (2011 dollars).

U.3. Livestock Grazing

Economic impacts due to changes in livestock grazing are a function of the amount of forage available and the economic value of the forage. For livestock grazing, long-term surface disturbance from actions listed in Appendix G (p. 1937) may affect available animal unit months (AUMs). In addition, land disposal actions may have economic impacts; however, those impacts were not analyzed quantitatively because it is difficult to predict the net change in AUMs as a result of land disposal. Subsequent landowners may continue to graze the land, leaving overall livestock production and output in the region unaffected.

The economic analysis of livestock grazing impacts is based on authorized use. The BLM's data indicate that authorized use in the Buffalo Field Office is 106,078 AUMs, which is the same as active use. (However, note that in some field offices, active and authorized use figures are not identical.) Whereas the 106,203 permitted AUMs include active and suspended non-use AUMs, active AUMs exclude suspended non-use AUMs. Authorized use represents AUMs billed for and paid for each year for a permit or lease. These AUMs are not the same as actual use AUMs, and may diverge from actual use AUMs depending on individual and climatic circumstances in a given year. Actual use represents the AUMs physically used on the ground. Actual use may be less than or equal to authorized use, but authorized use provides an upper bound for the actual use in a given year. The BLM adjusts authorized use on an annual basis to account for the forage value of the land in a given year, based on climatic conditions (e.g., drought), as well as taking into account the needs of the land and the ranch operators.

Reductions in land available for livestock grazing (e.g., via long-term surface disturbance) are based on active use AUMs, while financial conditions on a given ranch operation are determined

by actual use (i.e., the actual forage value of the land that is used for livestock) and authorized use (e.g., bank loans that are based on the available forage value of federal leases held by the ranch operator). Thus, for this study, authorized use is an appropriate baseline from which to measure reductions in available AUMs due to surface disturbance or restriction on grazing land. If reductions were measured from a higher baseline, such as permitted use, economic impacts would be overstated (although in this case the difference would be minimal, as the permitted use is essentially equal to authorized use).

Table U.8, “Estimated Forage Availability (Animal Unit Months)” (p. 2595) provides a summary of initial AUMs and total AUMs that the BLM projects would be lost by 2028 due to surface-disturbing activities or restrictions on grazing on BLM-administered lands. Projected losses of AUMs are BLM’s estimates, given the grazing restrictions imposed under each alternative. They reflect long-term expectations of losses that would occur over the years, not losses that would be felt concurrent with the signing of the Record of Decision. Based on current allocations of AUMs to cattle and sheep, 92 percent of the AUM reduction is allocated to cattle and the remainder is allocated to sheep, for the purpose of estimating changes in output and employment. (There are also some AUMs allocated to horse and yak grazing, but these comprise two percent and less than one percent, respectively. These AUMs are included in the analysis, but the assumption is that their economic value is comparable to that of cattle and sheep grazing.) Acres of surface disturbance were converted to AUMs using a conversion factor of 6 acres per AUM (BLM 2010g).

Table U.8. Estimated Forage Availability (Animal Unit Months)

Item	Alternative A	Alternative B	Alternative C	Alternative D
Initial AUMs (authorized use)	106,078	106,078	106,078	106,078
AUMs lost due to surface-disturbing activities (long-term disturbance) and restrictions on grazing	8,352	61,540	11,526	12,241
AUMs lost due to surface-disturbing activities (estimated annual) and restrictions on grazing	418	3,077	576	612
Net AUMs in 2028 (authorized use)	97,726	44,538	94,552	93,837
Source: BLM 2010g; BLM 2012l				
AUM Animal Unit Month				

Due to price fluctuations, average per-AUM values for cattle and sheep are based on the 2002 to 2011 average value of production estimates from the U.S. Department of Agriculture, adjusted to 2011 dollars (Taylor 2013). The value for cattle is \$49.67 per AUM and the value for sheep is \$59.23 per AUM. Including indirect and induced impacts, the value of one AUM for cattle is \$92.64 and for sheep \$121.30. Table U.9, “Assumptions for Analysis of Impacts on Output for Livestock Grazing” (p. 2595) shows the economic impact assumptions for cattle and sheep. The direct economic impact is the estimated change in livestock output per AUM; IMPLAN generates the indirect and induced impacts.

Table U.9. Assumptions for Analysis of Impacts on Output for Livestock Grazing

Economic Impact	Cattle	Sheep
Direct Economic Impact (\$/AUM)	\$49.67	\$59.23
Indirect Economic Impact (\$/AUM) ¹	\$28.14	\$46.91
Induced Economic Impact (\$/AUM) ²	\$14.83	\$15.17

Economic Impact	Cattle	Sheep
Total Economic Impact (\$/AUM)	\$92.64	\$121.30
Multiplier (Total Impact/Direct Impact)	1.87	2.05
Source: Taylor 2013		
Note: All dollar values are in 2011 dollars.		
¹ Indirect impacts reflect increased demand in sectors that directly or indirectly provide supplies to the livestock industry.		
² Induced impacts reflect increased demand in the consumer and government sectors.		
\$ U.S. dollar		
AUM Animal Unit Month		

Table U.10, “Assumptions for Analysis of Employment Impacts for Livestock Grazing” (p. 2596) provides a summary of the employment impacts assumed according to unit changes in livestock AUMs.

Table U.10. Assumptions for Analysis of Employment Impacts for Livestock Grazing

Employment Impact	Cattle	Sheep
Direct Employment (Jobs/1,000 AUMs)	0.558	0.980
Indirect Employment (Jobs/1,000 AUMs)	0.306	0.748
Induced Employment (Jobs/1,000 AUMs)	0.141	0.139
Total Employment (Jobs/1,000 AUMs)	1.006	1.868
Multiplier (Total Impact/Direct Impact)	1.73	1.72
Average Earnings per Job (2011 dollars)	\$32,747	\$18,976
Source: Taylor 2013		
Note: Direct, indirect, and induced employment impacts and average earnings per job are calculated using Impact Analysis for Planning (IMPLAN).		
AUM Animal Unit Month		

U.4. Recreation

The analysis of economic impacts considers only recreation expenditures of nonresidents of the planning area. This is based on the assumption that expenditures of residents would occur in the region regardless of the BLM’s actions that impact recreational opportunities; however, changes in nonresident recreation patterns would alter the amount of money entering the local region.

Economic impacts from recreation are a function of recreation visitor days (RVDs) and expenditures per day. Future RVDs were estimated based on current RVDs, recent growth rates, and projected trends. Estimates of future RVDs were based on the professional judgment of BLM staff, as well as a United States Forest Service (USFS) study that provides forecasts of recreation activity for the Rocky Mountain region (Bowker et al. 1999) and contacts with neighboring BLM field offices. Table U.11, “Projected Growth Rates for Nonresident Recreation Visitor Days” (p. 2597) provides a summary of estimated annual growth rates.

Table U.11. Projected Growth Rates for Nonresident Recreation Visitor Days

Item	OHV	Hunting	Fishing	Other Dispersed
2009 RVDs	487	2,081	290	2,739
2013 RVDs	507	2,140	296	2,919
2018 RVDs	533	2,216	303	3,160
2023 RVDs	560	2,294	311	3,421
2028 RVDs	588	2,376	319	3,703
Projected Annual Growth Rate	1.0%	0.7%	0.5%	1.6%
Source: BLM 2010f				
OHV Off-highway vehicle RVD Recreation visitor day				

The estimates for average expenditure per visitor day, in 2011 dollars, are \$93.32 for fishing (WGFD 2008a; USFWS 2008a), \$143.90 for hunting (Responsive Management 2004), \$57.58 for OHV use (Foulke et al. 2006), and \$35.80 for other dispersed recreation (Stynes and White 2005). Table U.12, “Assumptions for Analysis of Impacts on Output for Recreation Activities” (p. 2597) shows the direct, indirect, and induced output per RVD for each recreation activity.

Table U.12. Assumptions for Analysis of Impacts on Output for Recreation Activities

Economic Impact	OHV (per RVD)	Hunting (per RVD)	Fishing (per RVD)	Other Dispersed (per RVD)
Direct Economic Impact ¹	\$57.58	\$143.90	\$93.32	\$35.80
Indirect Economic Impact ²	\$5.79	\$24.73	\$10.16	\$4.31
Induced Economic Impact ³	\$6.60	\$23.54	\$10.21	\$3.84
Total Economic Impact	\$69.97	\$192.17	\$113.69	\$43.94
Multiplier (total impact/direct impact)	1.22	1.34	1.22	1.23
Sources: WGFD 2008a; USFWS 2008a; Responsive Management 2004; Foulke et al. 2006; Stynes and White 2005; Taylor 2010; Taylor 2013				
Note: Detail may not add to total due to rounding.				
¹ Direct economic impact is the average expenditure per visitor day.				
² Indirect impacts from IMPLAN reflect increased demand in sectors that directly or indirectly provide support for the recreation industry.				
³ Induced impacts from IMPLAN reflect increased demand in the consumer and government sectors.				
IMPLAN Impact Analysis for Planning OHV Off-highway vehicle RVD Recreation visitor day				

Table U.13, “Assumptions for Employment Impact Analysis for Recreation Activities” (p. 2598) provides a summary of employment impacts assumed according to unit changes in RVDs.

Table U.13. Assumptions for Employment Impact Analysis for Recreation Activities

Employment Impact (annual number of jobs)	OHV (per 1,000 RVDs)	Hunting (per 1,000 RVDs)	Fishing (per 1,000 RVDs)	Other Dispersed (per 1,000 RVDs)
Direct Employment	0.54	1.65	0.92	0.36
Indirect Employment	0.06	0.24	0.09	0.04
Induced Employment	0.06	0.21	0.09	0.04
Total Employment	0.65	2.10	1.11	0.44
Multiplier (Total Impact/Direct Impact)	1.22	1.27	1.20	1.20
Average Earnings per Job (2011 dollars)	\$26,332	\$25,097	\$23,183	\$22,883
Source: Taylor 2013				
Note: Direct, indirect, and induced employment impact and average earnings per job are calculated using Impact Analysis for Planning (IMPLAN).				
OHV Off-highway vehicle				
RVD Recreation visitor day				

Appendix V. Oil and Gas Operations

Note: This appendix was added following the release of the Buffalo Draft Resource Management Plan (RMP) and Environmental Impact Statement (EIS).

The purpose of this appendix is to summarize the Bureau of Land Management's (BLM) procedures for considering proposals to conduct exploration, leasing and production operations for federal oil and gas. This appendix is provided for information purposes only, and is not necessarily a complete statement of rights, obligations, or processes. This appendix is not a part of the BLM's land use plan decision for the RMP. Any conflict with any statute or regulation is unintentional. In the event of a conflict, the statute or regulation controls. Federal oil and gas lessees and operators, and private surface owners, are advised to confer with the BLM at the time an action is proposed for BLM's consideration, in order to obtain information about the current regulations and policies that may apply to the proposal. Nothing in this appendix affects the authority of any Tribe or of the Bureau of Indian Affairs in any way. This RMP applies to federal lands as defined by the Federal Land Policy and Management Act (FLPMA), and does not apply to lands held in trust for any Tribe or for any individual Indian or Indians.

V.1. Geophysical Exploration

Oil and gas can be discovered by direct or indirect exploration methods, such as the mapping of rock outcrops, seeps, borehole data, and remote sensing data. In many cases, indirect methods, such as seismic, gravity, and magnetic surveys are required to delineate subsurface features that could contain oil and gas. Geophysical exploration could provide information that increases the chances of drilling a discovery well, as well as information that could discourage drilling and the associated surface disturbance. More sophisticated geophysical techniques, such as three-dimensional seismic surveys, could supply enough information to model a reservoir and optimize drilling to prevent excess wells and the associated surface disturbance. Economics and past information also play a role in determining the method used.

V.1.1. Seismic Reflection Surveys

Seismic prospecting is the best and most popular indirect method for locating subsurface structures and stratigraphy that might contain hydrocarbons. Seismic energy (shock waves) is induced into the Earth using one of several methods. As these waves travel downward and outward, they encounter various rock strata, each having a different seismic velocity characteristic. As the wave energy encounters the interface between rock layers, where the lower layer is of lower seismic velocity, some of the seismic energy is reflected upward. Sensing devices, commonly called geophones, are placed on the surface to detect these reflections. The geophones are connected to a recording truck that stores the data. The time required for the shock waves to travel from the shot point down to a given reflector and back to the geophone is related to depth, and this value is mapped to give an underground picture of the geologic structure.

There are many methods available today that an explorationist can use to induce the initial seismic energy into the Earth. All methods require preliminary surveying and laying of geophones. The thumper and vibrator methods pound or vibrate the ground to create a shock wave. Usually large trucks are used, each equipped with vibrator pads (about 4 feet square). The pads are lowered to the ground, and vibrators on all trucks are triggered electronically from the recording truck. Information is recorded, and then the trucks move forward a short distance, and the process

is repeated. Less than 50 square feet of surface area is required to operate the equipment at each test site. The trucks are equipped with large flotation type tires, which reduce the impact of driving over undisturbed terrain.

The drilling method uses vehicle-mounted or heli-portable drills that drill small-diameter holes to depths down to 100 feet. Depending on type of survey, over 100 holes are drilled per mile of line. Usually, a 20-pound charge of explosives is placed in the hole, covered, and detonated. The detonated explosive sends a shock wave below the Earth's surface that is subsequently reflected back to the surface from various subsurface rock layers. In rugged topography, a portable drill is sometimes carried in by helicopter. In remote areas where there is little known subsurface data, a series of short seismic lines might be required to determine the subsurface geology. Subsequently, more extensive seismic lines are arranged to obtain the greatest amount of geologic information.

Seismic information can be obtained in two- (2D) or three- (3D) dimensional configurations. To obtain 3D seismic information, the seismic sensors and energy source are located along lines in a grid pattern. This type of survey differs from the more common 2D surveys because of the large volume of data and the intensive computerization of the data. The results are expensive to obtain but give a more detailed and informative subsurface picture. The orientation and arrangement of the components in 3D seismic surveys are less tolerant of adjustments to the physical locations of the lines and geophones, but they are also more compact in the area they cover. Although alignment can be fairly critical, spacing of the lines can often be changed to significantly increase the information collected. The depth of the desired geologic information dictates the spacing of the grid lines, with smaller spacing detailing shallower formations. The 3D surveys are more detailed and are usually conducted after 2D surveys or drilling has delineated a geologic prospect. Extensive computer processing of the raw data is required to produce a usable seismic section from which geophysicists can interpret structural relationships to depths of 30,000 feet or more. The effective depth of investigation and resolution are determined, to some degree, by which method is used.

A typical drilling seismic operation can use 10 to 15 people operating 5 to 7 trucks. Under normal conditions, 3 to 5 miles of line can be surveyed each day using the explosive method. Larger seismic operations may require up to approximately 160 personnel onsite during project operations. Work day shifts are 13 to 14 hour days, although some workers may occasionally be present earlier or later during the day, if necessary. The vehicles used for a drilling program include several vehicle-mounted or heli-portable drill rigs, helicopters, water trucks, a computer recording truck, and several light pickup trucks for the surveyors, shot hole crew, geophone crew permit man, and party chief.

Use of off-highway vehicle (OHV) travel may be authorized to carry out cross-country tasks. Vehicles are spread out so that vehicle routes are not straight, and vehicles do not retrace the same route. In some cases, this approach has prevented the establishment of new vehicle routes and has reduced impacts. Drilling water, when needed, is usually obtained from a permitted source.

Reconnaissance type surveys of gravity and geomagnetic can be run in areas where there is limited information with the attendant lower costs and less impact. More expensive and higher impact seismic surveys are run when more detailed information is required.

V.2. Geophysical Management (Permitting Process)

Geophysical operations on and off an oil and gas lease are reviewed by the appropriate federal surface management agency (e.g., BLM, Bureau of Reclamation, or U.S. Forest Service). Effective administration and surface protection can only be accomplished through close cooperation between the operator and the affected agency. The responsibilities of the geophysical operator and the authorized officer are as follows (BLM 2006f).

Geophysical Operator: An operator is required to file with the authorized officer a Notice of Intent to Conduct Oil and Gas Exploration Operations. The Notice of Intent shall include site-specific project information and field techniques to minimize surface impacts; a map showing the location of the proposed 2D geophysical lines or 3D source and receiver proposed locations; all access routes and ancillary facilities; and a proposed schedule of field activities. The map should be at a minimum scale of one-half inch equals 1 mile; however, a 1:24,000 USGS topographic map is recommended.

The party filing the Notice of Intent should be bonded. When applicable, a copy of the bond or other evidence of satisfactory bonding must accompany the Notice of Intent. Holders of statewide or nationwide oil and gas lease bonds may satisfy this requirement by obtaining a rider to include coverage of geophysical operations.

For geophysical operation methods involving surface disturbance, a cultural resources survey may be necessary. In some circumstances, sensitive or Threatened and Endangered species surveys may also be necessary. A pre-work field conference is recommended and may be conducted by the surface management agency. Earth moving equipment shall not be used without prior approval. Upon completion of operations, including any required reclamation, the operator is required to file a Notice of Completion of Oil and Gas Geophysical Exploration Operations (BLM Form 3150-5).

Authorized Officer: The authorized officer will contact the operator after the Notice of Intent (BLM Form 3150-4) is filed and inform the operator of the practices and procedures to be followed and the estimated timeframe for approval.

The authorized officer will complete a final post-work inspection of the site and notify the operator that the terms and conditions of the Notice of Intent have been met or that additional action is required by the operator. Consent to release the bond or terminate liability will not be granted by the surface management agency until the operator has met the terms and conditions of the Notice of Intent (e.g., National Environmental Policy Act [NEPA], approved Form 3040-1) before commencing operations on BLM- administered lands. After the operations are completed, as specified by the Notice of Completion, the authorized officer should complete a final inspection and notify the operator if the terms and conditions of the Notice of Intent have been met or if additional action is required. Consent to release the bond or termination of liability should not be granted until the terms and conditions have been met.

V.2.1. State Standards

The operator is required to register with the Wyoming Oil and Gas Conservation Commission (WOGCC). WOGCC standards for plugging shot holes and personnel safety will be followed.

V.2.2. Mitigation

Seasonal restrictions may be imposed to reduce conflicts with wildlife, watershed damage, and hunting activity. The most critical management practice is compliance monitoring during and after seismic activity. Compliance inspections during the operation ensure that stipulations are being followed. Compliance inspections upon completion of work ensure that the lines are clean, and the drill holes are properly plugged.

V.3. Oil and Gas Leasing

Based on the Federal Onshore Oil and Gas Leasing Reform Act of 1987, all leases must be available for competitive lease sales. Lands for which bids are not received at the lease sale will be available for noncompetitive leasing for a period not to exceed 2 years. Competitive sales will be held at least quarterly and by oral auction. Competitive and noncompetitive leases are issued for a 10-year term or for as long as oil and/or gas are produced. The federal government receives yearly rental fees on non-producing leases. Royalty is received at the rate of 12.5 percent of the total saleable production, one-half of which is returned to the State of Wyoming.

Lease stipulations may be attached to each parcel and become part of the lease after sale. Initially, stipulations are attached to a parcel by the BLM State Office leasing section from various databases. The parcel list is segregated and sent to the field office that has the parcel lands in its area. In the field office, the parcel is reviewed by a group of resource specialists to ensure that lands are in conformance with the RMP, the stipulations are correct, and that any missing stipulations are included. This completes the process and allows the parcel to be included in a sale package.

The authorized officer has the authority to relocate, control timing, and impose other mitigation measures under Section 6 of the Standard Lease Form. This authority is invoked when lease stipulations are not attached to the lease, or new resources are discovered on a lease. Lease stipulations are conditions of lease issuance that provide protection for other resource values or land uses by establishing authority for delay, site changes, or the denial of operations within the terms of the lease contract. The stipulations are specified for each applicable parcel in the Notice of Competitive Oil and Gas Lease Sale and are intended to inform interested parties (potential lessees, operators) that certain activities will be regulated or prohibited unless the operator and the surface management agency arrive at an acceptable plan for mitigation of anticipated impacts. These stipulations are either attached to the entire lease, or by aliquot portions identifying the protection measure specific to the lease.

Lease stipulations are based on the perceived resource requirements and land uses as specified in NEPA documentation. New science, comprehensive documentation of resource requirements, land pattern interference, and ongoing monitoring of the effectiveness of a stipulation may allow granting of a waiver, exception, or modification to a stipulation. A lease stipulation waiver is a permanent exemption to a lease stipulation. An exception is a one-time exemption to a lease stipulation and is determined on a case-by-case basis. A modification is a change to the provisions of a lease stipulation, either temporarily, or for the term of the lease.

There are three lease notices and three lease stipulations that are attached to every lease issued within the planning area. These and the site-specific lease stipulations are included in Appendix H (p. 1959).

V.4. Drilling Permit Process

In the initial permitting process, the operator selects the location of a proposed drill site. This selection is based on WOGCC spacing requirements, the subsurface geology, the topography, and the avoidance of known protected surface resource values.

Location of wells and spacing requirements are established by the WOGCC to protect the correlative rights of offsetting mineral owners and efficiently recover the resource. This applies to all mineral ownership (i.e., fee, state, and federal minerals). The spacing requirements are to be applied to the subsurface point of production. A proposed location may be moved beyond the designated tolerance by a spacing exception granted by WOGCC. A spacing exception requires notification of the offsetting mineral lease owners. If there is a protest, the matter must be presented at a public hearing with full evidence of the need to relocate the well before a decision can be made by WOGCC. Surface density of wells would be a variable based on the surface resource conflicts, economics of directional drilling and the subsurface density. Coalbed natural gas (CBNG) wells are typically spaced on an 80 acre pattern, vertical oil and gas wells are typically spaced on a 40 acre pattern, and horizontal oil and gas wells are spaced from 1,280 acres down to 320 acres depending on geologic conditions.

V.4.1. Permitting

Permitting a new well is governed by Onshore Oil and Gas Order No. 1 and other applicable federal and state laws and regulations. This includes new and future laws and regulations such as the residence setback being finalized by the WOGCC. After the operator makes a decision to drill a well, the well, access road, and pipeline can be surveyed and staked without prior approval from BLM. Cultural resource inventories and wildlife surveys can also take place without prior approval from BLM. An Application for Permit to Drill (APD) or Reenter, on Form 3160-3, is required for each proposed well, and for reentry of existing plugged and abandoned wells (including disposal and service wells). Further details on the APD process are described below. Three methods of notification are as follows:

Early Notification - The operator may wish to contact the BLM and any applicable surface management agency, as well as all private surface owners, to request an initial planning conference as soon as the operator has identified a potential area of development. Early notification is voluntary and would precede the Notice of Staking option or filing of an APD.

Notice of Staking Option - After the operator makes the decision to drill a well, it must decide whether to submit an Notice of Staking or an APD. The Notice of Staking is an abbreviated notice that consists of a filled Notice of Staking form, a sketch showing road entry onto pad, pad dimensions, and reserve pit(s), and a topographical or other acceptable map showing location, access road and lease boundaries. This notice is posted for a 30-day public review. The Notice of Staking triggers the onsite inspection of the well, which determines whether there are any conflicts with critical resources, as well as provides the preliminary data to assess what additional items are necessary to complete the APD. The onsite inspection is conducted by an interdisciplinary team of specialists from the BLM including but not limited to a Natural Resource Specialist, wildlife biologist, archeologist, soil scientist, civil engineer, hydrologist, petroleum engineer and geologist. Along with the BLM representatives there will be company representatives and other agency specialists such as U.S. Fish and Wildlife Service, Wyoming Department of Environmental Quality, and Wyoming Game and Fish Department. In the case of

split estate the landowner or a representative of the landowner may be present. During the onsite inspection any notes taken are incorporated into the administrative record for the processing of the APD. Any conflicts identified during the onsite inspection will be addressed and mitigated when the APD is submitted. Some conflicts may be addressed by moving the surface location of the well up to 200 meters from the original location. The proposed access route and pipeline can also be proposed to be moved at this time.

Application for Permit to Drill - The operator can submit a completed APD in lieu of an Notice of Staking, but in either case, no surface-disturbing activity can be conducted in conjunction with the drilling operations until the APD is approved by the authorized officer. Operators are encouraged to consider and incorporate Best Management Practices (BMPs) into their APDs because BMPs can result in reduced processing times and reduced number of Conditions of Approval (COAs).

If the APD option is used, an APD is submitted to the authorized officer. In order for the APD to be approved it has to be deemed complete and appropriate site specific NEPA has to be conducted. A complete APD contains a completed form 3160-3, a well plat, a 9 point drilling plan, a 12 point surface use plan, appropriate bonding, an operator certification as described in Onshore Oil and Gas Order 1 III.D.6., and an onsite inspection as described in the Notice of Staking option. In the Buffalo Field Office (BFO), a water management plan is required for processing of the APD as explained in the 2003 Powder River Basin EIS and associated Record of Decision. Included with the approval of an APD, site-specific mitigations are added to the APD as COA for protection of surface and subsurface resource values in the vicinity of the proposed activity that were not mitigated as part of the proposed action.

The field office is responsible for preparing environmental documentation necessary to satisfy the NEPA requirements and provide any mitigation measures needed to protect the affected surface and subsurface resource values. The drilling program is reviewed by geologists, petroleum engineers, and possibly hydrologists to ensure the proposed plan meets applicable federal laws and isolates identified zones of interest. These zones of interest include but are not limited to usable water zones (defined as waters containing less than 10,000 ppm total dissolved solids), coal zones, uranium bearing zones, bentonite zones, salt zones, hydrocarbon zones, waste disposal zones, lost circulation zones, high pressure zones, and zones containing hydrogen sulfide. This review looks at how the casing and cement program is designed to ensure the design is sufficient to isolate and protect the formations of interest while also being strong enough to handle any pressures that the well may encounter. These pressures come from the muds used in drilling the well, the formation pressure exerted by the producing zone, or the pressures exerted during the hydraulic fracturing of the well.

Usable water is protected by casing and cement. The shallower fresh water zones (containing less than 5,000 parts per million Total Dissolved Solids) are typically isolated by the surface casing and associated cement job. Within the planning area for this RMP there are deeper fresh water zones that cannot be isolated with the surface casing and associated cement job. When the formations cannot be isolated with the surface casing and cement job then they are isolated with either the intermediate or production casings and cement operations. The zones that are typically deeper are the Fox Hills Sandstone and Madison Formation. Neither of these zones are encountered when drilling CBNG wells but the Fox Hills is always encountered when drilling deeper oil and gas wells. The Madison is not typically encountered during drilling in the planning area as it is located below the economically producible hydrocarbon bearing zones. Determining the depth of fresh water requires specific water quality data in the proposed well vicinity or geophysical log determination of water quality, depending on existing well proximity and log

availability. If water quality data or logs from nearby wells are not available, the area within a 2-mile radius of the proposed well is checked for water wells. If wells exist, the entire formation in which the wells are located is required to be isolated in the new well. In the BFO, usable water can be available to great depths and beyond the surface casing setting point. In order to protect all usable water, the surface casing is set anywhere from 1,000 feet to 3,500 feet in depth and cemented back to surface. The next string of casing is set at least 100 feet below the deepest usable water zone expected to be encountered in the well and the casing is cemented back to a point where the usable waters are isolated from deeper hydrocarbon bearing zones. These depths are verified on a case-by-case permit basis by a staff geologist and petroleum engineer. An additional protection measure that is required is the use of fresh water based muds while drilling through a usable water zone until that zone is isolated by casing and cement. If there is not enough information to determine whether the water is usable it is treated as usable for protection purposes. Figure V.1, “Generalized Stratigraphic Chart of the Powder River Basin and Buffalo Planning Area Showing Water and Mineral Zones” (p. 2606) highlights those formations that will be isolated and protected in relation to all formations in the planning area.

Rock Unit		
Western		Eastern
White River Formation		
Wasatch Formation		
Fort Union Formation	Tongue River Member	Fort Union Formation
	Lebo Shale Member	
	Tullock Member	
Lance Formation		Hell Creek Formation
Fox Hills Sandstone		
Bear Paw Shale	Lewis Shale (Teckla Sandstone Member)	Pierre Shale
MesaVerde Formation (Teapot Sandstone and Parkman Sandstone members)	Pierre Shale	
Cody Shale (Sussex and Shannon sandstones, Steele Shale, Niobrara and Sage Breaks members)		
Frontier Formation (wall Creek, 2nd Wall Creek, and Belle Fourche members)	Niobrara Formation	
	Carlile Shale (Sage Breaks, Turner Sandy, and Pool Creek members)	
	Greenhorn Formation	
	Belle Fourche Shale	
Mowry Shale		
Muddy Sandstone		Newcastle
Thermopolis Shale		Skull Creek Shale
Cloverly Formation	Fall River Formation	Inyan Kara Group
	Lakota Formation	
Morrison Formation		
Sundance Formation (“Upper” and “Lower” Sandstone)		Sundance Formation (Redwater Shale, Pine Butte, Lak, Hullet Sandstone, Stockade Beaver, and Canyon Springs members)
Gypsum Spring Formation		
Popo Agie Formation		
Crow Mountain Sandstone	SpearFish Formation (Pine Salt, Forelle Limestone, and Glendo Shale members)	
Alcova Limestone		
Red Peak Formation		
Goose Egg Formation (Little Medicine Limestone, Freezeout Shale, Ervay, Difficulty Shale, Forelle Limestone, Glendo Shale, Minnekahta Limestone, and Opeche Shale members)		Minnekahta Limestone
		Opeche Shale
Tensleep Sandstone	Minnelusa Formation	
Amsden Formation		
Madison Limestone	Pahasapa Limestone	
	Englewood Limestone	
Bighorn Dolomite	Whitewood Dolomit	
	Winnipeg Formation	
Gallatin Limestone	Deadwood Formation	
Gros Venture Formation		
Flathead Sandstone		

Source: Stilwell et al. 2012
All Formations colored in blue are isolated and protected water zones.
All Formations colored in grey are isolated and protected hydrocarbon bearing zones.
All Formations colored in green are isolated and protected for both water and hydrocarbon bearing zones.

Figure V.1. Generalized Stratigraphic Chart of the Powder River Basin and Buffalo Planning Area Showing Water and Mineral Zones

All casing used in the construction of a well has to meet American Petroleum Institute standards for that grade and weight of casing. The standard is to use new casing but there is an allowance for using used casing when it meets a minimum wall thickness of 87.5 percent of the new pipe. Used casing has to be approved on a site specific basis by the authorized officer. The casing design has to meet minimum safety factors for burst rating, collapse rating and yield ratings. These designs take into account the maximum pressure and stress that will be applied to the casing in the given permit.

The cements used in the construction of the well are tested in a lab under simulated field conditions. The cements have to meet minimum design criteria in order to be approved for use. All non-“neat” cements require the lab data to accompany the permit for review by the petroleum engineer. “Neat” cement is cement that has no additives to modify its setting time or rheological properties. In the planning area additives are typically added to reduce the weight of the cement thereby reducing the hydrostatic head exerted on the formation. This ensures the cement does not break down the formation and stays where it was intended to be. The top of all cement that is not circulated back to surface is verified through electric logging operations and any remedial actions are taken before the well is put into production. Remedial actions would be undertaken when the logging operations show that the formations of interest have not been isolated.

When final approval is given by BLM, the operator can commence construction and drilling operations in accordance with the approved permit. Approval of an APD is valid for 2 years. If drilling does not begin within the 2 years the permit may be extended up to 2 more years at the operator’s request. This extension may be granted after the appropriate NEPA analysis is conducted. The operator is responsible for reclaiming any surface disturbance that resulted from its actions, even if a well was not drilled.

Economic conditions dramatically affect drilling activity. A downturn in the oil and gas market could create a significant decrease in the number of drilling wells within the BFO. More information on drilling and production trends for the BFO can be found in the reasonable foreseeable development (RFD) scenario created for the RMP and EIS.

V.4.2. Standard Drilling Conditions of Approval

In addition to any COAs that are developed during the environmental analysis, APDs are also subject to BFO’s standard drilling COAs which are listed below.

For CBNG wells:

1. The operator shall complete wells (case, cement and under ream) as soon as possible, but no later than 30 days after drilling operations, unless an extension is given by the BLM authorized officer.
2. If in the process of air drilling the wells there is a need to utilize mud, all circulating fluids will be contained either in an approved pit or in an aboveground containment tank. The pit or containment tank will be large enough to safely contain the capacity of all expected fluids without danger of overflow. Fluid and cuttings will not be squeezed out of the pit, and the pit will be reclaimed in an expedient manner.

Well Control Equipment

1. The flow line shall be a minimum of 30 feet from the wellbore and securely anchored. The 30-foot length of line is a minimum and operators must make consideration for increasing this length for topography and/or wind direction.
2. The flow line shall be a straight run.
3. The flow line must be constructed from non-flammable material.
4. All cuttings and circulating medium shall be directed to and contained in a reserve pit.
5. The nearest edge of the pits shall be a minimum of 25 feet from the rig.
6. A minimum of 2 feet of freeboard shall be maintained in the pits at all times.
7. The authorized officer may modify these requirements at any time if it is determined that increased pressure control is deemed necessary.
8. Verbal notification shall be given to the authorized officer at least 24 hours before formation tests, Blow Out Prevention tests, running and cementing casing, and drilling over lease expiration dates.

Cement Program

1. If there are indications of inadequate primary cementing of the surface, intermediate, or production casing strings; such as but not limited to no returns to surface, cement channeling, fallback or mechanical failure of equipment, the operator will evaluate the adequacy of the cementing operations. This evaluation will consist of running a cement bond log or an alternate method approved by the authorized officer no sooner than 12 hours and no later than 24 hours from the time the cement was first pumped.
2. If the evaluation indicates inadequate cementing, the operator shall contact a BLM BFO Petroleum Engineer for approval of remedial cementing work.
3. The adequacy of the remedial cementing operations shall be verified by a cement bond log or an alternate method approved by the authorized officer. All remedial work shall be completed and verified prior to drilling out the casing shoe or perforating the casing for purposes other than remedial cementing.
4. The cement mix water used must be of adequate quality so as not to degrade the setting properties of the cement. Any water that does not meet municipal quality water standards shall be tested by mixing the water and cement in a lab and comparing the results to the municipal quality water mix results. If the results show that the cement qualities are not the same or greater, then the non-municipal water shall not be used for mixing cement in the well.

Production Equipment

Other actions such as off-lease measurement, commingling, allocation, etc. shall be approved via a Notice of Intent sundry (Form No. 3160-5). Submission of additional information in the Plan of Development (POD) shall not be construed as permission for these items. If the operator wishes to use off-lease gas measurement for wells approved in this POD, they are required to obtain approval via a Notice of Intent sundry (Form No. 3160-5) prior to any gas production.

Well and POD Building Identification

1. From the time a well pad is constructed or a well is spudded (if no well pad needed), until abandonment, all well locations must be properly identified with a legible sign. The sign will include the well name and number, operator name, lease number, and the surveyed location.
2. At each POD building site where federal wells are metered, the operator is required to maintain a legible sign displayed in a conspicuous place. This sign is required to be in place at the time metering goes online. The sign shall include: POD name, Operator, federal well

names and numbers, federal lease numbers being metered at the POD building, and surveyed location of the building.

Protection of Fresh Water Resources

All oil and gas operations shall be conducted in a manner to prevent the pollution of all freshwater resources. All fresh waters and waters of present or probable future value for domestic, municipal, commercial, stock, or agricultural purposes will be confined to their respective strata and shall be adequately protected. Special precautions will be taken to guard against any loss of artesian water from the strata in which it occurs and the contamination of fresh water by objectionable water, oil, condensate, gas or other deleterious substance to such fresh water.

Miscellaneous Conditions

1. Any changes to the approved drilling plan and/or these COAs shall be approved by the BLM BFO Petroleum Engineer prior to being implemented.
2. If any cores are collected, a copy of all analysis performed shall be submitted to the BLM BFO Petroleum Engineer.

For Conventional and Unconventional Oil and Gas Wells:

1. Verbal notification shall be given to the authorized officer at least 24 hours before formation tests, Blow Out Prevention tests, running, and cementing casing, and drilling over lease expiration dates.
2. New hard-band drill pipe shall not be rotated inside any casing. Hard-band drill pipe shall be considered new until it has been run at least once.
3. All Blow Out Prevention Equipment tests shall include a 5 minute low pressure test between 250 psi and 500 psi with no drop in pressure with the only exception being the chokes. The chokes are only required to have the high pressure test held for a minimum length of time necessary to verify their functional integrity.
4. All operations must be conducted in accordance with all applicable laws and regulations: with the lease terms, Onshore Oil and Gas Orders, Notice to Lessee's; and with other orders and instructions of the authorized officer, unless a variance has been granted in writing by the authorized officer.
5. The Operator shall install an identification sign consistent with the requirements of 43 Code of Federal Regulation (CFR) 3162.6 immediately upon or before the completion of the well pad construction operations.
6. All Blow Out Prevention Equipment rated 5M or greater shall be isolated from the casing and tested to stack working pressure. All Blow Out Prevention Equipment tests shall be performed by a suitable test pump, not the rig-mud pumps and recorded on a chart. The chart shall be submitted to the BFO.
7. Low test on Blow Out Prevention Equipment shall be performed and passed before moving onto the high test for each component.
8. If there are indications of inadequate primary cementing of the surface, intermediate, or production casing strings; such as but not limited to no returns to surface, cement channeling, fallback or mechanical failure of equipment, the operator will evaluate the adequacy of the cementing operations. This evaluation will consist of running a cement bond log or an alternate method approved by the authorized officer no sooner than 12 hours and no later than 24 hours from the time the cement was first pumped.
9. If the evaluation indicates inadequate cementing, the operator shall contact a BLM BFO Petroleum Engineer for approval of remedial cementing work.

10. The adequacy of the remedial cementing operations shall be verified by a cement bond log or an alternate method approved by the authorized officer. All remedial work shall be completed and verified prior to drilling out the casing shoe or perforating the casing for purposes other than remedial cementing.
11. The cement mix water used must be of adequate quality so as not to degrade the setting properties of the cement. Any water that does not meet municipal quality water standards shall be tested by mixing the water and cement in a lab and comparing the results to the municipal quality water mix results. If the results show that the cement qualities are not the same or greater, than the non-municipal water shall not be used for mixing cement in the well.
12. All oil and gas operations shall be conducted in a manner to prevent the pollution of all freshwater resources. All fresh waters and waters of present or probable future value for domestic, municipal, commercial, stock or agricultural purposes will be confined to their respective strata and shall be adequately protected. Special precautions will be taken to guard against any loss of artesian water from the strata in which it occurs and the contamination of fresh water by objectionable water, oil, condensate, gas or other deleterious substance to such fresh water.
13. Any changes to the approved drilling plan and/or these COAs shall be approved by the BLM BFO Petroleum Engineer prior to being implemented.

V.4.3. Surface Disturbance Associated With Oil and Gas Drilling

Upon receiving approval to drill the proposed well, the operator moves construction equipment over existing roads to the point where the access road will begin. Generally, the types of equipment include trackhoe, dozers (track-mounted and rubber-tired), scrapers, and motor-graders. Moving equipment to the construction site requires moving several loads (some overweight and overwidth) over public and private roads. Existing roads and vehicle routes are improved in places and occasionally, culverts and cattleguards are installed as specified in the approved APD.

The length of the access road varies. Generally the route is selected to reduce impacts to resources identified in the NEPA document. Environmental factors or the landowner's preference might dictate a longer route. Roads will be existing two-track roads with only spot upgrades to crowned and ditched with up to a 30-foot running surface. The type of road is selected based on drilling and completions activities as well as production activities. Soil texture, steepness of the topography, and moisture conditions might require surfacing (e.g., gravel, dust suppressants) the access road. For CBNG wells the equipment is smaller and will typically be serviced by a two-track or primitive road. The production from CBNG wells is piped off location. The deeper oil and gas wells require a bigger road because the equipment used to construct an oil or gas well is much larger. The gas production from oil and gas wells is typically piped off location but the liquids are stored at either the wellsite or a centralized point for the field. The methods of production and the disposition of that production are described later on in this document.

All soil material suitable for plant growth is first removed and stockpiled in a designated area. Sites on flat terrain usually require slightly more than removing the topsoil material and vegetation. Drilling sites on ridge tops and hillsides are constructed by cutting and filling portions of the location. The majority of the excess cut material is stockpiled in an area that will allow it to be easily recovered for rehabilitation. It is important to confine extra cut material in a stockpile rather than to cast it down hillsides and drainages where it cannot be recovered for rehabilitation. The proposed wellpad design has to be balanced in there is no excess spoil dirt and fill dirt does

not have to be brought in from offsite to level the pad. Offsite materials may be brought in for surfacing of the wellpad and access road.

The amount of level surface required for safely assembling and operating a drilling rig varies with the type of rig, the depth, type of the well, and number of wells on the pad. The average size for a CBNG well pad is 2.5 acres initial disturbance with a long term disturbance of 1.5 acres. The average size for an oil and gas location varies from 2.75 acres to 23 acres of initial disturbance with a long term disturbance of 2 to 10 acres depending on the type and number of wells on the wellpad. In addition to the drilling rig footprint, a reserve pit may be constructed, usually square or oblong, but sometimes in another shape to accommodate topography. Generally, the reserve pit is 8 to 12 feet deep, but could be deeper to compensate for smaller length and width or deeper drilling depths. Most horizontally drilled wells utilize a closed loop or semi-closed loop system. With the closed loop system the drill cuttings are hauled to an approved disposal site for remediation. The semi-closed loop system has the cuttings buried on location. The cuttings are separated between water based mud cuttings and oil based mud cuttings. Both types of cuttings are dried and solidified before burial. If there is a reserve pit on location, the pit has to be dried and solidified before it can be reclaimed. Depending on the relationship of the location to natural drainages, it might be necessary to construct water bars or diversions. The amount of area disturbed for construction depends largely on the steepness of the slope and the size of the pad. Depending on the soil permeability, pits may be lined with an impermeable material to contain the drilling fluids. If water is encountered while digging the reserve pit, a closed loop mud system, consisting of steel tanks, will be required.

Moving a drill rig will require from 5 to 50 truck trips of construction equipment over public highways and private roads. Drill rigs for CBNG as compared to deep drilling rigs are smaller, require fewer loads, and are generally only on location for a couple of days to a week. The bigger rigs used to drill the vertical and horizontal wells will be on location anywhere from a week to 8 months depending on the depth and number of wells on the location.

Water for drilling and well completion may be hauled or piped to drilling locations. Water sources are usually commercial water sources or recycled water if drilling is below the surface casing and fresh water aquifer zones. When drilling commences, and as long as it progresses, water is continually transported to the rig location. Depending on the type of well being drilled anywhere from 5,000 barrels to 100,000 barrels of water is needed for drilling and completion activities. More water would be required if circulation is lost, or permeable zones that cannot withstand the pressure of the drilling fluid are encountered.

V.4.4. Issuance of Rights-of-Way

Rights-of-way (ROW) are required for all facilities, tank batteries, pipelines, powerlines, and access roads that occupy federally owned land outside the lease or unit boundary. When a third party (someone other than the operator) constructs a facility or installation on or off the lease, a ROW is also required. The ROW is issued by BLM.

V.5. Drilling Operations

This section describes more conventional or traditional drilling operation techniques. BLM encourages the use of other new alternative construction and drilling techniques and technologies designed to limit environmental effects.

V.5.1. Rotary Drilling

Initially, drilling proceeds rapidly because of the less competent nature of shallow formations. Drilling is accomplished by rotating the drill string and putting variable weights on the bit located at the bottom of the string. While drilling, the derrick and associated hoisting equipment bear a majority of the drill string's weight. The combination of rotary motion and weight on the bit causes rock to be gouged away at the bottom of the hole. There are two types of rotary drilling. The first type is the older style which includes a kelly and rotary table. The second type is a top drive system. The rotary motion on the older style is created by a square or hexagonal rod, called a kelly, which fits through a square or hexagonal hole in a large turntable, called a rotary table. The rotary table sits on the drilling rig floor and as the bit advances, the kelly slides down through it. When the kelly has gone as deep as it can, it is raised, and a new piece of drill pipe about 30 feet in length is attached in its place. The drill pipe is then lowered, the kelly is reattached, and drilling recommences. The top drive system does not have a rotary table or a kelly. The rotation of the drill string is accomplished with the top drive unit which is hydraulically driven. Since there is no kelly a piece of drillpipe is screwed together at the top and drill string. When this piece of pipe reaches the rig floor drilling stops and a new piece of pipe is connected. The drillpipe is the same for both styles of rotary drilling. When the bit becomes dull, it is necessary to trip the drill string and replace the bit. This is a time-consuming process of withdrawing 90-foot sections of the drill pipe until the bit is out of the hole. This trip can be anywhere from a couple of hours roundtrip to a couple of days depending on the length of the drillpipe and any hole problems that may be encountered. Each time a string of casing is run you must first trip the drillpipe out of the hole. New bits constructed with modern metals and manufactured polycrystalline diamonds along with down hole mud motors have revolutionized drilling operations, whereby thousands of feet of hole can be drilled with one bit run. The mud motor is a positive displacement pump (moineau pump run in reverse) driven by high-pressure mud and is placed at the top of the bit to enable more rotational power to be transmitted to the bit and thus increase penetration rates.

Drilling a directional or horizontal well requires extra tools to be used in the drill string. These tools include bent pieces of pipe to angle the drilling direction of the hole, measurement while drilling tools, and mud motors. The bent pipe is manufactured with a bend in the pipe of 0.5 degrees to 3 degrees. Having a mud motor after the bent piece of pipe allows the driller to rotate the drill bit without having to rotate the drill string thus causing the bit to drill away from vertical at a controlled rate. Within a couple of joints of drill pipe from the drill bit the measurement while drilling tools are installed to relay the direction and penetration angle of the drill string. Once the desired angle has been attained rotary drilling may commence again to the total depth of the well.

Drilling mud is circulated through the drill pipe to the bottom of the hole, through the bit, up the annulus (i.e., the space around a pipe in a wellbore) of the well, across a screen that separates the rock chips, and into holding tanks from which finer sediments settle from the mud before it is pumped back into the well. The mud is maintained at a required weight and viscosity to cool the bit, reduce the drag of the drill pipe on the sides of the hole, seal off any porous zones, contain formation fluids to prevent a blowout, and bring the rock chips to the surface for disposal. Various additives are used in maintaining the mud at the appropriate viscosity and weight. Most of the mud consists of bentonite. Some of the additives are caustic, toxic, or acidic, but these hazardous additives are used in small amounts during the drilling operations and later contained at the surface.

Within the BFO, drilling is usually accomplished with water or light mud to depths within about 1,000 feet of the prospective formation. Water and natural clays recovered during the

drilling operation, or light drilling mud, allow fast drilling rates and the attendant reduction in mud chemicals. Once the bit reaches the target depth, the mud system is gradually made more sophisticated by addition of bentonite, chemicals, and natural weight materials to reduce water loss to the potential producing zones and to control the subsurface pressure. In almost all cases except CBNG, the subsurface pressure is higher than an equivalent water column, and it is necessary to increase the mud weights to control the pressure and prevent a blowout or uncontrolled flow of formation fluids. Many wells are drilled in an underbalanced condition, whereby the mud pressure is slightly less than the formation pressure, which increases penetration rate and reduces the time on the well, or in the formations of interest. Drilling in this condition also reduces the potential of damaging the formation, with the attendant loss of flow capacity and recovery. The wells are always overbalanced for safety requirements when a bit trip is made, the well is logged, or the casing is installed.

Drilling operations are continuous, 24 hours a day, 7 days a week. The crews usually work three 8-hour shifts or two 12-hour shifts a day. Pickup trucks or cars are used for workers' transportation to and from the site. During normal drilling operations typically the only people on location are the rig crew, company man, tool pusher, and mud logger. Other operations, such as cementing, running casing, and rig maintenance will require additional personnel who will not remain on location once their part of the operation is completed.

Upon completion of the drilling, a determination is made regarding the productive potential of the well. If oil or gas is not discovered in commercial quantities, the well is considered dry. The operator is then required to follow BLM procedures to properly plug the dry hole. These procedures are described in depth later in this appendix. The drill site and access road are then rehabilitated in accordance with the stipulations attached to the APD and the plugging approval. If the well is a producer, drilling operations continue until the production casing is cemented into the well and the well is secured. Once the casing has been cemented in place and the well is secure rig down operations commence to remove the drilling equipment from the location. The completion equipment and crews will come in at a later time and complete the well as described later in this appendix.

V.5.2. Logging

Geophysical logs are obtained by running various instruments into the hole on a wire cable or attached to the drill string for Measuring While Drilling. Logs are usually run at a depth point where casing will be installed. A log is not usually run before surface casing is set, but in most instances a log recording natural gamma radiation is run through the surface casing to determine the geology of that section. If cement was not circulated to surface a cement bond log or temperature log will be run and interpreted to decide the course of remedial operations. The logs can determine water resistivity, hydrocarbon saturations, natural gamma radiations, porosity of the rock by density, nuclear receptivity and sonic measurements, permeability, pressure, temperature, hole geometry including hole size for cement calculations, and subsurface direction. Logs are used to evaluate whether the well is dry or has the potential for a satisfactory completion. Logs also delineate the various geologic horizons; hydrocarbon zones; fresh, usable, and unusable water; and sands, shales, limestone, coal, and other minerals. Logs are required to specify productive intervals so that they can be perforated and stimulated during the completion program. Normally in the BFO, logs recording resistivity and a combined porosity log of density and nuclear receptivity are run in the well. The dual porosity logs are a direct indicator of oil and gas because the measured values can be compared to provide contrasting porosities.

V.5.3. Casing

Various types of casing are placed in the drilled hole to enhance completion operations and safety. Casing is a string of steel pipe composed of approximately 40-foot lengths of pipe that are threaded together. Centralizers are attached to casing to ensure that the casing is centered in the hole. This practice improves the efficacy of cement jobs. Casing is cemented into the well to protect against migration of fluids along the annulus between the casing and the hole. Cementing isolates the formations so they can be completed and produced without interference from other zones containing hydrocarbons or water. Hole deviation, depth, bore hole environment, placement of centralizers, and a myriad of other factors affect the integrity of the casing and cement job, and must be considered in the original design.

Surface casing that is properly set and cemented also protects surface aquifers from contamination by drilling and production operations. Surface casing should be set to a depth greater than the deepest fresh water aquifer that could be reasonably developed. Surface casing is designed to be large enough to allow subsequent strings of smaller casing to be set as the well is drilled deeper. Cement is placed in the annulus of the surface casing from casing shoe to ground level. The surface casing is the first string on which blowout preventer equipment is installed. The blowout preventer equipment allows the well to be shut in at any time that conditions warrant, protecting against unanticipated formation pressures and allowing safe control of the well. Blowout preventer equipment is tested and inspected regularly by both the rig personnel and the inspection and enforcement branch of BLM. Minimum standards and enforcement provisions are part of Onshore Order No. 2.

Casing strings subsequent to the surface string are required to be cemented from the casing shoe to above any zone of interest as described previously. In the BFO, the annulus (i.e., the space around a pipe in a wellbore) is required to be filled with sufficient cement to provide adequate protection from interzonal migration of unsuitable water and hydrocarbons. Production casing or production liner is designed to provide isolation of oil and gas formations, and a high-pressure conduit to the hydrocarbon zones that allows stimulation of these intervals to improve the productivity.

For CBNG wells the surface casing is required to be set at a minimum of 60 feet or 10 percent of the well depth, whichever is greater. This is then required to be cemented back to surface. The next string of casing is the production casing which is set through the coalbeds or to the top of the coalbed depending on the type of completion that will occur. This casing string is then cemented back to the surface at the well site.

For the deeper oil and gas wells a conductor pipe is set to 60 feet to 80 feet, to control sloughing of the ground under the rig, and it is cemented back to surface. The next string of pipe is the surface casing. It is set anywhere from 750 feet to 3,000 feet and cemented back to surface. This depth is determined by the depth of the shallower fresh water zones, the lost circulation zones (i.e. coals), and where a competent formation can be found. The next string of pipe that is installed in the well is typically the production string for vertical wells and the intermediate string for horizontal wells. These strings of pipe are required to be cemented from the shoe to the Lance formation. Many operators choose to cement all the way into the surface casing. This operation will isolate the Fox Hills Formation from any other zone both below and above it. For vertical wells there is no more casing installed but for a horizontal well the next string of pipe installed is the production liner. Depending on the geology this liner may be cemented from the shoe to the top of the liner. Other times it is set with swellable packers located on the outside of the casing.

These packers help to centralize the casing in the hole and provide a method for isolation of the production. The liner has to be set at least 100 feet above the shoe of the intermediate casing.

During completion operations, there are three ways to get a pathway for the oil and gas to migrate from the formation into the casing. The first way is to perforate the casing in the zone(s) of interest. The second option is called an openhole completion. The third option is to use a pre-slotted or perforated casing. All three methods can be used in both CBNG wells and the deeper oil and gas wells. Perforating the casing is usually done after the casing has been cemented in place. This is accomplished with a perforating gun. It consists of shaped explosive charges that will penetrate through the steel casing, cement sheath, and into the formation as much as 48 inches depending on the size of the explosive charge. This will leave a hole from 0.25 inch to 0.4 inch in the casing, cement and formation depending on the requested hole size. These perforations can be spaced from 1 shot per foot (spf) to 48 spf.

With an openhole completion casing is set to the top of the productive formation and then a smaller drill bit drills through the casing shoe and into the formation. The hydrocarbons are then produced through the well without an additional casing and cement. For those formations where sloughing occurs a steel or plastic pipe is run into the openhole to hold the formation back. This openhole may be under-reamed to enhance production. The under-reaming is accomplished by a drill bit that expands in diameter as it is rotated. Currently technology allows the under-ream to be about double the size of the casing that the under-reamer passes through. Under-reaming cannot be accomplished inside cased hole.

The third option for completions goes along with an openhole completion. For CBNG once the well has been under-reamed a pre-slotted liner is installed in the well to keep the coals from sloughing into the under-ream and closing off the path for the CBNG to flow. In horizontal wells, a slotted liner is sometimes used. This liner has swellable packers on the outside that provide both centralization and isolation within the formation for both completion operations and administrative purposes. The swellable packers absorb the drilling mud around them to swell like a sponge filling the annular space between the pipe and the formation. The slots in the liner are hydraulically actuated sleeves that open when a rubber ball is pushed through them. Each sleeve in the pipe requires a little larger ball so they can be opened from the end of the pipe back to the beginning of the pipe. Once the sleeve is opened the formation can be hydraulically fractured as described later in this appendix.

V.5.4. Hydraulic Fracturing

Hydraulic fracturing is the process of creating small cracks, or fractures, in deep, underground geological formations to liberate oil or natural gas and allow it to flow up the well for capture. To fracture the formation, fracturing fluids – approximately 99.5 percent water and sand, with the remaining percentage chemical additives – are injected down the wellbore into the formation. The fluid, injected under pressure, causes the rock to fracture along weak areas. These fractures typically range from 0.1 to 0.3 inches in width, 20 to 300 feet in height, and 300 to 1,500 feet in length. When the fractures are complete, and pressure is relieved, the fluids flow back up the well where they are captured and stored for later treatment or disposal. As the fluids flow back up, sand remains in the fractures and props the rock open. This allows the oil and gas to seep from the rock into the pathway, up the well and to the surface for collection. In the planning area, the targeted formations for hydraulic fracturing are often more than 7,000 feet underground, and some 2,000 feet below any drinking water aquifers.

The process is much different for CBNG wells than the deeper oil and gas wells. CBNG wells have water enhancements and are not hydraulic fractured as defined above. The water enhancement consists of up to 3,000 bbls of chlorinated water pumped at high rates into the coals. The pressure rarely exceeds 1,500 psi and other chemicals and sand are not used. This process cleans the cleats of the coals around the wellbore and allows the formation water and CBNG to flow more freely into the casing for extraction.

V.5.5. Oil and Gas Exploratory Units

Surface use in an oil or gas field could be affected by unitization of the leaseholds. In areas of federal and mixed mineral ownership, an exploratory unit can be formed before a wildcat exploratory well is drilled. The boundary of the unit is based on geologic data and attempts to consolidate the interests in an entire structure or geologic play. The developers of the unit enter into an agreement to develop and operate as a single entity, regardless of separate lease ownerships. Costs and benefits are allocated according to agreed-upon terms. Development in a unitized field can proceed more efficiently than in a field composed of individual leases because competition between lease operators and drainage considerations is not a primary concern. Unitization also can reduce surface use requirements because all wells are operated as though under a single lease, and operations can be planned for more efficiency. Duplication of field processing facilities is eliminated, and consolidation of facilities into more efficient systems is probable. Unitization can also involve wider spacing than usual, or spacing based on reservoir factor rather than a set rule, which could result in fewer wells and higher recovery efficiency. Through planning, access roads are usually shorter and better organized, and facilities are usually consolidated. Units are voluntary for operators to propose and cannot be required by BLM.

V.5.6. Field Development

New field development is analyzed in an environmental assessment (EA) or EIS after the sufficient confirmation wells are drilled. The operator generally can estimate the extent of drilling and disturbance required to extract and produce the oil and gas at that time. Many fields go through several development stages. A field can be considered fully developed, and can produce for many years when it is determined that a well can be drilled to a deeper pay zone, a new interval is discovered to be economically attractive, or drilling and completion technology changes. In this case, there is typically less new disturbance because the old wellbores or the old well pads are used for the new completions. With changes in drilling and completion technology the surface disturbance maybe reduced because fewer wells are required to drain the reservoir. A new stage of field development, such as infill drilling, can lead to increases in roads and facilities. All new construction, reconstruction, or alterations of existing facilities, including roads, flow lines, pipelines, tank batteries, or other production facilities must be approved by BLM and could require a new environmental document. Throughout field development, partial restoration and rehabilitation is required to reduce the surface impacts to the minimum required to produce the resource.

The most important factor in further development of an oil or gas field is the economics of production. When an oil or gas discovery is made, a well spacing pattern can be established before development drilling begins. This pattern is dependent on the current statewide or area wide spacing. Well spacing is regulated by WOGCC, and factors considered in the establishment of a spacing pattern include data from the discovery well that translate into recovery efficiency. These data include porosity, permeability, pressure, composition of reservoir and fluids, depth of

formations, well production rates, and the economic effect of the proposed spacing on recovery. These data are relatively sparse in the initial phase of development, and extended production permits refinement of these values. Because these data are so tentative, WOGCC tends to define large spacing until the data are more conclusive. Spacing requirements can pose problems in selecting an environmentally sound location or in the cumulative impacts because spacing is based on administration of correlative rights and not reservoir characteristics. Reservoir characteristics determine the most efficient spacing to achieve maximum recovery. If an operator determines that a different spacing is necessary to achieve maximum recovery, the State of Wyoming (with input from BLM) may grant exceptions to the spacing requirements.

V.6. Production

Gas, oil, and water are being produced in the BFO by means of natural pressure (flowing or plunger lifts) and artificial lift (gas and electric pumping units and submersible pumps). Gas and oil production methods are equivalent for vertical, horizontal and directional wells and are not separated in the discussion that follows.

V.6.1. Gas Production (other than CBNG)

A typical gas well facility consists of methanol injection equipment (to keep production and surface lines from freezing), separator (which separates gas, oil, and water), dehydrator (uses glycol or calcium chloride to extract entrained water in the gas), and an orifice meter. An intermitter is sometimes used to either shut-in the well to build up pressure, or to blow the well down if it is being loaded with fluid. If the gas well is producing some oil or condensate, oil tanks are used to store the oil or condensate until it is sold by truck or pipeline. Pipeline quality gas at the wellhead requires a minimum of processing equipment. As the quality of gas decreases with the increased presence of water, solids, or liquid hydrocarbons, the amount of processing equipment increases. Water or liquid hydrocarbons in the gas are removed before the gas is sold, usually in the separation equipment near the wellhead. If liquid hydrocarbons are present, storage facilities (tank batteries) are required to store the liquids until they accumulate in sufficient quantities to be hauled out by large trucks. Gas dehydration equipment might also be onsite to remove water entrained in the gas to a water content defined by pipeline specifications. Gas production data can be found in the RFD scenario for oil and gas that was developed for the revised RMP.

Gas that occurs with oil is separated by collecting it into feeder lines leading to compressors that boost the pressure to the transportation system, venting or flaring. If enough casing head gas is separated to make it economical for marketing, a plant can be constructed to process the gas, or a pipeline can be constructed to carry the product to an existing plant. If the volume of casing head gas is insufficient to warrant treatment in a gas plant, it is usually used as fuel for pump engines in the field, or as heating fuel for the heater-treaters. Gas may be flared or vented into the atmosphere if the quantity exceeds the fuel requirements on the lease but is not recoverable in commercial quantities. Venting and flaring has to meet the requirements of NTL-4A and be approved prior to commencing. Typically for federal wells, gas is flared within the first 30 days after completion or until the well has produced 50,000 MCF of gas whichever occurs first. Any venting or flaring beyond this limit has to have approval prior to commencing. The request for venting or flaring has to include economic data along with other reasons as to why the gas cannot be inserted into a pipeline for sales.

V.6.2. Oil Production

In the BFO, oil is generally produced using artificial lift methods (pump units). The oil production equipment, such as heater-treater, tank battery, and holding facility for production water, are either placed on a portion of the location (on cut rather than fill) and located a safe distance from the wellhead, or placed as a centralized facility that services a number of wells with pipeline connections. The heater treater and tanks are surrounded by earthen dikes to contain accidental spills. Either all the facilities or only the produced water pit (if present) will be fenced. Production facility colors are required to be from the standard color chart and are specified in the APD COAs.

Production from several wells on one lease can be carried by pipeline to a central tank battery. Use of a central tank battery can depend on whether the oil is from the same formation, the same lease ownership, or multiple lease ownerships and formations, or whether a commingling agreement is approved. Because of the nature of the oil, adequate separation of oil and water is enhanced or accelerated through applications of heat and chemicals. The fluid stream arrives at a separator point where the flash gas is taken off. In most cases, this flash gas is used for lease operations. The remainder of the flash gas is either compressed and sold or flared. Flash gas is defined as solution gas liberated from the oil through a reduction in pressure. Water and oil are also being separated at this point by gravity segregation. The oil is sent to storage tanks, and the water is sent to a disposal or injection facility. Two main methods of oil measurement used in the BFO are lease automatic custody transfer units and tank gauging. Measurement is required by 43 CFR 3162.7-2 and Onshore Order No. 4 to ensure proper and full payment of federal royalty.

Oil wells can be completed as flowing (those wells with sufficient underground pressure to raise the oil to the surface), or if the pressure is inadequate, they are completed with the installation of subsurface pumps. The subsurface pumps are usually mechanically powered by a pumping unit. Pumping units come in a variety of sizes, the larger ones reaching a height of 30 to 40 feet. The units are powered by internal combustion engines or electric motors. Fuel for the engines may be casing head gas or propane. In cases where large volumes of water are produced with the oil, electric submersible pumps can be installed. These pumps could produce up to 6,000 barrels of fluid per day at an oil cut of $\frac{1}{2}$ of 1 percent oil. Oil production data can be found in the RFD scenario for oil and gas that was developed for the revised RMP.

V.6.3. CBNG Production

CBNG production combines high water production rates of some oil fields with low- pressure operations of some gas fields. Because of the reservoir characteristics of coal, high water production rates are initially required to dewater the reservoir and allow gas to be liberated from cleat surfaces (i.e., the vertical cleavage in coal seams) within the coal. In a coal reservoir, gas is primarily trapped on the face of the coal within the cleat system by molecular attraction. Pressure must be reduced to liberate the gas molecules from the coal face. The production history shows that water production rates begin high, with little or no gas. The water rate then drops at a constant rate, with increasing gas rates until a maximum gas rate is achieved relative to the original gas saturation and reservoir pressures. The gas rate then declines to the economic limit. This process is the exact opposite of that associated with most oil and gas production, which starts at high hydrocarbon rates and low water rates and advances to low hydrocarbon rates and high water rates. The reservoir depths of CBNG production are generally shallow (less than 3,500 feet) compared with most oil and gas production in the BFO. The depth limit is based on coal permeability, which is highly sensitive to overburden weight. A CBNG operation usually

consists of a high-capacity submersible or progressive cavity pump, with water produced out of the tubing, and low-pressure gas produced out of the casing. Centralized facilities collect the gas for compression to pipeline pressures and the water for disposal. Electric power is usually used to power the well pumps and is connected to the well by a subsurface cable laid with the water and gas lines. The producing well pad is very small, with only the wellhead and an insulating house to cover the wellhead. The centralized production facilities contain well header buildings where the individual well gas is measured, and where house collection tanks, injections wells, and pumps for disposal of the water as well as multistage compressors that bring the very low pressure gas to sales line pressure. Sometimes the water can be disposed of in the local drainages if the Wyoming Department of Environmental Quality, and the Wyoming State Engineer's Office (WSEO) and the BLM approve this type of disposal. Currently in the BFO, CBNG production is past its peak and is in a decline both from the amount of production and the number of wells expected to be drilled. The RFD has further discussions production and the future prognosis of CBNG on development within the BFO.

V.6.4. Water Production

Produced water associated with oil, gas, or CBNG is disposed of by trucking or piping the water to an authorized disposal pit, placing the water in lined pits, discharging the water into surface drainages, or through subsurface injection. Water disposal is controlled by both the BLM and WOGCC for subsurface disposal and secondary recovery purposes. The quality of the water often dictates the appropriate disposal method, and Wyoming Department of Environmental Quality has primacy through the Environmental Protection Agency to approve surface disposal of this water. Produced water is also used in enhanced recovery projects. The RFD contains further discussions on produced water production rates.

V.6.5. Production Problems

Weather extremes pose problems for producers by causing roads to become impassable, equipment to malfunction, and flow lines, separators, and tanks to freeze up. Other problems producers may encounter in the area are production of hydrogen sulfide (H₂S), carbon dioxide (CO₂), and paraffin; corrosion; electrolysis; and broken flow lines.

V.6.6. Secondary and Enhanced Oil Recovery

Gas reservoirs typically have no secondary recovery associated with the recovery of gas because natural gas is produced by expansion resulting from the reduction of reservoir pressure. A high reservoir recovery factor can be expected from this expansion process unless the reservoir is of such low permeability that economics becomes a factor in the recovery efficiency. Economics is a determining factor because of the expense of operating compression facilities to reduce the reservoir pressure to the minimum.

Secondary recovery in coal reservoirs has been tested in the San Juan Basin and found to be technically feasible. This recovery process involves the molecular replacement of natural gas by CO₂ or nitrogen. An oil reservoir typically contains oil, gas, and water trapped within the rock matrix under pressure. Because of the pressure, much or all of the gas is dissolved in the oil. Primary drive is accomplished by expanding gas in solution, which forces oil out of the reservoir into the well and up to the surface. Oil flowing out of the reservoir drains energy from

the formation and the primary drive diminishes. To keep oil flowing in the reservoir, pressure drawdown is required, and subsurface pumps could be used to lift oil to the surface. As reservoir pressures continue to drop, solution gas in the oil escapes, forming bubbles in the pore space. These bubbles further retard the flow of oil and increase the gas saturation and the flow of solution gas. This process accelerates as the pressure declines, and at some point, production rates become uneconomical, with as much as 80 percent of the original oil remaining in the reservoir. Currently, in the United States, primary oil recovery accounts for less than half of the current oil production. The remaining oil is produced by secondary and enhanced recovery techniques.

Two basic secondary recovery methods are in use—water flooding and displacement by gas. The preferred secondary recovery method is water flooding, which involves injecting water into oil reservoirs to maintain or increase pressure. The process is usually most efficient when the pressure has not fallen to the point where the reservoir is highly saturated with gas. Reservoir heterogeneity in the form of fractures, directional permeability, and thin zones could limit the success of this process.

The process of injecting gas is a less popular secondary recovery technique. Historically, produced gas was considered a waste product and was flared (burned) at the point of production. Later, it was recognized that the energy could be conserved and the recovery of oil increased if the produced gas was reinjected into the reservoir. Increased production was achieved by maintaining reservoir pressure by injecting the gas into the existing gas cap and also by injecting the gas directly into the oil-saturated zone, creating an immiscible gas drive that displaced the oil. To achieve miscibility, the reservoir must have reasonably high pressures and temperatures and contain high-gravity oil. Many gas injection projects use the water alternating gas process, which is injecting water and gas alternately to achieve better contact with the oil within the reservoir.

The term enhanced recovery is used to describe recovery processes other than the more traditional secondary recovery procedures. These enhanced recovery methods include thermal, chemical, and miscible (mixable) drives. Currently, no enhanced recovery techniques are being implemented within the BFO, but there is a large CO₂ enhanced recovery project to the south of the planning area in the Salt Creek Field. There are also preliminary CO₂ enhanced recovery projects being developed.

Some reservoirs contain large quantities of heavy oil that cannot be produced using normal or secondary methods. These reservoirs can be stimulated by thermal drive processes in which heat is introduced from the surface or developed in place in the subsurface reservoir. In the surface introduction process, hot water or steam is injected. Raising the temperature of heavy oil reduces the viscosity and makes the oil more mobile. In the in-situ process, both heavy and light oils can be processed. Spontaneous or induced ignition within the reservoir is induced by injected air to develop a fire front that burns the hydrocarbons. Evaporation of the lighter ends immediately ahead of the fire front, and later condensation is the primary recovery mechanism. The remaining hydrocarbons are consumed by the fire and are generally not considered of any value. These techniques are very expensive and must have large reserves and thick pay zones to be economical. It is unlikely these techniques will be used within the BFO in the immediate future unless new discoveries are made.

Several chemical drive techniques are currently in use, including polymer flooding, caustic flooding, and surfactant-polymer injection. These methods attempt to change reservoir conditions to allow recovery of additional oil. Caustic and surfactant-polymer flooding have not been economical in the past, and unless a breakthrough in technology is achieved, these techniques

will probably not be considered during the planning period. Polymer flooding is an economically viable process but is used mainly in viscous reservoirs with high permeability.

V.6.7. Gas Storage

Pipeline-quality gas can be stored in good quality reservoirs with sufficient sealing parameters. This gas is pumped into the reservoir during nonpeak, usually lower priced time periods, and then pumped out into the transmission lines at times of peak demand and higher prices. The price differential pays for the governmental fees required the use of the storage reservoir and the injection/compression costs required to store and retrieve the gas. Gas storage also serves as a buffer for cold periods when demand is high and levels out the summer slack period of production. There is one active gas storage reservoir within the BFO.

V.7. Plugging and Abandonment Of Wells

The purpose of plugging and abandoning a well is to prevent fluid migration between zones, to protect mineral and water resources from damage, and to restore the surface area. Each well must be handled individually because of a combination of factors, including geology, subsurface well design, and specific rehabilitation concerns; therefore, only minimum requirements can be established, and these must be modified for individual wells.

The first step in the plugging process is the filing of the Notice of Intent to Abandon. This notice is reviewed by both the surface management agency and BFO petroleum engineer and geologist. The notice must be filed and approved before plugging a previously producing well. Verbal plugging instructions can be given for plugging current drilling operations, but a notice must be filed after the work is completed. If usable fresh water was encountered while the well was being drilled, the surface management agency may be allowed, if interested, to assume future responsibility for the well. This assumption of responsibility becomes effective after the deeper zones are plugged back to the usable water zone. In all cases the productive zone is isolated prior to being turned over to the surface management agency.

The operator's plan for securing the hole is reviewed. The minimum requirements, as stated in Onshore Order No. 2, are as follows: In open hole situations, cement plugs must extend at least 50 feet above and below zones that have fluid with the potential to migrate, zones of lost circulation (this type of zone could require an alternate method to isolate it), and zones of potentially valuable minerals. Thick zones may be isolated using cement plugs across the top and bottom of the zone. In the absence of productive zones and minerals, long sections of open hole may be plugged with cement plugs placed every 3,000 feet. In cased holes, cement plugs must be placed opposite perforations and extending 50 feet above and below, except where limited by plug back depth. The length of the plug is 100 feet plus 10 percent per 1,000 feet (i.e., at 10,000 feet the plug will be 200 feet long).

Cement plugs could be replaced with a cement retainer, if the retainer is set 50 feet above the open perforations and the perforations are squeezed with cement. A bridge plug could also be used to isolate a producing zone and must be capped, if placed through tubing, with a minimum of 50 feet of cement. If the cap is placed using a dump bailer, a minimum of 35 feet of cement is required. A dump bailer is an apparatus run on wire line to convey the cement to the bottom of the hole. In the event that the casing has been cut and recovered, a plug is placed 50 feet within the casing stub, and the 100 feet plus 10 percent per 1,000 feet rule is used for the space

above the cutoff point. In all cases, a plug is set at the bottom of the surface casing that has a volume of cement using the 100 feet plus 10 percent per 1,000 feet rule. This could require perforating the casing and circulating or squeezing cement behind the production casing if that casing is not removed. Annular space at the surface will be plugged with 50 feet of cement using small-diameter tubing or by perforating and circulating cement.

If the integrity of a plug is questionable, or the position is extremely vital, it can be tested with pressure or by tagging the plug with the tubing or drill string. Tagging the plug involves running a pipe into the hole until the plug is encountered, and placing a specified amount of weight on the plug to verify its placement and competency. The surface plug within the casing must be a minimum of 50 feet. The interval between plugs must be filled with mud that will balance the subsurface pressures, and if this balance point is unknown, a minimum of 9 pounds per gallon is specified. After the casing has been cut off below the ground level, any void at the top of the casing must be filled with cement. A metal plate is welded over the top of the casing, a weep hole is placed in the plate. A permanent abandonment marker is required on all wells unless otherwise requested by the surface management agency. After the plugging operations have been completed a subsequent report of abandonment is filed detailing the operations and giving a status update on the reclamation of the well site. Once reclamation has occurred and the wellsite is ready for release a Final Abandonment Notice is submitted to the BLM for review. Usually this will occur after two full growing seasons have elapsed since seeding was finished.

The Surface Management Agency is responsible for establishing and approving methods for surface rehabilitation, and determining when this rehabilitation has been satisfactorily accomplished. With satisfactory rehabilitation, a final abandonment notice is approved, and the well bond is released.

Appendix W. Buffalo Water Resources Management Plan

Note: This appendix was added following the release of the Buffalo Draft Resource Management Plan and Environmental Impact Statement.

W.1. Introduction

W.1.1. Purpose

1. The purpose of this Water Resources Management Plan (Plan) is to further clarify water quality goals, objectives, and management actions set forth in Table 2.9, “1000 PHYSICAL RESOURCES (PR) – WATER” (p. 131) of the Proposed Resource Management Plan (RMP) and Final Environmental Impact Statement (EIS). This Plan describes water resources management, and outlines specific requirements for proponents of projects that have the potential to produce water as a by-product or waste which could impact water resources within the planning area. Where applicable, this Plan refers to the goals and objectives found in Table 2.9, “1000 PHYSICAL RESOURCES (PR) – WATER” (p. 131) of the Proposed RMP and Final EIS.

2. This Plan may be modified as necessary to comply with law, regulation, and policy and to address new information and changing circumstances.

W.1.2. Authority for Water Resource Management

1. **Federal Land Policy and Management Act of 1976.** Federal Land Policy and Management Act (FLPMA) provides Bureau of Land Management’s (BLM) basic operating authority. It establishes a unified, comprehensive, and systematic approach to managing and preserving public lands in a way that protects “the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values.” FLPMA directs that in developing and revising its RMPs, the BLM shall provide for compliance with applicable water pollution control laws, including state and federal pollution standards or implementation plans.

2. **Clean Water Act of 1972.** The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under the CWA, United States (U.S.) Environmental Protection Agency (EPA) has implemented pollution control programs such as setting wastewater standards for industry and water quality standards for all contaminants in surface waters. The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained. EPA's National Pollutant Discharge Elimination System (NPDES) permit program controls discharges. Point sources are discrete conveyances such as pipes or man-made ditches. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters (EPA 2013c).

The Wyoming Department of Environmental Quality (DEQ) Water Quality Division (WQD) has been delegated authority by the EPA to implement federal programs of the CWA. The Wyoming DEQ WQD is responsible for managing water quality through the Wyoming Water Quality Rules and Regulations and the Wyoming State Implementation Plan. In accordance with revisions to

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Chapter 2 of the Wyoming Water Quality Rules and Regulations the state program name, NPDES, was changed to the Wyoming Pollutant Discharge Elimination System (WYPDES). This change clarified that the Wyoming DEQ is the permitting authority for surface discharges within the state. BLM's authority relating to water discharges is described in Onshore Oil and Gas Order No. 7; Disposal of Produced Water. **Approval by the Wyoming DEQ, Wyoming Oil and Gas Conservation Commission (WOGCC) or EPA is not considered as granting approval for discharge or disposal from a federal mineral action until and unless BLM approval is obtained.**

In 1990, the EPA published regulations requiring all storm water discharges associated with industrial facilities to obtain storm water discharge permits. In Wyoming, where the Wyoming DEQ is the permitting authority, Chapter 2, Section 6, of the Wyoming Water Quality Rules and Regulations requires permits for storm water discharges from all construction activities disturbing 1 or more acres. The type of facility being constructed does not change the requirement to obtain permit coverage. As such, construction of oil and gas facilities requires storm water discharge permits from the Wyoming DEQ.

Section 404 of the CWA requires approval prior to discharging dredged or fill material into waters of the United States, including wetlands. Any person or entity planning to work in waters of the United States, or dump or place dredged or fill material in waters of the United States, must first obtain a permit from the U.S. Army Corps of Engineers. Prior to issuing a permit, the U.S. Army Corps of Engineers must be presented with a certification from the state that the proposed project will not result in a violation of the state's water quality standards. This is referred to as a CWA Section 401 certification and is provided by the Wyoming DEQ, WQD.

3. Resource Conservation and Recovery Act of 1976. The Resource Conservation and Recovery Act gives EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. Resource Conservation and Recovery Act also set forth a framework for the management of non-hazardous solid wastes. The 1986 amendments to Resource Conservation and Recovery Act enabled EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances.

4. Safe Drinking Water Act of 1974. The Safe Drinking Water Act is the main federal law that ensures the quality of Americans' drinking water. Under Safe Drinking Water Act, EPA sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement those standards. Authorities under the Safe Drinking Water Act reside with EPA; they have not been delegated, except in limited cases, to the State of Wyoming. The law was amended in 1986 and 1996 and requires many actions to protect drinking water and its sources: rivers, lakes, reservoirs, springs, and ground water wells.

5. National Environmental Policy Act. The National Environmental Policy Act (NEPA) establishes a public, interdisciplinary framework for federal decision-making and ensures that the BLM and other federal agencies take environmental factors into account when considering federal actions. The BLM uses the NEPA process to analyze potential impacts of its proposed actions on water and other resources and to consider appropriate measures to mitigate adverse impacts.

6. Powder River Basin Final Environmental Impact Statement and Record of Decision. The Powder River Basin (PRB) Final EIS and Record of Decision (ROD) for the PRB Oil and Gas Project (BLM 2003c) is a programmatic document that provides guidance for managing BLM-administered oil and gas activities with the PRB. The analysis and decision document

included a description of the management goals, objectives, management actions, and conditions of use that guide future management of oil and gas operations on public lands and federal mineral estate managed by the BLM within the Buffalo planning area.

The PRB Final EIS ROD is not the final approval for the action proposed within the PRB oil and gas area. A separate authorization is required from BLM (or other permitting agency such as U.S. Forest Service [USFS]) prior to approval of any application for permit to drill (APD), Plan of Development (POD), Sundry Notice, Right-of-way (ROW) Grant or Special-Use Permit before any construction can occur. (BLM 2003c) Prior to the approval of an application, additional site-specific NEPA analyses would most likely be required.

The ROD requires that the operator of a coalbed natural gas (CBNG) project include a water management plan that addresses the handling of produced water during the testing and production of CBNG wells as part of the submission of APDs or PODs. The water management plan must provide adequate information for the BLM to complete site-specific NEPA analysis.

Water disposal for conventional oil and gas must conform with 43 Code of Federal Regulations (CFR) 3160 Onshore Oil and Gas Order No. 7; Disposal of Produced Water. For water management under this order, the operator must submit a sundry request which identifies the water quality to be disposed, type of disposal facility (well, pit, evaporation pond, etc.), method of transport to the disposal facility, and proof of authorization for that facility through the pertinent state agency (Wyoming DEQ or WOGCC).

Under both FLPMA and the CWA, the BLM cannot authorize any activity which does not comply with all applicable local, state, tribal, and federal air quality laws, statutes, regulations, standards, and implementation plans.

W.1.3. Background and Current Conditions

Preparation of the Analysis of the Management Situation in 2009, as well as the PRB Final EIS disclosed that extensive energy development within the planning area, especially coal and fluid minerals, could lead to water quality and quantity impacts. Since the production of CBNG requires that the coal zone pressure be reduced to the point of gas evolution and water management was identified as one of the major issues, there was extensive surface and groundwater analysis included in the NEPA assessment for the PRB Final EIS.

Establishment of baseline conditions and monitoring selected representative water components, such as water level, quality and flow rates, can continue to characterize changes over time.

W.1.3.1. Water Baseline

Surface Water

The PRB Final EIS ROD selected water management from Alternative 2A to reduce the volume of produced water that would reach basin mainstems and their tributaries in the PRB, reducing the potential for adverse effects on surface water quality. The Powder River, Little Powder River, and Tongue River watersheds are heavily used by downstream irrigators. Alternative 2A emphasized infiltration and storage of the produced waters in shallow aquifers for local beneficial use. Historic flow rates for the mainstems were summarized in the PRB Final EIS, Table 3-8, page 3-41. Data from 2001 through 2011 is presented below in Table W.1, “Monthly

Mean Discharge (cubic feet per second) 2001 to 2011” (p. 2627) and further discussed in the *Water Resources* section of Chapter 3.

Table W.1. Monthly Mean Discharge (cubic feet per second) 2001 to 2011

Year	January	February	March	April	May	June	July	August	September	October	November	December
Upper Powder River												
2001	118	101	408	189	140	61.2	232	2.4	0	38.2	92.2	65.3
2002	55.8	76.6	197	274	188	34.1	60.6	139	111	95.6	198	87.2
2003	97.8	112	360	375	344	301	76.8	10.3	17	40.9	89.4	102
2004	65.3	109	244	147	131	31.6	77.8	8.3	0.51	64.1	114	110
2005	151	192	132	176	683	383	70.7	42.2	0.26	80.8	111	81
2006	135	126	271	222	270	84.7	14.7	3.41	24.8	83.6	97.3	78.4
2007	64.8	80.3	267	342	688	440	208	84.8	25.8	104	136	94
2008	98.1	132	318	184	1,561	1,321	319	50.7	69.5	129	173	88.6
2009	131	293	347	472	439	338	189	144	73.4	184	182	57.1
2010	65.7	141	264	439	1,111	1,055	264	70	33.9	94.4	160	137
2011	96.2	171	299	217	1,059	1,984	399	71	75	174	174	106
Monthly Mean	105	139	283	276	601	549	174	57	39	99	139	91
Middle Powder River												
2001	139	144	294	230	177	93	173	2.57	7.65	55.2	127	134
2002	196	237	185	312	181	67.2	53.8	250	185	160	190	131
2003	154	201	588	578	574	666	155	26.3	64	79	91.3	157
2004	56.6	76.4	368	212	124	31.1	117	33.3	58.1	162	222	142
2005	136	158	199	242	1,389	975	227	151	47.3	163	175	107
2006	196	173	339	323	315	126	10	0.97	45.8	118	180	86.5
2007	83.4	71.8	288	427	1,183	1,156	281	161	138	199	233	182
2008	93.9	158	540	292	2,514	3,204	1,030	92.2	148	250	289	191
2009	213	412	641	757	859	968	429	272	104	322	306	165
2010	180	248	419	513	1,430	2,013	548	116	60.6	149	233	216
2011	216	225	461	360	1,616	3,702	1,224	134	93.4	242	293	275
Monthly Mean	151	191	393	386	942	1,180	386	113	86	173	213	162
Belle Fourche River												
2001	3.62	4.37	37.8	29.8	14.7	28.4	7.23	2.56	2.46	5.02	6.13	6.3
2002	2.41	4.7	14.1	39.2	23.9	22.1	3.77	15.7	5.98	5.14	7.27	4.89
2003	5.15	6.86	100	14.2	14	79.7	9.99	2.21	4.93	4.73	6.05	5.57
2004	3.61	12.9	11.9	6.72	4.24	1.67	16.3	2.32	1.45	2.51	6.4	3.43
2005	4.37	7.49	9.29	20.7	53.4	8.73	1.56	4.35	1.06	4.65	3.6	5.51
2006	6.5	5.56	9.49	7.05	15.9	3.02	0.17	2.87	3.61	3.86	5.11	3.21

Year	January	February	March	April	May	June	July	August	September	October	November	December
2007	1.87	9.8	37.2	42.9	116	59.3	3.84	2.83	3.23	4.25	2.93	3.11
2008	2.84	8.57	49.9	13	173	101	15.2	5.88	6.67	9	8.35	4.21
2009	8.53	32.8	25.4	111	18.1	14.6	12.5	9.05	4.22	8.43	9.47	5.72
2010	4.09	8.44	26.2	18.3	63.3	41.9	10.4	6.76	2.39	3.7	5.17	3.14
2011	3.5	64	147	30.4	282	109	18.5	7.93	7.34	8.92	11.9	7.28
Monthly Mean	4.2	15	43	30	71	43	9	5.7	3.9	5.4	6.6	4.8
Cheyenne River												
2003	-	-	-	-	-	-	-	-	-	0.06	0.09	0.08
2004	0.05	0.02	0.29	0.14	0.22	0.07	0.01	0	0	0	0.02	0.03
2005	0	0.06	0.15	1.84	7.98	28.6	4.35	6.36	0.68	0.28	0.56	0.04
2006	0.01	0	0	0.16	0.07	1.07	0	27.8	0.05	0.02	0.05	0.21
2007	0.13	0.04	5.71	2.91	56.2	1.6	0.92	3.79	0.02	0.03	0.62	0.17
2008	0	0.05	0.77	0.27	267	39	35.2	3.74	0.14	0.07	0.15	0.1
2009	0.02	4.3	1.18	52.8	14.3	25.4	53.3	10.3	0.2	0.35	0.32	0.17
2010	0.04	0.01	11.9	12.1	168	123	33.5	3.87	0.93	7	3.41	2.36
2011	2.86	182	330	36	86.9	67.6	24.5	5.79	2.12	1.72	2.59	1.72
Monthly Mean	0.39	23	44	13	75	36	19	7.7	0.52	1	0.87	0.54
Clear Creek												
2003	-	48.9	117	142	195	235	60.5	20.6	53.9	52.7	66.8	56.3
2004	48.5	60.3	74.3	71.1	5.61	1	42.4	15.3	53.6	86.7	62.7	70
2005	59.7	75.1	62.7	70.8	650	511	159	115	45.5	93.3	92.3	64.3
2006	91.4	64.8	87.9	137	87.9	25	1.63	0.77	19.2	48.6	59.2	52.7
2007	45.2	44.3	103	102	495	704	92.8	20.7	101	106	94.2	72.4
2008	62.6	72.6	167	95.5	901	1466	478	24.9	71.6	113	102	59.1
2009	75	124	140	199	371	608	253	89	33.2	130	131	59.7
2010	59.9	57.9	105	93.5	392	1,124	258	37.3	26.8	63	77.3	64.5
2011	79.6	89.9	151	142	580	1,616	678	47.6	26.9	104	114	102
Monthly Mean	65	71	112	117	409	699	225	41	48	89	89	67
Crazy Woman Creek												
2001	17.2	12.5	36.8	12.5	8.57	6.58	74.1	0.29	0.06	0.1	3.19	8.62
2002	5.61	7.94	14.6	20.5	7.09	4.18	8.08	14.4	1.87	4.05	12.2	11.4
2003	10	13	30.3	53.1	84.9	125	31.7	2.41	4.2	5.21	12.7	15.3
2004	8.65	15.4	27.5	8.76	5.5	1.78	12.3	0.95	0.11	3.94	10.8	13.9
2005	10.2	13.4	11.2	20.6	174	168	38.2	11.4	1.37	10.2	13.3	8.73
2006	14.8	11.3	18.6	13.9	7.73	2.05	0.01	0.02	0.02	0.05	0.45	1.04

Year	January	February	March	April	May	June	July	August	Septem-ber	October	November	December
2007	0.64	3.5	15.5	11	29.4	48.4	14.1	3.9	0.11	4.29	9.22	6.48
2008	7.58	17.6	28.2	13	258	424	88.8	13.8	12.7	18	22.9	13.4
2009	14.3	35.4	52.3	58.1	33.6	102	52.5	28.7	11.9	21.5	19.5	12.1
2010	7.97	12.8	20.3	52	151	328	86.1	15.8	2.54	4.3	17.3	13.7
2011	15.4	19.3	25.5	20.1	163	580	145	22.6	13.5	23	22.8	20.1
Monthly Mean	10	15	26	26	84	163	50	10	4.4	8.6	13	11
Tongue River												
2001	172	200	233	203	323	176	54.7	13.1	73.3	117	126	107
2002	78.7	79.8	88.5	147	268	354	83.3	78.1	128	148	136	122
2003	145	145	443	307	971	1264	287	69.9	168	174	180	144
2004	129	150	169	159	192	181	150	63.5	104	157	139	116
2005	93.9	86.1	124	158	1,703	1,527	384	180	162	215	169	139
2006	145	134	154	213	499	324	40.6	21.2	106	181	161	122
2007	104	97.1	348	496	2,176	2,203	290	128	164	244	185	151
2008	152	165	244	214	1,453	2,761	940	181	265	264	244	195
2009	226	221	279	551	928	1,655	507	268	201	254	216	149
2010	140	145	219	261	1,033	2,322	516	115	174	185	176	164
2011	161	212	243	281	1,688	3,659	1,454	311	211	310	268	221
Monthly Mean	141	148	231	272	1,020	1,490	428	130	160	204	182	148
Source: USGS 2013												

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The PRB Final EIS disclosed existing water quality and quantity conditions around the basin as of 2001 (see PRB Final EIS pgs. 3-36 to 3-53). Surface water quality in the planning area is generally affected by depletions and return flows from irrigation. Surface water withdrawals in the planning area are used to support agricultural, domestic, and stock water uses. Prior to 2000, irrigation use accounted for about 95 percent of the surface water withdrawals in the planning area. Existing water quality of the mainstems is monitored by the U.S. Geological Survey (USGS) at numerous locations throughout the basin.

Parameters of primary interest include the electrical conductivity (EC) which is a manifestation of the concentration of solids dissolved in the water or salinity; Sodium Adsorption Ratio (SAR) which represents the proportion of sodium ions to calcium and magnesium ions in water and suspended solids or sediment which is the result of erosion or sediment movement. Concentrations of suspended solids are high throughout the planning area which is reflective of the highly erosive nature of the shale deposits through which the rivers flow. SAR is an indicator of the potential for water to affect soil structure when used for irrigation (PRB Final EIS pgs. 3-47 to 3-48).

Surface discharge water quality is regulated by Wyoming DEQ through WYPDES permits. These permits establish discharge water quality criteria which specify maximum concentrations of pollutants which may be discharged into surface waters of the state. Concentrations permitted are based on the location of the discharge point with respect to the waters of the state, the volume to be discharged, and the quantity and nature of the pollutants. Any project subject to BLM approval would require compliance to state requirements. However, approval for discharge by the Wyoming DEQ is not considered as granting approval for a federal mineral action until and unless BLM approval is obtained.

Data published by the USGS (Clark 2012) summarized water quality for four major watersheds in the PRB for the period between the beginning of full scale CBNG development (2001) through peak production (2008) to 2010. The watersheds evaluated are the Powder, Tongue, Belle Fourche, and Cheyenne drainage basins. Clark concluded that CBNG developments may have contributed to some trends in the PRB, with upward trends (concentration of constituents) noted at some locations, and downward trends (dilution of constituents) noted at other locations.

Impaired Water Bodies

The quality of water in the rivers and streams within the planning area is protected for designated uses in accordance with the State of Wyoming's water quality standards. Section 303(d) of the CWA requires the state to develop a listing of all waters of the state that are impaired and do not fully support existing or designated uses. The most recent listing was issued in 2012. See the *Water Resources* section in Chapter 3 for a more complete discussion. Most sources of the impairments are unknown, although some have been attributed to agricultural practices as well as natural background sources.

Belle Fourche River Basin

Primary land uses in the Belle Fourche River Basin are livestock grazing, hay production, and mineral extraction. Mineral extraction includes rare earth, bentonite and coal mining, oil and gas, and CBNG development. There are two distinct topographic regions in this basin, the rolling plains of the Powder River geologic basin in the west and the Black Hills uplift in the east. Most streams originating in the plains are naturally intermittent; however, discharges from coal mines, CBNG production, and the City of Gillette provide perennial flow to Donkey Creek, portions of

the Belle Fourche River and several other plains streams. There are no BLM-administered lands associated with any impaired water bodies in the Belle Fourche River Basin.

The Belle Fourche River headwaters originate in the plains south of Gillette. The river flows northeast past the Bearlodge Mountains, where it then turns to the southeast and flows into South Dakota. South Dakota's 2008 303(d) list included the Belle Fourche River from the Wyoming and South Dakota state lines downstream to Fruitdale, South Dakota, for fecal bacteria and total suspended solids. The South Dakota Department of Environment and Natural Resources completed a Total Maximum Daily Load (TMDL) for total suspended solids on the Belle Fourche River in early 2005. The TMDL concluded that the most significant source of sediment in the river is likely from stream incision and bank failure. The South Dakota Department of Environment and Natural Resources has also completed a TMDL for fecal coliform. Bacterial source tracking used in the study provided no direct evidence that humans, livestock, or wildlife are fecal coliform sources for this segment of the Belle Fourche River.

Upper Belle Fourche Sub-basin

The Upper Belle Fourche Sub-basin includes those waters upstream of the confluence of Beaver Creek with the Belle Fourche River. Coal and CBNG development are important land uses in the western portion of the sub-basin, while logging, wildlife habitat, and recreation are common land uses in the Black Hills to the east. Livestock grazing and hay production are common land uses throughout this sub-basin.

Gillette is the fourth largest community in Wyoming and lies at the headwaters of the Donkey Creek drainage. Monitoring by Wyoming DEQ (2012b) and Campbell County Conservation District (CCCD) indicate that the contact recreational use of Donkey Creek is impaired due to exceedances of the fecal bacteria criterion, from the confluence with the Belle Fourche River upstream 61.4 miles to Brorby Boulevard within the City of Gillette. Stonepile Creek, a tributary to Donkey Creek, is also on the 303(d) list for not supporting its contact recreation uses. Data from the 2008 Little Powder River and Belle Fourche Drainages Watershed Implementation Section 319 Project show that this impairment extends from the confluence with Donkey Creek upstream to the junction of Highways 14/16 and 59. The plan will likely be updated following completion of the Belle Fourche River TMDL. Implementation strategies will focus on septic system improvements, education of urban and rural residents, urban sewage treatment, storm water runoff, solid waste management, small acreage land use management, and rural development issues. CCCD completed a Section 319 project in 2010, which included data spanning 2007 to 2009. These data indicated that *Escherichia coli* (E. coli) concentrations at nearly all sampling sites along the currently listed segments of Stonepile and Donkey Creeks exceeded the state's primary recreational use criterion. The study also found elevated chloride and ammonia concentrations in both creeks, but because neither is classified as a fishery, the state's aquatic life acute and chronic chloride standards do not apply. The Campbell County Natural Resource District also completed a Section 319 project in 2010 for the upper Belle Fourche River Watershed, which included data spanning 2005 to 2009. Multiple E. coli samples during the sampling period showed that Donkey Creek exceeds the primary contact recreational use criterion from the confluence with the Belle Fourche River upstream to the Campbell County line. E coli samples were also collected from the Belle Fourche River from the Campbell County line to below the outfall of the Hulett wastewater treatment facility that showed exceedances of the primary contact recreational use criterion. The study reported no chloride concentrations exceeding of the chronic aquatic life other than fish criterion on the Belle Fourche River. However, USGS data indicate that exceedances of the chronic chloride criterion continue to occur.

Gillette Fishing Lake is currently on the 303(d) list for sediment and phosphate impairments. The source of these pollutants was investigated by CCCD, and data suggested that storm water from the City of Gillette was the primary source. CCCD, in cooperation with the City of Gillette, has developed a Water Quality Improvement Plan to address these two impairments. Corrective actions have been initiated by the City of Gillette.

Wyoming DEQ currently identifies three segments of the Belle Fourche River as having impaired contact recreation uses. Of these, only sections of Donkey Creek and Stonepile Creek are within the planning area. Two TMDLs were initiated in 2009 for the upper Belle Fourche watershed 303(d) listings within the planning area. These are for bacterial impairments and fecal coliform listings on Donkey and Stonepile Creeks.

Cheyenne River Basin

The Cheyenne River Basin includes the southeast portion of the planning area, in east-central Wyoming and drains areas of the Powder River geologic basin and southern portion of the Black Hills uplift. Besides the southern Black Hills and some breaks and escarpments, most of the basin consists of rolling high plains. The Thunder Basin National Grasslands occupy a large portion of the central part of this basin. Primary land uses are livestock grazing, hay production, coal mining, oil and gas production, and some CBNG production. These activities occur primarily in the western portion of the basin. Lowland streams are usually intermittent or ephemeral, and most perennial streams originate in the Black Hills or Pine Ridge escarpment. Because the sedimentary rocks in the Powder River geologic basin contribute elevated levels of iron, manganese, and sulfate to surface waters, several streams have had their secondary (aesthetic) drinking water criteria removed for iron and manganese. There are no BLM-administered lands associated with any impaired water bodies in the Cheyenne River Basin.

Antelope Creek Sub-basin

The northern portion of the Antelope Creek Sub-basin of the Cheyenne River Basin lies within the planning area. The headwaters of the Antelope Creek Sub-basin are east of Edgerton. Land uses are primarily grazing and oil production, along with coal mining in the northeastern third of the sub-basin. Antelope Creek contains many beaver dam complexes in its lower reaches which store water, keeping it from reaching the Cheyenne River except during high flow periods. Concentrations of dissolved iron in Antelope Creek occasionally exceed the aquatic life other than fish chronic criterion; however, this is likely due to the natural geology and spring dominated hydrology. Wyoming DEQ (2007) monitoring indicated that the benthic macroinvertebrate community of Antelope Creek is comparable to reference condition for intermittent streams in this basin and is supporting its aquatic life other than fish use. There are no BLM-administered lands associated with any impaired water bodies in the Antelope Creek Sub-basin.

Upper Cheyenne Sub-basin

The Upper Cheyenne Sub-basin is the northeastern portion of the Cheyenne River Basin within the planning area. Coal mining occurs in the Upper Cheyenne Sub-basin east of Wright. Other land uses include grazing and oil and gas development. The Cheyenne River in this sub-basin typically has an intermittent flow regime, with flows reduced to standing pools of water fed by springs during the drier seasons. Assessment by Wyoming DEQ (2007) indicates that the Cheyenne River in this sub-basin, from Lance Creek upstream to the Dry Fork of the Cheyenne River, fully supports its fisheries and aquatic life other than fish uses and contains a diverse

assemblage of benthic macroinvertebrates and fish. There are no BLM-administered lands associated with any impaired water bodies in the Upper Cheyenne River Sub-basin.

Little Thunder and Black Thunder Creeks are ephemeral or intermittent with some perennial spring-fed pools and those created by beaver dams. Although Little Thunder Creek receives some discharge from oil treater and CBNG production, most is lost to evaporation and infiltration, or is stored within beaver dam complexes before reaching Black Thunder Creek. Wyoming DEQ (2007) found that the benthic macroinvertebrate community in Black Thunder Creek is comparable to the reference condition for similar intermittent streams and that it is fully supporting its aquatic life other than fish use.

Little Missouri River Basin

In Wyoming, the Little Missouri Basin includes only the Little Missouri Sub-basin. Only small portions of the Little Missouri Basin fall within the extreme east-northeast part of the planning area.

Area land uses include livestock grazing, dry land and irrigated farming, bentonite mining in the lower drainages, and oil production in the upper drainages. Streamflow is often intermittent, but pools typically persist, even during dry periods. Concerns with turbidity, siltation and flow alteration in the Little Missouri and the North Fork Little Missouri have been identified by Crook County Natural Resource District. However, bentonite clays often remain suspended in water and therefore, a certain degree of turbidity is natural. Approximately 500 acres of abandoned bentonite mine lands have been reclaimed by Abandoned Mine Land in the basin, although bentonite mining continues in the area.

Powder River Basin

The Powder River flows north from central Wyoming into Montana. Nearly all of the naturally perennial streams which reach the Powder River originate in the Big Horn Mountains. The Big Horn Mountains are composed of igneous and metamorphic rocks flanked by well-indurated sedimentary rocks. The water quality of these mountain streams is generally high, except in areas where land use practices have led to excessive erosion and sediment loading. In the lowlands of the Powder River geologic basin, the geology primarily consists of fine-grained sedimentary strata which are easily erodible and often high in dissolved constituents. Streams that originate in basin terrain are generally ephemeral and flow only in response to snowmelt or rainfall events unless receiving discharge water from industry (e.g., CBNG). These streams are generally high in dissolved solids and are often naturally turbid. Due to these conditions, site-specific criteria have been adopted and numeric secondary human health criteria for manganese and iron do not apply to most Class 2 waters originating in the basin. Wyoming DEQ, Wyoming Game and Fish Department (WGFD), and U.S. Fish and Wildlife (USFWS) have concerns about how aquatic communities may be affected by CBNG development, but the effects of development on aquatic biota are unknown. WGFD biologists and a University of Wyoming graduate student recently surveyed the basin from 2004 to 2008. Survey data confirmed that the Powder River still hosts the most diverse fish assemblage of any Wyoming river basin. However, biologists also noted the near absence of the sturgeon chub, a species that was common in the Powder River in the mid-1990s. Of the 16.4 miles of impaired water bodies in the planning area in 2012, 14.1 of them are within the PRB.

Middle Fork Powder Sub-basin

The headwaters of the Middle Fork Powder River flow through a steep canyon with little potential for disturbance. Wyoming DEQ data indicate that the Middle Fork Powder River above Buffalo Creek and Rock Creek, an upper tributary, fully support their aquatic life other than fish uses. Blue Creek and upper Beaver Creek were also assessed by Wyoming DEQ and fully support their aquatic life other than fish uses (Wyoming DEQ 2012).

Beartrap Creek is a spring-fed tributary of Red Fork. Historically, the upper Beartrap Creek drainage has been used as a stock driveway and holding ground. However, management practices have changed over the past 20 years, and livestock now have limited access to streams, are moved through relatively quickly, and are only in the drainage for a short period in spring and fall. Log spill structures were installed by BLM and WGFD in 1989 to create additional pool and riffle habitats. Monitoring by Wyoming DEQ shows that both upper Beartrap Creek and Sawmill Creek are fully supporting their aquatic life other than fish uses.

Monitoring by Wyoming DEQ (2004a) in 1998 and 2003 indicates that Webb Creek, a Class 2AB tributary to the North Fork Powder River, is fully supporting its aquatic life other than fish uses.

Upper Powder River Sub-basin

The Upper Powder Sub-basin encompasses most of the drainages into the Powder River mainstem from the confluence of the North and Middle Forks downstream to the confluence of the Powder River and Clear Creek. Primary land uses are livestock grazing and oil and gas production. Except for the mainstem reaches, most reaches in this semi-arid sub-basin are non-perennial.

The Powder River got its name from the large amounts of very fine sediment it naturally carries. Sturgeon chub, a native fish considered rare by WGFD and now found only in the Powder River in Wyoming, is believed to be adapted to, and actually require, turbid water.

Monitoring by Wyoming DEQ in 1998 showed that Pumpkin Creek was an ephemeral or intermittent stream and was supporting its aquatic life other than fish uses. However, CBNG development has since progressed through the watershed. As part of the Wyoming DEQ's watershed based permitting process, physical data were collected in the Pumpkin Creek drainage (Wyoming DEQ 2012) to determine how much additional flow from CBNG discharges the drainage could accommodate without physically degrading. This monitoring showed that parts of the drainage now have perennial flows that reach the Powder River and identified areas of severe erosion and active headcutting. The 1998 data collected by Wyoming DEQ can no longer be considered representative of current conditions, and it is unknown whether Pumpkin Creek is fully supporting its aquatic life other than fish uses. Fortification Creek was also monitored by Wyoming DEQ in 1999 (Wyoming DEQ 2004a) and showed full support of the aquatic life other than fish use. Ninemile (Wyoming DEQ 2007) and Fourmile (Wyoming DEQ 2007) Creeks, located near Sussex, are ephemeral Class 3B tributaries to the Powder River. Dikes and other small impoundments trap sediment and help support riparian vegetation. Assessments by Wyoming DEQ indicate that aquatic life other than fish uses are supported in these watersheds.

Analysis of chloride data in the PRB shows that the majority of chloride loading in the Powder River comes from Salt Creek. The Powder River below Salt Creek was added to the 1998 303(d) list for exceedances of the chloride criteria, which was 230 mg/L at that time. Although the Powder River below Salt Creek now has a site-specific chloride criterion of 984 mg/L, because chloride concentrations occasionally exceed this criterion at the USGS sampling site near Sussex, the Powder River has remained on the 303(d) list for chloride. Although Salt Creek does not appear to exceed its site-specific chloride criterion of 1,600 mg/L, a TMDL or watershed-based

plan on the Powder River will need to address loading from Salt Creek. Data collected on the Powder River at the Sussex USGS station also showed exceedances of the state's aquatic life other than fish chronic selenium criterion and it was added to the 2000 303(d) list. Data collected on the Powder River and its tributaries while monitoring CBNG development in the basin have indicated that the selenium impairment extends from the confluence with the South Fork Powder River downstream to the confluence with Crazy Woman Creek. The relatively low selenium concentrations found in Crazy Woman Creek apparently dilute the Powder River at this point and enable the river to meet the aquatic life other than fish chronic selenium criterion. Historic USGS and Powder River Conservation District data indicate that the primary source of the selenium may be the South Fork Powder River drainage, but Salt Creek also occasionally has high concentrations and contributes to the loading in the Powder River. It is unknown whether the selenium loading to the Powder River is natural or anthropogenic. Data collected by the USGS show that the Powder River exceeded the total arsenic criterion protective of drinking water use between the sampling site near Sussex downstream to the Arvada site during 2009 and 2010 and two segments of the river have been added to the 2012 303(d) list for this pollutant. Data from the USGS Salt Creek sampling station indicate that this tributary contributes arsenic to the Powder River, but the source of arsenic within the Salt Creek watershed is unknown.

CCCD monitored portions of this sub-basin under a Section 319 Project. Results indicated exceedances of the fecal bacteria criterion in the lower reach of the Middle Prong of Wild Horse Creek, and this water was added to the 303(d) list in 2006 from its confluence with Wild Horse Creek to a point 4.6 miles upstream. CCCD and Natural Resources Conservation Service (NRCS) have assisted landowners in implementing 13 water quality improvement projects in the watershed, but the effects of these actions on water quality is unknown. Local stakeholders and CCCD initiated watershed planning in this watershed in 2007 (Wyoming DEQ 2012). CCCD completed a Section 319 Project in 2010, which included data spanning 2007 to 2009. Data indicated that *E. coli* concentrations in 2008 and 2009, continued to exceed the primary recreational use criterion.

South Fork Powder Sub-basin

The South Fork Powder Sub-basin lies mostly in Natrona County, and extends into the Waltman area. The most downstream portions of the sub-basin lie within the planning area. Livestock grazing and oil and gas development are the primary land uses. The few perennial stream reaches in this sub-basin are primarily in the Rattlesnake Hills for the Wallace Creek headwaters, the lower portions of Willow Creek, which partially lies within the planning area, and Cottonwood Creek, and the lower portion of the mainstem of South Fork. Cave Gulch and Okie Draw, tributaries to the South Fork Powder River, have perennial flow due to oil field discharges.

Data collected by USGS and Powder River Conservation District have showed exceedances of the aquatic life other than fish chronic selenium criteria on Willow Creek from the confluence with the South Fork Powder River to a point 10.5 miles upstream, and it was placed on the 303(d) list in 2006. Further monitoring by Powder River Conservation District showed that both Posey and Murphy Creeks, each tributaries to the South Fork Powder River immediately downstream of the Willow Creek confluence, also exceed the aquatic life other than fish chronic selenium criterion and were added to the 2008 303(d) list. The source of the selenium for both creeks appears to be related to the natural geology of the area, but additional loading from anthropogenic sources may also occur in the Posey Creek watershed, as lands are irrigated and selenium is dissolved from marine shales. Another possible source may be oil treater discharges.

Salt Creek Sub-basin

Most downstream portions of Salt Creek are within the planning area. The towns of Midwest and Edgerton are near the center of the Salt Creek Sub-basin but are outside of the planning area. Land uses are primarily livestock grazing and oil and gas production. Soils of the area have developed from fine-grained sandstone and calcareous shales, are dry, and easily eroded by wind or water.

Several natural oil seeps have been documented along Salt Creek in the Midwest area, which prompted the development of the oil fields beginning in 1908. While most reaches in this semi-arid sub-basin are non-perennial, Salt Creek now has perennial flow due to oil treater discharges. Even prior to these discharges, the creek naturally carried a high load of salts; however, studies conducted by Powder River Conservation District have confirmed that the vast majority of perennial flow and chloride loading are from oil production discharge water. High chloride concentrations in the creek exceed Wyoming's aquatic life other than fish chronic criteria, and thus it was added to the 303(d) list. A Use Attainability Analysis proposing a site-specific chloride criterion of 1,600 mg/L for Salt Creek has been approved, and because there have been no exceedances of this criterion, chloride has been removed from the 303(d) list as a cause of impairment on Salt Creek. However, since Salt Creek is the primary contributor of chloride loading to the Powder River, any TMDL or watershed-based plan on the Powder River will need to address loading from Salt Creek. Data collected as part of the chloride Use Attainability Analysis on Salt Creek showed exceedances of the chronic aquatic life other than fish criterion for selenium, and this pollutant was added on the 303(d) list in 2008. It is unknown whether the primary source of this selenium exceedance is natural or anthropogenic, but both of these sources are likely contributors. Salt Creek was also added to the 303(d) list of threatened waters in 1996, due to the regular occurrence of oil and produced water spills in the watershed. Most of the oil field infrastructure dates to the 1960s and spills have been primarily due to a combination of the age of the infrastructure and bacterial corrosion in the injection lines. Most spills have been contained before they enter Salt Creek. At the request of Wyoming DEQ, the current operator has developed a long-term upgrade and maintenance plan for the field to reduce the potential for large spills that may affect water quality. The operator is also phasing into carbon dioxide flood injection to enhance oil recovery, which will also reduce spills because it requires the replacement of both injection and production lines. Lastly, a biocide treatment has been added to many water flood lines since 2003 to reduce bacterial corrosion.

Crazy Woman Sub-basin

The headwaters of the Crazy Woman Sub-basin are on the eastern slope of the Big Horn Mountains. Land uses are primarily oil and gas development, recreation, grazing, and irrigated agriculture.

The North Fork Crazy Woman Creek was added to the 1996 303(d) list due to water quality threats from habitat degradation, nutrients and bioindicators. A mistake was made in the listing process when bioindicators was added as a cause and it has thus been removed from the 2012 303(d) list. Several Section 319 projects have been conducted in this watershed, resulting in changes to both irrigation and livestock grazing practices in many areas. Considerable water quality data have been gathered in this watershed; however, it remains uncertain whether these practices are effective because effectiveness monitoring of the implemented best management practices (BMPs) has been inconsistent (Wyoming DEQ 2012). Wyoming DEQ (2012b) has conducted monitoring in the watershed, but the effectiveness of the above Section 319 Project

BMPs in improving physical degradation was not examined. A Wyoming DEQ summary report, including a use support determination for North Fork Crazy Woman Creek, is expected in 2012.

The EPA has established National Secondary Drinking Water Regulations that set water quality standards for 15 contaminants, including manganese. EPA does not enforce these secondary maximum contaminant levels. Instead, they are intended to serve as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color and odor. These contaminants are not considered to present a risk to human health at these secondary maximum contaminant levels (EPA 1992). Wyoming's aesthetic drinking water criterion for manganese is set at the EPA secondary maximum contaminant levels. Crazy Woman Creek exceeds the aesthetic drinking water criterion for manganese, primarily during low flows, but the aquatic life other than fish chronic criterion for manganese has not been exceeded. Lower Crazy Woman Creek was added to the 303(d) list in 2002 for manganese. However, high manganese concentrations are common in streams in the Powder River Structural Basin due to the natural geology (Wasatch and Fort Union Formations), and thus much of the basin does not have a human health criterion for this pollutant in Chapter 1. There are no known sources of anthropogenic manganese in Lower Crazy Woman Creek, and the creek will unlikely ever be used as a drinking water source due to its intermittent hydrology. Lake DeSmet Conservation District requested that the manganese drinking water criterion from Crazy Woman Creek be removed by Wyoming DEQ.

Several other streams in this watershed have been monitored by Wyoming DEQ and are fully supporting their aquatic life other than fish uses. These streams include: Crazy Woman Creek (from confluence of North and Middle Crazy Woman Creek to approximately 2 miles below Wallows Creek), Little North Fork Crazy Woman Creek, Pole Creek, Poison Creek, Middle Fork Crazy Woman Creek, Doyle Creek, South Fork Crazy Woman Creek, Beaver Creek, and Billy Creek.

Clear Creek Sub-basin

The headwaters of Clear Creek, Piney Creek and Rock Creek are in granitic geology in the Cloud Peak Wilderness within the Bighorn National Forest. Recreation, livestock grazing, and logging are land uses within the mountains, while livestock grazing, oil and gas development, irrigated agriculture, and residential development are the primary land uses at lower elevations. Clear Creek is the last major tributary to join the Powder River upstream of the Wyoming and Montana state lines.

A Section 205j water quality assessment project in Rock Creek and the North and South Fork Shell Creek drainages indicated that these watersheds were threatened by physical degradation of the stream channel and they were added to the 1996 303(d) list. The primary sources of degradation to Rock Creek were identified as heavy livestock grazing in small horse pastures near the stream. Landowners implemented BMPs specifically designed to improve irrigation efficiency. Data indicate that Rock Creek now supports its aquatic life other than fish use and it was removed from the 2004 303(d) list. Impacts to the North and South Fork Shell Creek drainages are primarily due to irrigation diversions and conveyance. Lake DeSmet Conservation District completed a Section 319 Project which addressed these problems, primarily through the installation of more efficient irrigation systems. Biological data collected as part of the project were highly variable across collection dates and were inconclusive. Wyoming DEQ (2012b) monitoring suggests that the BMPs used on the North and South Forks of Shell Creek were somewhat effective, but that additional data were needed. Wyoming DEQ conducted biomonitoring on these streams again in

2006. Several nongame fish were observed while sampling North and South Fork Shell Creeks, suggesting that these streams may be better classified as 2C. Data now indicate full support of the aquatic life other than fish use in these creeks. EPA Section 319 Nonpoint Source Success Stories have been written for both Rock Creek and the North and South Forks of Shell Creek.

In response to citizen concerns of suspected sewage contamination from failed septic systems in surface waters, Wyoming DEQ (2012b) collected *E. coli* samples in several waters in and near the town of Story. There are no other known sources of fecal contamination in the area. Results showed exceedances of the primary contact *E. coli* criterion in Dalton Ditch and North Piney Creek. Thus, North Piney Creek from the confluence with Piney Creek to a point 6.4 miles upstream, and Dalton and Piney-Cruse Ditches were added to the 2006 303(d) list. As part of a 2009 Section 205j planning grant, Sheridan County investigated impacts from septic systems on shallow groundwater and the possibility of linkages between potentially contaminated groundwater and surface water in the area. The high *E. coli* levels recorded in 2005 are considered a potential human health risk. These waters have been posted with health risk warnings and have been prioritized for TMDL development.

A short reach of Hunter Creek was impacted by excessive sediment from an adjacent road and was added to the 1998 303(d) list. Road modifications and changes in maintenance have since been implemented by the USFS to reduce this impact, and subsequent Wyoming DEQ data indicate that the creek fully supports its aquatic life other than fish use. As a result, Hunter Creek was removed from the 2004 303(d) list. A Section 319 Nonpoint Source Success Story has been written for Hunter Creek.

Wyoming DEQ assessment data suggest that Little Piney Creek (Wyoming DEQ 2002) and Boxelder Creek (Wyoming DEQ 2012) support their aquatic life other than fish uses. Wyoming DEQ observed many nongame fish during the assessment of Boxelder Creek, and therefore this creek may be better classified as a nongame fishery. Clear Creek was monitored by Wyoming DEQ (2004a) in 1999, and data indicated full support of aquatic life other than fish uses; however, WGFD records indicate that streamflow alterations may sometimes have an adverse effect on cold water fishes. Several stream restoration projects on Clear Creek have improved the connection between the stream and its floodplain and improved riparian condition. The potential impacts of future CBNG development in the Clear Creek drainage are currently a concern. Wyoming DEQ's CBNG monitoring network is designed to assess these potential impacts.

Wyoming DEQ (2004a) monitoring identified impacts to French Creek from flow augmentation; however, the stream is meeting its aquatic life other than fish use. Although the creek is not currently on the 303(d) list, Lake DeSmet Conservation District has developed a watershed plan as a proactive measure to improve water quality in this watershed.

Middle Powder Sub-basin

The Middle Powder Sub-basin includes the lower portion of the Powder River. Historic land uses have been primarily livestock grazing with some oil and gas development. CBNG development has also become a major land use in much of the sub-basin. Except for the mainstem of the Powder River, reaches in this sub-basin are naturally ephemeral or intermittent. However, many of these streams (e.g., LX Bar, SA, and Fence Creeks) now have perennial flows due to the discharge of CBNG produced water.

Wyoming DEQ monitored the Powder River in 2000, but due to very low streamflows, the absence of reference streams and fluctuating environmental conditions from CBNG development, data

were considered inconclusive. Since 2005, water quality and biological (i.e., macroinvertebrates, fish, and algae) data have been collected as part of a long term, interstate and interagency (e.g., Wyoming DEQ, USGS, and BLM) monitoring program by PRB Interagency Working Group. These data are primarily intended to support an adaptive management approach to CBNG development, but may also be used by Wyoming DEQ to make use support determinations.

Little Powder Sub-basin

The Little Powder River originates near Gillette and flows north into Montana. Primary land uses in the Little Powder Sub-basin include coal mining, CBNG development, and livestock grazing. Moyer Spring is fed by water accumulated in porcelanite (clinker) beds and supports a small brook trout population. Moyer Spring Creek and the Little Powder River are Class 2AB waters, while all other creeks in the sub-basin are Class 3B waters.

Wyoming DEQ monitored the Little Powder River in 1999 and 2005, but aquatic life other than fish use support has not been determined. USGS data collected from the Little Powder River near the Montana border have shown exceedances of the fecal bacteria criterion, and the river was placed on the 303(d) list in 2002. A Section 319 Project sponsored by CCCD reported in 2008 that the impairment extends upstream to the confluence with Spring Creek, and this information has been used to better define the extent of impairment in the 2010 303(d) list from the Wyoming and Montana state lines upstream to the confluence with Spring Creek. CCCD and local citizens have sponsored a watershed plan for the river, and to date, 8 animal feeding operations and 14 septic improvement projects have been implemented (Wyoming DEQ 2012). CCCD completed a Section 319 Project in 2010, which included data spanning 2007 to 2009. These data indicated that *E. coli* concentrations in 2008 at Soda Well still exceed the primary recreational use criterion. CCCD completed a watershed plan for Little Powder River in 2006.

Tongue River Basin

The Tongue River Basin originates in the Big Horn Mountains west of Sheridan. Land uses within the Bighorn National Forest are recreation, livestock grazing, and logging, while in the lower sub-basin, primary land uses are irrigated agriculture, livestock grazing, and coal mining, with increasing residential and CBNG development. Wohl et al. (2007) reported that many streams within the Bighorn National Forest have been substantially impacted by cattle ranching, irrigated crop production, flow regulation and diversion, and timber harvest. The Tongue River passes through approximately 2.1 miles of BLM-administered land at Welch Ranch north of Sheridan. This section of the Tongue River is impaired for temperature.

Tongue River Sub-basin

Big and Little Goose Creeks were placed on the 1996 303(d) list due to exceedances of the fecal coliform criterion. Subsequent monitoring by Wyoming DEQ in 1998 and 1999 revealed exceedances in several other locations within these watersheds, including Kruse Creek, Sacket Creek, and Jackson Creek irrigation canal, which are all tributaries of Little Goose Creek; Beaver Creek, Park Creek, and Rapid Creek, which are tributaries of Big Goose Creek; and Goose and Soldier Creeks. Sheridan County Conservation District monitored fecal bacteria in the Goose Creek Watershed in 2001 and 2002, and results corroborate the 1998-1999 Wyoming DEQ data (Wyoming DEQ 2012). The Sheridan County Conservation District study also resulted in the extension of the impaired reach of Goose Creek from the confluence of Big and Little Goose Creeks downstream to the Highway 339 bridge crossing, and indicated that McCormick Creek is not meeting its contact recreation uses from the confluence of Little Goose Creek upstream an

undetermined distance. All of the streams listed above are on the 303(d) list. Sheridan County Conservation District, with the guidance of a local watershed steering committee, developed a watershed plan for the Goose Creek watershed, which was approved by Wyoming DEQ in 2005. Implementation projects have begun, including septic system improvements, animal feeding operations, riparian buffer development, stream bank stabilization, reservoir development, and changes in grazing management. A Section 205j Little Goose Creek Wastewater Treatment Feasibility Study was completed by Sheridan County in 2009.

Monitoring by Wyoming DEQ (2009) on Soldier Creek spanning the years 1998 to 2003 showed that the aquatic life other than fish use is impaired from PK ditch downstream to the confluence with Goose Creek and supported from PK ditch upstream to the headwaters of the creek. Because the impairment is thought to be caused by flow alterations in the watershed, the segment was placed in category 4C in 2010 and a TMDL is not necessary.

Sheridan County Conservation District data collected in 2001 and 2002 showed exceedances of the temperature criteria for cold water fisheries in lower portions of the Goose Creek drainage and poor biotic condition close to Sheridan. Because the data were collected during near record low streamflows, definitive aquatic life other than fish and cold water fisheries use determinations could not be made. Sheridan County Conservation District and Wyoming DEQ monitoring indicated that storm water discharges are contributing excessive fine sediment to, and causing physical degradation of, Little Goose Creek (Wyoming DEQ 2012) from the confluence with Goose Creek upstream to Brundage Lane in Sheridan and Goose Creek (Wyoming DEQ 2012) within Sheridan. Aquatic life other than fish and cold water fisheries uses are not supported, and both of these reaches were added to the 303(d) list for this pollutant in 2006. TMDLs for 13 of the listed waters in the Goose Creek watershed were approved by EPA in 2010 and these waters were subsequently removed from the 303(d) list in 2012. These de-listed waters included 11 for fecal coliform on Park, Rapid, Big Goose, Beaver, Sackett, Jackson, Little Goose, McCormick, Kruse, Goose, and Soldier Creeks; and two for sediment on Little Goose and Goose Creeks.

Sheridan County Conservation District reports that Beaver Creek (a Class 3B water) has perennial streamflow, even during drought conditions, and suggested that it should be reclassified to Class 2AB (Wyoming DEQ 2012).

Wyoming DEQ (2002) monitoring on the Tongue River concluded that the cold water fishery use of lower Tongue River is impaired due to high temperatures. The USGS began continuously monitoring temperature on the stream, and showed that the cold water temperature criterion was exceeded every day for a 30-day period in 2001. Elevated temperatures were again observed by USGS during the 2002-2004 water years. Wyoming DEQ has conducted continuous temperature monitoring on the Tongue River at several sites. It has not been determined to what extent these high temperatures are due to anthropogenic influences, but the data suggest that the loss of riparian cover and an irrigation diversion may contribute. Because of these consistently high temperatures, the Tongue River below Goose Creek was added to the 303(d) list in 2002.

Assessments conducted by Sheridan County Conservation District (Wyoming DEQ 2012) indicate that the lower reach of the Little Tongue River from its mouth upstream to the confluence with Frisbee Ditch above the town of Dayton is not meeting its contact recreation uses, and it was added to the 303(d) list in 2002. Sheridan County Conservation District data also identified concerns with the effects of habitat degradation on the biological community in and near Dayton. Above Frisbee Ditch, the Little Tongue River is fully supporting its aquatic life other than fish and coldwater fisheries uses.

Bacteria samples collected by Sheridan County Conservation District on Smith Creek in Dayton, Columbus Creek near the Highway 14 crossing, Fivemile and Wolf Creeks near Ranchester, and the Tongue River between Monarch and Ranchester indicate that these streams are not supporting their contact recreational uses, and were added to the 303(d) list in 2002. Sheridan County Conservation District developed a watershed plan for the Tongue River watershed from Ranchester upstream to the Bighorn National Forest boundary and has received a Section 319 Grant to address the above issues. Implementation measures include animal feeding operations projects, riparian buffer development, stream bank stabilization, reservoir development, and grazing management changes.

Prairie Dog Creek, a tributary to the Tongue River, receives trans-basin diversion water, and this additional streamflow has contributed to habitat degradation in portions of the stream channel (Wyoming DEQ 2012). A riparian improvement project implemented by the WGFD and a landowner has rehabilitated portions of the instream and riparian habitats. Wyoming DEQ (2012) and Sheridan County Conservation District have conducted considerable monitoring in the Prairie Dog Creek watershed, and data indicate that most streams support their aquatic life other than fish uses, though isolated areas of poor habitat and high water temperatures in the lower watershed are concerns. *E. coli* counts in Prairie Dog Creek exceed the Wyoming DEQ criterion, indicating that it does not support its contact recreational use, so the stream was added to the 303(d) list in 2004. As part of a 2009 Sheridan County Watershed Improvement Project, Sheridan County Conservation District, NRCS, and local citizens used a Section 319 Grant to implement 31 projects designed to address bacterial impairments in the Tongue River, Goose and Prairie Dog Creek Watersheds; including 6 to replace septic systems, 3 stream bank stabilization projects, and 1 large scale river restoration project. Effectiveness monitoring for these projects was planned for 2009 through 2011. Prairie Dog Creek is also on the 303(d) list for exceedances of the secondary (aesthetic) human health criterion for manganese. Concentrations of manganese in the creek are far below the human health criteria, but can cause the discoloration of water and the staining of cooking utensils. It is likely that the high manganese concentrations are due to the natural geology of the basin (Rice et al. 2002), and a site specific criterion for the watershed is being considered. Sheridan County Conservation District completed the final report for the Prairie Dog Creek Watershed Assessment (2007-2008) in 2009. The report indicated that sedimentation may be affecting the macroinvertebrate community in Prairie Dog Creek and the impact of this pollutant is a concern. Data collected during this project resulted in seven additions to the 2012 303(d) list. The 2012 listings include: manganese and water temperature along lower Prairie Dog Creek, from Interstate 90 to a point 47.2 miles downstream; temperature from the confluence with the Tongue River to a point 6.7 miles upstream; manganese and primary contact recreation on Meade Creek, a tributary to Prairie Dog Creek, from the confluence with Prairie Dog Creek upstream to the confluence with an unnamed tributary; primary contact recreation on Dutch Creek from the confluence with Prairie Dog Creek to a point 1.9 miles upstream; and primary contact recreation on Wildcat Creek from the confluence with Prairie Dog Creek to a point 0.8 miles upstream. Sheridan County Conservation District completed a watershed-based plan for Prairie Dog Creek in 2011, which has been approved by Wyoming DEQ.

In 2004, the North Fork Tongue River was placed on the 303(d) list for non-support of its contact recreation use. In 2010, USFS data were used to modify the extent of the impairment from Road 171 upstream to the confluence with Pole Creek. A diverse stakeholder group, sponsored by the USFS, is working to manage this resource. Projects initiated by the stakeholder group include monitoring the watershed and using the resulting data to recommend, implement, and assess stocking rates and herding changes on the allotments within the watershed. These actions, along with federal land management and allotment planning is considered equivalent

to watershed planning, and therefore, the North Tongue River has been given a low priority for TMDL development.

USFS completed a channel stabilization project on the South Fork Tongue River in 2003 that helped to reduce sediment input to the South Tongue Watershed from the vicinity of the Dead Swede Campground. Wyoming DEQ (2008) monitoring conducted in 1993, 1995, 1998, and 2003 on the South Fork Tongue River indicated that it supports its aquatic life other than fish and cold water fisheries uses from Highway 14 upstream to the confluence with the East Fork South Fork Tongue River.

Wyoming DEQ monitoring of Prune Creek (Wyoming DEQ 2002), and Coney and West Fork of Big Goose Creeks (Wyoming DEQ 2002) indicates that these streams are supporting their aquatic life other than fish uses. USFS and Wyoming DEQ have removed improperly designed fish habitat structures within a livestock grazing exclosure on Bull Creek that were causing channel widening and excessive sediment deposition.

Groundwater

Two systems of differing groundwater chemistry are described within the PRB (Bartos and Ogle 2002; Rice et al. 2002). A shallow, chemically dynamic system, generally 200 to 500 feet deep, exhibits localized flow and consists of groundwater with a mixed composition of ions (charged particles in solution). Shallow groundwater contains calcium, magnesium, and lesser amounts of sodium as cations (positively charged ions) and bicarbonate or sulfate as the dominant anion (negatively charged ion). A deeper, underlying system that is chemically static exhibits regional flow and consists of groundwater with sodium and bicarbonate as the dominant ions (PRB Final EIS pg. 3-5).

The PRB Final EIS conducted extensive groundwater modeling efforts to determine existing conditions and enable forecasting for fluid mineral development. Volumes of water produced in association with CBNG were estimated by watershed based on Reasonable Foreseeable Development (RFD) predictions (PRB Final EIS Table 2-8 pg. 2-26). The WOGCC accumulates production figures for all wells in the state, including water production. Table W.2, “Coalbed Natural Gas Water Production” (p. 2642) presents comparison of actual water production (for all CBNG wells) by watershed to the predictions made in the PRB Final EIS. In general, actual production figures are much less than half of predictions, with the exception of the Middle Powder River and the Cheyenne River watersheds. In no cases have water production rate approached those anticipated, therefore impacts associated with water production should also not have achieved full force. For more information, regarding groundwater quality and quantity see the PRB Final EIS at pages 3-1 to 3-36 and the *Water Resources* section of Chapter 3.

Table W.2. Coalbed Natural Gas Water Production

Year	Predicted (Annual Acre-feet)	Predicted (Cumulative Acre-feet from 2002)	Actual (Annual Acre-feet)		Actual (Cumulative Acre-feet Beginning 2002)	
			Acre-feet	Percent of Predicted	Acre-feet	Percent of Predicted
Upper Tongue River						
2002	11,019	11,019	8,675	78.7	8,675	78.7
2003	16,950	27,969	8,574	50.6	17,248	61.7
2004	20,272	48,241	7,971	39.3	25,220	52.3
2005	22,133	70,374	9,397	42.5	34,617	49.2

Year	Predicted (Annual Acre-feet)	Predicted (Cumulative Acre-feet from 2002)	Actual (Annual Acre-feet)		Actual (Cumulative Acre-feet Beginning 2002)	
			Acre-feet	Percent of Predicted	Acre-feet	Percent of Predicted
2006	22,351	92,725	10,795	48.3	45,412	49.0
2007	19,945	112,670	11,984	60.1	57,396	50.9
2008	20,282	132,952	13,114	64.7	70,558	53.1
2009	15,782	148,734	10,523	66.7	81,081	54.5
2010	15,782	164,516	8,986	56.9	90,067	54.7
2011	15,654	180,170	7,739	49.4	97,806	54.3
2012	8,646	188,816	6,580	76.1	104,386	55.3
2013	4,721	193,537	-	-	-	-
2014	2,522	196,059	-	-	-	-
2015	1,290	197,349	-	-	-	-
2016	601	197,950	-	-	-	-
2017	214	198,164	-	-	-	-
Total	198,164		104,386			
Upper Powder River						
2002	100,512	100,512	15,846	15.8	15,846	15.8
2003	137,942	238,454	18,578	13.5	34,424	14.4
2004	159,034	397,488	20,991	13.2	55,414	13.9
2005	167,608	565,096	27,640	16.5	83,054	14.7
2006	171,423	736,519	40,930	23.9	123,984	16.8
2007	163,521	900,040	42,112	25.8	166,096	18.5
2008	147,481	1,047,521	45,936	31.1	212,522	20.3
2009	88,046	1,135,567	43,079	48.9	255,601	22.5
2010	60,319	1,195,886	43,263	71.7	298,864	25.0
2011	44,169	1,240,055	43,163	97.7	342,027	27.6
2012	23,697	1,263,752	31,755	134.0	373,782	29.6
2013	12,169	1,275,921	-	-	-	-
2014	5,672	1,281,593	-	-	-	-
2015	2,242	1,283,835	-	-	-	-
2016	1,032	1,284,867	-	-	-	-
2017	366	1,285,233	-	-	-	-
Total	1,285,233		373,782			
Middle Powder River						
2002	8,257	8,257	3,929	47.6	3,929	47.6
2003	10,421	18,678	3,860	37.0	7,789	41.7
2004	11,640	30,318	3,547	30.5	11,336	37.4
2005	12,328	42,646	4,588	37.2	15,924	37.3
2006	12,044	54,690	6,368	52.9	22,292	40.8
2007	9,897	64,587	7,020	70.9	29,312	45.4
2008	9,689	74,276	7,624	78.7	36,939	49.7
2009	6,030	80,306	6,253	103.7	43,192	53.8
2010	6,030	86,336	5,649	93.7	48,841	56.6
2011	5,899	92,235	4,764	81	53,605	58.1
2012	3,276	95,511	4,072	124.3	57,677	60.4
2013	1,797	97,308	-	-	-	-
2014	964	98,272	-	-	-	-
2015	495	98,767	-	-	-	-
2016	231	98,998	-	-	-	-
2017	82	99,080	-	-	-	-
Total	99,080		57,677			
Little Powder River						
2002	18,613	18,613	11,391	61.2	11,391	61.2

Year	Predicted (Annual Acre-feet)	Predicted (Cumulative Acre-feet from 2002)	Actual (Annual Acre-feet)		Actual (Cumulative Acre-feet Beginning 2002)	
			Acre-feet	Percent of Predicted	Acre-feet	Percent of Predicted
2003	20,822	39,435	8,767	42.1	20,158	51.1
2004	21,832	61,267	8,266	37.9	28,424	46.4
2005	22,427	83,694	8,529	38.0	36,953	44.2
2006	21,330	105,024	8,383	39.3	45,336	43.2
2007	18,607	123,631	7,566	40.7	52,902	42.8
2008	19,121	142,752	7,690	40.2	60,608	42.5
2009	8,016	150,768	4,266	53.2	64,874	43.0
2010	7,124	157,892	3,361	47.2	68,235	43.2
2011	6,439	164,331	1,558	24.2	69,793	42.5
2012	3,930	168,261	1,821	46.3	71,614	42.6
2013	2,340	170,601	-	-	-	-
2014	1,335	171,936	-	-	-	-
2015	699	172,635	-	-	-	-
2016	350	172,985	-	-	-	-
2017	133	173,118	-	-	-	-
Total	173,118		71,614			
Antelope Creek						
2002	15,460	15,460	2,668	17.3	2,668	17.3
2003	17,271	32,731	4,042	23.4	6,710	20.5
2004	17,685	50,416	5,181	29.3	11,891	23.6
2005	17,503	67,919	5,234	29.9	17,125	25.2
2006	17,385	85,304	5,869	33.8	22,994	27.0
2007	16,180	101,484	2,327	14.4	25,321	25.0
2008	12,613	114,097	1,983	15.7	27,304	23.9
2009	5,226	119,323	1,295	24.8	28,599	24.0
2010	3,574	122,897	1,097	30.7	29,696	24.2
2011	2,956	125,853	985	33.3	30,681	24.4
2012	1,041	126,894	769	73.9	31,450	24.8
2013	363	127,257	-	-	-	-
2014	124	127,381	-	-	-	-
2015	40	127,421	-	-	-	-
2016	13	127,434	-	-	-	-
2017	3	127,437	-	-	-	-
Total	127,437		31,450			
Upper Belle Fourche River						
2002	54,735	54,735	26,761	48.9	26,761	48.9
2003	67,481	122,216	24,309	36.0	51,070	41.8
2004	76,259	198,475	18,906	24.8	69,975	35.3
2005	82,713	281,188	12,817	15.5	82,792	29.4
2006	85,761	366,949	12,502	14.6	95,294	26.0
2007	84,507	451,456	8,677	10.3	103,971	23.0
2008	79,493	530,949	7,275	9.2	111,602	21.0
2009	49,435	580,384	4,541	9.2	116,142	20.0
2010	39,170	619,554	2,954	7.5	119,097	19.2
2011	31,277	650,831	2,073	6.6	121,170	18.6
2012	21,215	672,046	887	4.2	122,057	18.2
2013	13,495	685,541	-	-	-	-
2014	7,630	693,171	-	-	-	-
2015	3,347	696,518	-	-	-	-
2016	1,849	698,367	-	-	-	-
2017	790	699,157	-	-	-	-

Year	Predicted (Annual Acre-feet)	Predicted (Cumulative Acre-feet from 2002)	Actual (Annual Acre-feet)		Actual (Cumulative Acre-feet Beginning 2002)	
			Acre-feet	Percent of Predicted	Acre-feet	Percent of Predicted
Total	699,157		121,170			
Upper Cheyenne						
2002	7,978	7,978	7,118	89.2	7,118	89.2
2003	8,421	16,399	7,420	88.1	14,538	88.6
2004	8,365	24,764	7,926	94.7	22,463	90.7
2005	8,275	33,039	7,203	87.0	29,666	89.8
2006	8,228	41,267	7,291	88.6	36,957	89.6
2007	7,002	48,269	3,159	45.1	40,116	83.1
2008	5,897	54,166	2,760	46.8	43,207	79.8
2009	2,144	56,310	1,869	87.2	45,076	80.1
2010	1,456	57,766	1,475	101.3	46,551	80.6
2011	1,013	58,779	1,271	125.5	47,822	81.4
2012	357	59,136	1,169	327.5	48,991	82.8
2013	125	59,261	-	-	-	-
2014	43	59,304	-	-	-	-
2015	14	59,318	-	-	-	-
2016	4	59,322	-	-	-	-
2017	1	59,323	-	-	-	-
Total	59,323		48,991			
Crazy Woman Creek						
2002	9,449	9,449	4	0.0	4	0.0
2003	15,185	24,634	1	0.0	5	0.0
2004	18,418	43,052	126	0.7	130	0.3
2005	20,240	63,292	113	0.6	243	0.4
2006	21,135	84,427	392	1.9	635	0.8
2007	21,036	105,463	349	1.7	984	0.9
2008	20,279	125,742	560	2.8	1,573	1.3
2009	15,962	141,704	605	3.8	2,178	1.5
2010	13,716	155,420	1,113	8.1	3,291	2.1
2011	12,240	167,660	1,124	9.2	4,415	2.6
2012	6,731	174,391	649	9.6	5,064	2.9
2013	3,629	178,020	-	-	-	-
2014	1,881	179,901	-	-	-	-
2015	910	180,811	-	-	-	-
2016	422	181,233	-	-	-	-
2017	150	181,383	-	-	-	-
Total	181,383		5,064			
Clear Creek						
2002	10,697	10,697	875	8.2	875	8.2
2003	18,192	28,889	1,489	8.2	2,364	8.2
2004	22,415	51,304	1,434	6.4	3,798	7.4
2005	24,795	76,099	1,228	5.0	5,026	6.6
2006	26,267	102,366	752	2.9	5,778	5.6
2007	25,997	128,363	622	2.4	6,400	5.0
2008	24,879	153,242	2,081	8.4	8,486	5.5
2009	22,762	176,004	1,849	8.1	10,335	5.9
2010	22,071	198,075	1,504	6.8	11,839	6.0
2011	21,576	219,651	1,257	5.8	13,096	6.0
2012	11,969	231,620	1,270	10.6	14,366	6.2
2013	6,552	238,172	-	-	-	-
2014	3,500	241,672	-	-	-	-

Year	Predicted (Annual Acre-feet)	Predicted (Cumulative Acre-feet from 2002)	Actual (Annual Acre-feet)		Actual (Cumulative Acre-feet Beginning 2002)	
			Acre-feet	Percent of Predicted	Acre-feet	Percent of Predicted
2015	1,780	243,452	-	-	-	-
2016	832	244,284	-	-	-	-
2017	299	244,583	-	-	-	-
Total	244,583		14,366			
Source: WOGCC 2013						

Drilling and completion procedures for CBNG and conventional oil and gas wells are strictly controlled by WOGCC and BLM requirements which ensure each formation remains as isolated as it is under natural conditions and that the integrity of the wellbore remains intact. Development that occurs in accordance with these requirements is not likely to have allowed any leakage or mixing of groundwater in the formations that were penetrated due to recent development. However, many existing non-fluid mineral wellbores may not effectively isolate the formations penetrated and may serve as conduits for mixing of waters from different aquifers. Water wells frequently are screened over multiple aquifer zones, which would facilitate mixing of groundwater from different aquifer zones. Many older, conventional oil and gas wells likely are inadequately cased, which could have allowed any groundwater present to leak from one formation to another. Numerous uncased boreholes were drilled in the PRB to evaluate uranium potential and were not properly plugged, which could have allowed any groundwater present to leak through the formations penetrated. For additional information see Appendix V (p. 2599) as well as the Buffalo RMP RFD.

An additional groundwater use in the planning area is related to in situ recovery (ISR) uranium. There are several locations in the PRB where uranium is currently being solution mined (see the *Locatable Minerals* section in the Proposed RMP and Final EIS). Potential surface and groundwater issues could arise from the development of ISR uranium. However, ISR development is under the regulatory authority of the U.S. Nuclear Regulatory Commission (NRC), and water quality regulation and protection would be under the authority of Wyoming DEQ. In these active mining areas, the ambient groundwater is circulated as mining solution when oxidants are added for dissolving the uranium in the target formation. Mine areas are maintained in an under-balanced condition with respect to water quantity, which means that slightly more water is removed than the amount injected to prevent excursion of the solution from the targeted areas. The mined area is ringed with groundwater monitor wells in the target zone as well as above and below to monitor for leakage of the mine solution. Additionally, the mines are required to determine pre-mining baseline water quality which serves to set the goal for groundwater restoration after mining is complete. The Wyoming DEQ Land Quality Division (LQD) and WQD have authority over the restoration of the groundwater in a mined area, in concert with the requirements of the NRC. BLM's only nexus to the mining of uranium would be the management of BLM-administered surface within the mine boundary.

In areas where there is potential for conflict between oil and gas development of federal minerals and potential uranium extraction, the BLM requires that the operator's project includes design features to minimize impacts to the fluid mineral (oil and gas), as well as the locatable mineral (uranium).

W.1.3.2. Monitoring Programs

Federal and state government agencies, the oil and gas industry, local municipalities, and the mining industry have numerous programs for monitoring surface and groundwater quality, as well as quantity.

Surface Water

As noted above, the USGS is funded by numerous entities, including the BLM, to perform water quality and flow monitoring on selected mainstem locations within the planning area, such locations where some of the primary watersheds leave the planning area or state (Tongue River, Powder River, Little Powder River, Belle Fourche River, and Cheyenne River). Due to funding availability and decline of CBNG production, some of these locations may be discontinued or changed over time, based on results and related issues.

Every surface discharge is permitted through the Wyoming DEQ with conditions that the water quality be monitored at specific intervals with the results submitted to the state. These results provide information to guide the WYPDES permitting program. The BLM is obligated to insure compliance with all applicable state and federal laws and regulations, but in this case for water quality issues, the Wyoming DEQ is the enforcement agency.

Impaired Streams

The Wyoming DEQ is in the process of establishing TMDLs for pollutants for the impaired water bodies in the planning area. The BLM will continue to cooperate with the state in those efforts. As working groups are formed to address issues of impairment for specific reaches, the BLM will participate if, and when surface management authority dictates.

Groundwater

Beginning in the early 1990s with the onset of CBNG development, the BLM in concert with Wyoming State Engineer's Office (WSEO) and USGS, began a groundwater monitoring program to document the changes in water levels in the producing coal zones. The PRB Final EIS modeled the extent of drawdown in the Ft. Union coalbeds based on this historic production and groundwater levels. Since 1989, the monitoring program has been expanded to include most of the areas of current CBNG production (62 sites). The anticipated effects of CBNG production on groundwater were summarized as follows: "Because coal mining and CBM operations are dynamic, the maximum areal extent of drawdown may change over time and may increase in some areas of the PRB while it recovers in others. The maximum drawdown in any sub-watershed generally coincides with or closely follows the period of peak water production in the watershed." PRB Final EIS pg. 4-15.

Ongoing groundwater monitoring by the BLM has been documented and summarized by the Wyoming State Geological Survey in several updates available on their website at <http://www.wsgs.uwyo.edu/public-info/onlinepubs/PRB-Drawdown.aspx>. The updated data summary through 2012 will be available by the end of 2013. This summary validates the statement that the maximum area of drawdown will be the areas of peak water production. In the report, drawdown results are compared with aggregate CBNG production volumes (gas and water) within 1.5 miles of the monitoring well. In general, water levels have dropped where

CBNG water production has been highest. Gas pressures at the monitor wells have increased as gas production in the surrounding area increases and water production generally decreases.

The PRB Final EIS also predicted that there could be impacts to shallow groundwater sources due to infiltration at or near surface discharge points and containment impoundments, but made no predictions regarding changes to quality or quantity. In the early days of CBNG development, BLM began monitoring shallow groundwater at selected locations around the planning area. Results from this and other monitoring eventually led the Wyoming DEQ to apply additional requirements for testing through “Compliance Monitoring for Groundwater Protection Beneath Unlined Coalbed Methane Produced Water Impoundments” June 2004. Wyoming DEQ requires that prior to new impoundment construction, the proponent must determine the class of any groundwater located below the site of installation and estimate the volume of water by drilling an investigative well to at least 150 feet below ground surface or to bedrock, depending on the proposed size of impoundment. Depending on the designated class of use determined, the operator may be required to relocate the impoundment, monitor impacts to the groundwater or perform no additional monitoring (Wyoming DEQ 2006). Table W.3, “Summary of Wyoming DEQ WQD Coalbed Natural Gas Groundwater Database: 4th Quarter 2011” (p. 2648) below presents the data collected by the Wyoming DEQ regarding the shallow groundwater protection program as of the end of 2011.

Table W.3. Summary of Wyoming DEQ WQD Coalbed Natural Gas Groundwater Database: 4th Quarter 2011

Category	Number	Explanation
Operators	42	Unique company names
POD and/or Projects	285	Unique POD or Project names
Impoundments	2,017	Unique impoundment names
Wells or borings	2,306	Unique well and/or boring names and dry boreholes which were not given names
Permits (compliance monitoring authorization)	111	Chapter 3 as-built monitoring well permits (often includes multiple wells)
Permitted impoundments	249	Impoundments with permitted (CH ₃) monitor wells and thus require ongoing compliance monitoring
Permitted: Class I Groundwater	2	As above over Class I Groundwater
Permitted: Class II Groundwater	1	As above over Class II Groundwater
Permitted: Class III Groundwater	234	As above over Class III Groundwater
Permitted: Class IV Groundwater	10	As above over Class IV Groundwater (likely a mix of Classes III and IV)
Compliance monitoring wells	307	-
Permitted impoundments in use (submitting monitoring data)	125	Impoundments with permitted (CH ₃) monitor wells and confirmed in use by submitting data
Permitted impoundments not receiving discharge	91	Impoundments with permitted (CH ₃) monitor wells and confirmed not in use (operator's word)
Permitted impoundments for which permits have been terminated	47	Permits terminated at operators request, not needed after all, did not receive discharge
Exempt impoundments total)	1,493	Impoundments which do not require further groundwater monitoring
Exempt: Class IV Groundwater	309	As above: exempt because groundwater is Class IV
Exempt: No groundwater encountered	1,091	As above: exempt because no groundwater was encountered

Category	Number	Explanation
Exempt: Small capacity	39	As above: exempt because capacity of reservoir is less than 2 acre-feet
Exempt: Other reasons (Class V, ET uptake, etc.)	54	As above: miscellaneous
Data submitted, groundwater authorization denied or not requested by operator	216	Impoundments for which a review or decision has not been made
Impoundments which have wells that have ever exceeded class of use limits for any parameter	26	-
Source: Wyoming DEQ 2012		
CH ₃ Methyl		
DEQ Department of Environmental Quality		
ET Evapotranspiration		
POD Plan of Development		
WQD Water Quality Division		

W.1.3.3. Reclamation Efforts

As stated previously, water produced in association with CBNG development is primarily discharged to impoundments. Through 2011, over 2,000 impoundments have been approved for water management associated with federal mineral development. All impoundments detaining waters of the state must be properly permitted through the WSEO. The WSEO began documenting impoundments permitted for CBNG development around 2003. As of 2011, over 3,100 CBNG-related impoundment permits were still active in the PRB. These impoundments contain over 36,000 acre-feet of water and disturb over 7,500 acres of surface area.

As CBNG production decreases and the volume of water containment/management facilities is also decreased, the operators are required to reclaim impoundments no longer needed for water management, as is required for all other federal actions that result in surface disturbance. In 2010, the Buffalo Field Office (BFO) issued a guidance document for the reclamation of impoundments which addresses some of the potential issues identified in the PRB Final EIS. The document “BFO Impoundment Reclamation Guidelines” can be accessed at: http://www.blm.gov/wy/st/en/field_offices/Buffalo/minerals.html. At reclamation, the operator is required to quantify the amount and chemical character of sediment deposited in the impoundment and propose disposition based on contaminants detected. As part of the reclamation process the location must be reclaimed to approximate the channel geometry that existed prior to disturbance to restore natural flow regimes. If the location is split estate, landowner notification is required.

At the time of abandonment, the BLM reviews requests from landowners or grazing lessees that desire to leave impoundments in place for range or grazing management. Additional reviews are also completed by the WSEO.

In 2005, the BFO began to require that operators proposing to construct impoundments or modify an existing structure submit a bond in the amount of the cost of reclamation for the facility. If for some reason the operator would default on their responsibilities to reclaim an impoundment, any bond monies held could be applied to the cost of reclamation of the site.

Currently, the WOGCC is in the process of adopting baseline groundwater monitoring requirements for all oil and gas development in the state. Operators will be required to sample for baseline water quality of any existing permitted functional water well within a 0.5 mile radius of the proposed well site. Additional sampling will be required at regular intervals following

development to determine if there were impacts to the water well resulting from the drilling and completion of the fluid mineral well. When this requirement is adopted by the state, the BLM will require compliance from any related federal action.

W.2. Water Resource Management Plan

W.2.1. Locatable Mineral Development and Coal Lease by Application

1. Mining plans for locatable minerals, including Bentonite and uranium are developed in cooperation with the Wyoming DEQ LQD. The NRC also has authority for the permitting of uranium development projects, in concert with the LQD. In all cases, the proponent would include a water management component in the POD or operation. Even locatable minerals projects not directly under BLM permitting authority can be reviewed by the BLM to ensure that no undue or unnecessary degradation would occur.
2. In the case of uranium mining, including ISR, the LQD and NRC are the permitting authorities, including the water management. Only in cases where there is BLM-administered surface included within the mine boundary would the BFO be responsible for conducting a NEPA review and approval of the project for the use of that surface. The BLM BFO has opportunity to comment on any and all mineral development projects as necessary.
3. The Wyoming DEQ and U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement have the permitting oversight and authority to mitigate water quality issues for a coal mining operation. The BLM does not stipulate any specific water quality permitting requirement for a coal lease, but requires lessees to comply with all applicable state and federal laws. A BLM EIS for a coal mining operation will analyze the potential effects to water quality, but any mitigation will be a requirement of the Wyoming DEQ through its permitting process.
4. The Wyoming DEQ WQD administers a WYPDES storm water permitting program to assist in managing the state's water resources. Under this program, anyone planning to construct, modify, or use a facility capable of emitting storm water and related effluents into waters of the state must obtain coverage under a Permit to Discharge Storm Water Under the WYPDES. Mineral and coal mining projects are required to prepare pollutant prevention plans as part of the permit application.
5. Water disposal through subsurface injection would require a permit from the Wyoming DEQ Underground Injection Control division of the WQD.
6. All permitted activities that include surface disturbance are required to address the eventual reclamation of that disturbance. (Management Action Water-1016 to achieve goals PR:3.1, PR:3.3, and PR:3.5) Authority for this is documented in 30 United States Code 226(g) which states: "The Secretary concerned shall, by rule or regulation, establish such standards as may be necessary to ensure that an adequate bond, surety, or other financial arrangement will be established prior to the commencement of surface-disturbing activities on any lease, to ensure the complete and timely reclamation of the lease tract, and the restoration of any lands or surface waters adversely affected by lease operations after the abandonment or cessation of oil and gas operations on the lease."
7. A new coal mine, or a modification to an existing mine, must be permitted by Wyoming DEQ LQD. A permittee must compile detailed water quality and quantity inventories and demonstrate compliance with all applicable aspects of Wyoming Water Quality Standards

and Regulations, including compliance with CWA, before either a permit or amendment is granted.

8. A Best Available Control Technology analysis is required to demonstrate the use of an appropriate level of air emissions controls, specifically for air quality issues in mining applications (Wyoming Air Quality Standards and Regulations Chapter 6, Section 2). Some of these control measures at mining operations would also be protective of water quality as well as air quality. Protective measures would include, but are not limited to: the paving of access roads to reduce erosion potential; the treating of major and temporary haul roads and work areas with a suitable dust suppressant which improves the erosion resistance of the surface; and the use of silos, trough barns, or similar enclosed containers for the storage of large volumes of material awaiting load out and shipment reducing the potential for impacts to surface waters.

W.2.2. Mineral and Energy Development Authorizations

1. The BLM manages the location, density, and/or rate of development on a site-specific basis to protect surface and water resources. 43 CFR 3101.1-2 allows that the BLM authorized officer may relocate a proposed action to a location within 200 meters (656 feet) of the original location to minimize adverse impacts to other resource values. This flexibility would enable the BLM to move any proposed action to a more suitable location, such as farther away from surface water, if there were potential environmental issues identified.
2. When reviewing a proposed project, the BLM will consider the magnitude of potential water impacts from the project, existing water quality conditions including impairments, proximity to riparian areas and other surface waters, and other issues identified during project scoping to identify pollutants of concern and to determine the appropriate level of water analysis to be conducted for the project.
3. Prior to approval, all projects submitted to BLM that involve construction, drilling or other surface disturbance will be assigned to an interdisciplinary team of specialist for site specific environmental analysis. The interdisciplinary team could consist of a Natural Resource Specialist, Wildlife Biologist, Archeologist, Civil Engineer, Realty Specialist, Geologist, Soil Scientist, Hydrologist, Legal Instruments Examiner, Petroleum Engineer, and Legal Assistant. All proposed disturbance is inspected (onsited) to identify site-specific resource protection concerns and requirements.
4. As required in the PRB Final EIS ROD, the proponent must submit a water management plan for proposed CBNG projects that are analyzed through an Environmental Assessment, Categorical Exclusion or Determination of NEPA Adequacy. The Water Management Plan requirements can be found in the ROD. The operator is required to estimate the quantity and quality of water produced in association with CBNG, describe the water management strategy selected (i.e., channel discharge, discharge to containment, re-injection, etc.), identify potential impacts from the management strategies and recommend or incorporate design features to address potential impacts. This information will inform monitoring (see the *Monitoring* section), and mitigation (see the *Mitigation* section).
5. The RFD for this RMP and Appendix G (p. 1937) projects that up to 10,000 additional CBNG wells may be drilled in the planning area from 2012 through 2028. Production from these wells is estimated at 2,473 billion cubic feet of gas and 318,754 acre-feet of water. The total volume of water estimated to be produced from development under the PRB Final EIS from 2002 through 2011 was 2,912,756 acre-feet. According to the data collected by the WOGCC, actual cumulative water production associated with CBNG through 2011 totaled 754,271 acre-feet or 26 percent of the total volume of water estimated to be produced. The additional

water production associated with newly constructed wells falls well within the volume estimated for CBNG development and thus should not exceed the impacts predicted. For more information, refer to the Proposed RMP and Final EIS Chapter 4, *Water Resources* section.

6. The quality of the water produced in association with CBNG predicted through 2028 is expected to be similar to that analyzed in the PRB Final EIS.
7. Water produced in association with CBNG will continue to be managed through surface discharge to containment impoundments, direct discharge to a receiving stream, storage and retrieval injection, injection in deep disposal wells, land application or discharge to evaporation ponds. The Wyoming DEQ has permitting authority for all the options with the exception of any injection associated with conventional oil and gas production. The Wyoming DEQ has revised the requirements for surface discharge and direct discharge to streams in specific watersheds to protect active irrigation downstream. The BLM reserves the right to deny any water management option that does not meet agency environmental standards.
8. The BLM will require a water management plan for proposed oil and gas development projects that are analyzed through an EIS.
9. For conventional oil and gas development, the operator must comply with Onshore Oil and Gas Order No. 7 by submitting a sundry notice to propose the water management for each well or groups of wells if it was not included in the design features of the original proposal.
10. Historically, the volume of water produced in association with oil starts very low and increases with time, dependent on reservoir characteristics. The RFD presents volumes of oil, gas and water produced through 2008 by formation in Table W.1, "Monthly Mean Discharge (cubic feet per second) 2001 to 2011" (p. 2627). For the average barrel of oil produced, 2.9 barrels of water have been produced considering all formations for a total of 451,791 acre-feet of water since the beginning of record keeping.
11. As described in Appendix V (p. 2599), conventional produced water is often used for secondary recovery or waterflooding through reinjection into the producing zone to increase oil recovery. However in the planning area, there are several locations where the water quality in various oil-bearing formations is such that it can be treated to meet WYPDES surface discharge water quality standards. The Wyoming DEQ has authority for permitting and monitoring surface discharge in the State of Wyoming.
12. The BLM has the responsibility to implement the decisions of the RMP in a manner that protects water quality. The BLM also must recognize valid and existing leasing rights. At the project approval stage, the BLM can require specific actions and measures to protect water quality based on expected impacts (Management Actions Water-1004, Water-1005, Water-1007, Water-1009, Water-1013, and Water-1014).
13. The proponent of an energy development project will be required to provide a detailed description of operator committed measures. These measures would include specific components to reduce project related potential water pollutant discharges, including petroleum product release and sediment movement due to surface erosion. Following, in the *Mitigation* section, is a list of potential mitigation measures. The list is not intended to preclude the use of other effective water pollution control technologies that may be proposed. Details of the mitigation measure would be submitted by the applicant and enforced as a condition of the BLM-issued authorization.
14. Prior to approval, all projects submitted to the BLM for review that are in close proximity to any identified impaired water body will be evaluated for their likelihood to contribute to the impairment and appropriate mitigation measures will be applied. The BLM will coordinate efforts with Wyoming DEQ in any programs they may have initiated to address the impairment.

15. In compliance with Executive Order 11190, BLM's initial recommendation for wetland and riparian areas is for the proponent to avoid the areas to the extent possible. However, if it is necessary to develop in those areas, mitigation will be required to be included in the design of the project. Alternatively, the BLM will apply any mitigation deemed necessary at the time of approval as a Condition of Approval.

W.2.3. Monitoring

1. As part of a comprehensive Water Management Plan for the planning area, the BLM will continue to work cooperatively with federal and state agencies responsible for managing water resources to determine, characterize, and track water resource conditions (Management Action Water-1006). BLM will cooperate with efforts of the Wyoming DEQ to evaluate monitored exceedances. Wyoming DEQ has authority and primacy for regulating and monitoring water quality within the state, including determining causes of monitored exceedances.
2. The BLM will support and participate in regional monitoring efforts to meet Management Actions Water-1004 and Water-1006.
3. The BLM will continue to perform Groundwater Monitoring to document changes to groundwater levels in the planning area due to fluid mineral or locatable mineral development to comply with Objective PR:3.6 through Management Action Water-1005. The Groundwater Monitoring program will also continue to document existing or potential migration between coal zones and adjacent sands.
4. A water quality exceedance would be the hard trigger requiring adaptive management to occur; Chapter 4 identifies NEPA significance criteria which would be additional hard triggers for adaptive management. Adaptive management can also be implemented prior to a water quality exceedance, such as when monitoring demonstrates a trend towards exceedance. BLM is committed to working cooperatively with the Wyoming DEQ, EPA, and other stakeholders to address water resource concerns.

W.2.4. Mitigation

The BLM reserves the right to modify the operations of surface-disturbing or disruptive activities as part of the statutory requirements for environmental protection. Those measures selected for implementation will be identified in the site-specific ROD or decision record for those activities and will inform a potential lessee, permittee, or operator of the requirements that must be met when using BLM-administered public lands and minerals.

1. Many of the activities that the BLM authorizes, permits, or allows include surface disturbance (vegetation removal or excavations) that have the potential to impact water quality. The primary mechanisms to reduce water quality impacts are to control and reduce erosion through strategies such as adjusting the rate of development, or by implementation of mitigations such as insuring interim reclamation success through use of surface stabilizing technologies.
2. The proponent of a project will be required to comply with all applicable state and federal regulations and may be required to apply additional mitigation and other technologies or strategies.
3. The BLM will ensure implementation of additional control measures and strategies within its regulatory authority and in consultation with federal and state agencies responsible for managing water resources, if:

- a. Proposed or committed measures are insufficient to achieve water quality Goal PR:3 and objectives PR:3.1, PR:3.4, PR:1.3, and PR:3.7 and Management Actions Water-1004, Water-1005, and Water-1006; or
- b. A BLM-authorized source caused or contributed to a monitored exceedance of the CWA as determined by Wyoming DEQ, in consultation with BLM.

Mitigation may include reduction in the number of locations, density, and/or rate of development, or other measures. BLM would apply mitigation as conditions of approval as a result of site-specific NEPA where design features of the project do not include adequate environmental protections.

Required Design Features

1. As required in the PRB Final EIS ROD, for CBNG development or for field development fluid mineral projects, the operator must include a water management plan for review with the APD or POD. The water management plan must provide adequate information for the BLM to complete site-specific NEPA analysis and to ensure compliance with all state and federal requirements prior to approval.
2. Operators need to certify that all potentially affected landowners (with water wells properly permitted by the WSEO) within each proposed oil or gas well's circle-of-influence were offered a Water Well Agreement. This agreement should commit the operator to replacing or repairing the water source if it is determined that the development has degraded or impaired the well. Example language for the Water Well Agreement is included in the PRB Final EIS ROD.
3. Proof of approved permit from the authorizing agency will be required prior to any surface water discharge or subsurface injection.
4. Lease Notice No. 1, which is attached to all leases, identifies that there are areas not specifically addressed by lease stipulations that may contain special values that require additional attention to prevent damage to surface and/or other resources. These areas include: slopes in excess of 25 percent; locations within 500 feet of surface water and/or riparian areas; locations within 0.25 mile of occupied dwellings.
5. Management action Water-1013 restricts surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams. Similarly, management action Riparian-4009 restricts surface disturbance within 500 feet of riparian systems, wetlands, and aquatic habitats (144,045 acres). BLM has determined these management actions are sufficiently protective of most aquatic resources within the planning area as the primary water resource is ephemeral streams. In addition, there are several other management actions that provide benefit to aquatic resources such as (all listed acreage represent federal fluid mineral estate):
 - Soil-1004: surface disturbance is restricted in areas with a severe erosion hazard (669,739 acres);
 - Soil-1006 surface disturbance is restricted on slopes >25% (170,590 acres);
 - Soil-1010 surface disturbance is restricted in areas with limited reclamation potential (685,950 acres);
 - Fish-4013 surface disturbance is restricted within 0.25 mile of naturally occurring water bodies containing native or desirable non-native fish species (261,870 acres);
 - SS Fish-4008 no surface occupancy or use is allowed within 0.25 mile of any waters containing special status fish species (4,846 acres);
 - SS WL-4028 no surface occupancy or use is allowed within 0.5 mile of consistently used bald or golden eagle winter roosts and the following consistently used riparian corridors:

Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River (58,902 acres);

- SS WL-4034 surface disturbance is restricted within 1,640 feet (500 meters) of perennial water, vernal pools, playas, and wetlands (1,217,959 acres).

This suite of management actions has been determined to be protective of the aquatic resources within the planning area. BLM reviews all project proposals and requires the appropriate mitigation to conserve water and other affected resources.

6. For CBNG development, the operator will be responsible for monitoring the natural springs which were identified within a 0.5 mile radius of the development. The springs will be sampled for a water analysis and the discharge rates will be determined at 6-month intervals for the duration of the associated CBNG development, or until the data trend indicates otherwise.
7. The operator is responsible for ensuring that the BLM has access to the area for monitoring and inspections in accordance with 43 CFR 3162.1(b) and 3164.3(b).

Recommended Design Features

1. Coordinate road construction and use among ROW and/or mineral lease holders to reduce the number of duplicate surface disturbance areas. Close and rehabilitate duplicate roads.
2. To reduce potential for surface and groundwater contamination, use only closed-loop systems for drilling operations, with no reserve pits.
3. In accordance with CWA Section 404, construct road crossing at right angles to ephemeral drainages and stream crossings.
4. Use directional and horizontal drilling to reduce surface disturbance and vegetation impacts (dust, erosion and sediment movement). Applicability depends on geologic strata.
5. Consider using oak (or other material) mats for drilling activities to reduce vegetation disturbance and for roads between closely spaced wells to reduce soil compaction and maintain soil structure to increase likelihood of vegetation reestablishment following drilling. This will reduce erosion potential.
6. Use mulch, soil amendments, and/or erosion control blankets to expedite reclamation and to protect soils.
7. The use of green (also known as closed-loop mud system) completions and green workovers, reduce or eliminate open pits and associated potential water contamination.
8. To reduce potential impacts to riparian areas or other sensitive wetlands or surface waters, locate disturbance activities 500 feet away from the water body, or further depending on site specific conditions.
9. To reduce potential impacts to surface water bodies impaired reaches or segments, locate 750 foot setback from reaches identified as being impaired due to surface flow contributions.
10. In order to provide protection for an aquifer that is currently being used for a domestic water supply, the operator should not attempt to locate an unlined produced water pit within 0.25 mile of a domestic use well.
11. In order to protect the surface waters of the state, produced water pits should be located 0.25 mile (1,320 feet) from the outermost alluvium (and adjacent mixtures) of any current stream system and, at a minimum, five hundred (500) feet from the edge of any bank-to-bank stream channel, pond, reservoir, wetland or lake.
12. General Guidance for Water Management Plan Development
 - a. Consult private surface owner(s) early in the planning process and throughout the development of Water Management Plans.
 - b. Develop Water Management Plans on a watershed basis, coordinating with other companies within the same watershed.

- c. Consider all existing and anticipated upstream contributions (natural flow, runoff and other discharges) and determine through sound hydrologic analysis if the produced CBNG water from the wells, based on known or anticipated water production rates, will adversely impact downstream improvements, uses, and users (reservoirs, hay meadows, etc.).
- d. Depending on the water quality and quantity, centralize the water discharge to localize the associated disturbance.
- e. The BLM encourages innovative methods of using and managing produced CBNG water. Any proposed method will be evaluated and authorized on a case-by-case basis.
- f. Locate discharge points and reservoirs in readily accessible areas for ease of installation and monitoring. Consider access options which involve the least surface disturbance in any erosion feature modification.

13. Discharge Points

- a. Locate discharge points in areas that will minimize erosion and impacts to the receiving channel, existing improvements, and downstream users.
- b. Locate discharge points in stable, low gradient drainage systems and below active headcuts when possible. If discharge is located above a headcut, mitigation measures will be required by the BLM authorized officer on a site-specific basis. Some mitigation measures will require engineering design.
- c. All discharge points will require energy dissipation measures.
- d. Discharge points may not be authorized by BLM regardless of WYPDES status or previous use and may be relocated or otherwise mitigated during onsite inspections where environmental issues exist.
- e. Cumulative produced water discharge must not exceed the naturally occurring 2-year peak flow of the receiving channel.
- f. Do not locate discharge points in playas or enclosed basins unless it can be demonstrated that it can be done without resulting in adverse impacts. Discharges into valley bottoms with no defined low-flow channel will generally not be allowed, but will be reviewed on a site-specific basis.

14. Channel Crossings

- a. Minimize channel disturbance as much as possible by limiting pipeline and road crossings.
 - i. Avoid running pipelines and access roads within floodplains or parallel to a stream channel.
- b. Channel crossings by road and pipelines will be constructed perpendicular to flow. Culverts will be installed at appropriate locations for streams and channels crossed by roads as specified in the BLM Manual 9112-Bridges and Major Culverts and Manual 9113-Roads. Streams will be crossed perpendicular to flow where possible, and all stream crossing structures will be designed to pass the 1-year discharge event without the buildup of static head and carry the 25-year discharge event or other capacities as directed by the BLM.
- c. Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.
- d. Low water crossings will be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.

15. Water Control Structures

- a. Reservoirs must be designed in accordance with WSEO standards. The reservoir should be designed to accommodate the proposed POD discharge volume as well as potential upstream development.
- b. Locate off-channel pits so that negative impacts on the adjacent surface, surface water or groundwater are minimized.
- c. On federal surface, if passage of water through a spillway is to be frequent, the spillway must be reinforced and designed for continual flow (regular flows on earthen spillways will not be allowed).

Mitigation Measures or Potential Conditions of Approval

1. The operator will be responsible for monitoring of the physical condition of the discharge point(s) on a monthly basis for the first year of operation. Inspectors will note the condition of each discharge point, check for evidence of erosion, and schedule any necessary maintenance work. (Note: the Wyoming DEQ is responsible for coordinating monitoring and compliance for the discharged water quality.)
2. Dam outlets (spillways and pipes) and culverts will be inspected quarterly and after major storm events for the first year of operation, for evidence of erosion, and schedule any necessary maintenance work.
3. Erosion stabilization measures and sediment control BMPs (head cut repairs, etc.) will be inspected on a monthly basis for the first year of operation and after major storm events. Inspectors will note condition and schedule any necessary maintenance work.
4. Channels within and below the project area will be inspected on a monthly basis and after major storm events for signs of accelerated erosion for the first year of operation.
5. The operator will inspect any wetland and/or riparian areas which are affected by the development for impacts resulting from the development.
6. Any mitigation work, repairs or other maintenance outside the scope of the initially authorized action will require approval by the BLM authorized officer prior to the initiation of any work. The proposed actions will be submitted as a Sundry Notice (Form 3160-5) to the BLM BFO.
7. After the first year of operation, inspections will occur annually unless specific sites have required mitigation action, then inspections will continue at the previous intervals until no action has been required for a full year.
8. If Land Application Disposal is a part of the Water Management Plan, monitoring of the soils and vegetation may be required on representative sites. Monitoring may include analysis of the water that is being applied and the affected soils.
9. The operator will monitor areas adjacent to discharge points and impoundments for vegetative changes, including the influx of noxious weeds and weeds of concern.
10. If the groundwater is designated as Class I by ambient quality, an unlined CBNG produced water pit may be allowed if it can be demonstrated that the water quality being discharged into the unlined CBNG produced water pit is of equal or better quality than the groundwater. If this condition cannot be met, the unlined CBNG produced water pit should not be located within that area, or an acceptable, alternative disposal method used. If the ambient quality of the groundwater is equal to or less than the quality of the CBNG produced water no restrictions would apply.

Best Management Practices

Environmental BMPs are state-of-the-art mitigation measures designed to provide for safe and efficient operations while minimizing undesirable impacts to the environment (BLM 2006f).

1. Eliminate the surface disposal of CBNG wastewater, as well as the construction of evaporation or infiltration reservoirs to hold wastewater. Inject CBNG wastewater underground into a formation of equal or lower water quality.
2. Place roads outside of riparian areas where possible.
3. Design and construct mineral exploration and development operations so as to disturb the smallest footprint practical on the landscape while meeting all safety requirements. Where feasible, consider mowing of parking and storage areas on portions of oil and gas well drilling locations rather than stripping the topsoil and vegetation from the entire location, and the use of two-track trails to conduct exploration activities.
4. Encourage the development of new technologies that would reduce total surface disturbance (i.e., directional drilling, multiple wells from the same well pad and reinjection of produced water).
5. The number of river, stream (including ephemeral streams), lake, and wetland crossings should be minimized, where possible. Bridges, culverts, and other drainage structures should be incorporated to ensure the free flow of water when drainage ways are intersected. Different flood stages should be considered for the design and construction of the crossings.
6. Injection and/or disposal wells should be completed so the injected fluids enter the desired formations and do not enter other formations or drinking water zones. Typical injections are completed with three levels of protection for drinking water formations:
 - a. Surface casing and cement,
 - b. Long string casing and cement, and
 - c. Tubing and packer.
7. Also, the area around the injection should be reviewed to see if any wells (active, inactive or abandoned) were drilled through the injection and/or disposal zone. If wells were drilled close to the injection/disposal well that penetrated the injection and/or disposal formation and those wells did not isolate those zones, the injected fluids could flow from the injection zone through the improperly plugged or completed well to other oil and gas zones or drinking water zones.
8. For both new and existing wells, the known and anticipated needs for remedial cementing to protect underground sources of drinking water should be considered in the planning stage.
9. Natural drainage patterns of the area should be considered in the location of equipment, pads, and pits so that storm water runoff does not create an environmental hazard by erosion of base material, which could lead to equipment instability, or by flooding of pits, which could cause a discharge of oil or other fluids into the local surface waters.
10. Discharges of storm water from inside facilities such as bermed areas around tank batteries (including oil and gas exploration, production, processing, or treatment operations or a transmission facility), which can reach waters of the United States, require a storm water discharge permit and submittal of a storm water pollution plan to the Wyoming DEQ. Contamination includes storm water that comes into contact with any overburden, raw materials, or waste products on the site.
11. Construction designs should include installation of erosion and sedimentation control systems. Site construction should be inspected routinely and after each significant storm event. Any repairs to the control systems should be completed promptly. During the drilling and completion phases, all raw materials should be stored in a manner to prevent contaminating the natural runoff of precipitation. Temporary containment and liners should be used to minimize the impact of spills and to prevent impacted precipitation from affecting surface or groundwater.
12. Drip pans should be provided under equipment and storage containers potentially subject to minor leaks. These drip pans should be monitored on a routine basis to recover and recycle or dispose of accumulated oil and other liquids.

13. Bulk storage, recyclable, and reusable containers should be considered in order to reduce the number of containers that must be maintained and disposed. All reusable containers should be well marked to denote contents and the fact that they are to be reused.
14. For production equipment, the installation or use of double stuffing boxes, leak detectors, and shutdown devices should be considered in areas of particular environmental sensitivity.
15. Flare pits, sometimes called blowdown or emergency pits, cannot be used for storage or disposal. The primary purpose of a flare pit is to catch any incidental fluid that might be associated with the gas stream that does not burn. Fluids in a flare pit should be removed daily, or as quickly as practical.
16. Siting and construction of flare pits should minimize the risk of surface and groundwater contamination. The size of the flare pit should be proportionate to the volume of liquid effluent that might be expelled from the gas flare. Use of a knockout vessel should be considered.
17. It is essential that all formations bearing usable quality water, oil, gas, or geothermal resources be protected and/or isolated. The prevention of gas or fluid migration to other zones or to the surface is of primary importance. Open-hole plugs, casing plugs, or cement squeezed through casing perforations will isolate the target formations in most cases. However, special procedures, such as perforating casing and circulating cement, may be necessary to isolate that potential production or injection formations existing behind uncemented casing. It is important to prevent interzonal flow in an abandoned well so that such cross-flow does not interfere in the commercial exploitation of the zones through nearby wellbores.
18. Proximity to lakes, streams (including dry washes and ephemeral streams), wetlands, drainage and irrigation ditches, canals, flood plains, and shallow water wells should be evaluated in terms of disturbances during construction and routine operations, and in the event of accidental releases of production or completion fluids.
19. Depth to, and quality of, groundwater should be determined for the construction area. The potential impact to groundwater, particularly from any releases from buried lines should be considered.
20. Water handling facilities are typically located adjacent to, or within, production facilities. Initial planning for these facilities within a field should consider future development potential in order to minimize surface disturbance. When practical and economic, central field locations should be considered to avoid the use of multiple facilities. Facility sizing should consider future throughput increases to minimize the need for additional tankage and treating vessels.
21. Production and water handling facilities should be planned to utilize the smallest practical surface area consistent with safe, prudent, and economic operations. In addition, produced water may be saline and corrosive. Therefore, special care should be taken to minimize the possibility of environmental damage due to equipment upsets, spills, and leaks.
22. Baseline conditions and past land-use in the area should be documented. At a minimum, drinking water supplies should be identified and sampled before any development. Water usage should be determined during the planning phase so that water rights can be secured and disposal options evaluated and selected.
23. Whenever practical, tanks should be used instead of pits.
24. Pits should be designed and constructed to have 2 feet of freeboard, or provide adequate reserve capacity, to prevent overflow under maximum anticipated operating requirements and precipitation.
25. Installation of safety equipment and systems should be considered, i.e., emergency shutdown systems which have the ability to shut wells in, shut down compressors or other engines, or divert production during malfunctions or accidental releases. Where appropriate, alarm systems should be installed to notify the public or company officials of equipment failure or accidental releases.

26. Minimize and/or eliminate venting and/or use closed loop process where possible during "blow downs."
27. Reclaim and/or remediate existing open pits. Do not construct new open pits. This reduces potential for soil and water contamination.
28. Centralization (or consolidation) of water processing facilities (separation, disposal, injection, etc.) would reduce vehicle miles traveled (truck traffic) and associated erosion as well as surface disturbance.
29. Initiate an equipment leak detection and repair program, such as an enhanced direct inspection and maintenance program to reduce potential surface and groundwater contamination due to leakage.
30. Protect unpaved travel surfaces using treatments including watering, chemical suppressants, and gravel to reduce potential impacts to water and vegetation from runoff.

Appendix X. Federal Oil and Gas Operations on Split Estate Lands

Note: This appendix was added following the release of the Buffalo Draft Resource Management Plan and Environmental Impact Statement.

X.1. Purpose

The purpose of this appendix is to summarize the Bureau of Land Management's (BLM) procedures for considering proposals to conduct exploration and production operations on split estate federal oil and gas leases. This appendix is provided for information purposes only, and is not necessarily a complete statement of rights, obligations, or processes. This appendix is not a part of the BLM's land use plan decision for the Resource Management Plan (RMP). Any conflict with any statute or regulation is unintentional. In the event of a conflict, the statute or regulation controls. Federal oil and gas lessees and operators, and private surface owners, are advised to confer with the BLM at the time an action is proposed for BLM's consideration, in order to obtain information about the current regulations and policies that may apply to the proposal. Nothing in this appendix affects the authority of any Tribe or of the Bureau of Indian Affairs in any way. This RMP applies to federal lands as defined by the Federal Land Policy and Management Act (FLPMA), and does not apply to lands held in trust for any Tribe or for any individual Indian or Indians.

X.2. Definitions

Casual use (operations): "Casual use means activities involving practices that do not ordinarily lead to any appreciable disturbance or damage to lands, resources, or improvements. This term does not apply to private surface. Casual use includes surveying activities" (Onshore Oil and Gas Order No. 1, part II).

Lease: "means any contract, profitshare arrangement, joint venture or other agreement issued or approved by the United States under a mineral leasing law that authorizes exploration for, extraction of or removal of oil or gas" (Onshore Oil and Gas Order No. 1, part II).

Lease facility or production facility: "Production facilities means a lessee's or lease operator's pipes and equipment used on the leasehold to aid in extracting, processing, and storing oil and gas..." (64 Federal Register [FR] 32140). See also BLM Manual Section 2880 ("Mineral Leasing Act Rights-of-Way") at Page 9.

Lease site: "means any lands, including the surface of a severed mineral estate, on which exploration for, or extraction and removal of, oil or gas is authorized under a lease" (43 Code of Federal Regulations [CFR] 3160.0-5).

Lessee: "means any person holding record title or owning operating rights in a lease issued or approved by the United States" (43 CFR 3160.0-5).

Operator: "means any person or entity including but not limited to the lessee or operating rights owner, who has stated in writing to the authorized officer that it is responsible under the terms

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and conditions of the lease for the operations conducted on the leased lands or a portion thereof” (43 CFR 3160.0-5).

Public lands: “means any land and interest in land owned by the United States within the several States and administered by the Secretary of the Interior through the Bureau of Land Management...” (Federal Land Policy Management Act of 1976, Sec. 103(e)).

Private surface owner: “Private Surface Owner means a non- Federal or non-state owner of the surface estate and includes any Indian owner of surface estate not held in trust by the United States” (Onshore Oil and Gas Order No. 1, part II).

Split estate: “Split Estate means lands where the surface is owned by an entity or person other than the owner of the Federal or Indian oil and gas” (Onshore Oil and Gas Order No. 1, part II). “When tribal lands are held in trust or are subject to Federal restrictions against alienation the Bureau of Indian Affairs is the Surface Managing Agency, but if lands are held in unrestricted fee, those lands are treated the same as private surface” (Preamble to Onshore Oil and Gas Order No. 1 revisions, 72 FR 10322-10323, March 7, 2007).

Surface Managing Agency: “Surface Managing Agency means any Federal or state agency having jurisdiction over the surface overlying Federal or Indian oil and gas” (Onshore Oil and Gas Order No. 1, part II).

X.3. General

In considering and authorizing exploration and development of split estate federal oil and gas leases, the BLM prefers that the operator and split estate surface owner reach a Surface Access Agreement for proposed oil and gas operations. The BLM coordinates with both the operator and surface owner, in accordance with the requirements of Onshore Oil and Gas Order No. 1, and generally provides the surface owner’s lands the same level of resource (soil, water, vegetation, air, visual, cultural, etc.) protection as would be required on BLM-administered public lands.

“The BLM will offer the surface owner the same level of surface protection that the BLM provides on Federal surface. The BLM will not apply standards or conditions that exceed those that would normally be applied to Federal surface, even when requested by the surface owner” (The Gold Book, page 12).

Federal mineral lessees may enter onto a privately-owned surface to the extent necessary to explore and produce the federal minerals in compliance with the relevant statutes and BLM regulations and land use designations. The BLM does not have the authority to regulate a surface owner’s use of the surface estate, but does have the authority to regulate the activities of federal mineral lessees and mining claimants. The BLM adds lease stipulations to split estate federal oil and gas leases, in order to ensure that leasing decisions conform to the approved RMP for the area.

X.4. Operations

X.4.1 Geophysical

The BLM’s authority to permit geophysical operations is described under 43 CFR §3150.0-1:

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Geophysical exploration on public lands, the surface of which is administered by the Bureau, requires Bureau approval. The procedures in this part also apply to geophysical exploration conducted under the rights granted by any Federal oil and gas lease unless the surface is administered by the U.S. Forest Service. However, a lessee may elect to conduct exploration operations outside the rights granted by the lease, in which case authorization from the surface managing agency or surface owner may be required... The procedures of this part do not apply to... operations conducted on private surface overlying public lands unless such operations are conducted by a lessee under the rights granted by the Federal oil and gas lease...

As BLM Handbook H-3150-1¹ at pages 1–2 explains:

In those situations where Federal minerals are underlying private surface and the private surface owner's consent is obtained, the BLM is not to become involved. However, when landowner consent for access to the surface cannot be obtained for geophysical exploration operations on a Federal lease by the lease operator, the geophysical operation is to be authorized using the Sundry Notice process...²

When the geophysical exploration operator is the Federal lessee or designated operator of the lessee, it is to file a Sundry Notice... with the BLM and provide notification to the surface owner by certified mail that it intends to enter onto the lands and conduct lease operations. The lessee/operator must then submit proof to the BLM authorized officer that the surface owner has been notified. The lessee or operator must also submit proof to the BLM authorized officer that it has a current and adequate bond payable to the United States for use by the surface owner for damages caused during exploration operations. The authorized officer must give the surface owner 30 days to comment on the proposed action before approving the Sundry Notice.

When a surface access agreement is reached to conduct geophysical operations on split estate lands with leased or unleased federal oil and gas, the BLM does not become involved.

The BLM will not accept a NOI to Conduct Geophysical Operations (NOI), BLM Form 3150-4 or bond to permit entry to split estate lands with unleased federal oil and gas, since the BLM has not issued an oil and gas lease to allow for operations under 43 CFR Part 3160 (see 43 CFR 3150.0-1).

In order to conduct geophysical operations on split estate lands where a federal oil and gas lease has been issued and where an agreement with the surface owner has not been reached, the lessee or the operator must first obtain BLM authorization through an NOI that proposes entry to those lands in order to conduct geophysical operations. The lessee or designated operator must provide to the BLM a certification (see Attachment 1) that a good-faith effort was made to: (a) notify the landowner prior to entry; (b) obtain a Surface Access Agreement; and (c) deliver a copy of the proposed NOI to the surface owner.³ The NOI must also identify the surface owner and include the owner's name, address, and telephone number, if known. A good and sufficient bond to secure

¹Onshore Oil and Gas Geophysical Exploration Surface Management Requirements. January 9, 2007.

²In BLM Washington Office Instruction Memorandum (IM) 2009-121, "Approval of Notice of Intent (NOI) to Conduct Geophysical Exploration to Federal Oil and Gas Lessee on Split Estate", dated May 8, 2009, the BLM recognized that the Sundry Notice form (BLM Form 3160-5) is an imperfect form to use for permitting of geophysical operations. This policy clarified that the BLM will "no longer require the lessee or its operator to file a Sundry Notice" for the purpose of proposing entry to federal leases where a surface owner denies access to the lessee or its operator. In its place the BLM would use the NOI form (BLM Form 3150-4).

³See Onshore Oil and Gas Order No. 1, Part VI.

payment of applicable damages for the use and benefit of the surface owner must be provided to the BLM on BLM Form 3160-19. The lessee or designated operator must also submit to the BLM evidence of service of a copy of the bond upon the surface owner. Prior to authorizing the NOI proposing entry to the lands for which the bond has been submitted, the BLM notifies the surface owner and provides a 30-day period during which the surface owner may protest the sufficiency of the bond. If the sufficiency of the bond is protested, the BLM reviews the bond amount and determines if it is adequate. That decision by the BLM is subject to State Director Review upon a request by any adversely affected party and the State Director's decision is subject to appeal to the Interior Board of Land Appeals.⁴

X.4.2 Notice of Staking/Application for Permit to Drill

X.4.2.1 Surveying and Staking Activities

The lessee or operator is encouraged to contact the surface owner of split estate lands early in the process of planning for exploration and development of a federal lease. This facilitates early discussion about the goals and objectives of both the surface owner and operator. Communication between the lessee or operator and surface owner can reduce potential conflicts, thereby reducing misunderstandings and permit processing times.

For surveying and staking activities, “[t]he operator is responsible for making access arrangements with the appropriate Surface Managing Agency (other than the BLM and the FS) or private surface owner” (Onshore Oil and Gas Order No. 1, part III.D.2.a).

“No entry on split estate lands for surveying and staking should occur without the operator first making a good faith effort to notify the surface owner. Also, operators are encouraged to notify the BLM or the FS, as appropriate, before entering private lands to stake for Federal mineral estate locations” (Onshore Oil and Gas Order No. 1, part III.D.2.b).

Aside from surveying and staking the proposed well location, road, pipeline, and/or other lease facilities, the operator may also be required to conduct resource condition surveys of the leased lands.

“As provided in the oil and gas lease, the BLM may request that the applicant conduct surveys or otherwise provide information needed for the BLM's National Historic Preservation Act consultation with the State Historic Preservation Officer or Indian tribe or its Endangered Species Act consultation with the relevant fisheries agency. The Federal mineral lessee has the right to enter the property for this purpose, since it is a necessary prerequisite to development of the dominant mineral estate. Nevertheless, the lessee or operator should seek to reach agreement with the surface owner about the time and method by which any survey would be conducted” (Onshore Oil and Gas Order No. 1, part VI).

X.4.2.2 Onsite Inspection(s)

On split estate lands, the onsite inspection provides the opportunity for the BLM, operator, and surface owner to evaluate and discuss the proposed well location or lease facility in the field.

“Within 10 days of receiving the application, the BLM, in coordination with the operator and Surface Managing Agency, including the private surface owner in the case of split estate minerals,

⁴See 43 CFR §3165.3(b). See, e.g., *William P. Maycock*, 176 Interior Board of Land Appeals 206 (2008).

will schedule a date for the onsite inspection (unless the onsite inspection has already been conducted as part of a Notice of Staking)” (Onshore Oil and Gas Order No. 1, part III.E.2.a).

“On non-NFS lands, the BLM will invite the Surface Managing Agency and private surface owner, if applicable, to participate in the onsite inspection. If the surface is privately owned, the operator must furnish to the BLM the name, address, and telephone number of the surface owner if known” (Onshore Oil and Gas Order No. 1, part III.C).

At the onsite inspection, the BLM will consider applicable Best Management Practices (BMPs) that would avoid or mitigate environmental impacts to natural resources. The onsite inspection provides the surface owner with the opportunity to review the proposed well location and/or lease facilities; provide information to the BLM and operator about resources, improvements, and land uses; and express preferences for BMPs to be used for lease operations.

“All parties who attend the onsite inspection will jointly develop a list of resource concerns that the operator must address in the APD. The operator will be provided a list of these concerns either during the onsite inspection or within 7 days of the onsite inspection. Surface owner concerns will be considered to the extent practical within the law” (Onshore Oil and Gas Order No. 1, part III.C).

“The BLM will invite the surface owner to the onsite inspection to assure that their concerns are considered” (Onshore Oil and Gas Order No. 1, part VI).

X.4.2.3 Required Components of a Complete APD for Split Estate Operations

X.4.2.3.1 Description of Surface Ownership

A description of the surface ownership (with name, address, and telephone number, if known) along with a certification must be included in the APD submitted by the operator to the BLM.

“The operator must indicate (in a narrative) the surface ownership at the well location, and of all lands crossed by roads that the operator plans to construct or upgrade, including, if known, the name of the agency or owner, phone number, and address. The operator must certify that they have provided a copy of the Surface Use Plan of Operations required in this section to the private surface owner of the well site location, if applicable, or that they made a good faith effort if unable to provide the document to the surface owner” (Onshore Oil and Gas Order No. 1, part III.D.4.k).

X.4.2.3.2 Surface Access Agreement or Waiver

For operations on leased split estate lands, the operator must undertake a good faith effort to reach a Surface Access Agreement.

“[I]n the case of actual oil and gas operations, the operator must make a good faith effort to notify the private surface owner before entry and make a good faith effort to obtain a Surface Access Agreement from the surface owner... The Surface Access Agreement may include terms or conditions of use, be a waiver, or an agreement for compensation. The operator must certify to the BLM that: (1) It made a good faith effort to notify the surface owner before entry; and (2) That an agreement with the surface owner has been reached or that a good faith effort to reach an agreement failed” (Onshore Oil and Gas Order No. 1, part VI).

“The operator must make a good faith effort to provide a copy of their Surface Use Plan of Operations to the surface owner” (Onshore Oil and Gas Order No. 1, part VI). The operator must also provide a copy of any revisions to the Surface Use Plan of Operations to the surface owner. If required under Onshore Oil and Gas Order No. 6 (“Hydrogen Sulfide Operations”), the BLM requires the operator to provide a copy of the Public Protection Plan to the surface owner.

“The surface use agreement between the surface owner and the operator is confidential. However, the APD Surface Use Plan of Operations must contain sufficient detail about any aspects of the agreement necessary for NEPA documentation and to determine that the operations will be in compliance with laws, regulations, Onshore Orders, and agency policies” (The Gold Book, page 12).

“If the BLM’s requirements conflict with provisions in the Surface [Access] Agreement, the operator or surface owner should disclose that conflict at the onsite or to the BLM in writing, and the BLM should consider those conflicts in making its final decision” (BLM’s Split Estate Report to Congress at page 15). Thus, to the extent terms of the agreement may conflict with Conditions of Approval, or Conditions of Approval, to the APD, the BLM should be made aware of those terms, so that they can be considered in the BLM’s final decision.

“The BLM does not review the Surface Use Agreement and does not enforce portions of the Surface Use Agreement that are not contained within the approved APD” (BLM’s Split Estate Report to Congress at page 17).

X.4.2.3.3 Bonding In Lieu of a Surface Access Agreement or Waiver

It is the preference of the BLM that the operator and surface owner reach a Surface Access Agreement. However, in those cases where an agreement is not reached, the BLM follows the procedural requirements in the BLM’s regulations and policies. A good and sufficient bond to secure payment of applicable damages for the use and benefit of the surface owner must be provided to the BLM on BLM Form 3160-19. The lessee or designated operator must also submit to the BLM evidence of service of a copy of the bond upon the surface owner. Prior to authorizing the APD proposing entry to the lands for which the bond has been submitted, the BLM notifies the surface owner and provides a 30-day period during which the surface owner may protest the sufficiency of the bond. If the sufficiency of the bond is protested, the BLM reviews the bond amount and determine if it is adequate. That decision by the BLM is subject to State Director Review upon a request by any adversely affected party and the State Director’s decision is subject to appeal to the Interior Board of Land Appeals.⁵

“If no agreement was reached with the surface owner, the operator must submit an adequate bond (minimum of \$1,000) to the BLM for the benefit of the surface owner sufficient to: (1) Pay for loss or damages; or (2) As otherwise required by the specific statutory authority under which the surface was patented and the terms of the lease. Surface owners have the right to appeal the sufficiency of the bond. Before the approval of the APD, the BLM will make a good faith effort to contact the surface owner to assure that they understand their rights to appeal” (Onshore Oil and Gas Order No. 1, part VI).

“The bond amount will be reviewed by the BLM to assure that it is sufficient based on the appropriate law” (Preamble to Onshore Oil and Gas Order No. 1 revisions, 72 FR 10323, March 7, 2007).

If operations under an approved APD result in loss or damages that are compensable under the statutes by which the lands were patented, the surface owner may obtain judgment from a court of competent jurisdiction. The BLM will then release from the bond the amount ordered by the court to the surface owner.

⁵See 43 CFR §3165.3(b). See, e.g., *William P. Maycock*, 176 Interior Board of Land Appeals 206 (2008).

X.4.2.4 Approval of the APD

The BLM considers the views of the surface owner before approving the APD. The BLM must prepare an environmental record of review (43 CFR 3162.5-1(a)) to document its evaluation of potential resource impacts, including documentation of NEPA compliance.

“The BLM must comply with NEPA, the National Historic Preservation Act, the Endangered Species Act, and related Federal statutes when authorizing lease operations on split estate lands where the surface is not Federally owned and the oil and gas is Federal. For split estate lands within U.S. Forest Service (USFS) administrative boundaries, the BLM has the lead responsibility, unless there is a local BLM/USFS agreement that gives the USFS this responsibility” (Onshore Oil and Gas Order No. 1, part VI).

“After the APD is approved the operator must make a good faith effort to provide a copy of the Conditions of Approval to the surface owner. The APD approval is not contingent upon delivery of a copy of the Conditions of Approval to the surface owner” (Onshore Oil and Gas Order No. 1, part VI).

X.4.3 Sundry Notices

Operations proposed by Sundry Notice that will result in additional surface disturbance or re-disturbance of previously reclaimed areas require a Surface Use Plan of Operations.

“Prior to commencing any operation on the leasehold which will result in additional surface disturbance, other than those authorized under § 3162.3-1 or § 3162.3-2 of this title, the operator shall submit a proposal on Form 3160-5 to the authorized officer for approval. The proposal shall include a surface use plan of operations” (43 CFR 3162.3-3).

“The operator must certify on Form 3160-5 that they have made a good faith effort to provide a copy of any proposal involving new surface disturbance to the private surface owner in the case of split estate” (Onshore Oil and Gas Order No. 1, part VIII.A).

For review of Final Abandonment Notices (FANs) submitted by an operator on split estate lands, the BLM will consider the views of the surface owner.

“If applicable, the private surface owner will be notified and their views will be carefully considered” (Onshore Oil and Gas Order No. 1, part XII).

“In cases where the Surface Managing Agency or private surface owner desires to acquire an oil and gas well and convert it to a water supply well or acquire a water supply well that was drilled by the operator to support lease operations, the Surface Managing Agency or private surface owner must inform the appropriate BLM office of its intent before the approval of the APD in the case of a dry hole and no later than the time a NOI to Abandon is submitted for a depleted production well... The Surface Managing Agency or private surface owner must reach agreement with the operator as to the satisfactory completion of reclamation operations before the BLM will approve any abandonment or reclamation. The BLM approval of the partial abandonment under this section, completion of any required reclamation operations, and the signed release agreement will relieve the operator of further obligation for the well. If the Surface Managing Agency or private surface owner acquires the well for water use purposes, the party acquiring the well assumes liability for the well” (Onshore Oil and Gas Order No. 1, part IX.B).

“Completion of a well as plugged and abandoned may also include conditioning the well as water supply source for lease operations or for use by the surface owner or appropriate Government Agency, when authorized by the authorized officer. All costs over and above the normal plugging and abandonment expense will be paid by the party accepting the water well” (43 CFR 3162.3-4(b)).

X.4.4 Emergency Operations

“In the event of an emergency, the operator may take immediate action without prior Surface Managing Agency approval to safeguard life or to prevent significant environmental degradation. The BLM or the USFS must receive notification of the emergency situation and the remedial action taken by the operator as soon as possible, but not later than 24 hours after the emergency occurred. If the emergency only affected drilling operations and had no surface impacts, only the BLM must be notified. If the emergency involved surface resources on other Surface Managing Agency lands, the operator should also notify the Surface Managing Agency and private surface owner within 24 hours” (Onshore Oil and Gas Order No. 1, part IV.d).

X.5. References

- Onshore Oil and Gas Order No. 1
- Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (“The Gold Book”)
- 43 CFR Part 3150
- 43 CFR Part 3160
- 43 CFR Subpart 3814
- BLM Wyoming – Wyoming Oil and Gas Conservation Commission Memorandum of Understanding
- BLM Handbook H-3150-1 (Geophysical Handbook)
- BLM Form 3160-019 (“Bond For Surface Owner Protection”)
- BLM Brochure: Split Estate – Rights, Responsibilities, and Opportunities
- BLM Brochure: Split Estate – Cultural Resource Requirements on Private Surface – Federal Minerals for Oil and Gas Development
- BLM-Washington Office Instruction Memorandum 2003-131 (“Permitting Oil and Gas on Split Estate Lands and Guidance for Onshore Oil and Gas Order No. 1”), April 2, 2003.
- BLM-Washington Office Instruction Memorandum 2007-165 (“Split Estate Report to Congress – Implementation of Fluid Mineral Leasing and Land Use Planning Recommendations”), July 26, 2007.
- Energy Policy Act of 2005, Section. 1835 (“Split-Estate Federal Oil and Gas Leasing and Development Practices”).

- Energy Policy Act of 2005 – Section 1835 – A Report to Congress (December 2006).
- BLM-Washington Office Instruction Memorandum 1989-201 (“Legal Responsibilities of BLM for Oil and Gas Leasing and Operations on Split Estate Lands”), January 4, 1989.

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Appendix Y. Comment Analysis

Note: This appendix was added following the release of the Buffalo Draft Resource Management Plan and Environmental Impact Statement.

Y.1. Introduction

On June 28, 2013, the Bureau of Land Management (BLM) published the Notice of Availability (NOA) in the Federal Register announcing the release of the Draft Resource Management Plan (RMP) and Environmental Impact Statement (EIS) for the Buffalo Field Office planning area. The NOA initiated the 90-day public comment period. The public comment period ended on September 26, 2013. During the public comment period, the BLM hosted four public meetings in August 2013, in towns and cities throughout the planning area. At the public meetings, the BLM gave a formal presentation on the RMP revision, encouraged meeting attendees to comment on the Draft RMP and EIS, and Interdisciplinary Team members were available to answer questions from the public.

During the public comment period, the BLM received 134 unique comment documents and 2,143 form letters. This report summarizes the full range of issues and concerns as submitted by the public during the comment period. The submitted comments and summaries presented in this report do not necessarily represent the sentiments of the public as a whole. However, this summary does attempt to provide fair representation of the wide range of views submitted during the public comment period. Comment analysis is a process that allows the BLM to review and consider received comments, develop appropriate responses, revise the Draft RMP and EIS in response to comments, and support the BLM's decision-making process.

The remainder of this report is organized as follows:

- **Comment Analysis Process** – Describes how the BLM received, recorded, and categorized comment documents and comments.
- **Commenter Demographics** – Presents demographic information associated with submitted comment documents, including geography and affiliation of commenters.
- **Analysis of Comments** – Provides a breakdown of the number of comments received by issue category, a summary of comments received, and a summary of the BLM's response to comments received.
- **Attachment A: Commenter Index** – Includes instructions on how to use the tables in Attachment A and Attachment B. It also includes an index listing the names of all commenters and their associated comment document number. Attachment A is provided on the Buffalo RMP website: <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo.html>.
- **Attachment B: Individual Comments and Issue Categories** – Includes all substantive public comments received during the public comment period along with issue categories to help users find the associated comment and response summaries. Attachment B is provided on the Buffalo RMP website: <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo.html>.

Y.2. Comment Analysis Process

The BLM used a systematic process to compile, categorize, and evaluate written comments from individuals, federal and state agencies, Tribal governments, elected representatives, and other organizations on the Draft RMP and EIS to identify substantive issues for review and response by

BLM decision-makers. The comment analysis process provides a methodical approach for the BLM to revise text in the Draft RMP and EIS based on comments provided during the public comment period. Additionally, through the comment analysis process, the BLM supplemented the project mailing list, and compiled demographic information on the geographic distribution of commenters.

Public comment documents include hardcopy comments received at the public meetings, and electronic or written comment documents postmarked within the 90-day public comment period. Methods of comment document submittal included U.S. mail, email, and electronic submission through ePlanning. All individuals attending public meetings were encouraged to submit comments in writing. The entire written submission from a commenter (e.g., full letter or email) is referred to as a "public comment document;" an individual and identifiable substantive expression of interest or issue statement included in a public comment document is referred to as a "comment." For example, a letter (i.e., public comment document) received within the public comment period might have included one or more separate comments. "Commenter" refers to the individual or organization who submitted the comment document.

Y.2.1. Analysis Process

The BLM comment analysis team used the software program CommentWorks®, an online comment tracking and analysis platform, to catalogue, number, review, categorize, and respond to public comments on the Draft RMP and EIS.

Upon receipt of a public comment document, a member of the comment analysis team logged the comment document into a comment tracking spreadsheet, assigned the document a unique identifier (e.g., Document 1001), and converted the comment document to a searchable electronic (i.e., PDF) document. The analysis team then added all pertinent commenter information (e.g., name, affiliation, address, and type of comment document) into CommentWorks® and uploaded the electronic documents to the system.

The first step in the analysis process was to identify individual substantive comments within a public comment document. The comment analysis team identified each substantive comment based on guidance in the BLM National Environmental Policy Act (NEPA) Handbook (H-1790-1). Substantive comments are those that do one or more of the following:

- Question, with reasonable basis, the accuracy of information in the RMP and EIS
- Question, with reasonable basis, the adequacy of, methodology for, or assumptions used for the environmental analysis
- Present new information relevant to the analysis
- Present reasonable alternatives other than those analyzed in the RMP and EIS
- Cause changes or revisions in one or more of the alternatives

Comments not considered substantive included the following:

- Comments in favor of or against the Proposed Action or alternatives without reasoning that meet the substantive comment criteria listed above
- Comments that only agree or disagree with BLM policy or resource decisions without justification or supporting data that meet the substantive criteria listed above
- Comments that do not pertain to the planning area or scope of the RMP and EIS
- Comments that take the form of vague, open-ended questions

The analysis team established an issue coding structure for all substantive comments within CommentWorks® and used the coding structure to bracket and sort comments into logical groups or issue categories (e.g., air quality, cumulative impacts, and cultural resources). Table Y.1, “Issue Categories” (p. 2673) lists all issue categories identified for the Draft RMP and EIS.

Table Y.1. Issue Categories

Issue Categories		
Air Resources	Irreversible and Irretrievable Commitment of Resources	Rights-of-Way and Corridors
Areas of Critical Environmental Concern	Lands and Realty	Riparian-Wetland
Cave and Karst	Laws, Regulations, Guidance, and Process	Salable Minerals
Climate Change	Leasable Minerals – Coal	Socioeconomic Resources
Consultation	Leasable Minerals – Fluids	Soil
Cultural Resources	Leasable Minerals – Other	Special Status Species
Cumulative Impacts	Livestock Grazing Management	Travel and Transportation Management
Edit Grammar, Punctuation, Spelling, and Readability	Locatable Minerals	Tribal Treaty Rights
Environmental Justice	Methods and Assumptions	Unavoidable Adverse Impacts
Extension Request	Minerals - General	Vegetation
Fire and Fuels Management	National Environmental Policy Act	Visual Resource Management
Fish	Out of Scope	Water
Federal Land Policy and Management Act	Paleontological	Wilderness Characteristics
Greater Sage-Grouse	Planning Issues	Wild and Scenic Rivers
Health and Safety	Recreation	Wilderness Study Areas
Invasive Species, including Non-native and Pest Species	Renewable Energy	Wildlife

The BLM Interdisciplinary Team reviewed individual comments after the comments were assigned to an issue category and provided direction to develop a response. The comment analysis team then used the individual comments and Interdisciplinary Team direction to analyze, group, and summarize comments, and to develop responses to the summary comments.

When reviewing comments, the analysis team looked not only for each action or change requested by the public, but also for any supporting information to capture the comment and its context in its entirety. In doing so, paragraphs within a comment document might have been divided into several comments because the paragraphs contained more than one comment; conversely, multiple sections of a comment document might have been combined to form one coherent comment.

It is important to note that during the process of identifying individual comments and concerns, the BLM treated all comments equally. The BLM did not weigh comments based on organizational affiliation or status of commenters, and the number of duplicate comments did not increase the priority or merit of one comment over another. The process was not one of "counting votes," and the BLM did not make any effort to tabulate the exact number of people for or against any given aspect of the Draft RMP and EIS. Rather, the BLM focused on an understanding of the content of a comment, how it related to the Draft RMP and EIS, and appropriate responses and revisions to the Draft RMP and EIS.

Y.3. Commenter Demographic

This section summarizes commenter demographics based on information provided in comment documents. Demographic analysis allows the BLM to form an overall picture of issues, and a better understanding of who is submitting comments, the geographic distribution of commenters, their affiliations, and the format of the public comment documents.

Y.3.1. Geographic Representation

The BLM tracked the geographic representation for each comment document that included such information. Table Y.2, “Number of Comment Documents by Geographic Location” (p. 2674) identifies the number of comment documents received from individual geographic locations (excluding form letters). Figure Y.1, “Number of Comment Documents by Geography” (p. 2676) depicts the geographic distribution of comment documents received from within the planning area, from outside the planning area but within the State of Wyoming, and from outside Wyoming. The BLM received the most comment documents from commenters outside the planning area.

Table Y.2. Number of Comment Documents by Geographic Location

State	City	Number of Comment Documents
Alberta	Calgary	1
California	Carlsbad	1
California	Corte Madera	1
California	Redwood City	1
Colorado	Denver	11
Colorado	Fort Collins	1
Colorado	Grand Junction	1
Colorado	Ridgeway	1
District of Columbia	Washington	2
Georgia	Atlanta	1
Idaho	Boise	1
Idaho	Hailey	1
Idaho	Ketchum	1
Illinois	Murphysboro	1
Kansas	Lawrence	1
Massachusetts	Wellesley	1
Maryland	Rockville	1
Montana	Billings	1
Montana	Bozeman	2
North Dakota	Bismarck	1
New Jersey	Galloway	1
New Mexico	Santa Fe	1
New Mexico	Taos	1
New York	Brooklyn	1
Ohio	Cardon	1
Oklahoma	Oklahoma City	1
Oregon	Baker City	1
Oregon	Eugene	2
Oregon	Portland	1
Pennsylvania	Philadelphia	1
South Dakota	Black Hawk	1

State	City	Number of Comment Documents
Tennessee	Gatlinburg	1
Utah	Logan	2
Utah	Salt Lake City	2
Washington	Blaine	1
Washington	Deer Harbor	1
Washington	La Conner	1
Washington	Richland	1
Wyoming	Big Horn	3
Wyoming	Buffalo	4
Wyoming	Casper	4
Wyoming	Cheyenne	8
Wyoming	Cody	2
Wyoming	Douglas	3
Wyoming	Gillette	7
Wyoming	Glenrock	1
Wyoming	Kaycee	6
Wyoming	Lander	5
Wyoming	Laramie	1
Wyoming	Pavilion	1
Wyoming	Rock Springs	1
Wyoming	Sheridan	12
Wyoming	Wright	1
Unknown	-	22
Total	-	134
Note: Comments received through email that did not include mailing addresses or geographic representation accounted for 22 submissions. Note: Form letters were counted once based on the geographic location of the originating entity for the master form letter.		

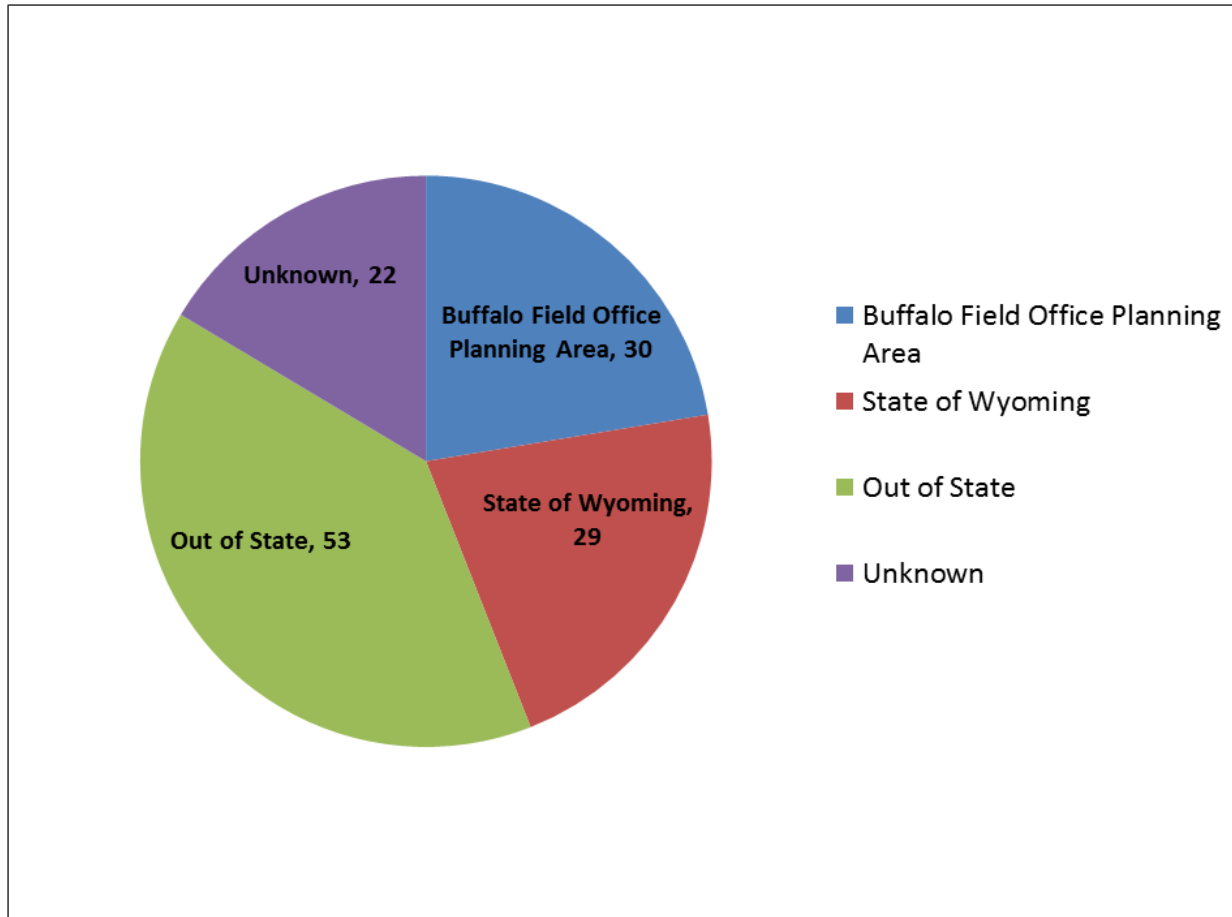


Figure Y.1. Number of Comment Documents by Geography

Note: Comments received through email that did not include mailing addresses or geographic representation accounted for 22 submissions. Note: Form letters were counted once based on the geographic location of the originating entity for the master form letter.

Y.3.2. Organizational Affiliation

The BLM received comments from a range of entities, as listed in Table Y.3, “Number of Comment Documents by Affiliation (excluding form letters)” (p. 2676) and shown on Figure Y.2, “Number of Comment Documents by Affiliation” (p. 2677). The BLM affiliated comment documents with a government or non-governmental organization if the comment document was received on official letterhead or was received through an official agency or organization email address. The BLM classified all other comment documents as unaffiliated individuals. The BLM received the most comment documents from unaffiliated individuals.

Table Y.3. Number of Comment Documents by Affiliation (excluding form letters)

Affiliation	Number of Public Response Documents
Federal Agency	6
State Agency	7
Local Government	7
Non-Governmental Organization	35
Private Industry	24

Affiliation	Number of Public Response Documents
Unaffiliated Individual	55
Total	134

Note: Form letters were counted once based on the geographic location of the originating entity for the master form letter.

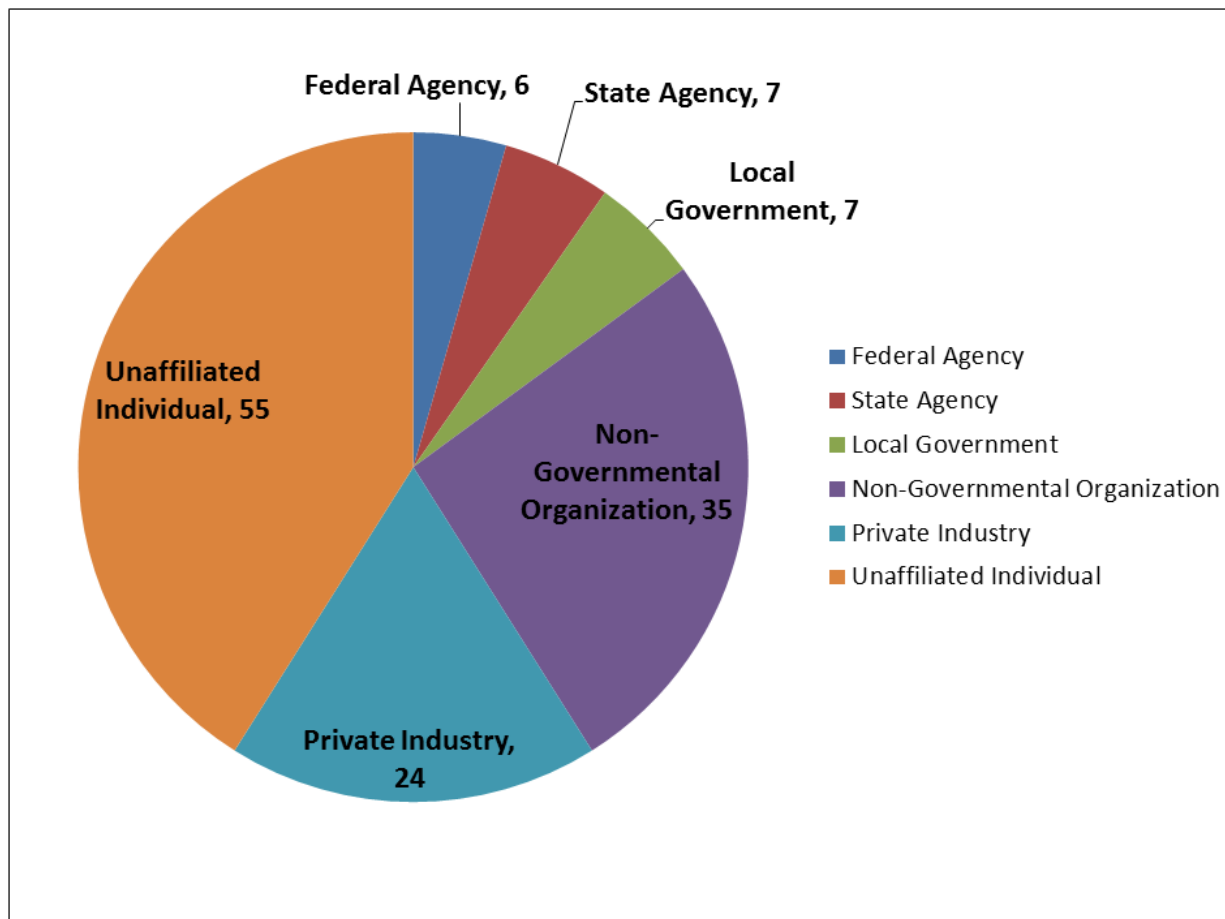


Figure Y.2. Number of Comment Documents by Affiliation

Y.3.3. Public Comment Document Method of Delivery

The BLM received comment documents through a variety of delivery methods, as listed in Table Y.4, “Number of Public Comment Documents by Method of Delivery” (p. 2677). The BLM received the most comment documents through email (101) and U.S. mail (32).

Table Y.4. Number of Public Comment Documents by Method of Delivery

Method of Delivery	Number
Email	101
U.S. Mail	32
ePlanning	1
Fax	0
Total	134

Y.3.4. Form Letters

The BLM received approximately 2,143 form letters. Form letters are standardized and duplicated letters that contain the same text or portions of text and comments. The BLM reviewed the form letters and extracted and analyzed any comments unique and supplemental to the form letter; however, the BLM considered comments with the same text as one comment. The BLM designated the first form letter from each originating entity as the “master” comment document and reviewed each subsequent form letter to ensure the content was identical to the master comment document. The BLM received form letters from at least 2 entities, for a total of 2 master comment documents, BFO-1030 and BFO-1115. The BLM received 1 form letter via U.S. mail; all other form letters arrived via email. When form letters included additional text, the BLM reviewed and processed them if they contained substantive individual comments.

Y.4. Analysis of Comments

The 134 public comment documents contained substantive and non-substantive comments. Representative non-substantive comments included requests to be added to the project mailing list, requests for a copy of the Draft RMP and EIS, personal preference or opinion, unsupported comments and questions, and comments that do not pertain to the Draft RMP and EIS.

In accordance with the BLM NEPA Handbook (H-1790-1), the BLM analyzed and responded to comments on the Buffalo Draft RMP and EIS if they were substantive and related to inadequacies or inaccuracies in the analysis or methodologies used; identified new impacts or recommended reasonable new alternatives or mitigation measures; or involved substantive disagreements on interpretations of significance. (See 40 Code of Federal Regulations 1502.19, 1503.3, 1503.4, 1506.6, and 516 DM 4.17). BLM NEPA Handbook (H-1790-1) identifies the following comment category examples and appropriate responses:

Substantive Comments

- **Question, with a reasonable basis, the accuracy of the information in the EIS.** Factual corrections should be made in the Proposed RMP and Final EIS in response to comments that identify inaccuracies or discrepancies in factual information, data, or analysis.
- **Question, with a reasonable basis, the adequacy of environmental analysis as presented.** Comments that express a professional disagreement with the conclusions of the analysis or assert that the analysis is inadequate might or might not lead to changes in the EIS. Interpretations of analyses should be based on professional expertise. Where there is disagreement within a professional discipline, a careful review of the various interpretations is warranted. In some cases, public comments might necessitate an evaluation of analytical conclusions. If, after reevaluation, the manager responsible for preparing the EIS does not think a change is warranted, the response should provide the rationale for that conclusion.
- **Identify New Impacts, Alternatives, or Mitigation Measures.** If public comments on a Draft RMP and EIS identify impacts, alternatives, or mitigation measures that were not addressed in the draft, the manager responsible for preparing the RMP and EIS should determine if they warrant further consideration. If they do, that manager must determine whether the new impacts, new alternatives, or new mitigation measures should be analyzed in either the Proposed RMP and Final EIS, a supplement to the Draft RMP and EIS, or a completely revised and recirculated Draft RMP and EIS.
- **Disagree with Significance Determinations.** Comments might directly or indirectly question determinations regarding the significance or severity of impacts. A reevaluation of these

determinations could be warranted and might lead to changes in the Proposed RMP and Final EIS. If, after reevaluation, the manager responsible for preparing the EIS does not think a change is warranted, the response should provide the rationale for that conclusion.

Non- Substantive Comments

- **Express Personal Preferences.** Comments that express personal preferences or opinions on the proposal do not require further agency action. They are summarized whenever possible and brought to the attention of the manager responsible for preparing the RMP and EIS. Although personal preferences and opinions might influence the final selection of the agency's preferred action, they generally will not affect the analysis.
- **Other.** In addition to the five categories from the NEPA Handbook described above, the BLM added a sixth category named “other” which includes requests for copies of the Draft RMP and EIS, requests to be added to the project mailing list, and comments outside the scope of the RMP and EIS. These comments are considered non-substantive and do not require further agency action.

Y.4.1. Comment Submittals by Issue Category

Within the 134 received comment documents, the BLM identified 2,142 individual substantive comments covering a broad range of issue categories. The greatest number of substantive comments was associated with Greater Sage-Grouse (482), Air Resources (197), and Fish and Wildlife (181). Attachment A includes an index for users to identify their comment documents, and Attachment B includes all individual substantive comments and the issue category for each comment that can be used to identify the corresponding BLM comment and response summary. Both attachments are located on the Buffalo RMP website: <http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo.html>. Table Y.5, “Number of Comments per Issue Category” (p. 2679) and Figure Y.3, “Number of Individual Comments by Issue Category” (p. 2681) identify the number of comments submitted by issue category.

Table Y.5. Number of Comments per Issue Category

Issue Category	Number of Comments Per Issue Category
Air Resources	197
Areas of Critical Environmental Concern (ACECs)	93
Cave and Karst	2
Climate Change	24
Cultural	69
Cumulative Impacts	16
Edit: Grammar, Punctuation, Spelling, and Readability	25
Extension Request	1
Fire and Fuels Management	17
Fish and Wildlife	181
Federal Land Policy and Management Act (FLPMA)	15
Greater Sage-Grouse	482
Health and Safety	4
Lands and Realty	7
Laws, Regulations, Guidance, and Process	26
Leasable Minerals – Coal	67
Leasable Minerals – Fluids	180
Livestock Grazing Management	75
Locatable Minerals	32

Issue Category	Number of Comments Per Issue Category
Minerals – General	7
Mitigation Measures	21
National Byways	4
National Environmental Policy Act (NEPA)	25
Paleontological	3
Range of Alternatives	16
Recreation	66
Renewable Energy	2
Rights-of-Way and Corridors	36
Riparian-Wetland	20
Scoping Process	1
Socioeconomic	63
Soil	62
Special Status Species	56
Travel and Transportation Management	22
Vegetation	9
Visual Resource Management	60
Water	101
Wild and Scenic Rivers	1
Wilderness Characteristics	39
Wilderness Study Areas	15
Total	2,142
Note: Duplicative comments in form letters were only counted once.	

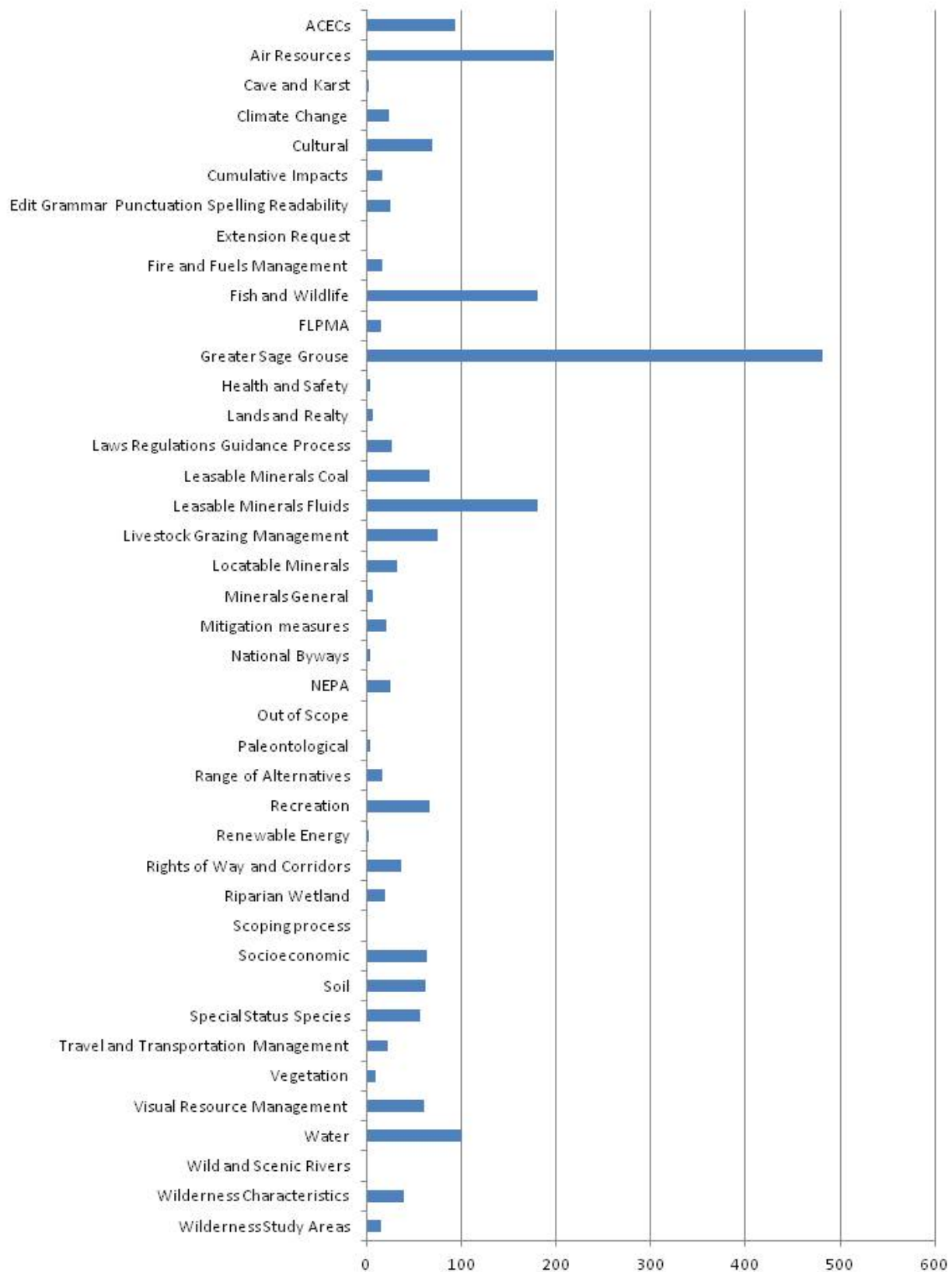


Figure Y.3. Number of Individual Comments by Issue Category

Y.4.2. Substantive Comment Summary and Response

To provide a user-friendly method of understanding the broad themes and topics of concern expressed in the substantive comments, the BLM grouped individual comments with similar topics and concerns and developed 111 summary comments and responses. Table Y.6, “Comment and Response Summaries” (p. 2683) lists the 111 summary comments and responses generally organized by BLM resource program and other appropriate issue categories (e.g., extension and hard copy requests), as described in Table Y.1, “Issue Categories” (p. 2673). The issue categories in Table Y.6, “Comment and Response Summaries” (p. 2683) can be used to track the summary comment and response to the individual comments presented in Attachment B.

Table Y.6. Comment and Response Summaries

Issue Category	Summary Number	Summary Comment	Summary Response
National Environmental Policy Act (NEPA)	1000-1	In order to avoid inconsistencies with Bureau of Land Management's (BLM's) policy and public confusion, commenters requested the Resource Management Plan (RMP) be modified to recognize that Wyoming's split estate law does not apply to situations where the mineral estate is owned by the federal government, and that statute and regulations implementing the statute are limited in application to state and private mineral estate.	The Proposed RMP complies with all applicable laws, regulations, and policies.
NEPA	1000-2	Commenters requested that county land use plans be considered in the design of the alternatives, analyses of specific resources, and to avoid duplication of protection measures for specific resources. Commenters requested the RMP recognize the Thunder Basin Grasslands Association's conservation strategy as an adaptive conservation and management strategy.	BLM crafted the management actions with the assistance of the Cooperating Agencies which included the three counties. Local plans were considered during alternative development, including the Thunder Basin Grasslands Association's conservation strategy.
Scoping Process	1001-1	The commenters requested further information regarding how scoping comments were addressed by the BLM, and the criteria used to determine if they were in or outside the scope of the Environmental Impact Statement (EIS).	Section 1.3.1 (Planning Process) and Section 2.3 (Alternatives Development Process) explain how scoping comments were addressed by BLM and the criteria used to determine whether were in the RMP's scope.
Range of Alternatives	1002-1	Commenters requested further explanation of the acreage of surface disturbance between the alternatives.	BLM actions can influence non-federal actions. For example, if an area is predominantly federal fluid minerals and BLM has closed the area to leasing the economic attraction of the non-federal minerals would be affected. See Appendix G (p. 1937) for specific activities. Most activities do identify greater foreseeable acreage affected in Alternative C than D. However, some activities such as habitat restoration forecast more activity under Alternative D (77,560 acres of Greater Sage-Grouse habitat restoration) than C (none).

Issue Category	Summary Number	Summary Comment	Summary Response
Range of Alternatives	1002-2	Commenters expressed concern that the BLM failed to consider a full range of reasonable alternatives for analysis. Specifically, commenters requested the BLM consider and analyze an alternative that would reduce energy development or otherwise prevent impacts to water, air, and land resources, a “no grazing” alternative, and a “50% reduction in grazing” alternative to address the presence of endangered, special status, and sensitive species in the planning area.	<p>The BLM developed and analyzed alternatives in the Proposed RMP and Final EIS using the best available information and in compliance with federal laws, guidelines, and policies.</p> <p>The purpose of the RMP, as explained in Section 1.21, is to provide direction for managing public lands in accordance with BLM’s multiple use mandate. Recognizing the Nation’s need for domestic sources of minerals, food, timber, and fiber, and incorporating the requirements of the Energy Policy Act of 2005 (Pub. L. 2005) are examples of the multiple uses BLM accommodates. Section 2.6, “Alternatives Considered, but not Carried Forward for Detailed Analysis” (p. 94) describes alternatives the BLM considered but did not carry forward for detailed analysis including no livestock grazing and administrative closures to mineral development. These alternatives generally did not meet the purposes and need of the RMP, did not recognize valid existing rights, or, in the case of no livestock grazing, and were determined by the BLM to not be warranted based on the evaluation of resource conditions and conflicts.</p>
Range of Alternatives	1002-3	Commenters requested additional information as to why a phased development alternative was rejected from detailed analysis and why Alternative B was not selected. Commenters generally requested the BLM to consider specific aspects of Alternative B, such as preventing development in poor reclamation suitability areas, as part of a new Preferred Alternative.	The primary purpose of the RMP is to identify where fluid mineral development is appropriate, not to determine how or at what rate fluid minerals could be developed. In addition to the reasons identified in the <i>Alternatives not Carried Forward for Detailed Analysis</i> section (Section 2.42), phased development was not considered because an RMP is foremost an allocation document.

Issue Category	Summary Number	Summary Comment	Summary Response
Mitigation Measures	1003-1	Commenters requested that BLM re-evaluate its definition and use of “mitigation” for cultural resources throughout the document.	BLM clarified the definition of “mitigation” to indicate that adverse effects to historic properties must be resolved prior to project approval "to develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize or mitigate adverse effects on historic properties" (36 Code of Federal Regulations [CFR] 800.6(a)) and that minimization is not the same as mitigation.
Mitigation Measures	1003-2	Commenters generally supported mitigation measures that can be applied on private lands that result in no loss of long-term landowner management sovereignty. Commenters supported the assessment of funds from energy developers to be invested in Term Limit Habitat Contract Accounts when substantial adverse impacts to wildlife and associated habitats cannot be avoided. Commenters supported the non-federal government purchase of deeded lands as a secondary conservation/mitigation response.	For those impacts that cannot be sufficiently avoided or minimized onsite, the BLM will implement effective measures to offset (or compensate for) such impacts. A mitigation strategy for BLM-administered lands will comply with BLM’s Regional Mitigation Manual Section (MS) 1794.
Mitigation Measures	1003-3	Commenters requested that monitoring and adaptive management plans should link to the mitigation obligations established through regional mitigation plans or individual projects and must measure the effectiveness attributable to actions required for compensatory mitigation.	For those impacts that cannot be sufficiently avoided or minimized onsite, the BLM will implement effective measures to offset (or compensate for) such impacts. A mitigation strategy for BLM-administered lands will comply with BLM’s Regional Mitigation Manual Section (MS) 1794.
Mitigation Measures	1003-4	Commenters requested the BLM develop regional conservation mitigation plans for each geographic area, pooling habitat conservation resources and targeting conservation efforts in high priority areas.	Wyoming BLM will coordinate with the State of Wyoming in implementation planning to develop a statewide adaptive management plan and a framework to evaluate causal factors. The adaptive management plan will identify adaptive management triggers; indicators to be measured; and appropriate effective mitigation, restoration, and reclamation actions, including targets and benchmarks for responses. The plan will include both short-term and long-term monitoring. The adaptive management plan will guide the development of project level adaptive management strategies.

Issue Category	Summary Number	Summary Comment	Summary Response
Extension Requests	1004-1	Commenter requested that the BLM extend the comment period by 45 days to allow more time to review and comment on the Draft RMP and EIS.	The public comment period for the plan is consistent with BLM regulations and policy. BLM is committed to maintaining the 90-day public comment period in order to meet the court-ordered deadline for the U.S. Fish and Wildlife Service to reach a final determination on listing the Greater Sage-Grouse under the Endangered Species Act (ESA). Given the critical and time-sensitive nature of planning issues related to Greater Sage-Grouse, the BLM will be unable to extend the 90-day public comment period.
Federal Land Management and Policy Act (FLPMA)	1005-1	Commenters asserted that Alternative D exceeds BLM's authority under FLPMA by incorporating management actions that would restrict development and activities on private land, indicating FLPMA authorizes the BLM to regulate air quality, and by suggesting areas are closed to oil and gas leasing, which is effectively a withdrawal under FLPMA. Commenters stated the BLM should clarify that only the Secretary of the Interior could withdraw the entire planning area for oil and gas leasing under FLPMA and there are specific procedures under FLPMA for withdrawals. Commenters indicated that Alternative D should not be selected because it would result in unnecessary or undue degradation of public lands and under FLPMA, this should not occur.	BLM is responsible for allocating where mineral resources can be leased; BLM does not regulate where a lessee sells the mineral resources that it has leased, much of which is used domestically. The Draft RMP did not indicate that BLM regulated air quality. Decisions made in the RMP are limited to BLM-administered lands (surface and minerals). BLM acknowledges their decisions may influence activities on non-federal lands but the purpose of the RMP is not to limit development on private lands. The BLM is authorized to close areas to oil and gas leasing in the planning process, no withdrawal is necessary. The commenters' suggestion that a withdrawal is required is legally incorrect. In addition, Alternative D includes sufficient resource protections to prevent unnecessary and undue degradation of public lands.
FLPMA	1005-2	Commenters requested the BLM assess whether allowing coal leasing for coal aimed at export markets meets Congressional directives under the 2005 Energy Policy Act and what the impact is to our national energy and economic security. Commenters also requested the BLM fully assess environmental and socioeconomic impacts related to coal exports.	BLM is responsible for allocating where mineral resources can be leased; BLM does not regulate where a lessee sells the mineral resources that it has leased, much of which is used domestically. Therefore, it is not appropriate for BLM to address impacts related to coal exports.

Issue Category	Summary Number	Summary Comment	Summary Response
Laws, Regulations, Guidance, Process	1006-1	Commenters expressed general concern of various management actions in regards to split estate lands. Commenters requested that BLM require additional bonding from oil and gas companies for use in compensating landowner if their private lands are being irreparably damaged.	Decisions made in the RMP are limited to BLM-administered lands (surface and minerals). BLM acknowledges that its decisions may influence activities on non-federal lands but the purpose of the RMP is not to limit development on private lands. Additional bonding and landowner consent are national level issues which are beyond the scope of the Buffalo RMP. In addition they are implementation level practices not at the allocation level which is the focus of the RMP.
Laws, Regulations, Guidance, Process	1006-2	Commenters requested that BLM provide better documentation of relevant regulatory (CFR), state, and federal law citations that enable the actions presented in the document.	Footnotes have been added to reference those actions that the BLM authorizes. In addition, both current Wyoming Greater Sage-Grouse executive orders and the current BLM Greater Sage-Grouse policies have been added to the new data section.
Laws, Regulations, Guidance, Process	1006-3	Commenters stated that BLM needs greater flexibility in order to manage public lands encumbered by existing leases, permits, grants, and other authorizations such as related to bonding and landowner consent on reclamation requirements.	The BLM Field Office level is bound by the national bonding regulations and does not have the ability to increase bond requirements. The regulations include a process to assess risk and ensure proper bonding on a case by case basis. Bond amount are periodically reviewed. BLM is committed to work with landowners and consider their views on reclamation requirements as required by Onshore Order #1.

Issue Category	Summary Number	Summary Comment	Summary Response
Laws, Regulations, Guidance, Process	1006-4	<p>Some commenters asserted that BLM failed to properly undertake or complete the Area of Critical Environmental Concern (ACEC) designation process, and continued to state that they did not agree with using the designation of the ACECs as a means to enforce management prescriptions on private surface lands.</p> <p>Commenters requested that the RMP recognize the Thunder Basin Grassland Prairie Ecosystem Association Candidate Conservation Agreement (CCA)/Conservation Agreement as an adaptive conservation and management strategy that meets the stated goals and objectives of the RMP.</p>	<p>The ACEC evaluation forms were included as Appendix S (p. 2531) in the Draft RMP. BLM worked with cooperating agencies involving designation of ACECs.</p> <p>BLM can identify the Thunder Basin (and Statewide Greater Sage-Grouse) CCA as a source of BMPs (discretionary mitigation measures). However, if the measures from a draft CCA are included in the BLM's RMP as required management actions, those measures are automatically no longer considered appropriate for the CCA because they are a required element of the authorized agency's guiding document. CCAs and Candidate Conservation Agreements with Assurances are by their very definition, voluntary, so to include measures in the agreements that are required would be counter to the objectives of the agreement.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Cumulative Impacts	1007-1	<p>Commenters recommended that the BLM further analyze cumulative impacts regarding multiple resources, resource uses, socioeconomic conditions, and special designation areas. Specifically, commenters requested a higher degree of analysis of cumulative impacts to soil, wildlife habitats, air quality, and surface and groundwater quality and quantity from the combined impacts of fracking, coalbed natural gas (CBNG), uranium, and coal occurring in close proximity to each other.</p>	<p>Cumulative impacts included those impacts on the environment that resulted from the incremental impact of the action added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions (40 CFR 1508.7). CEQ guidance directs cumulative impact analysis to focus on important issues of national, regional, or local significance. This analysis focuses on RMP actions that, when combined with other past, present, and reasonably foreseeable future actions, would collectively be significant. Not all issues identified for direct or indirect impact assessment in the RMP are analyzed for cumulative effects.</p> <p>Because of the wide geographic scope of a cumulative impact assessment and the variety of activities assessed, cumulative impacts are commonly examined at a more qualitative and less detailed level than are direct and indirect impacts. Public documents prepared by federal, state, and local government agencies are the primary sources of information regarding past, present, and future actions considered in the cumulative effects analysis.</p> <p>The reader should also review Appendix G (p. 1937) where foreseeable development is identified by individual resource.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Air Resources	1008-1	Commenters questioned the authority of the BLM to regulate air quality in the region and the State of Wyoming overall and requested clarification of the scope of BLM's authority in regulating air quality.	The RMP is a planning level document and does not authorize or guarantee the development of resources within the planning area without further NEPA review. At this time, the BLM-WY does not require mitigation for greenhouse gases (GHGs) which have no ambient standards by which to establish a compliance threshold. The BLM provides for compliance with all current air quality rules and regulations, both state and federal, for BLM-authorized activities. GHG emissions will be reduced in part due to the regulations in 40 CFR 60, Subpart OOOO- Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution.
Air Resources	1008-2	Commenters requested additional reference to applicable air quality laws and policies and that management demonstrate compliance with Wyoming DEQ regulations and other applicable regulations. Specifically, commenters requested that BLM must ensure that its proposed Buffalo Air Resources Management Plan is consistent with the Air Memorandum of Understanding (MOU) entered into by the Department of the Interior (DOI).	The text has been updated to include appropriate references to applicable air quality laws and references and compliance with regulations. The BLM developed an Air RMP (Appendix N (p. 2479)) in conjunction with the Wyoming DEQ and Environmental Protection Agency (EPA) Region 8 to address how the agency will evaluate and mitigate air impacts for future development in the planning area.
Air Resources	1008-3	Commenters questioned the baseline data used in the affected environment, stating that the BLM did not use the most recently available data.	More detailed and accurate emissions estimates will be required for future development in the planning area. The BLM recognizes that stricter regulations for oil, gas, and coal development will be enforced over the next decade; however, the emissions estimates in the RMP are appropriately conservative for disclosure purposes and will be retained for the Final EIS.

Issue Category	Summary Number	Summary Comment	Summary Response
Air Resources	1008-4	<p>Commenters expressed concern about inadequate, inaccurate or insufficient information/data in the air quality impact analysis. Commenters questioned the use of qualitative data rather than quantitative data in assessing potential air quality impacts, and requested that air quality modeling be conducted as part of the assessment. Or, commenters requested additional information and assurance for modeling that will be conducted at the implementation level.</p>	<p>Except for natural gas, oil, and CBNG, emissions information presented in the Draft EIS is from sources and activities operating on BLM-administered lands where the BLM has responsibility and authority for managing the land and resources. For natural gas, oil, and CBNG, information was not available for these activities in areas not under the jurisdiction of BLM. The RMP does not address emission sources that the BLM has no authority or responsibility for managing, such as existing power plants which are major stationary sources permitted and regulated by the Wyoming DEQ.</p> <p>For the development of the Buffalo RMP, no air quality modeling was conducted. The United States Department of the Interior, the United States Department of Agriculture, and the EPA recently entered into a MOU regarding how and when air quality modeling for oil and gas projects will be conducted. In addition, BLM maintains the ultimate decision making authority for determining when modeling is necessary. The decision to model a particular project or geographic area is made on a case-by-case basis and is dependent on availability of input data, geographic and meteorological conditions, current state of air quality, and proximity of sensitive air sheds or receptors. Project specific requirements will be determined during the development of an EIS and subsequent Record of Decision for projects.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Air Resources	1008-5	Commenters also indicated that the analysis failed to clearly address or present whether or not “levels of concern” have been reached for specific criteria pollutants including oxides of nitrogen and sulfur. Commenters questioned why a thorough cumulative impact assessment of air quality was not included for the Planning Area, and questioned the boundary defined in the cumulative impacts assessment.	BLM included foreseeable development within the cumulative impacts analyses. Cumulative impacts included those impacts on the environment that resulted from the incremental impact of the action added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions (40 CFR 1508.7). In addition, a cumulative impacts analysis for the Powder River Basin (PRB) is being completed as part of the PRB II Coal Review (release in 2014). The PRB will be included the cumulative impacts modeling being completed for the Montana RMP modeling effort (underway).
Air Resources	1008-6	Commenters expressed concern that Alternative D provided insufficient or unrealistic management actions for mitigation measures.	The Buffalo Air Resources Management Plan describes the BLM’s general approach to mitigation of air quality impacts and includes a table of sample emission reduction strategies for oil and gas development. The application of mitigation measures will be determined on a project specific basis as guided by the mitigation framework in the RMP.
Climate Change	1009-1	Commenters expressed concern that although impacts from climate change are described in the document, the BLM does not provide management actions or mitigation measures to address those impacts. Some commenters insisted the BLM incorporate more climate change planning in the RMP and EIS.	The RMP is a planning level document and does not authorize or guarantee the development of resources within the planning area without further NEPA review. The BLM does not require mitigation for GHGs which have no ambient standards by which to establish a compliance threshold. The BLM must ensure that authorized activities demonstrate compliance with all current air quality rules and regulations, both state and federal. GHG emissions will be reduced in part due to the regulations in 40 CFR 60, Subpart OOOO- Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution.

Issue Category	Summary Number	Summary Comment	Summary Response
Climate Change	1009-2	Commenters stated that BLM fails to sufficiently analyze cumulative and incremental effects of coal, oil, and gas development on climate change in the RMP. Some commenters indicated the proposed plan did not account for the impacts of livestock grazing on climate change while other commenters indicated livestock grazing does not impact air quality.	<p>The BLM does not have the tools or resources to analyze climate change impacts. The BLM can only reasonably quantify and disclose GHG emissions for the alternatives and put that estimation into the context as far as a percentage of the climate change that is occurring, and the BLM has disclosed the additional GHG contribution that would result from the planning area alternatives. Additional discussion of the current regulatory framework for GHGs and recent Intergovernmental Panel on Climate Change (IPCC) reports have been included in Chapters 3 and 4 of the RMP.</p> <p>Chapter 3 mentions livestock grazing in the context of Climate Change.</p>
Climate Change	1009-3	Additionally, commenters requested quantification of air emissions data or that the BLM conduct air quality modeling.	<p>At the time the analysis was conducted, the latest available emissions factors were used. The data has been updated in the Final EIS. For the development of the Buffalo RMP, no air quality modeling was conducted. The United States Department of the Interior, the United States Department of Agriculture, and the EPA recently entered into a MOU regarding how and when air quality modeling for oil and gas projects will be conducted. Furthermore, the Final EIS has been updated to elaborate on the MOU and why modeling was not conducted.</p> <p>In addition, BLM maintains the ultimate decision making authority for determining when modeling is necessary. The decision to model a particular project or geographic area is made on a case-by-case basis and is dependent on availability of input data, geographic and meteorological conditions, current state of air quality, and proximity of sensitive air sheds or receptors. Project specific requirements will be determined during the development of an EIS and subsequent Record of Decision (ROD) for projects.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Climate Change	1009-4	Commenters requested that the BLM recognize the President's administration call to put forth a Climate Action Plan. Other commenters requested that the BLM consider a transition towards a renewable energy alternative.	<p>The BLM provides for compliance with all current air quality rules and regulations, both state and federal, for BLM-authorized activities. At this time, EPA is working to develop GHG regulations. However, the primary focus is New Source Performance Standards for electric generating units (EGUs). Until such time as additional GHG emissions sources are regulated, the BLM does not require mitigation for an unregulated pollutant with no overarching air quality standard.</p> <p>The BLM has a number of renewable energy projects within the state, however, the Reasonable Foreseeable Development (RFD) for the planning area relies heavily on the input and interest for further development by local industries. At this time, there has not been an expressed interest in renewable energy projects in the Buffalo planning area. However, there are several projects completed or underway within other regions of Wyoming that are better suited to siting and developing renewable energy resources.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Soil	1010-1	<p>Commenters expressed concern over the baseline data used to assess impacts to soil resources and requested additional specificity and substantive text edits within the <i>Affected Environment</i> section, including the determination of soil health and quality, soil order descriptions, regulations affecting soils, and additional soil erosion parameters used for analysis. Commenters noted a need for additional information on the Soil, Water, and Air Program and what parameters were used to create the WEB Soil Survey map.</p>	<p>State Soils Geographic Database (STATSGO2) was used (Analysis of the Management Situation chapter 2, 2–11–13) for the relative proportion and general description of the soils in the planning area. The BLM provided clarifications and edits based on the comments received.</p> <p>BLM requires site-specific construction, stabilization, and reclamation plans for all surface-disturbing activities to assure soil quality and other resources are protected while providing for multiple land uses. A site specific analysis will include an onsite field investigation to confirm the presence or absence of key features due to the level of detail of the Natural Resources Conservation Service (NRCS) Order 3 soil surveys. The onsite investigation will determine the detail of the construction, stabilization, and reclamation plans needed for the NEPA analysis. This information will determine the significance of the impacts and whether the impacts can be mitigated adequately to avoid undue and unnecessary degradation. These details are in addition to other BLM regulatory documents.</p> <p>The proposed surface disturbance will be evaluated by its potential for reclamation and restoration within site-specific NEPA analyses. Where reclamation is determined to be challenging, BLM may include mitigation measures, relocate the activity to a more suitable soil type, or deny the authorization.</p> <p>The WEB parameters used to create the thematic map is "source of reclamation material."</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Soil	1010-2	<p>Comments regarding the soil impact analysis stated that Alternative D did not do enough to protect soil resources with preference given to Alternative B, and others stated that Alternative B was overly restrictive and citing examples. Commenters noted that the impacts analysis was flawed because the existing mapping was too coarse to analyze impacts to minor soil units; other commenters requested clarification on the methods used to determine impacts to soil resources. There was confusion regarding the definition and classification of the terms “miscellaneous soils,” “soils with poor reclamation suitability,” “soils with severe erosion hazard,” and “limited reclamation potential” (LRP) areas. Commenters had questions regarding impacts within LRP areas on BLM mineral estates, and requests for additional detailed, quantitative, science-based, and enforceable management provisions for soil resources during site-specific planning processes.</p>	<p>BLM has determined that Alternative D is sufficient to conserve the soil resource. Reclamation standards prescribed by other resource values will be applied to the soil resource as appropriate.</p> <p>As part of the RMP process the BLM is required to look at a range of alternatives. Alternative B is a resource protection alternative and is within the bounds of the process.</p> <p>Definitions of terms can be found in Chapter 3 and/or in the glossary.</p> <p>LRP areas are of limited acreage in the planning area. BLM soil program guidance is established under BLM Manual Section 7100, Soil Resource Management, which focuses on BLM’s relationship with the National Cooperative Soil Survey (NCSS) and describes program goals and objectives, organization, management roles and responsibilities, and applicable authorities and regulations. BLM Handbook H-7100-1 Soil Inventory, Monitoring, and Management (Final Draft September 21, 2010) provides BLM personnel with information, guidance, and direction related to the inventory, monitoring, assessment, and management of soil resources on public lands. To help implement the many laws, rules, and regulations, the BLM Soil Program relies on various guidance documents developed by BLM and other agencies. Additional BLM soil resource information is available in the soil resources section of the BLM Soil, Water, and Air Program (http://www.blm.gov/wo/st/en/prog/more/soil2/soil2.html), and the BLM soil web page (http://www.blm.gov/nstc/Soil2007/index.html).</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Soil	1010-3	With respect to reclamation of soil resources, commenters expressed concern over reclamation plan requirements on private lands, how reclamation success with respect to soils was to be determined, a perceived lack of clarity over reclamation plan requirements for all oil and gas drilling operations, and stipulations for erosion and other soil mitigation measures within a broad planning document like the RMP as opposed to within site-specific planning processes. A number of commenters urged the BLM to reconsider its choice of Alternative D in light of reclamation concerns.	The Soils Exception Criteria appendix (Appendix I in the Draft RMP and EIS) has been removed since the requirements are included in the site specific construction, stabilization, and reclamation plan, Appendix O (p. 2495), and Appendix H (p. 1959).
Water	1011-1	Commenters questioned the BLM's authority to regulate surface water quality, which they noted was under the jurisdiction of Wyoming DEQ and requested the BLM clearly state that Wyoming DEQ has primacy regarding water issues.	Throughout Chapter 3 BLM references the State of Wyoming's and other federal agencies authority over water resources. Great effort was taken by the BLM during the preparation of this document to ensure that proposed management actions were tied directly to the agency that has the appropriate regulatory authority.
Water	1011-2	Commenters requested that BLM provide an analysis of surface and groundwater quality impacts related to coal, uranium, and oil production. Commenters requested the analysis consider the beneficial uses of produced water, impacts of discharged water, long-term buildup of sediments, and groundwater depletion. Additionally, commenters requested that the additional information be circulated for full public review in a supplemental or revised Draft RMP/EIS.	BLM added additional discussion relative to surface and groundwater impacts and beneficial uses. The additional information did not result in changes to the proposed action or any other alternative or present any significant new circumstances or information relevant to environmental concerns; therefore a supplemental or revised Draft RMP/EIS are not necessary.

Issue Category	Summary Number	Summary Comment	Summary Response
Water	1011-3	<p>Commenters indicated that the <i>Water</i> section was missing information demonstrating compliance with Wyoming water laws. Additionally, commenters indicated that the analysis failed to use the most recent data or current scientific reports pertaining to the characterization and classification of specific water resources and their uses in the planning area.</p> <p>Commenters expressed concern that the RMP was devoid of modeling in its cumulative effects analysis of water quality.</p>	<p>The EIS has been revised to include a discussion regarding the information commenters felt was missing</p> <p>The BLM edited the <i>Water Cumulative Impacts</i> section to better address mineral development issues.</p>
Water	1011-4	<p>Commenters questioned the validity of statements and language used to support BLM management decisions pertaining to water quality standards in the planning area, and requested clarification on implementation of proposed BLM water monitoring actions. Commenters requested that the BLM include additional protective management for water resources</p>	<p>The RMP is an allocation document. Any surface-disturbing project will be evaluated under a site specific NEPA document. Such impacts will be evaluated there. Examples of issues that will be considered on the individual projects will be discussed in the <i>Methods and Assumptions</i> section of the <i>Water</i> section in Chapter 4 of the RMP as well as Appendix W (p. 2623) that has been added to the RMP.</p>
Water	1011-5	<p>Commenters requested the BLM use a buffer of 500 feet near springs, reservoirs, perennial streams, riparian/wetland areas, and aquatic habitat. In addition, commenters requested the BLM use a buffer of 750 feet for water bodies that are impaired or become impaired in the future. Commenters also requested that the BLM coordinate with Wyoming DEQ regarding water discharge from CBNG operations.</p>	<p>BLM has determined a 500-foot restriction (Controlled Surface Use [CSU]) to be sufficient; additional analysis has been added.</p>
Water	1011-6	<p>Commenters requested the BLM disclose all methods that they would use to enhance production of existing CBNG wells. In addition, commenters requested the EIS analyze potential impacts of these techniques to groundwater.</p>	<p>An oil and gas operations appendix (Appendix V (p. 2599)) and a water management plan appendix (Appendix W (p. 2623)) have been added to the RMP.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Cave and Karst	1012-1	Commenters requested clarification regarding the prohibition of surface-disturbing activities near the entrance of caves, specifically if livestock grazing would be considered a surface-disturbing activity, and what method would be used to enforce the buffers around cave entrances (e.g., fences).	The definition of the term "Surface-Disturbing" can be found in the <i>Glossary</i> section of Volume 3 of this document. In general, livestock grazing is not considered a surface-disturbing activity. However, the Proposed RMP for Cave-1007 would restrict livestock from cave entrances, but this would not require a buffer. If a barrier was required to prevent livestock access into a cave, it would be placed in the cave entrance or as near to the entrance as possible. The type of barrier proposed for installation would be analyzed through the NEPA process at the project implementation phase to ensure compliance with resource management goals and objectives.
Mineral – General	1013-1	Commenters requested more information regarding carbon sequestration projects in the Buffalo planning area including any programmatic planning, approval of specific projects, and why these projects would be considered rights-of-way projects.	CCS still remains a mostly untested methodology, and certainly still unproven to be effective and safe in the long-term. Current interim guidance is that CCS projects will be authorized as Land Use Applications and Permits, a type of right-of-way (ROW) (see Washington Office [WO] Instruction Memorandum [IM]-2012-035, http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2012/IM_2012-035.html). The Buffalo Field Office (BFO) has not conducted planning for CCS projects, as none have yet been received here yet. Should any proposals be received by BFO, either an RMP Maintenance Action or Amendment may be necessary to capture and address impacts of such projects.
Mineral – General	1013-2	Commenters asserted that phased development needs to be prioritized so that reclamation occurs before new development proceeds. Commenters requested clarification of where the BLM addressed management and leasing actions for mineral and energy development to protect natural, biological and cultural resources.	Given the extent of non-federal mineral ownership within the planning area, a phased development alternative regulating when development could occur would not allow compliance with the requirements to ensure that leased federal minerals are fully developed and that production on non-federal leases does not drain federal minerals.

Issue Category	Summary Number	Summary Comment	Summary Response
Mineral – General	1013-3	Commenters were concerned with the lack of consistency in the Draft RMP language regarding management actions, surface occupancy, wildlife buffers or closures, and viewshed restrictions as applied to BLM split estate and BLM surface ownership lands throughout the document, as well as language regarding Notices of Intent and Plans of Operation.	The socioeconomics analysis (Section 4.8) discusses the effects of the various alternatives, including surface occupancy and wildlife restrictions, on socioeconomic resources. Correct terminology is “Notice” for locatable minerals, and “Notice of Intent” for geophysical.
Locatable Minerals	1014-1	Commenters expressed concern that In-Situ Leach uranium mining efforts could compromise the future development of oil and gas resources. Commenters asserted that given its multiple-use mandate, the BLM must protect property rights owned by the public and leases owned by oil and gas operators. Additionally, commenters requested additional analysis related to the historical and potential impacts from In-Situ Leach locations.	Currently, all subsurface impacts from uranium In Situ Recovery (ISR) mining-related activities are overseen and regulated by Nuclear Regulatory Commission (NRC), EPA, and Wyoming DEQ, via a number of laws, regulations, and policies. BLM has no administrative or regulatory management capacity in this matter. However, BLM is working with Wyoming Oil and Gas Conservation Commission (WOGCC) to ensure that no further oil/gas-containing formations in the planning area are approved for injection of wastes, including those of uranium operations. However, typical fluid wastes from uranium ISR operations contain only low-levels of radioactivity, at the most, and are therefore not considered to be harmful.
Locatable Minerals	1014-2	Commenters asserted that impacts to locatable minerals be reexamined and revised with respect to correcting trend, Reasonable Foreseeable Action (RFA), and forecasting information. Commenters requested the BLM provide more information regarding uranium disposal and its impacts. Commenters requested updated data and related to current and historical market value and research on mineral potential.	Recent trends and likely future trends have been updated for more recent figures and forecasts. No permitted uranium disposal sites occur on BLM-administered lands. BLM ensures accepted Notices and approved Plans of Operations (for operations containing at least some BLM-administered lands) would not result in unnecessary or undue degradation of public lands, per 43 CFR 3809.415. Transport and disposal of radioactive waste and contaminated materials is regulated, monitored, and enforced by NRC, EPA, and Wyoming DEQ under the auspices of numerous laws, regulations, and policies. BLM has no administrative responsibility over these issues.

Issue Category	Summary Number	Summary Comment	Summary Response
Locatable Minerals	1014-3	<p>Commenters expressed concern that alternatives D and B showed no difference in effects to locatable mineral resources, the impact assessments were inconsistent or contradictory, and the analysis should include impacts to groundwater and aquifers.</p> <p>Commenters indicated ACEC designations and the likely effects on the federal locatable minerals resource were in disagreement and the potential impacts remain unknown. Commenters stated that half of the authorized and pending locatable minerals projects occur in or near the potential ACECs and the BLM should take this into account in the impacts analysis.</p>	<p>The Locatable Minerals analyses were reviewed, the impact analyses were performed appropriately.</p> <p>Potentially contradictory language and acreage numbers have been clarified. The BLM also updated text in Chapter 4 regarding impacts from designated ACECs by including language that "actual impacts are unknown, but likely to be..."</p>
Leasable Minerals Coal	1015-1	Commenters expressed concern the Preferred Alternative favors the development of coal over the development of oil and gas resources in the planning area.	Existing leases will be handled under WO IM 2006-153. Coal mines and oil and gas development are not compatible at the same time. If a coal mine has to avoid an oil and gas well the coal that is avoided will be lost and a waste of the coal resource will happen. The oil and gas resource that is deeper than the coal resource will not be lost but may be uneconomical to re-drill. In those cases where the oil and gas resource has not been developed no loss to the oil and gas resource will occur.
Leasable Minerals Coal	1015-2	Commenters requested additional and updated information and data regarding historical, present, and future coal production and updated coal lease data. Commenters questioned the BLM's description of future coal production in the Planning Area.	The <i>Affected Environment</i> section has been updated with the most current available data.

Issue Category	Summary Number	Summary Comment	Summary Response
Leasable Minerals Coal	1015-3	Commenters stated the BLM should include a broader range of alternatives for coal (e.g., no coal leasing, less coal leasing).	The Code of Federal Regulations at 43 CFR 3420.1-4(e) presents four coal screens that must be applied during land use planning to identify areas of the coal resource acceptable for further consideration for leasing. As presented in the 2001 RMP update, these screens were applied to lands within the Buffalo planning area and coal decisions were updated in coordination with the U.S. Forest Service (USFS) and other cooperators. Areas that passed these screens became available for further coal leasing consideration. Changes have been made to the Final EIS to clarify the decision to carry forward the 2001 coal leasing management decisions.
Leasable Minerals Coal	1015-4	Commenters stated that existing coal mines have not been properly reclaimed and requested that stricter management actions be implemented to ensure reclamation is being completed.	Wyoming's coal mine reclamation is under the authority of the Wyoming DEQ and the Office of Surface Mining Reclamation and Enforcement, and as such, BLM has no jurisdiction to set coal mine reclamation policy.

Issue Category	Summary Number	Summary Comment	Summary Response
Leasable Minerals Coal	1015-5	<p>Commenters requested more information regarding the process for determining new coal leases. Additionally, commenters questioned the current coal leasing process described in the RMP, and, specifically citing several outside studies, requested the BLM modify the discussion on coal leasing to reflect potential flaws in the current leasing process.</p>	<p>43 CFR 3420.1-4(e) presents four coal screens that must be applied during land use planning to identify areas of the coal resource acceptable for further consideration for leasing. As presented in the 2001 RMP update, these screens were applied to lands within the Buffalo Field Office planning area and coal decisions were updated in coordination with the USFS and other cooperators. Areas that passed these screens became available for further coal leasing consideration.</p> <p>The 2001 RMP update coal management decisions remain the basis for current coal management in the planning area. Those areas determined to be available for future coal leasing consideration will be carried forward in this RMP revision (Map 11). It is not the intent of the BLM to open lands outside of these areas to coal leasing with this RMP revision.</p> <p>A decision on coal lands outside of those already screened and determined to be available for further coal leasing consideration will be deferred for leasing determinations until an application to lease the coal in those lands is received. At such a time, the four coal planning screens will be applied to those lands and prior to leasing an amendment to this RMP will be required.</p> <p>Changes have been made to the Final EIS to clarify the decision to carry forward the 2001 RMP update coal leasing management decisions.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Leasable Minerals Coal	1015-6	Commenters expressed concern that the RMP fails to apply federal coal management program land use planning screens.	<p>43 CFR 3420.1-4(e) presents four coal screens that must be applied during land use planning to identify areas of the coal resource acceptable for further consideration for leasing. As presented in the 2001 RMP update, these screens were applied to lands within the Buffalo planning area and coal decisions were updated in coordination with the USFS and other cooperators. Areas that passed these screens became available for further coal leasing consideration.</p> <p>A decision on coal lands outside of those already screened and determined to be available for further coal leasing consideration will be deferred for leasing determinations until an application to lease the coal in those lands is received. At such a time, the four coal planning screens will be applied to those lands and prior to leasing an amendment to this RMP will be required.</p> <p>Changes have been made to the Final EIS to clarify the decision to carry forward the 2001 RMP update coal leasing management decisions.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Leasable Minerals Fluid	1016-1	<p>Commenters stated that there are various instances of inadequate, inaccurate, or insufficient information and/or data related to well production. Commenters asserted that use of inadequate data did not capture current production levels and cannot be used to accurately anticipate future trends. Commenters generally expressed support for a phased development approach. Commenters requested that the BLM acknowledge that it cannot impose stipulations or new restrictions on existing leases and particularly cannot impose new NSO restrictions on existing leases.</p>	<p>BLM has made edits to text to eliminate misinformation referenced by commenters. The AMS was prepared in 2008 and used as the baseline for the Affected Environment. The RFD, which is correlated with well production, was updated in 2012 to accurately anticipate new trends. Lease numbers, lease status and other current condition data have not changed sufficiently and would not further inform a decision maker.</p> <p>Phased development was an alternative considered but not forwarded to detailed analysis, see the <i>Alternatives Considered, but Not Carried Forward for Detailed Analysis</i> section in Chapter 2.</p> <p>Pages 495 and 496 explain BLM's stance on operating on split estate lands. If the surface owner's wishes are contrary to the BLM recommendations, the BLM will generally adopt the surface owner's request unless the request is contrary to the BLM's planning decisions, non-discretionary laws, current policy, or would result in avoidable significant impacts.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Leasable Minerals Fluid	1016-2	<p>Commenters requested that BLM should specifically identify honoring valid existing rights as one of the purposes of the RMP revision. Commenters asserted that it is insufficient for the BLM to suspend an oil and gas lease based on the notion that the oil and gas lease can be developed in the future. Commenters also requested that the BLM include information about the current status of idle and abandoned CBNG wells in the planning area in its assessment of the affected environment. Commenters expressed that the BLM should develop language in the RMP to encourage seismic exploration. In addition, commenters requested the BLM fully assess impacts related to increased truck traffic, noise, and light pollution. Commenters requested that the BLM show how they have complied with the requirements from the Pennaco decision.</p>	<p>Statements are made throughout the RMP including the planning criteria that valid existing rights will be honored.</p> <p>Existing leases will be handled under WO IM 2006-153. Coal mines and oil and gas development are not compatible at the same time. If a coal mine has to avoid an oil and gas well the coal that is avoided will be lost and a waste of the coal resource will happen. The oil and gas resource that is deeper than the coal resource will not be lost but may be uneconomical to re-drill. In those cases where the oil and gas resource has not been developed no loss to the oil and gas resource will occur.</p> <p>The analyses of truck traffic, noise, and light pollution are incorporated into each resource based on the RFD and RFA tables of the RMP.</p> <p>When approved, the RMP will replace other existing plans and will comply with the Pennaco decision.</p>
Leasable Minerals Fluid	1016-3	<p>In several instances, commenters requested BLM cite supplemental text and supporting regulations, rules, and scientific documents, as appropriate. Additionally, commenters offered technical corrections to various statements made in Appendix D (p. 1863). Specifically, commenters expressed concern that Appendix D (p. 1863) did not include sufficient reclamation. Commenters requested that management actions include more stringent restrictions in an effort to protect resources.</p>	<p>BLM reviewed and revised the text as necessary to include supplemental text/terminology, supporting scientific citations, supporting regulations, and rules, as appropriate.</p> <p>The RMP is a land use allocation document and does not address site specific authorizations that permit development of enhanced mitigation or reclamation plans.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Leasable Minerals Fluid	1016-4	Commenters stated that the analysis of the RFD underestimates the potential for the discovery of minerals and oil and gas reserves, noting the large number of potential well sites identified in recent development proposals. Commenters requested that the BLM include additional clarification that the RFD does not represent a planning decision or development “cap.” Commenters requested that the BLM should ensure it fosters development from so-called unconventional resource plays in the RMP.	<p>It was assumed during the creation of the surface disturbance calculations that a horizontal well would require 10 acres per pad and that there would be 2 wells per pad. This is much larger than the 2.75 acres calculated for a vertical well. Given the data available this assumption is reasonable.</p> <p>The RFD was revised in 2012 at the request of operators. Part of this process involved data from operators that the BLM could analyze and make a reasonable and science based projection into the future. Without any additional data to reconsider it is impossible to determine whether or not the latest RFD is unreasonable.</p>
Leasable Minerals Fluid	1016-5	Commenters stated that the BLM did not adequately describe the impacts that Greater Sage-Grouse restrictions will have on oil and gas development. Additionally commenters stated that Greater Sage-Grouse mitigation actions were too broad and vague.	The BLM analysis acknowledges Greater Sage-Grouse management effects on fluid mineral development.
Fire and Fuels Management	1017-1	Commenters indicated that the overall analysis of fire and fuels requires explanations that are more descriptive. Specifically, commenters asked that more description be given to issues including benefits of prescribed fires particularly in Greater Sage-Grouse habitat, physical and biological impacts on fuels, Fire Regime Condition Class criteria and trends, impact criteria, and impacts on or due to fuel loading.	The BLM has revised the fire and fuels analysis to provide more clarity and detail. Managing Wyoming big sagebrush stands with prescribed fire would be allowed under any alternative, however these types of treatments would likely be rare due to current and anticipated levels of disturbance from other events and human actions. Additional text was added to further describe fire suppression and ecology, human actions, cheatgrass, grazing, and Fire Regime Condition Class criteria as related to suspected trends of fuels in the planning area.

Issue Category	Summary Number	Summary Comment	Summary Response
Fire and Fuels Management	1017-2	Regarding firefighting, commenters expressed desire for clarification on how cooperation with stakeholders to enhance local fire prevention would occur. Commenters also requested the Preferred Alternative be altered to include more specifics regarding fire management, and expressed concern over the restriction of heavy equipment to fight fires in Greater Sage-Grouse Core Population Areas.	Annual Operating Plans (AOPs) are developed and signed yearly among county, state, and federal firefighting agencies and provide direction for each stakeholder to meet each other's objectives. Fire prevention is an aspect of fire management that aims to decrease ignitions from human activities through public education, outreach, and fire restrictions. Fire prevention activities such as fire restrictions are coordinated among stakeholders. If Alternative D is selected and stakeholders agree to use fire for resource benefit in some parts of the planning area, site specific planning, coordination, and implementation plans would specify details for managing wildfire for resource benefit. Regarding the use of heavy equipment to fight fires in Greater Sage-Grouse Core Population Areas, under Alternative D Fire-3012 explains that protection of Greater Sage-Grouse habitat could include use of heavy equipment if judged to be less damaging than the fire itself.

Issue Category	Summary Number	Summary Comment	Summary Response
Vegetation	1018-1	<p>Commenters requested additional information on how BLM calculated reclamation requirements for coal and fluid mineral development, including grassland and shrubland reclamation acreage requirements. Commenters also requested that BLM specify the total acreage of impacts anticipated to grassland and shrubland communities as a result of mineral development. Commenters were confused by the use of vegetation community descriptions provided by both the Wyoming Game and Fish Department (WGFD) and Natural Resources Conservation Service (NRCS), expressing preference for the NRCS.</p>	<p>The acreages for oil and gas were calculated as follows: CBNG wells projected for each alternative times 2.5 acres of disturbance initially, and 1.5 acres long term. For conventional wells it is two parts. First is horizontal wells. For each alternative it was assumed there would be 2 wells per pad and each pad would be 10 acres initial disturbance and 3 acres long term. For vertical wells it was assumed for each alternative there would be 2.75 acres of initial disturbance and 1.5 acres long term. Coal mines will be reclaimed as areas are mined out and new areas opened.</p> <p>BLM updated the text to include initial and long-term disturbance acreages for grassland and shrubland communities.</p> <p>The WGFD vegetation classification data was used for mapping purposes, so initial descriptions use their terminology. However, it was thought that the NRCS Major Land Resource descriptions added useful information, so both WGFD and NRCS are referenced.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Vegetation	1018-2	Commenters noted the difficulty in re-establishing native shrublands and expressed concern that native sagebrush shrublands are declining across the planning area. Commenters expressed concern with the discussion regarding seed mixes to be used for reclamation on private land.	<p>BLM believes that the overall trend of grassland and shrubland communities will stay fairly static from this point forward. In the past, there has been a reduction in the sagebrush community, but now reclamation is underway on much of the CBNG development and future authorized surface-disturbing activities will include plans for reclamation; site-specific reclamation actions should reflect the complexity of the project, environmental concerns, and the reclamation potential of the site.</p> <p>BLM acknowledges that the BLM can recommend seed mixes on private surface, but the ultimate mixture is at the discretion of the surface owner.</p>
Vegetation	1018-3	Commenters encouraged the BLM to work with WGFD and private landowners to establish vegetation composition, production and forage utilization transects in the area where WGFD has documented potential habitat degradation resulting from elk numbers.	<p>In order for the BLM to work with WGFD and private landowners to establish vegetation composition, WGFD would need to facilitate their relationship with private landowners. BLM does vegetation monitoring on some grazing allotments that have elk habitat. The BLM will continue to support WGFD's objectives for elk.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Riparian Wetland	1019-1	<p>Commenters expressed concern over the baseline data used to assess impacts to riparian and wetland areas and whether BLM carried out a baseline assessment of riparian and wetland areas as part of the RMP and EIS. The baseline definition of a wetland was questioned and commenters requested clarification as to why U.S. Fish and Wildlife Service (USFWS) was used as a source and not NRCS. Commenters expressed an interest in partnering with the BLM in developing management actions or baseline inventories on private lands within the Planning Area.</p>	<p>BLM agrees with the concerns presented by commenters regarding the baseline data. An updated baseline inventory is needed. However, at this time funding and other higher priority workloads has not allowed that inventory to be completed. In addition, delineation and marking are implementation activities that will occur with site-specific project proposals.</p> <p>The BLM's definition for "baseline for wetlands" was agreed upon by BLM and all of the cooperators. The USFWS defines wetlands as lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have one or more of the following three attributes:</p> <ol style="list-style-type: none"> 1. at least periodically, the land supports predominantly hydrophytes 2. the substrate is predominantly undrained hydric soil, and 3. the substrate is nonsolid is saturated with water or covered by shallow water at some time during the growing season of each year. <p>The NRCS definition has similar three attributes:</p> <ol style="list-style-type: none"> 1. Predominance of hydric soils, 2. Support hydric vegetation, 3. Usually have ponded water at least 1 to 2 weeks during the growing season. <p>When BLM initiates plans for any new management actions or baseline inventories it will coordinate with adjacent landowners/grazing lessee, local Conservation Districts, and other interested parties.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Riparian Wetland	1019-2	Commenters also requested additional analysis on the impact assessment, requesting the BLM consider additional information showing significant impacts to riparian and wetland areas resulting from leasable fluid minerals. Another commenter questioned the veracity of the BLM's impact analysis with respect to livestock grazing closures and soil management actions.	<p>The Draft EIS stated that fluid mineral development does have adverse impacts on riparian/wetland vegetation. Parts of the riparian/wetland section have been updated to incorporate discussion of additional impacts addressed in your attached references (Alternative D Mineral Resources).</p> <p>In regards to soil management, <i>Riparian/Wetland Resources</i>, Alternative D, Soil section has been updated to a negligible adverse effect. There will be some adverse effects from disturbance of sensitive soils, but disturbance will only occur when there are approved site-specific construction, stabilization, and reclamation plans.</p>
Riparian Wetland	1019-3	The majority of the comments were related to the management actions associated with riparian and wetland areas. Commenters requested clarification about what monitoring and management plans were developed as part of the RMP. Commenters also requested that the BLM consider both larger and smaller setbacks from riparian and wetland areas in different alternatives. Commented requested consideration of additional management actions related to the placement of salt or mineral blocks, watershed monitoring requirements, and limiting range improvements.	<p>BLM has determined that from a multiple use stand point, surface disturbance within 500 feet of riparian/wetlands systems and aquatic habitats can be allowed, as long as it meets resource objectives.</p> <p>Alternative D, the Proposed RMP states "Apply a CSU stipulation to any fluid mineral lease within 500 feet of riparian/wetlands systems, and aquatic habitats." This does not preclude disturbance in riparian/wetland areas. Development can occur; it just needs to be done in a manner that meets the resource objectives.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Fish and Wildlife	1020-1	Commenters suggested text edits to wildlife-related goals and objectives contained in the RMP. Commenters requested clarification on baseline conditions and data and requested additional documentation of data sources/citations. Other concerns with respect to the Affected Environment included using updated: (1) WGFD wildlife maps, (2) forest ecology studies and existing conditions, (3) big game and sharp-tailed grouse population trends, (4) wildland fire studies and its relationship with wildlife, and (5) road densities/effects of roads on wildlife species. Commenters requested an explanation of how the WGFD determined population objectives for various wildlife species, and requested that BLM define certain terms more clearly.	<p>Goals and objectives were developed through a collaborative process with cooperators. The goals and objectives are broad statements to describe desired outcomes for a specific resource, and should remain general. They do not establish a basis for prioritization of management objectives among different resources.</p> <p>Wildlife management actions in Alternative D were developed with a team of cooperators, including the WGFD, and are designed to meet the obligations of the BLM to uphold federal and state laws and policies, as well as support population objectives set by the WGFD. The information in the RMP in regards to the affected environment and effects analysis for wildlife is accurate and appropriate.</p> <p>In specific instances, the BLM edited the text to clarify terms and included updated population estimates from the WGFD.</p>
Fish and Wildlife	1020-2	Commenters noted the importance of consistent regulations and close coordination with other state and federal wildlife agencies (e.g., USFWS, WGFD). Some commenters were opposed to incorporating USFWS recommendations for spatial and seasonal buffers, favoring management restrictions from the WGFD.	<p>WGFD is an RMP cooperator and was involved in the development of the Preferred Alternative. The current and proposed BLM management are designed to help support WGFD population objectives for big game and Greater Sage-Grouse. If population objectives are not being met, the BLM will use the adaptive management process to address that issue in cooperation with the WGFD.</p> <p>The use of the USFWS seasonal timing limitations are supported by the WGFD, the agency with primary management authority over Wyoming's wildlife.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Fish and Wildlife	1020-3	A number of commenters questioned the adequacy of the impact assessment for wildlife. Most requested additional citations of the science behind the impact assessment. Commenters noted perceived discrepancies with the analysis of impacts to wildlife resulting from livestock grazing and requested the BLM to remove some language and add citations/justifications for other language in the RMP. Additional impact analysis was requested for top-level predators such as wolves and mountain lions and the impacts to those species resulting from “predator management” actions.	<p>Analysis of each specific species is outside the scope of the RMP. The BLM has edited text to add/correct citations, update information and correct discrepancies for impacts to wildlife, specifically resulting from livestock grazing.</p> <p>The RMP is an allocation plan; predator management is better suited for a programmatic activity plan. BLM cooperates with U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) when there is a need for predator control. The actions typically conducted by APHIS Wildlife Services on public lands are described on page 343 under predatory animals.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Fish and Wildlife	1020-4	<p>Comments on management actions specific to big game species included requests for less stringent management actions for big game, and requests for tighter restrictions, such as (1) designating crucial habitats for mule deer in addition to elk and (2) using No Surface Occupancy (NSO) within and including 0.5-mile of critical habitat areas instead of relying on timing limitations. Commenters expressed concern with: (1) how the BLM intends to balance big game management with oil and gas development considering its multiple use requirement; (2) the proposed management for big game under Alternative B; (3) the requirement for fluid mineral production and byproducts to be piped out of crucial elk winter range and calving areas; and (4) potential redundancy in restrictions on surface disturbance and CSU and Timing Limitation Stipulations (TLS) within big game areas. Another commenter requested that the BLM consider augmentation of elk populations after CBNG development. Commenters also expressed concern with proposed forest management actions related to big game and other wildlife species. Another commenter suggested that hunting management activities should be modified to help manage big game populations.</p>	<p>The RMP identifies that habitat loss and disruptive activities are assumed to have adverse impacts to wildlife in the context of the RMP impacts analysis. Whether or not big game may habituate to oil and gas activities after a given time would not result in a change to the RMP effects determinations. Site-specific impacts from oil and gas related activities, including potential habituation, will be analyzed at the project level in finer detail.</p> <p>BLM does not propose to restrict oil and gas development in big game habitats other than crucial winter range, calving areas, and migration routes (travel corridors). These elements of big game natural history and habitat use are considered essential to long-term protection of these resources. A map was added to the Final RMP showing migration corridors.</p> <p>The WGFD does not and will not impose timing restrictions on BLM permits. Likewise, BLM does not regulate hunting license numbers, but will forward commenter's hunting recommendations to the WGFD, the agency with primary management authority over Wyoming's wildlife.</p> <p>Restrictions on travel corridors will be evaluated through site-specific analysis. BLM will continue to coordinate with private landowners where protection may be beneficial.</p> <p>Applications of protections for identified travel corridors will be evaluated on a site-specific basis and consistent with other resource values.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Fish and Wildlife	1020-5	Commenters expressed concern with restrictions on human access to certain portions of the Planning Area during certain times of the year, including provisions for seasonal travel restrictions, travel restrictions within big game priority travel corridors, restrictions within certain buffer distances, and seasonal restrictions that would preclude operations and maintenance activities. Commenters requested removal, modification, and/or clarification of these restrictions. Multiple commenters requested the BLM to revise timing limitations specific to elk populations.	<p>New lease stipulations will not be applied to existing leases. Conditions of approval may be applied to permits issued after the implementation of the final RMP, and will be evaluated on a site-specific basis. The BLM will honor valid existing rights of lease holders in accordance with applicable law.</p> <p>There are currently no "big game" species that have a special designation, BLM-sensitive or otherwise, so the management actions were not changed to include them. Applications of protections for identified travel corridors will be evaluated on a site-specific basis and consistent with other resource values.</p>
Fish and Wildlife	1020-6	Multiple commenters felt that burying powerlines for raptor protection, anti-perching devices on powerlines, seasonal restrictions, and the size of the nest buffers for raptors were unnecessary and not adequately justified. Commenters requested clarification on current nest buffers and seasonal timing restrictions, as well as clarification on how the BLM will implement certain provisions of the restrictions. Some commenters proposed additional restrictions protecting eagles.	<p>Alternative D requires that all above ground powerlines must be part of an approved distribution plan. This requirement would only apply where BLM has authority. A distribution plan is intended to apply in instances where electric utility companies have large-scale projects planned. A distribution plan provides for a community based long-term cost-effective plan for electric distribution versus the current uncoordinated approach which often results in duplicate lines.</p> <p>Dates and distances for buffers were based on recommendations from the appropriate state and federal agencies; the BLM will continue to work with the USFWS and WGFD when issues arise. Appropriate sources were consulted for species ranges and locations.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Fish and Wildlife	1020-7	Commenters expressed concern for management actions related to fish species, including (1) the 0.25-mile prohibition of development around water bodies, (2) fisheries enhancement design considerations in reservoir design; and (3) requirements to minimize the spread of West Nile virus. Other commenters felt that management actions for fish species placed undue constraints on other resources.	<p>A CSU to 0.25 mile is needed in areas where fish bearing waters are at the bottom of canyons, which is common in the planning area. In these situations the buffer from Onshore Order No. 1 is insufficient to protect the fish habitat from sedimentation since canyon rims are well over 500 feet distance from the water. The CSU does not prevent development within 0.25 mile, and is designed to provide management flexibility.</p> <p>Required design features and best management practices will be considered on a site-specific basis at the project level to identify and incorporate the applicable measures. This provides the opportunity to design reservoirs to meet all objectives such as West Nile Virus (WNV) reduction and safe livestock access. The Required Design Features (RDFs) and Best Management Practice (BMP) lists are not exhaustive, other methods may also be appropriate.</p>
Fish and Wildlife	1020-8	Other comments related to management actions included requests for additional clarification on (1) management requirements on privately owned surface lands, (2) coordination with livestock permittees in vegetation management discussions, (3) costs and responsibilities for BLM's proposed fence management policies benefitting wildlife species; and (4) mitigation for noise impacts.	<p>The BLM will continue to work with permittees on range improvement projects to ensure that they are compatible with resource uses in the area. The BLM will incur the costs for fence modifications that are instigated by BLM.</p> <p>The management actions state that facilities will be placed to mitigate impacts, which could include using topography to help buffer noise. Implementation of the management actions will be evaluated on a site-specific basis and consistent with other resource values.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Greater Sage-Grouse	1021-1	Commenters requested that BLM consider different scientific papers regarding Greater Sage-Grouse, including some papers that support the State's Greater Sage-Grouse Core Population Area Policy and others that contradict it. Commenters felt that the impact analysis required additional scientific references, clarity, and data to support BLM's conclusions regarding impacts to Greater Sage-Grouse under each alternative. The baseline Greater Sage-Grouse population data and the Garton modeling of Greater Sage-Grouse populations were also called into question. Commenters requested additional work on defining Winter Concentration Areas for Greater Sage-Grouse in the Buffalo Planning Area.	The BLM teams reviewed the suggested references to determine if they were substantially different than the information cited in the Draft RMP and EIS. The additional information did not improve upon the site specific, peer-reviewed studies used in the Draft RMP and EIS; inclusion and consideration would not substantially alter the conclusions or analysis. Therefore, they were not incorporated into the Final EIS. The studies by Walker et al. and Doherty et al. were conducted in the planning area. No peer-reviewed, published data was found to contradict these findings in the Powder River Basin. The BLM incorporated the Conservation Assessment of Greater Sage-Grouse and Sage-Grouse Habitats from the Western Association of Fish and Wildlife Agencies (WAFWA) (2004) into Chapter 3.

Issue Category	Summary Number	Summary Comment	Summary Response
Greater Sage-Grouse	1021-2	<p>Commenters thought that the BLM should adopt stricter protection standards for Greater Sage-Grouse, including recommendations developed by the National Technical Team (NTT), while other commenters favored less restrictive policies towards Greater Sage-Grouse protection. Many commenters expressed concern with the BLM's policies in non-Core Population Areas, seasonal buffer distances and access restrictions, wintering areas, development density, livestock restrictions, fence design requirements, fire management, required design features, and noise buffers. A Greater Sage-Grouse-specific ACEC was requested for consideration and/or adoption in the Final RMP, as well as additional consideration for the area to support genetic linkages with other Greater Sage-Grouse populations. Provisions from other Wyoming BLM RMPs were offered for consideration in the Buffalo RMP. Other commenters felt that Alternative D should be more consistent with the State's Greater Sage-Grouse Core Population Area Policy. Existing lease holders expressed concern with how Greater Sage-Grouse protections might affect their operations. Commenters also questioned the powerline avoidance theory and BLM's requirement to bury powerlines. Other commenters doubted that WNvs could have serious impacts to Greater Sage-Grouse and provided additional citations. Many commenters requested clarification on a number of the proposed protection measures for Greater Sage-Grouse.</p>	<p>The Required Design Features in the RMP are from BLM's Greater Sage-Grouse National Technical Team. To provide BLM-wide consistency the recommendations cannot be revised. However, during implementation the site-specific situation shall be considered including effectiveness of the design feature as well as technical and economic feasibility. In a few instances, BLM has modified/clarified text for design features referenced by commenters. In addition, citations were added/corrected to reference applicable laws and regulations.</p> <p>The sagebrush ACEC is not part of the Proposed RMP. BLM's Proposed RMP is consistent with the Wyoming Governor's Executive Order (EO) 2011-5 that has been determined sufficient to conserve Greater Sage-Grouse throughout Wyoming and WAFWA Management Zone I.</p> <p>As a multiple use agency, the BLM considered the protection of Greater Sage-Grouse lekking, nesting and brood-rearing habitats as well as the potential for oil and gas mineral recovery. BLM's proposed RMP is the least restrictive management that effectively accomplishes resource objectives and therefore complies with the Energy Policy and Conservation Act. To be consistent with the Governor's Greater Sage-Grouse Core Population Area Strategy, appropriate restrictions were removed from Alternative D.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Greater Sage-Grouse	1021-3	Commenters felt that the BLM should implement a compensatory mitigation program as part of their overall Greater Sage-Grouse conservation planning. Others felt that the use of cooperative agreements (e.g., candidate conservation agreements) with private landowners was the best strategy for conservation of Greater Sage-Grouse. One commenter noted the importance of incorporating adaptive management provisions into the Final RMP. Commenters also requested consistent reclamation criteria regarding Greater Sage-Grouse habitat be adopted across all BLM offices.	Compensatory mitigation will be considered on a project specific basis in accordance with BLM policy. BLM is developing a statewide monitoring and adaptive management strategy in cooperation with the State of Wyoming which will be included in the Proposed Plan and Final EIS. Regarding reclamation criteria, this Planning Area, specifically, must rely heavily on Greater Sage-Grouse habitat restoration and provides this requirement as an imposition on federal surface only as a condition where it qualifies. It is not consistent with EO 2011-5, but has been agreed to by the cooperators of this plan, including the Governor's office.

Issue Category	Summary Number	Summary Comment	Summary Response
Special Status Species	1022-1	<p>Regarding special status species management, commenters requested more definition, objectivity, consistency, and updated references be added to support data in these sections in the Buffalo RMP and EIS. Commenters questioned specific data and conclusions, either supporting more or less restrictions surrounding special status species habitat and nesting or roosting sites, often suggesting language edits. Commenters urged the BLM to maintain compliance with statewide programmatic documents, regional planning documents, recommendations from the USFWS, and prior agreements between developers and the USFWS. Some commenters suggested including more birds in the <i>Special Status Species – Wildlife</i> section for analysis, while other commenters suggested eliminating certain birds from analysis. Commenters suggested expanding discussion of factors contributing to black-tailed prairie dog habitat and health impacts, as well as increasing monitoring and surveying of black-tailed prairie dogs and burrowing owls. However, other commenters request that language be added to state that BLM cannot authorize surveyors to traverse private lands. Some commenters were concerned that restrictions to oil and gas and utility line development due to habitat protections were overly adverse and inconsistent with Wyoming Executive Order 2011-5. Commenters cautioned the BLM from endorsement or approval of any particular products, for example specific anti-perch devices, due to potential liabilities.</p>	<p>The BLM updated the text to include more recent information regarding special status species where appropriate. The analysis of special status species is reasonable. Analysis of each specific species is outside the scope of the RMP. The purpose of the RMP is to inform the reader what larger habitat types occur in the resource area, along with their relative abundance, and how those habitat types and wildlife may be impacted by other resource allocations (not specific actions). Since many species utilize the same general habitat type in the Buffalo planning area, effects from habitat loss can be assumed to be similar. Site-specific analysis of proposed projects will address the impacts on a finer scale.</p> <p>The BLM is required to assess impacts to special status species from all federal actions, including those on federal mineral estate. Surveys on private land will be coordinated with landowners. The BLM does not authorize trespass on private lands.</p> <p>The BLM has and will continue to incorporate recommendations from large-scale regional plans and assessments as they become available.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Cultural Resources	1023-1	<p>Commenters wanted BLM to provide more detail in the cultural resources analysis, specifically regarding NSO and CSU stipulations, visual resource management, and the designation of certain areas as Traditional Cultural Properties (TCPs) and ACECs and not others. Many commenters specifically requested more information as to the reasons why the Preferred Alternative designates Pumpkin Buttes as an ACEC, and how Visual Resource Management (VRM) restrictions and NSO and CSU stipulations would affect existing and future leases in this area. Several commenters also expressed concern that the VRM restrictions and NSO and CSU stipulations around cultural sites were too restrictive. Multiple commenters stated that in the RMP the BLM should acknowledge that oil and gas development often leads to significant additional information about cultural sites due to policies requiring site analysis before development is approved. Commenters requested additional explanation regarding Cultural Resource Project Plans (CRPPs), the National Historic Preservation Act (NHPA) process, and National Historic Trails designations, and were concerned that some data and existing Cultural Resource Management Plans (CRMPs) could be outdated or incorrect. Commenters recommended expanding discussions of historic and cultural resources to include evaluation of the historic landscapes located within the project area.</p>	<p>The BLM has amended the cultural resources analysis in the RMP for clarity and additional description, adding detail regarding NSO and CSU stipulations, visual setting management for historic trails and other cultural sites, and added language to Appendix S (p. 2531) which details all ACEC designations. Additional text has been added to Chapter 3 describing existing conditions and agreements that address the Pumpkin Buttes TCP. Regarding the Pumpkin Buttes ACEC designation, the visual setting or viewshed was a consideration during nomination. BLM discussed the setting of the Pumpkin Buttes during consultations with numerous tribal representatives prior to the determination that it is a TCP in 2006. It was determined that the setting of the TCP had been impacted by recent development, but overall the site retained its setting.</p> <p>The width of the CSU to be applied to historic properties was discussed at length during the cooperators meetings. The three mile distance to consider impacts to the setting of certain historic properties was decided upon based on Wyoming State History Preservation Office's (SHPO)'s experience with historic trails issues in other parts of Wyoming. The distance is not arbitrary since it is consistent with other Wyoming BLM plans. The RMP discloses that NSO and CSU stipulations associated with this RMP cannot be applied to existing leases. Exceptions for the NSO and CSU stipulations are described in Appendix H (p. 1959). Text has been added to Chapters 3 and 4 clarifying these issues.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
			<p>The text of Chapter 3 of the RMP has been revised to acknowledge the information gained by inventories in relation to NHPA compliance. However, it is inaccurate to assume that heightened development provides for more data recovery or excavation. Cultural resources survey for the purpose of complying with NHPA Section 106 identifies archeological sites, but does not necessarily lead to advancement of archeological knowledge. Variable recordation techniques, limitations of regulation, private surface owner concerns, and other issues hinder pure scientific investigations.</p> <p>Text in Chapter 3 of the RMP has been revised to clarify the difference between CRPPs and CRMPs and to identify the need for CRPP development. The development of CRPPs is intended to define areas that have more significance than others within the region and can result in a reduction of the geographic scope of the plan. Cultural-5005 will prompt BFO to write new CRPPs for certain sites with all interested stakeholders.</p> <p>The BLM has acknowledged comments calling for evaluation of properties as historic landscapes and has added text to Chapter 3 discussing rural landscapes.</p>
Paleontological Resources	1024-1	Commenters expressed concern about the NSO stipulation on areas containing paleontological resources of high quality or importance under Alternative D and suggested other avoidance measures could be put in place that would protect the resource without the severity of limitations to mineral development associated with an NSO. Commenters also requested that BLM clarify what qualifies as “high quality or importance” in regards to paleontological resources.	BLM should have the flexibility to apply an NSO when appropriate to specific areas contacting known scientifically significant paleontological resources. As such, an alternative should be present which allows this. Currently, the BLM Washington Office is working on establishing criteria for scientifically significant paleontological resources.

Issue Category	Summary Number	Summary Comment	Summary Response
Visual Resources	1025-1	Commenters expressed concern that VRM in the RMP needs to consider existing leasing, ongoing oil and gas leasing, and valid existing rights. Commenters requested that the BLM make its new VRM class designations consistent with its prior leasing decisions.	<p>The BLM will honor the valid existing rights in the planning area as identified in the <i>Planning Criteria</i> section of Chapter 1.</p> <p>No objectives associated with VRM preclude or prohibit development or management activities. Rather, the VRM class objectives must be met when development occurs, if at all possible, using design features and topography of the landscape, and the objectives serve to encourage the use of mitigation techniques to reduce the impacts to visual quality. Development and disturbance can occur in all VRM Class areas as long as the objectives of the respective class are met.</p>
Visual Resources	1025-2	Commenters stated that BLM clarify that VRM classes do not apply to State of Wyoming and private lands and the analysis should reflect this. Commenters also stated that VRM classes should not be applied to oil rigs because they are a temporary disturbance.	<p>The Buffalo RMP does not assign VRM classes to non-BLM-administered surface and the <i>Affected Environment</i> and <i>Environmental Consequences</i> sections have been amended for clarity.</p> <p>The BFO RMP defines temporary structures as those present on BLM-administered lands for less than 90 days. The RMP notes that such facilities are not subject to visual effects mitigation. Structures remaining on BLM-administered lands longer than 90 days may be subject to additional VRM mitigation.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Visual Resources	1025-3	<p>Commenters requested clarification of, additional language, and changes to VRM classes, including Pumpkin Buttes and WSAs. Commenters offered additional areas to be considered for VRM class designations.</p> <p>Commenters generally stated that Alternative D is unnecessarily restrictive.</p>	<p>The visual resources inventory did incorporate the entire visual landscape, including aesthetic resources and impacts on adjacent private lands into the analysis; however, the BLM only assigns Visual Resource Inventory (VRI) and VRM classes to BLM-administered surface. The visual resources inventory and analysis uses the boundaries for the Pumpkin Buttes Traditional Cultural Property to implement the management prescriptions for visual resources. The Buffalo RMP does not assign VRM Classes to non-BLM-administered surface and the Affected Environment and Environmental Consequences sections have been amended for clarity. The maps in the RMP are generalized maps due to the scale of mapping required for an area the size of the planning area. As a result, some maps, e.g., Map 51, have been amended.</p> <p>The Federal Land Policy and Management Act of 1976, 43 United States Code (U.S.C.) 1701 et. seq. in (1) Section 102 (a)(8). States that "...the public lands be managed in a manner that will protect the quality of the...scenic...values...." and (2) Section 103 (c). Identifies "scenic values" as one of the resources for which public land should be managed. Alternatives B and D represent two alternatives within a reasonable range.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Lands and Realty	1026-1	Commenters requested more detail be given regarding how the BLM is planning to address split estate lands. Furthermore, commenters suggested BLM exchange lands, but with the result of no net acreage gain, in areas with mixed ownership resulting in more contiguous federal land ownership patterns for the benefit of management and priority resources, the ability to better manage the State's surface and mineral estate, and the capability to maintain access to State trust lands. Commenters identified specific parcels for potential exchange and recommended adopting management actions from other RMPs.	Split estate is discussed briefly within the land ownership (see the <i>Land Ownership within the Planning Area</i> section of Chapter 1), planning criteria (see the <i>Planning Criteria</i> section of Chapter 1), and under applicable resource sections. BLM also maintains a split estate website (http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/split_estate.html) that can be referenced for additional information. BLM will work with the Office of State Lands and Investment during RMP implementation. The management actions were created with the assistance of cooperating agencies including the State of Wyoming. BLM has worked with and will continue to work with the State of Wyoming to exchange State lands.
Lands and Realty	1026-2	Commenters recommended that acquisition priorities should emphasize lands with high habitat value or recreation potential. Commenters also recommended the BLM avoid disposing of federal lands that could fragment habitat blocks and connectivity corridors, as well as consolidate ownership of lands with sensitive habitat for Greater Sage-Grouse and other priority species.	The Buffalo Field Office's management actions L&R-6011 and L&R-6012 address acquiring lands with high habitat values (consistent with resource objectives, based on all resource values, presence of sensitive species). Lands identified for disposal are small, isolated parcels. BLM's main objective is to consolidate lands with larger blocks of BLM-administered surface.
Lands and Realty	1026-3	Commenters expressed concern that the BLM's goals for lands and realty management are too narrow for adequately managing forest products.	The RMP goals were created with the assistance of cooperating agencies. BLM and cooperators, including the Wyoming Department of Agriculture and the counties have determined that the goals are sufficient for managing forest products.

Issue Category	Summary Number	Summary Comment	Summary Response
Renewable Energy	1027-1	Commenters urged the BLM to recognize the value of wind energy to the American public and reconsider how some of the adverse impacts to wind energy are characterized. Commenters recommended ways impacts from wind energy could be mitigated to lessen visual impacts and reduce surface disturbance and suggested not all viewers considered wind turbines a blemish on the landscape.	<p>BLM does consider wind to be a valuable energy source; however, BLM is also responsible for disclosing the environmental effects, beneficial and averse, of proposed actions.</p> <p>All ROW applications including wind energy will be reviewed on a case-by-case basis, to balance protection of resources with America's wind energy needs. Environmental impacts often affect a larger area than the physical foot print of the project for example soil erosion and stream sedimentation, wildlife displacement from and avoidance of infrastructure, emissions during construction, etc.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Right-Of-Way and Corridors	1028-1	Some commenters were concerned that the proposed ROW corridors would be inconsistent with BLM's multiple-use land management obligations as well as limit the ability of oil and gas operators to sufficiently transport their products. Commenters were also concerned that the criteria and standards for evaluating proposals in avoidance areas were overly restrictive and inflexible. Multiple commenters requested the BLM provide maps for potential ROW exclusion and avoidance areas, correct the overlap of avoidance and exclusion areas with designated ROW corridors under all alternatives, and specify that ROW corridors take precedence over avoidance and exclusion areas. Commenters also expressed concern regarding the placement and locations of above and below-ground utility corridors. Some commenters sought specific information about the proposed ROW programs under each alternative including the width of designated corridors, the requirements for co-location of projects, justification for the proposed avoidance and exclusion areas, management regarding buffer zones around active raptor nests within ROWs, and reclamation management within ROWs.	<p>No ROW width limits will be applied with the current management action ROW-6004. BLM will consider adequate separation, safety, and appropriate federal, state and local statutes, regulations and policies, and land use constraints on each ROW application.</p> <p>In areas open to such uses, BLM will analyze each ROW application on a case-by-case basis and determine the best management action based on resources identified in the location of the proposed application to prevent undue or unnecessary degradation to the lands.</p> <p>BLM updated the text under the Methods and Assumptions area of Rights-of-Way and Corridors to help define avoidance versus exclusion areas. BLM created a new map for Alternative D showing the ROW exclusion and avoidance areas. Valid and existing lease rights will be honored as identified in the planning criteria.</p>
Travel and Transportation Management	1029-1	Commenters generally expressed opposition to the restrictions on motorized vehicle use within Big Game Crucial Winter Range under alternatives B and D and requested additional analysis. Commenters requested that the BLM analyze the impacts to oil and gas development from these restrictions, including the impacts on the local economy.	<p>During the alternative development process, cooperating agencies supported a Preferred Alternative that limits travel to designated routes for members of the general public. The land tenure, public access issues and mineral development levels coupled with defined resource management objectives for recreation, wildlife and cultural resources make locating an appropriate area for open off-highway vehicle (OHV) use difficult in the Buffalo Field Office.</p> <p>BLM has amended text to clarify Travel and Transportation Management Actions and their application to fluid mineral development.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Travel and Transportation Management	1029-2	Commenters requested that the BLM update its Motor Vehicle Use map, and work with local OHV stakeholders and recreationists before any decision regarding motorized travel areas. Commenters offered revisions to design features in Appendix D (p. 1863) that were associated with roads.	BLM has amended text for clarity. Site specific management plans for travel management will determine the most appropriate method for implementing, monitoring and enforcement. Various methods, including signage, gates, education, and law enforcement may be employed depending on a given situation. The land tenure in the Buffalo Field Office makes travel management a particularly challenging issue. Stakeholders will have an opportunity to be involved with travel management planning where BLM would consider nominations from the public for appropriate OHV use areas, consistent with other resource values.
Travel and Transportation Management	1029-3	Commenters stated that the BLM needs to ensure they have adequate budget and staffing to pursue inventories and closures, including habitat reclamation.	Generally, travel management planning is subject to funding availability and the timeline will depend heavily on whether or not travel management plans and reclamation efforts are funded by Congress. The Goals and Objectives for Travel and Transportation Management in the Buffalo Field Office would base road or trail closures and abandonments on desired road or trail densities, demands for new roads, resource protection, and existing uses. Unless otherwise authorized, BLM would close and reclaim roads and trails if they are heavily eroded, washed out, or if other access roads in better condition are available.
Travel and Transportation Management	1029-4	Commenters were concerned with the BLM's aggressive timeline for developing a travel management plan.	The five year timeline is prescribed in Manual 1626 – Travel and Transportation. The BLM will make every effort to meet national policy and guidance. Generally, travel management planning is subject to funding availability and the timeline will depend heavily on whether or not travel management plans are adequately funded.

Issue Category	Summary Number	Summary Comment	Summary Response
Recreation	1030-1	Commenters requested more description and consistency be given to recreation management in the Buffalo RMP and EIS. Commenters called for more detailed explanation regarding justification for closure areas, and how Special Recreation Management Areas (SRMAs) would impact oil and gas operations. Commenters recommended that information from Appendix T (p. 2543), be incorporated into the management actions in the RMP, and suggested specific wording edits to improve consistency and clarity.	BLM has edited management actions for consistency and clarity and revised text where appropriate, specifically regarding Appendix T (p. 2543). BLM has not edited text for management actions where BLM has no jurisdiction in the matter. Page 719 of the Draft RMP describes the effects of SRMAs on oil and gas development. An MOU Roundtable will be added as an interested party to site-specific management plans prior to any final decision to initiate a temporary or permanent closure.
Recreation	1030-2	Commenters provided suggestions for management of certain areas, particularly Welch Ranch, including trail development, land acquisition, motorized travel limitations, and hunting restrictions. Various commenters expressed concern over management they deemed too restrictive towards recreational shooting, while others considered recreational shooting management not restrictive enough. Commenters encouraged the BLM to prioritize increased and improved signage and recreationist safety measures, and to provide information from updated sources, especially concerning visitor use levels and economic benefits due to SRMAs.	As a broad-reaching document, the scope of the BFO RMP is generally narrowed to land use allocations and relies on references to previous public documents. The summarized analysis of impacts to recreation from recreational shooting closures in Alternative B states, "All SRMAs would be closed to recreational shooting, which would reduce noise, user conflicts between shooters and other recreationists, and would improve safety in areas without proper backdrops. Because the SRMAs and other developed recreational facilities are often the most easily accessible lands within the planning area, there would likely be a substantial reduction in opportunities for target shooting on BLM-administered lands. However, target shooting opportunities are readily available on other public lands in the planning area and at several private shooting ranges." The BLM maintains that the analysis of the issue is appropriate for the land use planning; however, the BLM anticipates forming a team with members of the roundtable to assist in the development of alternatives to manage target shooting in Weston Hills.

Issue Category	Summary Number	Summary Comment	Summary Response
Lands with Wilderness Characteristics	1031-1	Commenters questioned the BLM's identification of only one inventory unit possessing Wilderness Characteristics and requested review of the BLM field inventory data sheets. Commenters asked the BLM to provide additional information and/or explanation regarding the wilderness characteristics inventory. Commenters provided supporting information for lands with wilderness characteristics. Commenters asserted the BLM inventory was inadequate and should be reassessed following BLM Manuals 6310 and 6320. Other commenters suggested the lands with wilderness characteristics unit should be expanded under Alternative D.	BLM inventoried the entire planning area for lands with wilderness characteristics in accordance with BLM Manuals 6310 and 6320 and documented that only one unit met the requirements for size, naturalness and outstanding opportunities for solitude or primitive and unconfined recreation. The inventory worksheets have been added to the BLM website (http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo/docs.html). BLM will review new information on an ongoing basis. BLM has determined that the parcel proposed under Alternative D is appropriate.

Issue Category	Summary Number	Summary Comment	Summary Response
Lands with Wilderness Characteristics	1031-2	<p>Commenters challenged the BLM's determination that three areas in the Citizens' Wilderness Proposal (Gardner Mountain, North Fork Powder River, Fortification Creek) do not contain wilderness characteristics, suggested the BLM reconsider these areas, and provided supporting information for the BLM to consider. Commenters indicated that conditions had changed in the western sub-unit of Fortification Creek and that supplemental analysis was needed for this area. Other commenters stated that the 2010 inventory of lands with wilderness characteristics was inconsistent with the 2012 BLM Manual 6310 and that a new inventory was necessary. One commenter asked the BLM if a trespass cabin in the Fortification Creek area had been removed or not.</p>	<p>BLM analyzed and produced inventory reports on several areas in the Buffalo Field Office, including Fortification Creek and the BLM determined that the area did not meet the criteria set forth in Manual 6310- Conducting Wilderness Characteristics Inventories on BLM Lands. BLM would consider any new information regarding wilderness characteristics in this area.</p> <p>Lands with wilderness characteristics inventories are public documents. BLM inventoried the lands with wilderness characteristics unit (locally referred to as the Face of the Bighorns) and documented that the unit met the requirements for size, naturalness and outstanding opportunities for solitude or primitive and unconfined recreation. The inventory worksheets have been added to the BLM website (http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo/docs.html).</p> <p>The trespass cabin was removed in 2011 and full reclamation of the site has been completed. The unauthorized development was not considered in the assessment of the naturalness of the unit.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Lands with Wilderness Characteristics	1031-3	<p>Commenters suggested the 1979 inventory of potential lands with wilderness characteristics and Wilderness Study Areas (WSAs) was inadequate, outdated, and did not account for expanding energy development, resulting in a violation of BLM's Information Quality Guidelines of 2012. Commenters opposed closing lands with wilderness characteristics to mineral development, requesting that management allow for the flexibility to analyze development proposals on a project-specific basis. Commenters suggested that with modern reclamation, oil and gas development and production was not in conflict with wilderness protection and imposing additional management to protect these areas was not necessary.</p>	<p>BLM's initial inventories for lands potentially containing wilderness characteristics in the planning area were completed in 1978 and 1979. BLM updated inventories for lands potentially meeting the size and naturalness criteria according to the policy set forth in Manual 6310- Conducting Wilderness Characteristics Inventories on BLM Lands (currently in effect) between 2010 and 2012. FLPMA requires BLM to keep a current inventory of resources on public lands, including wilderness characteristics and will update these inventories periodically when new information is available.</p> <p>The purpose of the RMP, as explained in the <i>Purpose and Need for the Resource Management Plan Revision</i> section of Chapter 1, is to provide direction for managing public lands in accordance with BLM's multiple use mandate. Recognizing the Nation's need for domestic sources of minerals, food, timber, and fiber, and incorporating the requirements of the Energy Policy Act of 2005 (Pub. L. 2005) balanced with conservation of wildlife habitat, recreational opportunities and wilderness values are examples of the multiple uses BLM accommodates. The BLM developed and analyzed alternatives in the Proposed RMP and Final EIS using the best available information in compliance with federal laws, guidelines, and policies.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Livestock Grazing Management	1032-1	Commenters expressed concern regarding the lack of disclosure of direct impacts to livestock grazing. Specifically, commenters requested a more detailed description for each alternative of the direct impacts that would result from changing Animal Unit Month (AUM) allocations in the Planning Area.	The BLM developed and analyzed alternatives in the Proposed RMP and Final EIS using the best available information in compliance with federal laws, guidelines, and policies. The BLM analyzed specific terms and conditions for each allotment developed during the grazing lease renewal analysis. The terms and conditions would depend on the specific allotment characteristics including if the allotment was meeting Rangeland Health Standards. The BLM provided clarifying text regarding livestock grazing where appropriate.

Issue Category	Summary Number	Summary Comment	Summary Response
Livestock Grazing Management	1032-2	<p>Commenters requested that the BLM incorporate additional text to better address livestock grazing management, particularly related to the BLM's proposed management of potential conflicts between livestock grazing and other resources and uses. Specifically, commenters requested more discussion on the impacts of livestock grazing on special status species and wildlife; changes to vegetation as a result of livestock grazing; policies and specific management actions or changes to current management to guide livestock grazing activities in identified Greater Sage-Grouse seasonal habitats; and reserve common allotments.</p>	<p>Upon review conducted by BLM, there is no evidence that current stocking rates have impacted endangered, special status, and sensitive species. 97% of grazing allotments assessed to date meet the Wyoming Standards for Healthy Rangelands. The effects of livestock grazing on threatened, endangered, special status, and sensitive species are analyzed in detail in the grazing lease renewal Environmental Assessments (EAs) using site specific allotment data (such as presence of bald eagle nests and Greater Sage-Grouse leks).</p> <p>As stated in the Draft RMP and EIS, Special Status Species – Wildlife, livestock grazing management will have a major beneficial effect on special status wildlife species, including Great Sage-Grouse because of several actions to adjust livestock grazing management to achieve multiple resource health and objectives. These actions include seasonal rotations and appropriate stocking rates.</p> <p>The purpose of BMPs is not to select certain practices or designs and require that only those be used. It is not possible to evaluate all the known practices and make determinations as to which are best. BMPs should be matched and adapted to meet the site-specific requirements of the management action, project and local environment.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Livestock Grazing Management	1032-3	Commenters suggested revisions to the goals and management actions, requested clarification that livestock grazing is not a surface-disturbing activity, suggested terms and conditions for livestock grazing management, and indicated two additional alternatives to analyze. Some commenters expressed concern that the impacts were overstated, while other commenters stated the document did not address all the impacts.	<p>The RMP analyzes management actions at the planning area scale. Impacts to specific sites will be analyzed during implementation level projects.</p> <p>A surface-disturbing activity is an action that alters the vegetation, surface/near surface soil resources, and/or surface geologic features, beyond natural site conditions and on a scale that affects other Public Land values. Livestock grazing management done in accordance with Alternative D, following the Standards for Healthy Rangeland, would not meet the definition of a surface-disturbing activity.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Areas of Critical Environmental Concern	1033-1	<p>Commenters questioned if the proposed ACECs meet the relevance and importance criteria and requested additional documentation to support the designations. Commenters cited specific research supporting their position that the areas did or did not need special management. Commenters stated the information in Appendix S (p. 2531) should be included in Chapter 2.</p>	<p>According to the BLM ACEC Manual 1613: Designation [of ACECs] is based on whether or not a potential ACEC requires special management attention in the selected plan alternative. “Special management attention” refers to management prescriptions developed during preparation of an RMP or amendment expressly to protect the important and relevant values of an area from the potential effects of actions permitted by the RMP. These are management measures which would not be necessary and prescribed if the critical [relevant] and important features were not present. Special management attention also includes any plan provision intended to protect life and safety from natural hazards.</p> <p>Initial determinations for several ACECs were documented in Appendix R of the Powder River Basin Final EIS (BLM 2003). Other areas were analyzed due to agency requirements for newly acquired lands or for protection of sensitive resources. All areas analyzed within the RMP were determined to possess relevant and important values. Appendix S (p. 2531) identifies the relevant and important values for the areas analyzed and provides documentation to support the BLM’s ACEC decisions.</p> <p>The BLM reviewed the ACEC designations for Alternative D and determined the Fortification Creek ACEC would not be carried forward into the Proposed RMP as the RMP Amendment management prescriptions carried forward in the RMP have been determined sufficient to protect the relevant and important values.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
			<p>Regarding valid existing rights, the <i>Leasable Minerals - Fluids</i> section in Chapter 3 clarifies that, “the actions in [the RMP] are subject to valid existing rights.” Leases are an existing contract between the lessee and the federal government and the stipulations as part of that cannot be changed unless an exception, modification, or waiver of the lease stipulation occurs.</p> <p>The BLM noted recommendations to include information from Appendix S (p. 2531) in Chapter 2, and edited the RMP accordingly.</p>
Areas of Critical Environmental Concern	1033-2	<p>Commenters requested more information as to why Pumpkin Buttes should be an ACEC in addition to its current TCP designation. Commenters stated that the RMP fails to adequately describe the current conditions of Pumpkin Buttes or clearly explain how the ACEC will affect the current and proposed development and existing rights.</p>	<p>Pumpkin Buttes ACEC was originally inventoried during the Powder River Basin Final EIS (BLM 2003c). Subsequent tribal consultation documents that the area meets the relevance criteria standard according to the Federal Land Policy and Management Act of 1976 for ACEC designation due to its rare and sensitive archeological remains as well as the site’s significance to several native American tribes. A management plan would be created for the ACEC in consultation with all stakeholders which will acknowledge the valid existing rights associated with ROW holders, fluid mineral lessees, and locatable mineral claimants and explore potential mitigation for any proposed surface disturbances. Further, no objectives associated with ACEC designation would preclude or prohibit development or management activities. Text has been added to the RMP related to the current conditions of Pumpkin Buttes to better address the rationale for, and effects of, this proposed ACEC designation.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Areas of Critical Environmental Concern	1033-3	Some commenters supported the Fortification Creek ACEC and requested it include additional acreage, while other commenters indicated ACEC designation of this area was not warranted. Some commenters requested designating other ACECs identified in Alternative B.	<p>Fortification Creek was determined to meet the relevance and importance criteria in the 2003 PRB Final EIS and when re-evaluated for the RMP revision. The Draft EIS (pg. 449) and Fortification Creek RMP Amendment Decision Record identified that the citizen proposed boundary did not adequately represent the resources for which the ACEC was nominated. To better represent the relevant and important resource values, the boundary evaluated in the RMP revision is the BLM-administered lands within the crucial seasonal ranges (calving areas and crucial winter range).</p> <p>The sagebrush ACEC which was analyzed in Alternative B is much larger than the Core Population Areas and Connectivity Corridors that have been determined sufficient to conserve Greater Sage-Grouse throughout Wyoming and WAFWA Management Zone I.</p> <p>Neither the Fortification Creek nor Sagebrush Ecosystem ACEC are carried forward in the proposed alternative as the proposed management was determined sufficient to protect the important and relevant values for each area.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Scenic or National Back Country Byways	1034-1	Commenters expressed concern that designation of the Slip and Hazelton Roads as National Back Country or Scenic Byways would increase traffic and graffiti, litter, and unauthorized off-road travel along the roads. Other commenters suggested the roads are not maintained year-round or to a level that is sufficient for increased traffic, potentially affecting the safety of travelers and increasing county maintenance requirements and costs. Another commenter indicated that while designation of some roads was appropriate, it was not practical due to the lack of federal funding unless supported by counties responsible for maintaining the roads.	The decision to designate any road as a back country byway will occur separate from the RMP process, requiring subsequent analysis and input from counties and other stakeholders before designation.
Wild and Scenic Rivers	1035-1	Commenters recommended the BLM reconsider five waterways for inclusion in the National Wild and Scenic River (WSR) System, including Red Fork Powder River, Beartrap Creek, North Fork Powder River, Pass Creek, and Poison Creek.	The BLM evaluated all waterways in the planning area, including those listed, for designation as a WSR (see the <i>WSR</i> section in Chapter 3). Beartrap Creek and North Fork Powder River were found eligible, but they did not meet the suitability criteria for designation in BLM Manual 6400 - Wild and Scenic Rivers. The remaining three waterways did not meet the eligibility criteria for designation.
Wilderness Study Area	1036-1	Commenters expressed concern that designation of WSAs would invite public impacts. Commenters recommended expanding the Gardner Mountain WSA.	WSAs are special designations pending before Congress; BLM is required by law to manage WSAs so as not to impair their suitability for preservation by Congress as Wilderness. The BLM is precluded from amending the acreage of an existing WSA and from designating any new WSAs. The BLM conducted an inventory of additional lands outside of all three WSAs in the Buffalo Field Office and determined that additional lands with wilderness characteristics adjacent to WSAs are not present. The commenter is urged to contact Congressional representatives regarding Wilderness Study Area designations and management.

Issue Category	Summary Number	Summary Comment	Summary Response
Wilderness Study Area	1036-2	Commenters requested the BLM incorporate an additional goal and management actions supporting local and state government review processes to remove existing WSAs from land use restrictions. Commenters suggested revisions for management of WSAs related to mineral development and after congressional release of WSAs to maintain wilderness characteristics until a land use plan amendment is completed.	BLM added language, "If Congress decides not to designate a WSA as wilderness, do not lease mineral rights until a plan amendment is completed. Additionally, motorized travel, surface-disturbing activities and any other activities (except valid existing rights) that may impair the wilderness resource will be prohibited until a plan amendment is completed. WSAs released from Congressional designation would then be subject to consideration as Lands with Wilderness Characteristics."
Wilderness Study Area	1036-3	Commenters questioned if the three WSAs exhibit wilderness characteristics due to information that the WSAs contain considerable road systems. In addition, commenters indicated reevaluation of the Fortification Creek WSA was appropriate because the ecological importance of the area for vegetation and elk was overstated.	WSAs are special designations pending before Congress; BLM is required by law to manage WSAs so as not to impair their suitability for preservation by Congress as Wilderness. The BLM is precluded from amending the acreage of an existing WSA and from designating any new WSAs. The BLM conducted an inventory of additional lands outside of all three WSAs in the Buffalo Field Office and determined that additional lands with wilderness characteristics adjacent to WSAs are not present. Rarity of ecosystem does not affect whether or not the unit is designated as a WSA.

Issue Category	Summary Number	Summary Comment	Summary Response
Social and Economic	1037-1	<p>Commenters questioned the adequacy of the analysis of social and economic impacts, and expressed concern about the impact of BLM management on local and regional economies. In particular, commenters indicated that decisions restricting mineral development had not been adequately analyzed or justified in terms of their social and economic impacts including due to (1) large closures and application of major constraints to oil and gas leasing, (2) prioritizing coal over oil and gas, (3) seasonal timing restrictions, (4) travel management restrictions, and (5) designation of special management areas (e.g., SRMAs, ACECs). Additional analysis was also requested related to boom/bust cycles, locatable mineral withdrawals, and impacts on local jobs.</p>	<p>The BLM has added discussions of qualitative impacts on quality of life, conflicts over multiple use, and seasonal restrictions. Potential mitigation actions have been included where possible.</p> <p>To address concerns related to mineral development:</p> <ol style="list-style-type: none"> 1. BLM has added discussion of the potential impacts of future restrictions on current leases. 2. BLM has modified the proposed alternative, to clarify how coal and fluid minerals are to work together. 3. BLM has added language to expand on the discussion of the impacts of seasonal closures. 4. BLM has added language to clarify impacts to SRMAs. <p>BLM clarified that past boom and bust cycles and the vulnerability of the planning area to these cycles are briefly discussed in several sections of Chapter 3 (e.g., see pages 460 and 477). Chapter 4, p. 1461 recognizes the possibility of the boom and bust cycle type effects in the planning horizon but notes that the pace of development during the planning horizon is currently unknown. Therefore, it is not possible to presently determine whether a new boom and bust cycle will occur in the planning horizon, nor the extent of impacts of this cycle should one occur.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Social and Economic	1037-2	<p>Commenters made recommendations on the organization of the socioeconomic sections, sources to reference, additional baseline data collection, and monitoring. Specifically, commenters requested that the BLM describe the geographic distribution of communities and transportation infrastructure, identify different social groups and organizations in the planning area, include information on trends, and identify social and economic indicators to support monitoring. Commenters suggested that the socioeconomic management actions and goals and objectives were too generic to provide meaningful management direction.</p>	<p>The socioeconomic section is organized to facilitate presentation and BLM considers that it need not be organized in the same way as other sections as long as the necessary content is present. The BLM reviewed the socioeconomic affected environment for presence of all the required information and made edits as necessary. Clarification on the regional context and the choice of study region (three counties) has been added. Discussion of occupational and interest groups, of the distribution of communities, roads and resources and of impacts to specific counties or communities was expanded, to the extent possible.</p> <p>BLM has added clarification language and expanded sections to discuss impacts to specific counties and communities to the extent there is reliable predictive information.</p> <p>To address concerns regarding goals and objectives, BLM actions for management of other resources also have socioeconomic impacts and these actions are already described under those resources.</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Social and Economic	1037-3	<p>Commenters asked the BLM to provide further explanation and analysis on the economic impacts, including cumulative impacts, of BLM management decisions on livestock grazing and other agricultural operations. Commenters went on to suggest the BLM clarify how AUM decisions are made relative to the RMP process.</p>	<p>BLM maintains records of various indicators of economic activity on BLM-administered lands, including leases, visitation estimates, grazing allotment AUMs, among others. The socioeconomic analysis done in this EIS makes use of these indicators in the analysis of alternatives. A discussion of indicators has been included in the analysis. A qualitative discussion of the potential environmental costs associated with resource uses has been added. A discussion of non-market values associated with both livestock operations and environmental values has also been added. Current grazing meets the healthy rangeland standards, which is also the proposed alternative.</p> <p>The Draft EIS addresses cumulative impacts (e.g., see p. 1452, 1454, 1456, and 1458 addressing the concerns raised in county land use plans related to BLM management actions that affect the continued financial viability of livestock operators). Language has been added in the cumulative impacts section to ensure that this concern is considered.</p> <p>The BLM has added discussion language of indicators and added explanations regarding AUMs to Appendix U (p. 2589).</p>

Issue Category	Summary Number	Summary Comment	Summary Response
Social and Economic	1037-4	Commenters questioned the BLM's approach to the socioeconomic analysis and in particular to the Impact Analysis for Planning Model (IMPLAN). Commenters expressed concern that IMPLAN failed to capture impacts at the disaggregated scale of a local community, modeled only three economic sectors, and did not address uncertainty associated with the analysis assumptions. Recommendations for additional analysis included geographic dispersion of impacts among communities of the planning area including jobs, non-market values of grazing and resident recreation, economic impacts of constraints from additional seasonal restrictions and management layers.	<p>As noted in the Draft EIS, data are not sufficient to develop reliable estimate of earnings and jobs in other sectors, by alternative. The BLM has revised the document and added language where necessary to clarify.</p> <p>IMPLAN results are typically not expressed as full-time equivalents; this point has been clarified.</p> <p>The document has been edited as follows:</p> <ul style="list-style-type: none"> a. Chapter 4 has been expanded to discuss impacts to specific counties or communities, to the extent possible b. Discussion was added on non-market values c. Discussion was added on seasonal restrictions
Health and Safety	1038-1	Commenters expressed concern that timing limitations could potentially limit the ability of operators to conduct repairs and maintenance operations on producing wells, causing or exacerbating safety and environmental issues.	BLM does intend to regulate disruptive activities; however, there are provisions to provide for emergencies and other necessary operations in accordance with the CFR. It is the operator's responsibility to schedule those routine operations that can be scheduled outside timing limitation windows accordingly.
Edit, Grammar, Punctuation, Spelling, Readability	1039-1	Commenters recommended a number of editorial revisions in the Draft RMP and EIS including spelling and grammar corrections. Commenters also recommended additions and revisions to the glossary, incorporating updated guidance, adding specific terminology or clarifying language, and improving readability.	The BLM evaluated all requests regarding readability, editorial suggestions, reference citations, and suggested additions and corrections, and revised the document, as appropriate. The BLM updated the Proposed RMP and Final EIS to include additional citations to the sources as appropriate to support the determinations, and made various editorial changes and provided clarifying text as needed.

Y.4.3. Non-Substantive Comments

In addition to the substantive comments summarized and responded to above, the BLM received numerous non-substantive comments during the public comment period. In accordance with BLM NEPA Handbook (H-1790-1), a formal response to non-substantive comments is not required; however, the BLM has reviewed and acknowledges all comments received. Non-substantive comments generally included:

- Comments in favor of or against management alternatives and allocations without reasoning that meet the criteria for substantive comments (e.g., we disagree with the Preferred Alternative and believe the BLM should select Alternative C)
- Comments that only agreed or disagreed with BLM policy or resource decisions without justification or supporting data that meet the criteria for substantive comments (e.g., the BLM needs to better manage oil and gas development in the planning area)
- Comments that did not pertain to the Buffalo planning area
- Comments that were outside the scope of analysis for the RMP and EIS (such as comments related to revision and update of laws, policies, and regulations)
- Comments that took the form of vague, open-ended questions or statements that did not meet the criteria for substantive comments

Y.5. Conclusion

The BLM revised the Draft RMP and EIS and prepared the Proposed RMP and Final EIS in response to substantive public comments received during the public comment period. The BLM will continue to consider public, agency, and other stakeholder comments through completion of the Buffalo RMP revision, as appropriate.