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CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter presents the likely direct, indirect, and cumulative impacts on the human and natural environment that could occur from implementing the alternatives presented in **Chapter 2**, Alternatives. This chapter is organized by topic, similar to **Chapter 3**, Affected Environment. Each topic area includes a method of analysis section that identifies indicators, methods, and assumptions; a summary of effects common to all alternatives; and an analysis of impacts for each of the four alternatives. Separate sections describing cumulative impacts and irretrievable or irreversible commitment of resources are presented at the end of the chapter.

Many management actions proposed in **Chapter 2** are planning-level decisions and do not result in direct, on-the-ground changes. However, by planning for uses on BLM-administered surface estate and federal mineral estate during the 20-year planning horizon, the analysis focuses on impacts that could eventually result in on-the-ground changes. Federal mineral estate includes BLM-administered federal minerals that occur beneath surface estate managed by the BLM, as well as beneath surface estate within state or private jurisdiction (known as split-estate lands). Impacts for some resources or resource uses, such as recreation and OHV use, could be confined to the BLM-administered surface estate. Other impacts, such as energy and minerals and requirements to protect special status species and cultural resources from such activity, could apply to all BLM-administered federal mineral estate. Some BLM management actions may affect only certain resources and alternatives. This impact analysis identifies impacts that may enhance or improve a resource as a result of management actions, as well as those impacts that have the potential to deteriorate a resource. However, the evaluations are confined to the actions that have direct, immediate, and more prominent effects. If an activity or action is not addressed in a given section, no impacts are expected, or the impact is expected to be negligible based on professional judgment.

The BLM manages public lands for multiple uses in accordance with the FLPMA. Land use decisions are made to protect the resources while allowing for different uses of those resources, such as energy and mineral development, OHV use, recreation, and livestock grazing. When there are conflicts among resource uses or when a land use activity could result in unacceptable or irreversible impacts on the environment, the BLM may restrict or prohibit some land uses in specific areas. To ensure that the BLM meets its mandate of multiple use in land management actions, the impacts of the alternatives on resource users are identified and assessed as part of the planning process. The projected impacts on land use activities and the associated environmental impacts of land uses are characterized and evaluated for each of the alternatives.

Impact analysis is a cause-and-effect process. The detailed impact analyses and conclusions are based on the BLM planning team's knowledge of resources and the project area; reviews of existing literature; and information provided by experts in the BLM, other agencies, interest groups, and concerned citizens. The baseline used for the impact analysis is the current condition or situation, as described in **Chapter 3**, Affected Environment. Impacts on resources and resource uses are analyzed and discussed in detail commensurate with resources issues and concerns identified throughout the process. At times, impacts are described using ranges of potential impacts or in qualitative terms.

4.1.1 Analytical Assumptions

Several assumptions were made to facilitate the analysis of the projected impacts. These assumptions set guidelines and provide reasonably foreseeable projected levels of development that would occur within the GJFO during the planning period. These assumptions should not be interpreted as constraining or redefining the management objectives and actions proposed for each alternative, as described in **Chapter 2**. The following general assumptions apply to all resource categories. Any specific resource assumptions are provided in the methods of analysis section for that resource.

- Sufficient funding and personnel would be available for implementing the final decision.
- Implementing actions from any of the RMP alternatives would be in compliance with all valid existing rights, federal regulations, bureau policies, and other requirements.
- Implementation-level actions necessary to execute the land use plan-level decisions in this RMP would be subject to further environmental review, including NEPA, as appropriate. However, the RMP/EIS provides the necessary NEPA analysis for some large-scale implementation decisions, including the issuance of leases for fluid minerals such as oil, gas, and geothermal resources, and implementation-level travel management decisions in the GJFO decision area.

- The GJFO Reasonably Foreseeable Development Scenario (BLM 2012a), based on federal minerals and without any development restrictions, estimated that up to 2,108 horizontal shale wells and up to 1,831 combined conventional/directional wells could be drilled on BLM-administered mineral estate within the decision area during the planning period. The anticipated short-term disturbance for the drilling, road construction, and pipeline installation is approximately 2,700 acres for shale development and 6,700 acres for conventional development. The long-term disturbance associated with operation of the new producing exploratory and development wells would be approximately 1,046 acres for shale development and 2,092 acres for conventional development. Actual acres of disturbance could differ from these estimates as a result of advances in technology, changing industry needs, and site-specific measures employed to protect resources.
- A total of approximately 700 wells have been drilled on federal mineral estate in the planning area. The maximum number of federal wells drilled in a year in the planning area is 39 and the average number of federal wells drilled over the past 20 years is 11. The BLM expects development will continue over the life of this plan at a level somewhere between these historical development levels and the RFD projection scenario.
- Direct and indirect impacts of implementing the RMP primarily occur on the public lands administered by the GJFO.
- Local climate patterns of historic record and related conditions for plant growth would continue.
- In the future, as tools for predicting climate changes in a management area improve and changes in climate affect resources and necessitate changes in how resources are managed, the BLM may reevaluate decisions made as part of this planning process and adjust management accordingly.
- Appropriate maintenance would be carried out to maintain the functional capability of all developments.
- The discussion of impacts is based on the best available data. Knowledge of the planning area and professional judgment, based on observation and analysis of conditions and responses in similar areas, are used to infer environmental impacts where data are limited.
- Stipulations would apply, where appropriate, to all surface-disturbing activities (and occupancy) associated with land use authorizations, permits, and leases issued on BLM lands. The BLM administers 1,061,400 surface acres within the decision area. Stipulations also apply to fluid mineral leasing on lands overlying

federal mineral estate, which includes federal mineral estate underlying BLM lands, privately owned lands, and state-owned lands. There are 1,231,200 acres of federal mineral estate within the decision area.

- Data from geographic information systems (GIS) have been used in developing acreage calculations and for generating many of the figures in Appendix A. Calculations are dependent upon the quality and availability of data and most calculations in this RMP are rounded to the nearest one hundred acres. Given the scale of the analysis, the compatibility constraints between datasets, and lack of data for some resources, all calculations are approximate and serve for comparison and analytic purposes only. Likewise, the figures in Appendix A are provided for illustrative purposes and subject to the limitations discussed above. BLM may receive additional GIS data; therefore, acreages may be recalculated and revised at a later date.

4.1.2 General Methodology for Analyzing Impacts

Potential impacts or effects are described in terms of type, context, duration, and intensity, which are generally defined as follows:

- *Type of Impact* – Because types of impacts can be interpreted differently by different people, this chapter does not differentiate between beneficial and adverse impacts (except in cases where such characterization is required by law, regulation, or policy). The presentation of impacts for key planning issues is intended to provide the BLM decision maker and reader with an understanding of the multiple use tradeoffs associated with each alternative.
- *Context* – Context describes the area or location (site-specific, local, planning area-wide, or regional) in which the impact would occur. Site-specific impacts would occur at the location of the action, local impacts would occur within the general vicinity of the action area, planning area-wide impacts would affect a greater portion of the field office, and regional impacts would extend beyond the planning area boundaries.
- *Duration* – Duration describes the length of time an effect would occur, either short term or long term. Short term is defined as anticipated to begin and end within the first five years after the action is implemented. Long term is defined as lasting beyond five years to the end of or beyond the 20-year planning time frame addressed in the RMP.
- *Intensity* – Rather than categorize impacts by intensity (e.g., major, moderate, and minor) this analysis discusses impacts using quantitative data wherever possible.

- *Direct and Indirect Impacts* - Direct impacts are caused by an action or implementation of an alternative and occur at the same time and place. Indirect impacts result from implementing an action or alternative but usually occur later in time or are removed in distance and are reasonably certain to occur.
- *Cumulative Impacts* – Cumulative impacts are described in the Cumulative Impacts section of this chapter. Cumulative impacts are the direct and indirect effects of a proposed project alternative's incremental impacts when they are added to other past, present, and reasonably foreseeable actions, regardless of who carries out the action (40 CFR Part 1508.7). The list of actions used for cumulative impact analysis is provided in **Section 4.2.2**, Past, Present, and Reasonably Foreseeable Future Actions.

For ease of reading, impacts presented are direct, long term, and occur within the larger planning area unless they are noted as indirect, short-term/temporary, or localized. Analysis shown under Alternative A may be referenced in the other alternatives with such statements as "impacts would be the same as, or similar to, Alternative A" or "impacts would be the same as Alternative A, except for . . ." as applicable.

Irreversible and irretrievable commitment of resources is discussed in **Section 4.8**, Irreversible and Irretrievable Commitment of Resources. Irreversible commitments of resources result from actions in which resources are considered permanently changed. Irretrievable commitments of resources result from actions in which resources are considered permanently lost.

4.1.3 Incomplete or Unavailable Information

The Council on Environmental Quality (CEQ) established implementing regulations for NEPA, requiring that a federal agency identify relevant information that may be incomplete or unavailable for an evaluation of reasonably foreseeable significant adverse effects in an EIS (40 CFR 1502.22). If the information is essential to a reasoned choice among alternatives, it must be included or addressed in an EIS. Knowledge and information is, and would always be, incomplete, particularly with infinitely complex ecosystems considered at various scales.

The best available information pertinent to the decisions to be made was used in developing the RMP. Considerable effort has been taken to acquire and convert resource data into digital format for use in the RMP-both from BLM and outside sources.

Certain information was unavailable for use in developing this plan because inventories have either not been conducted or are not complete. Some of the major types of data that are incomplete or unavailable include the following:

- Field inventory of soils and water conditions;
- Field inventory of vegetation composition;
- Field inventory of wildlife and special status species occurrence and condition; and
- Field inventories for cultural and paleontological resources.

For these resources, estimates were made concerning the number, type, and significance of these resources based on previous surveys and existing knowledge. In addition, some impacts cannot be quantified given the proposed management actions. Where this gap occurs, impacts are projected in qualitative terms or, in some instances, are described as unknown. Subsequent project-level analysis will provide the opportunity to collect and examine site-specific inventory data required to determine appropriate application of RMP-level guidance. In addition, ongoing inventory efforts by BLM and other agencies in the planning area continue to update and refine information used to implement this plan.

4.2 CUMULATIVE IMPACTS

Cumulative impacts are effects on the environment that result from the impact of implementing any one of the RMP alternatives in combination with other reasonably foreseeable actions outside the scope of this plan, either within the planning area or adjacent to it. Cumulative impact analysis is required by CEQ regulations because environmental conditions result from many different factors that act together. The total effect of any single action cannot be determined by considering it in isolation, but must be determined by considering the likely result of that action in conjunction with many others. Evaluation of potential impacts considers incremental impacts that could occur from the proposed project, as well as impacts from past, present, and reasonably foreseeable future actions. Management actions could be influenced by activities and conditions on adjacent public and non-public lands beyond the planning area boundary; therefore, assessment data and information could span multiple scales, land ownerships, and jurisdictions. These assessments involve determinations that often are complex and, to some degree, subjective.

4.2.1 Cumulative Analysis Methodology

The cumulative impacts discussion that follows considers the alternatives in the context of the broader human environment—specifically, actions that occur outside the scope and geographic area covered by the RMP. Cumulative impact analysis is limited to important issues of national, regional, or local significance; therefore, not all resources identified for the direct and indirect impact analysis in this EIS are analyzed for cumulative impacts.

Because of the programmatic nature of an RMP and cumulative assessment, the analysis tends to be broad and generalized to address potential effects that could occur from a reasonably foreseeable management scenario combined with

other reasonably foreseeable activities or projects. Consequently, this assessment is primarily qualitative for most resources because of lack of detailed information that would result from project-level decisions and other activities or projects. Quantitative information is used whenever available and as appropriate to portray the magnitude of an impact. The analysis assesses the magnitude of cumulative impacts by comparing the environment in its baseline condition with the expected impacts of the alternatives and other actions in the same geographic area. The magnitude of an impact is determined through a comparison of anticipated conditions against the naturally occurring baseline as depicted in the affected environment (see **Chapter 3**) or the long-term sustainability of a resource or social system.

The following factors were considered in this cumulative impact assessment:

- Federal, nonfederal, and private actions.
- Potential for synergistic effects or synergistic interaction among or between effects.
- Potential for effects to cross political and administrative boundaries.
- Other spatial and temporal characteristics of each affected resource.
- Comparative scale of cumulative impacts across alternatives.

Temporal and spatial boundaries used in the cumulative analysis are developed on the basis of resources of concern and actions that might contribute to an impact. The baseline date for the cumulative impacts analysis is 2010. The temporal scope of this analysis is the life of the RMP, which encompasses a 20-year planning period.

Spatial boundaries vary and are larger for resources that are mobile or migrate (e.g., elk populations) compared with stationary resources. Occasionally, spatial boundaries could be contained within the planning area boundaries or an area within the planning area. Spatial boundaries were developed to facilitate the analysis and are included under the appropriate resource section heading.

4.2.2 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions are considered in the analysis to identify whether and to what extent the environment has been degraded or enhanced, whether ongoing activities are causing impacts, and trends for activities in and impacts on the area. Projects and activities are evaluated on the basis of proximity, connection to the same environmental systems, potential for subsequent impacts or activity, similar impacts, the likelihood a project will occur, and whether the project is reasonably foreseeable.

Projects and activities considered in the cumulative analysis were identified through meetings held with cooperators and BLM employees with local knowledge of the area. Each was asked to provide information on the most influential past, present, or reasonably foreseeable future actions. Additional information was obtained through discussions with agency officials and review of publicly available materials and Web sites.

Effects of past actions and activities are manifested in the current condition of the resources, as described in the affected environment (see **Chapter 3**). Reasonably foreseeable future actions are actions that have been committed to or known proposals that could take place within the 20-year planning period.

Reasonably foreseeable future action scenarios are projections made to predict future impacts—they are not actual planning decisions or resource commitments. Projections, which have been developed for analytical purposes only, are based on current conditions and trends and represent a best professional estimate. Unforeseen changes in factors such as economics, demand, and federal, state, and local laws and policies could result in different outcomes than those projected in this analysis.

Other potential future actions have been considered and eliminated from further analysis because there is a small likelihood these actions would be pursued and implemented within the life of the plan or because so little is known about the potential action that formulating an analysis of impacts is premature. In addition, potential future actions protective of the environment (such as new potential threatened or endangered species listings or regulations related to fugitive dust emissions) have less likelihood of creating major environmental consequences alone, or in combination with this planning effort. Federal actions such as species listing would require BLM to reconsider decisions created from this plan because the consultations and relative impacts might no longer be appropriate. These potential future actions may have greater capacity to affect resource uses within the planning area; however, until more information is developed, no reasonable estimation of impacts could be developed.

Data on the precise locations and overall extent of resources within the planning area are considerable, although the information varies according to resource type and locale. Furthermore, understanding of the impacts on and the interplay among these resources is evolving. As knowledge improves, management measures (adaptive or otherwise) would be considered to reduce potential cumulative impacts in accordance with law, regulations, and the final RMP.

Projects and activities identified as having the greatest likelihood to generate potential cumulative impacts when added to the RMP alternatives are displayed in **Table 4-1**, Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

Human Actions	
Energy and minerals development	Summary. Most oil and gas development on BLM-administered lands within the planning area has in the DeBeque/Collbran area and near the Utah border. Numerous mining claims exist, but the only significant mining activity is associated with past and current uranium/vanadium mining claims and coal mining. Several small individual placer mining claims exist along the Dolores River, and a large group of recently staked uranium mining claims exist on BLM-administered public lands in the GJFO, Uncompahgre Field Office, and Moab Field Office. As such, additional mining and oil and gas development is expected.
	Alabaster/Gypsum. Historically there has been one small-scale surface mining operation south of Gateway along Highway 141. There are no active operations underway (BLM 2010d).
	Copper. As of January 2011, there is one Notice of Intent on file for collection of hand specimen quality copper minerals (azurite and malachite) from an existing underground mine. Copper was also produced from some of the historic uranium/vanadium mines in the Uravan mineral belt within the GJFO (BLM 2010d).
	Coal. Until recently, there was one active underground coal mine operating within the GJFO along Highway 139 in the Book Cliffs. They have stopped operations until a Lease Modification is processed. Leasing for another larger underground coal mine is going through the NEPA/permitting process with an estimated Record of Decision sometime in the next few years
	Potash. There is a potential undefined potash resource underneath Sinbad Valley, and, in 2008, a company expressed interest in exploring the area for potential development via solution mining. Prior to 2008 there had been no exploration activity for potash within the planning area (BLM 2010d).
	Mineral material sales. There are two active commercial sand and gravel operations and three common use areas identified for disposal of bentonite clay, adobe fill, and red gravel via over-the-counter permit sales. Three common areas were closed due to potential impacts on cultural resources and a new NCA designation (BLM 2010d). Gravel mining on private lands in and surrounding the planning area is very common. As these resources are depleted on private lands, it is expected that demand for mining public lands will increase. There is an existing clay mine (Little Park Road community pit) that has a high occurrence potential, while there is moderate potential for clay development in other parts of the planning area.
	Oil shale development. There are no active or proposed oil shale projects as of March 2011. A Final EIS was completed and a ROD was issued in November 2008, amending the 1987 RMP to make lands available for oil shale leasing. Leases have not yet been issued. A NEPA analysis would be conducted prior to lease issuance (BLM 2010d). These decisions are currently being revisited by the BLM in a programmatic planning process and any additional decisions will be adopted by this RMP, as applicable.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

Renewable energy development. The BLM has authorized meteorological towers to test wind energy potential in the field office near Palisade. Potential exists for future geothermal, solar, and wind energy development on or off of BLM lands in or surrounding the planning area.
Uncompahgre Basin (1989) and San Juan/San Miguel (1985) RMPs and Oil and Gas Leasing Amendment (1991). These documents provide for mineral development on the Uncompahgre BLM Field Office and are currently being revised in a new RMP planning effort.
Moab Field Office RMP (2008). This RMP provides for mineral development on the BLM Moab Field Office
White River Field Office RMP (1996) and Oil and Gas amendment. The amendment addresses potential oil and gas exploration and development activities within the 1.5 million acres managed by the White River Field Office.
Glenwood Springs RMP Oil and Gas Leasing Amendment (1999) (Now Colorado River Field Office). The amendment evaluates the impacts of oil and gas leasing and development on BLM lands and federally owned mineral estate under private lands in the Glenwood Springs Planning Area.
Grand Junction Field Office Reasonably Foreseeable Development Scenario (2012). This document summarizes existing fluid minerals development activities on the field office and gives a future development scenario based on unconstrained development.
Grand Junction Field Office Mineral Potential Report (2010). Looks at all minerals (non-oil and gas) in the field office and gives a 20-year prediction of development potential.
Grand Mesa, Uncompahgre, and Gunnison National Forests (1993). Final Oil and Gas Leasing EIS and Record of Decision evaluate the potential effects of alternative programs for oil and gas leasing on the Grand Mesa, Uncompahgre, and Gunnison National Forests.
White River National Forest Oil and Gas Amendment. The White River National Forest issued its current oil and gas leasing availability decision in 1993 (Oil and Gas Leasing Final Environmental Impact Statement and Record of Decision). Since 1993, information and circumstances considered for that decision have changed, including the White River National Forest issuance of a revised Land and Resource Management Plan, technological advances in oil and gas exploration and development that expand development potential of previously noneconomic resources, and increased level of projected oil and gas development potential activities on the Forest. The White River National Forest plans to prepare an EIS to disclose the environmental effects from oil and gas leasing.
Orchard II Master Development Plan (2007). EnCana Oil and Gas (USA), Inc. is proposing a multi-year program of oil and gas development on approximately 12,067 acres of public, split estate, and private lands located southeast of the town of DeBeque.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

	EnCana Oil and Gas (USA), Rulison Area Oil and Gas Development (2007). EnCana proposes to develop oil and gas resources in an area of approximately 1,885 acres of federal, private, and split-estate lands located southwest of Rifle in Garfield County.
	Black Hills Western Properties Exploratory Proposal (2012). This project is in the planning phase, and a decision is expected in the near future. It could authorize drilling of 24 wells on 12 pads over a three-year period.
	Whitewater Master Development Plan. This project is in the planning phase, and a decision is expected in the near future. It would authorize development of oil/gas on multiple well pads.
	The Breaks Exploratory Proposal. This proposal is in the early planning stages for leases east and west of Highway 65, south of Mesa.
	Cedar Bench Master Development Plan. This project is in pre-planning (exploration) stages of existing unit re-vitalization using new technology.
	Mesa County Mineral and Energy Resources Master Plan (2011). This plan identifies known energy resources and opportunities in Mesa County and recommends policies to guide regulation and development.
Vegetation Management	Forestry. Past, current, and foreseeable forestry uses in the project area include personal and commercial harvest of pinyon and juniper fuel wood, poles and posts for fence building, wildings (live trees), and Christmas trees.
	Vegetation treatments. Mechanical treatments of vegetation (e.g., chaining, rollerchops, Dixie-harrow, drill seeding, hydro-axing, brush mowing) were very common in the past on public and private rangelands in the planning area. These treatments and maintenance of these vegetation treatments are still fairly common and will likely continue. In addition, manual, biological, and mechanical treatments of large woody invasive species such as tamarisk (*Tamarix sp*.) and Russian-Olive (*Elaeagnus angustifolia*) have occurred in the riparian areas of rivers and streams and this type of restoration work is likely to continue in the foreseeable future.
	Sage-grouse habitat. Implementation of conservation plans for sage-grouse within the planning area includes active management techniques to improve habitat quality for sage-grouse, maintain or increase management unit populations, and maintain or increase sage-grouse numbers.
	Hazardous fuels reduction. Fuels treatments, including prescribed fires, chemical, biological, and mechanical treatment, and seeding, would likely continue and potentially increase in the future.
	Biomass. Future forestry use of woody biomass for energy production could occur.
Livestock grazing	Livestock grazing has a long history in the region. Generally, livestock use has decreased over the past 100 years. Grazing in portions of the Cumulative Impacts Analysis Area has either remained stable or declined in the recent past, and demand on BLM-administered public lands has remained stable in the last 10 years. Approximately 978,600 acres of BLM-administered public lands are open to grazing within grazing allotment boundaries and are managed by the GJFO in accordance with the 1987 RMP. Some allotments within the planning area are managed by other field offices, while the GJFO manages

Table 4-1
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	portions of allotments that are within other field offices. Total active preference (permitted use) is 63,859 AUMs, with an additional 24,344 AUMs in suspension. The majority of the allotments are used for grazing cattle (99 percent), primarily cow/calf operations. The authorization of both sheep and cattle use occurs on only two allotments (1 percent). Two allotments also include a small amount of horse use. Grazing on private lands within the Cumulative Impact Analysis Area (CIAA) is expected to remain stable or slightly decrease as residential development increases.
Recreation and visitor use	Colorado's population has grown significantly in the past 10 years, and an increasing number of people are living near or seeking local public lands for a diversity of recreational opportunities characterized by the "mountain resort or outdoor lifestyle." The primary recreational activities in the GJFO are motorized vehicle touring, big and small game hunting, backpacking, horseback riding, mountain biking, sight-seeing, all-terrain vehicle use, rock climbing, hiking, and river boating. Recreation-based visitor use in the GJFO has increased in most areas in recent years and is expected to continue to increase on BLM and non-BLM lands.
Lands and realty	Since approval of the 1987 RMP, the GJFO has exchanged 2,271 acres, acquired 2,253 acres through exchange, issued patents for 440 acres through the Recreation and Public Purposes Act, purchased 2,296 acres, and acquired 375 acres through donation. The BLM is moving toward the consolidation of BLM lands to benefit the public. To achieve this goal, candidates for land tenure adjustment through disposal, sale, exchange, or acquisition include parcels that are difficult to manage or that do not have public access, relatively small parcels adjacent to other federal- or state-managed lands, parcels that would increase conservation of natural resources, and parcels that increase access and use of BLM lands. Residential development in the areas surrounding GJFO has been increasing.
	Existing and Valid Rights. Currently the GJFO administers 610 cases (8,330 acres) of FLPMA and pre-FPLMA rights-of-way and 262 cases (2,934 acres) of Mineral Leasing Act rights-of-way. These existing authorizations are usually limited to a 30 year term, which is typically renewed, and should be considered a long-term use of the land. Most of these authorizations are for roads, power lines, natural gas pipelines/facilities, water lines, phone lines, injection wells, communication sites, and compressor stations, in addition to other types of facilities. At any one time there are on average 35 pending (i.e., not authorized) rights-of-way requests in the GJFO.
	Bangs Canyon Land Acquisition. The Bangs Canyon acquisition project, consisting of 4 parcels containing 200 acres adjacent to the current Bangs Canyon SRMA boundary along the Gunnison River, was completed in 2011.
	Colorado Mesa University Recreation and Public Purposes Act Land Sale. In January 2012 BLM approved an application from Colorado Mesa University to acquire approximately 80 acres of public land in the Whitewater area for a regional public safety training facility.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

Grand Junction Regional Airport Land Transfer. BLM is considering a request from the Grand Junction Regional Airport Authority to acquire 720 acres of public land in the North Desert, located north and adjacent to airport property. Decision expected 2012.
Mountain Island Land Exchange. The proposed exchange is located in the Glade Park/Pinyon Mesa area and consists of 788 acres (10 parcels) of BLM-managed land in exchange for 576 acres (4 parcels) of Mountain Island Ranch land. Decision expected 2012.
Colorado National Monument General Management Plan Final EIS (2005). This plan sets management, protection, and use goals and guidelines for the Colorado National Monument.
Colorado Canyons National Conservation Area and Black Ridge Canyons Wilderness (2004). This plan sets management, protection, and use goals and guidelines for the McInnis Canyons National Conservation Area.
Interim Management Policy for Dominguez-Escalante National Conservation Area and Dominguez Canyon Wilderness (2010). This plan sets management, protection, and use goals and guidelines for the Dominguez-Escalante National Conservation Area. A new RMP is being prepared and is expected to be implemented in 2012.
Final EIS for White River National Forest (2002). This plan sets management, protection, and use goals and guidelines for the White River National Forest.
Amended Land and RMP for Grand Mesa, Uncompahgre, and Gunnison National Forests (1991). This plan sets management, protection, and use goals and guidelines for the Grand Mesa, Uncompahgre, and Gunnison National Forests.
Uncompahgre Basin (1989) and San Juan/San Miguel (1985) RMPs. These plans set management, protection, and use goals and guidelines for the BLM Uncompahgre Field Office. These plans are being revised in a new RMP planning effort. Decision expected 2014.
Moab Field Office RMP (2008). This plan sets management, protection, and use goals and guidelines for the BLM Moab Field Office.
White River Field Office RMP (1996) and Oil and Gas Amendment. The amendment addresses potential oil and gas exploration and development activities within the 1.5 million acres managed by the White River Field Office.
Mesa County Master Plan (2000). Countywide land use and growth plan for Mesa County.
Montrose County Master Plan (2010). Countywide land use and growth plan for Montrose County edited several times, including in 2006 and 2010.
Garfield County Comprehensive Plan (under revision as of 2011). Countywide land use and growth plan for Garfield County.
Dominguez-Escalante National Conservation Area Land Acquisitions. Decisions expected in 2012 and 2013.
Energy Gateway South 500kV interstate transmission project with one alternative in northwest corner of Mesa County. Decision expected 2014.
TransWest Express 600kV interstate transmission project with one alternative in northwest corner of Mesa County. Decision expected 2014.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

	Zephyr 500kV interstate transmission project with multiple alternatives through the Grand Junction FO. Decision time frame unknown.
	Designation of Energy Corridors on Federal Lands in the 11 Western States Programmatic EIS (2007). This multi-federal agency Programmatic EIS analyzes the environmental impacts of designating federal energy corridors on federal lands in 11 western states and incorporating those designations into relevant land use and resource management plans.
Roadway development	Road construction has occurred in association with timber harvesting, energy development, and mining on BLM lands, private lands, State of Colorado lands, and US Forest Service lands. The bulk of new road building is occurring for community expansion and energy development. Road construction is expected to continue at the current rate on BLM and US Forest Service lands; the future rate is unknown on private and State of Colorado lands. Since 1987, 146 additional rights of ways for roads have been authorized under FLMPA. These roads total 1,492 acres of encumbered land.
Water diversions	The GJFO has been and will continue to be affected by irrigation and drinking water diversions. Reservoir operations have affected water supply, aquatic conditions, and timing. Irrigation rights are expected to continue being bought and sold in the future, with some new property owners informally changing how the right was historically used. Due to population growth and land sales, more agricultural water rights may be converted to municipal and industrial uses. Future oil shale development could also result in water diversions.
Natural Processes	
Spread of noxious/invasive weeds	Noxious weeds, including tamarisk, have invaded and will continue to invade many locations in the planning area. Noxious weeds are carried by wind, humans, machinery, and animals. GJFO currently manages weed infestations through integrated weed management, including biological, chemical, mechanical, and educational methods. The 1991 and 2007 Records of Decision for Vegetation Treatment on BLM Lands in Thirteen Western States, and the 2007 Programmatic Environmental Report guide the management of noxious weeds in western states. GJFO finalized a noxious weed management EA in December 2010 that updated the field office integrated weed management plan. Noxious and invasive weeds are expected to continue to spread on all lands. Due to their ability to tolerate certain conditions, some species are expected to remain a serious long-term challenge in the planning area.
Wildland fires	Fires within the planning area are both naturally occurring and used as a management tool. Naturally occurring fires have been widely distributed in terms of frequency and severity. Increasing recurrence and severity of drought conditions have been predicted for this area as a result of climate change. This could, in turn, increase the occurrence and severity of wildfires on BLM land.
Spread of forest insects and diseases	Several years of drought in western states have resulted in severe stress on pine trees. This stress has made the trees less able to fend off attacks by insects such as mountain pine beetles. Mountain pine beetle infestation has been occurring in Colorado since 1996, and some pinyon pine stands in the planning area have experienced ips beetle kill. Sudden Aspen Decline is also impacting parts of the planning area.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

Drought	For much of the last decade, most of the western US has experienced drought. Inflows to Lake Powell (indicative of the Upper Colorado Basin) have been below average since 2000, and Colorado regularly goes through periods of drought that may be statewide, region-wide, or within a more localized area. Agriculture, drinking water supplies, and wildland fires are all impacted by drought.
Climate change	Increased concern over greenhouse gas emissions and global warming issues may lead to future federal and state regulations limiting the emission of associated pollutants. Regulation could include setting significance thresholds for greenhouse gases like those proposed under the California Environmental Quality Act.

4.3 RESOURCES

This section contains a description of the biological and physical resources of the GJFO and follows the order of topics addressed in **Chapter 3**, as follows:

- Air and climate resources;
- Soil resources;
- Water resources;
- Vegetation;
- Fish and wildlife;
- Special status species;
- Wild horses;
- Cultural resources;
- Paleontology;
- Visual resources;
- Wildland fire management; and
- Lands with wilderness characteristics outside existing WSAs.

4.3.1 Air and Climate Resources

Air resources were evaluated within the planning area to determine how air quality could be affected by future federal actions implemented under this RMP. Actions that initiate or increase emissions of air pollutants can result in negative effects on air resources, including increased concentrations of air pollutants, decreased visibility, increased atmospheric deposition on soils and vegetation, and acidification of sensitive water bodies. Actions that reduce or control emissions of air pollutants can be very effective at improving air quality and preventing degradation. This section addresses the potential effects of emissions

of air pollutants from specific activities authorized, allowed, or performed by the BLM under each alternative within the planning area.

Summary of Impacts and Conclusions

The potential for BLM actions to contribute to future significant adverse impacts on air quality was analyzed in the context of existing air quality conditions within the planning area and predicted future growth in emission generating activities. Potential emissions of air pollutants were estimated for several BLM management actions and activities likely to occur under each alternative that have the potential to generate quantifiable emissions of regulated air pollutants. The estimated emissions were compiled in an emissions inventory, summarized in **Appendix O**, Air Emissions Inventory. Total estimated emissions and predicted increases in emissions were analyzed to develop air resource management goals, objectives, and actions that would be effective in minimizing future impacts on air quality. The resulting adaptive management strategy is described in detail in **Appendix G**, Draft Air Resources Management Plan for the Grand Junction Field Office Planning Area.

Emissions were estimated for five criteria pollutants, volatile organic compounds, hazardous air pollutants, and greenhouse gases. A base year of 2008 was used to estimate actual (existing) emissions. Emissions were also estimated for two future years, a short term year (Year 10) and a long term year (Year 20), as the basis to evaluate potential increases in emissions over the life of the plan and the effectiveness of emissions control strategies. Potential emissions were also estimated for reasonably foreseeable future cumulative actions within the planning area and are discussed further in the Cumulative section.

Estimated absolute emissions from BLM actions and estimated changes in emissions from BLM actions over base year levels vary by pollutant and alternative. In general, the major contributor to total pollutant emissions over the life of the plan is predicted to be predominantly attributable to activities associated with oil and gas development. Activities associated with underground coal mining and surface mining of uranium and vanadium are predicted to be major contributors to particulate matter emissions. Activities associated with travel management, including off-highway vehicle use and road maintenance, are predicted to contribute to some pollutant emissions as well.

Existing air quality conditions, geographic characteristics, and estimated emissions for each alternative were evaluated to identify pollutants of concern and activities that emit significant quantities of pollutants of concern and to identify potential adverse impacts on air quality. The identification of the following pollutants, activities, and potential impacts under each alternative was used to design air quality management goals and objectives listed in Chapter 2 and the Air Resources Management Plan included in **Appendix G**:

- The magnitude of estimated emissions from BLM authorized oil and gas activities at the level of development predicted in Alternatives A, B, and C over the life of the plan have the potential to contribute to increased ambient concentrations of ozone in and adjacent to the Planning Area during the summer and/or winter ozone seasons. Emissions from BLM authorized oil and gas activities under Alternative D have the potential to contribute significantly to ozone formation in the region;
- The magnitude of and increases in estimated emissions from BLM-authorized oil and gas activities at the level of development predicted in Alternatives B and D have the potential to degrade visibility and increase atmospheric deposition at sensitive areas such as the Maroon Bells – Snowmass Wilderness Area;
- The magnitude of and increases in estimated emissions from BLM-authorized oil and gas activities predicted in Alternatives B and D have the potential to cause impacts related to short term and long term exposure to hazardous air pollutants;
- The magnitude of and increases in estimated emissions from solid mineral development, including underground coal mining and uranium and vanadium surface mining, at the level of development predicted for all alternatives over the life of the plan have the potential to cause impacts related to fugitive dust and increased ozone formation, visibility degradation, and atmospheric deposition;
- The estimated emissions at the levels of development predicted in all alternatives for solid mineral development and in Alternative D for oil and gas development have the potential to result in significant increases (greater than 75,000 tons) of greenhouse gases;
- The magnitude of and increases in estimated emissions from comprehensive travel and transportation management including off-highway vehicle use and road maintenance, at the level of activity predicted for all alternatives have the potential to cause impacts related to fugitive dust and increased ozone formation.

In general, Alternative C emission estimates result in the lowest total air pollutant emissions in future project years and decreases in emissions of some pollutants over the base year. Lower emissions are expected for this alternative as it is the alternative with the greatest surface restrictions on solid mineral development and lower predicted reasonably foreseeable development for oil and gas. This alternative would likely result in the least adverse impacts on air quality. Alternative D emission estimates result in the greatest magnitude and increases in total air pollutant emissions. Alternative D imposes the least restrictions on solid mineral development and includes the maximum reasonably foreseeable development rate for oil and gas, resulting in higher emissions than the other alternatives. This alternative has the highest potential for adverse

impacts on air quality. The total emissions estimated for Alternative A result in the next to lowest emissions. Alternative B (Preferred Alternative) results in the second highest estimated emission levels. **Table 4-2**, Estimated Annual Emissions Summary BLM Actions within the Planning Area, summarizes the estimated annual emissions for each alternative by pollutant.

Table 4-2
Estimated Annual Emissions Summary
BLM Actions within the Grand Junction Planning Area

Total Estimated Emissions by Alternative (tons per year)							
Scenario	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Base Year	1,102	1,992	1,536	2,047	289	66	104
Alternative A - Project Year 10	1,054	1,835	1,513	2,790	485	55	99
Alternative B - Project Year 10	1,627	2,655	2,185	2,450	471	89	162
Alternative C - Project Year 10	930	1,665	1,350	2,121	399	55	83
Alternative D - Project Year 10	5,130	7,811	6,516	3,448	769	283	548
Alternative A - Project Year 20	934	1,811	1,608	3,705	695	49	98
Alternative B - Project Year 20	1,709	2,808	2,195	3,028	649	112	179
Alternative C - Project Year 20	728	1,518	1,319	2,686	576	48	73
Alternative D - Project Year 20	6,783	9,631	6,723	4,469	1,001	472	709

Methods of Analysis

The air resource impact analysis consisted of a comparative emissions approach to evaluate existing emissions levels and air quality conditions compared with estimated future emissions for each alternative based on predicted rates of growth and decline and the potential for impacts on future air quality conditions. The purpose of conducting the emissions based analysis was to evaluate the magnitude of emissions of each pollutant from BLM authorized activities to identify the potential for those emissions to cause adverse impacts on air quality in the context of existing air quality conditions. By identifying those activities with significant estimated emissions, the BLM can focus its air resource management efforts effectively. The emissions based analysis was also used to evaluate increases in emissions from each activity over a base year for each alternative. This information is useful for evaluating the effect of various management actions on air emissions and for evaluating the effect of emission control strategies. This information is ultimately used to inform the selection of effective resource management actions under this RMP. This approach included the following steps:

1) evaluating existing air quality conditions based on available air monitoring data and identifying air quality issues (**Section 3.2.1**);

2) identifying management actions and activities authorized, permitted, or allowed by BLM within the planning area that generate air pollutant emissions;
3) compiling base year operational and production data for each identified emission generating activity;
4) compiling projected future development, operational, and production data for each identified emission generating activity for the selected future years over the life of the plan (Year 10 and Year 20);
5) calculating estimated current and projected future emissions of specific air pollutants for identified management actions and activities for each alternative and compiling the calculations in an emissions inventory (**Appendix O**);
6) analyzing the magnitude of predicted emissions for each activity and changes in estimated emissions over the base year and between alternatives to determine the potential for future impacts on air quality;
7) evaluating increases in estimated emissions from future BLM actions in the context of potential cumulative emissions within the planning area over the life of the plan;
8) evaluating the effect of development rates, restrictions, and control measures imposed under each alternative and designing management actions and an adaptive management strategy to protect air quality (**Appendix G**).

The following list of emission generating activities were identified as those management actions and activities authorized, permitted, allowed, or performed under this RMP that could potentially emit regulated air pollutants and could potentially cause impacts on air quality within the planning area and Class I areas within 100 kilometers of the planning area:

- Fluid Leasable Minerals – Conventional Oil and Gas
- Fluid Leasable Minerals – Coal Bed Natural Gas
- Fluid Leasable Minerals – Shale Gas
- Solid Leasable Minerals – Coal
- Locatable Minerals – Uranium and Vanadium
- Salable Minerals – Sand and Gravel
- Lands and Realty – Rights-of-Way
- Livestock Grazing
- Comprehensive Travel and Transportation Management

- Vegetation – Prescribed Fire and Mechanical Treatment

The following air pollutants were identified as being pollutants that could potentially be emitted by management actions and activities authorized, permitted, allowed or performed under this RMP. Emissions of each of these pollutants were estimated for each identified activity and addressed for each alternative in this analysis.

- Carbon monoxide (CO)
- Nitrogen oxides (NOx)
- Particulate matter less than or equal to 10 microns in diameter (PM10)
- Particulate matter less than or equal to 2.5 microns in diameter (PM2.5)
- Sulfur dioxide (SO2)
- Volatile Organic Compounds
- Hazardous Air Pollutants

The analysis focused on estimating emissions associated with peak construction, production, and operation activities associated with the identified emission generating management actions listed above for the pollutants listed above. Year 2008 was chosen as the base year for estimating actual emissions as this was the most recent year that reliable production and emissions data was available for existing sources within the planning area. Future year estimated emissions were calculated for ten and twenty years after the base year. Year 10 and Year 20 were selected for future year scenarios as these years represent potential peak construction and operation years for projected oil and gas development. Management actions associated with oil and gas development represent the largest single sector of emissions for most of the air pollutants, therefore, peak development years for this sector were considered most conservative for calculating air emissions.

Operational, production, and construction activity data used to estimate emissions for proposed emission sources were obtained from Grand Junction Field Office staff, the Reasonably Foreseeable Development Scenario for Oil and Gas for the Grand Junction Field Office (BLM 2012a), the Mineral Potential Report (BLM 2010b), and from NEPA analyses currently being conducted for BLM actions within the planning area. Emission factors used to estimate proposed emissions were obtained primarily from EPA's AP-42 Compilation of Air Pollutant Emission Factors (EPA 1995), EPA's NONROAD2008a Emissions Model (EPA 2009), EPA's MOVES2010a Motor Vehicle Emissions Simulator (EPA 2010a), API Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry (API 2009), Colorado Department of Public Health and Environment (CDPHE), and Western

Governors' Association - Western Regional Air Partnership (WRAP 2005). Emissions of air pollutants were estimated for the base year and the two future years (Year 10 and Year 20) for each identified activity and addressed for each alternative in this analysis. Given the uncertainties concerning the number, nature, and specific location of future emission sources and activities, the emission comparison approach provides an appropriate basis to compare the potential impacts under the various alternatives. Major assumptions used in this impact analysis include the following:

- Air pollutant emissions presented in this analysis are useful for comparing the relative impacts of each alternative and may not represent actual future emissions. Emissions estimates are based on predictions of future mineral resource development potential scenarios rather than actual development projects;
- Stationary sources associated with oil and gas development will operate in accordance with CDPHE Regulation 7, revised January 2011;
- Emissions from the following management actions were not estimated because the potential for development was considered low or speculative: oil shale research and development; geothermal, potash, gold, copper, and silver exploration and development; and miscellaneous gems and other salable materials development;
- Emissions from the following management actions were not estimated because the level of activity is not expected to change between alternatives and the magnitude of emissions from the activity is considered to be very small in comparison to other management activities, or sufficient operational or production data was not available to reliably quantify emissions: wild (unplanned) fires, fire suppression aircraft, invasive species and pest management, grassland and shrub land management, wild horse management and activities related to heritage and visual resources, socioeconomic resources, and fish and wildlife resources.

For additional information on the emissions inventory please refer to **Appendix O**. For a more detailed description of the methodologies and assumptions used in this analysis please refer to the Technical Support Document for Air Resources available upon request from the BLM.

Effects Common to All Alternatives

Air quality impacts include changes in air pollutant concentrations, changes in visibility, impacts on soils and vegetation from atmospheric deposition, and changes in lake chemistry. Several key factors play a role in determining the severity of these impacts such as the magnitude and chemistry of the air emissions, meteorological conditions, and topography. Emissions were quantified for each of the alternatives as an indication of the potential magnitude

of impacts on air quality from each alternative. Increases in potential emissions from the base year were also evaluated. All of the alternatives result in changes to emissions of air pollutants relative to the base year and would therefore result in impacts that have the potential to both improve and degrade air quality depending on the pollutant. For this analysis, the magnitude of the change in emissions was analyzed to determine whether the impacts on air quality have the potential to be significant (i.e., exceed NAAQS or exceed screening levels of concern for visibility and atmospheric deposition).

Air quality modeling can be used to determine ambient concentrations of air pollutants and to assess potential impacts on air quality however models are dependent on specific input data to predict impacts. These input data include actual meteorological data, actual emissions data, emission source spatial and temporal data, and actual topographic data. At this stage of the planning process, these project specific data are not known. Proponents of mineral development projects would be required to provide data to BLM to analyze project impacts on ambient air quality standards at the time that a project is proposed through appropriate NEPA analysis. The NEPA analysis may include air quality modeling to determine whether the project has the potential to exceed or violate any ambient standards or cause significant adverse impacts on air quality. In addition, as part of the adaptive management strategy for managing air resources within the planning area, the BLM will be conducting a regional air modeling study to evaluate potential impacts on air quality from future mineral development in western Colorado (see **Appendix G**).

The magnitude of emissions predicted for each analyzed pollutant was evaluated for each alternative for several different emissions generating activities. For all of the alternatives, the magnitude of emissions from oil and gas development, coal and uranium mining, and travel and transportation management activities have the potential to impact air quality within the planning area. In addition, there are several federally designated Class I areas located within 100 kilometers of the planning area. Arches National Park and Canyonlands National Park are to the West of the planning area. Flat Tops Wilderness Area lies to the north of the planning area, while Black Canyon of the Gunnison National Monument, Maroon Bells-Snowmass Wilderness, Eagles Nest Wilderness, and West Elk Wilderness are to the east of the planning area. For all of the alternatives, the magnitude of emissions from oil and gas development, coal and uranium mining, and travel and transportation management activities have the potential to impact air quality related values (e.g., visibility and atmospheric deposition) within these areas.

Emissions from oil and gas (fluid minerals) development are a major contributor to total estimated emissions under all alternatives. For the planning area this category includes conventional oil and gas, coal bed natural gas, and shale gas development. Activities quantified in this category include: well drilling and completion, road and well pad construction, flaring and venting, compressor

operations, dehydrator and separator operations, tank venting and load out, wellhead fugitives, pneumatic device operations, and vehicle traffic.

The quantities of emissions estimated from these activities are based on reasonably foreseeable estimates of development rates, well counts, production rates, and existing technologies. The emissions numbers should not be considered definitive and may not reflect actual emissions at the time of development. Although the quantity of emissions calculated for this category may not represent actual emissions from eventual development, the magnitude of estimated emissions of several pollutants for this source category is considerable. Emissions of NO_x and volatile organic compounds from this category have the potential to impact air quality under each of the alternatives. The estimated emissions of these two pollutants are predicted to decrease for Alternatives A and C over the life of the plan; however, the magnitude of emissions may still be large enough to contribute to air quality impacts. These impacts could include increased ambient concentrations of nitrogen oxides and increased ozone formation in summer and winter.

Predicted NO_x and $PM_{2.5}$ emissions from oil and gas development under all alternatives could result in visibility degradation and atmospheric deposition. Emissions of PM_{10} from this category could potentially result in increases in ambient concentrations of fugitive dust resulting in localized impacts on vegetation, decreases in visibility, and increases in atmospheric deposition. Emissions of hazardous air pollutants could potentially result in localized increased risk of impacts on human health. The emissions estimated for carbon monoxide under each alternative for this category may have the potential to contribute to the formation of ozone. Estimated sulfur dioxide emissions for this category under each alternative are minor, and, although they could contribute to impacts on visibility and atmospheric deposition, it is unlikely that these emissions would have a significant impact on air quality by increasing ambient concentrations of sulfur dioxide.

Another large contributor to total air pollutant emissions under each alternative is the category of solid minerals development. For the planning area, this category includes underground coal mining, uranium and vanadium surface mining, and sand and gravel sales. The primary pollutant of concern from this category is PM_{10}. Particulate matter emissions (fugitive dust) are primarily caused by earth moving activities and vehicular traffic on unpaved roads and surfaces associated with mine development and operation. Particulate matter emissions from this category under all of the alternatives have the potential to impact air quality including increases in ambient concentrations of fugitive dust resulting in localized impacts on vegetation, decreases in visibility, and increases in atmospheric deposition. Estimated emissions of NO_x, volatile organic compounds, and carbon monoxide from combustion sources at mining facilities are potentially significant. Emissions of these pollutants could result in increased ozone formation. Estimated emissions of sulfur dioxide and hazardous air

pollutants from this source category for all alternatives are minor and it is unlikely that these emissions would have a significant impact on air quality.

Estimated emissions from the travel and transportation management category have the potential to contribute to air quality impacts. Emission generating activities quantified under this category include combustion and fugitive dust emissions from off-highway vehicle use and combustion and fugitive dust emissions from road maintenance equipment. Particulate matter, carbon monoxide and volatile organic compound emissions from these sources under all alternatives have the potential to contribute to ozone formation and increase ambient concentrations of fugitive dust resulting in localized impacts on vegetation, decreases in visibility, and increases in atmospheric deposition. Emissions of hazardous air pollutants from this category could potentially result in localized increased risk of impacts on human health.

The CDPHE has the authority to implement emission controls for stationary sources that are required to obtain air permits under Colorado Air Quality Control Commission Regulations and to ensure that these sources do not contribute to an exceedance of an ambient air quality standard. To facilitate this process, the BLM works in cooperation with CDPHE and other federal agencies to share, review, and analyze emissions data, modeling results, and mitigation measures for development projects. This cooperation would continue under all alternatives. In addition, the BLM could require implementation of Best Management Practices (BMPs) and mitigation measures within its authority to minimize impacts on air quality from development projects. Determination and application of such measures would be completed during project approval, and would be subject to NEPA analysis at that time. Please refer to **Appendix H**, Best Management Practices and Standard Operating Procedures.

Table 4-3, Estimated Annual Emissions by Activity – Base Year, shows the estimated emissions for each pollutant from each emissions generating activity analyzed for the base year. The estimated emissions for each of the alternatives are compared with these base year emissions and are included in the discussion of each alternative.

Near- Field Air Quality Modeling Analysis

The near-field modeling analysis completed for the Colorado River Valley Field Office DRMP/DEIS (September 2011) and White River Field Office DRMP/DEIS (2012) is incorporated by reference into this air resources impact analysis. The analyses cover areas in close proximity to this RMP planning area and are representative of the potential impacts that would occur within the planning area (e.g. similar topography and meteorology). While the BLM has not quantitatively analyzed the potential impacts of development activities in this EIS, such activities are not expected to cause an exceedance of the 1-hour NO_2 NAAQS in ambient air. This conclusion is based on the near-field modeling

Table 4-3
Estimated Annual Emissions by Activity – Base Year

Annual Emissions - Base Year (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Natural Gas - Conv. and CBNG	811	1,282	1,295	100	43	59	75
Oil and Natural Gas - Shale gas	2	6	6	1	0	1	0
O&G Minerals Total	**813**	**1,288**	**1,301**	**101**	**43**	**60**	**75**
Coal	-	-	-	-	-	-	-
Sand and Gravel	1	9	14	231	27	0	0
Uranium	-	-	-	-	-	-	-
Non-O&G Minerals Total	**1**	**9**	**14**	**231**	**27**	**0**	**0**
Lands and Realty, ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	229	375	3	1,217	127	0	23
Vegetation –Prescribed Fire and Mechanical Treatment	59	319	217	494	91	6	6
Other Activities Total	**288**	**695**	**221**	**1,715**	**219**	**6**	**29**
TOTAL Base Year	1,102	1,992	1,536	2,047	289	66	104

completed for the Colorado River Valley DRMP/DEIS and White River Field Office DRMP/DEIS, which determined that maximum 1-hour modeled impacts would be below the 1-hour NO_2 NAAQS provided that drill rig engines meet the equivalent of Tier IV emission standards. Consistent with stationary source permitting methodologies, the BLM will either determine the need for better-controlled sources (i.e., the BLM will require all new and existing drill rig engines to meet Tier IV, etc.) or require project boundary exclusion setbacks (where feasible) to limit public access and exposure to ambient air at the worksite during NO_X intensive operations.

Similarly, based on analysis for the Colorado River Valley DRMP/DEIS and the relatively low amounts of production-related SO_2 emissions, impacts are anticipated to remain well below the 1-hour SO_2 NAAQS.

Alternative A

Total estimated emissions for Alternative A are the second lowest of the four alternatives. This is due primarily to the lower reasonably foreseeable development rate predicted for oil and gas activities than for Alternatives B or D but a higher level of predicted coal mining than Alternative C. Estimated emissions for Alternative A decrease compared with the base year for the following pollutants; volatile organic compounds, carbon monoxide, sulfur dioxide, and hazardous air pollutants. This can be attributed to declining production on existing oil and gas wells, more stringent regulatory controls on future oil and gas development, and predicted decrease in the use of prescribed fire for this alternative. Estimated emissions for Alternative A increase over the base year for NO_x, PM_{10} and $PM_{2.5}$. NO_x increases can be attributed to engine

combustion emissions at increased coal and uranium mining operations. PM_{10} and $PM_{2.5}$ increases are due primarily to fugitive dust and fuel combustion emissions from increased OHV activity as well as surface mining operations. **Tables 4-4 and 4-5**, Estimated Annual Emissions by Activity Alternative A – Project Year 10 and Project Year 20, respectively, show the estimated emissions for each pollutant from each emission generating activity analyzed for Alternative A. Tables of the estimated emissions calculations by source category and the key assumptions used in the calculations are provided in **Appendix O**.

Fluid Leasable Minerals – Oil and Gas

Estimated emissions from oil and gas development for Alternative A were calculated using a reasonably foreseeable development rate based on historical development rates for federal wells within the planning area over the last twenty years. Estimated emissions from oil and gas activities were based on a development level equivalent to 220 new BLM wells and associated drilling, completion, gas treatment, and compression activities over the life of the plan. Estimated emissions from 704 existing base year BLM wells and associated decline over a twenty year period were also included in the estimated emissions calculations. **Appendix O** includes additional details on the assumptions used in calculating emissions from oil and gas activities for this alternative.

Table 4-4
Estimated Annual Emissions by Activity
Alternative A – Project Year 10

Alternative A - Year 10 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	609	748	630	58	28	36	59
Oil and Gas - Shale	81	158	162	18	8	8	4
Fluid Minerals Total	**690**	**906**	**792**	**76**	**36**	**45**	**62**
Coal	6	21	217	60	19	0	1
Sand and Gravel	1	9	14	231	27	0	0
Uranium	29	203	364	587	187	7	3
Solid Minerals Total	**36**	**232**	**594**	**878**	**234**	**7**	**4**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	295	484	4	1,569	164	0	29
Vegetation –Prescribed Fire and Mechanical Treatment	33	212	121	263	52	4	3
Other Activities Total	**328**	**697**	**126**	**1,836**	**216**	**4**	**33**
TOTAL	1,054	1,835	1,513	2,790	485	55	99

Table 4-5
Estimated Annual Emissions by Activity
Alternative A – Project Year 20

Alternative A - Year 20 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	366	381	280	32	16	16	47
Oil and Gas - Shale	105	187	191	24	10	15	5
Fluid Minerals Total	**471**	**569**	**471**	**56**	**26**	**31**	**52**
Coal	7	18	269	42	12	0	1
Sand and Gravel	1	9	14	231	27	0	0
Uranium	58	406	727	1,173	375	13	6
Solid Minerals Total	**66**	**432**	**1,010**	**1,446**	**414**	**14**	**7**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	364	597	5	1,937	202	0	36
Vegetation –Prescribed Fire and Mechanical Treatment	33	212	121	263	52	4	3
Other Activities Total	**397**	**810**	**127**	**2,203**	**254**	**4**	**40**
TOTAL	934	1,811	1,608	3,705	695	49	98

The same level of oil and gas development was predicted for Alternatives A and C. However, different levels of emissions controls were assumed in each of these two alternatives. Alternative A controls reflect compliance with regulatory standards and continuation of current technology implementation in the field. Alternative C controls reflect the resource protection goals of that alternative and incorporate more stringent strategies. Alternative A estimated emissions for oil and gas development are based on the following assumptions:

- Drill rig and completion engines that meet or exceed Tier II engine emission standards as defined in 40 CFR Part 89;
- Fugitive dust control from pad, road, and pipeline construction using frequent watering and speed control with an assumed control efficiency of 50 percent;
- Control of waste gas from well stimulation and completion assuming 90 percent capture of all vented emissions then 50 percent sent to flare and 50 percent sent to "green completion;"
- 100 percent of drilling/completion fluids are delivered and disposed of by truck;
- 10 percent of well pad tank and gas treatment fugitive emissions are captured and flared; and
- 100 percent disposal of produced water and condensate is by truck.

Comparisons between estimated emissions from oil and gas development between Alternatives A and C show the potential effectiveness of emission control strategies at the predicted level of development for these two alternatives and are included under the Alternative C discussion. Estimated emissions from oil and gas development are predicted to decrease for all pollutants over the base year for this alternative. Decreases in emissions are predicted based on the lower development rated (compared with other alternatives), decline in production from existing wells, and the implementation of regulatory emission controls on new development.

Although emissions are predicted to decrease from base year levels over the life of the plan for this alternative, the magnitude of emissions estimated for some pollutants from oil and gas activities has the potential to impact air quality. The magnitude of NO_x and volatile organic compound emissions has the potential to contribute to ozone formation within the region. Ground-level ozone is formed in the atmosphere through a series of chemical reactions involving NO_x, volatile organic compounds, carbon monoxide, and other compounds in the presence of sunlight. Ozone formation is typically considered a summer time phenomenon, but recent measurements have shown that ozone formation can occur in the winter time under specific meteorological conditions as well. Measurements of ozone concentrations in the Green River Basin in Wyoming, Uinta Basin in Utah, and Piceance Basin in Colorado have shown elevated levels of ozone during stagnant winter atmospheric conditions and increased solar radiation reflected from snow cover. The availability of ozone precursor emissions from oil and gas activities in these basins is believed to contribute towards the elevated winter ozone concentrations.

Solid Minerals – Coal, Uranium, Sand and Gravel

Estimated emissions for solid mineral development activities for Alternative A include underground coal mining, uranium and vanadium surface mining, and sand and gravel sales. Development and production rates for this alternative are based on the Mineral Potential Report (BLM 2010b), historical production data for the planning area, and surface use restrictions included in this alternative. Solid mineral development and emissions estimates over the life of the plan for this alternative include the following assumptions:

- Development of one large underground coal mine (estimated production rate of 8 million tons per year) in the first five years of the plan;
- Development of three smaller underground coal mines (estimated production rate of 2 million tons per year per mine) over the life of the plan;
- Development of up to 20 small uranium/vanadium mines over the life of the plan;
- Continuous sales of sand and gravel equivalent to the base year; and

- Fugitive dust control from construction activities using frequent watering and speed control with an assumed control efficiency of 50 percent.

Emissions from solid mineral mining are expected to increase for all pollutants over the base year in both Year 10 and Year 20 of the plan due to expected increases in mining activities. Fugitive dust (PM_{10}) emissions from surface disturbing activities associated with uranium and vanadium mining are the most notable increase. These emissions have the potential to contribute to localized increases in particulate matter concentrations and impacts on visibility. NO_x emissions from mining equipment associated with coal and uranium mining are also expected to increase substantially. This increase has the potential to contribute to increased ozone formation and impacts on visibility and atmospheric deposition.

It is important to note that the magnitude and rate of increased mining operations over the life of the plan is dependent on economics and the demand for the materials as well as the construction of product transportation facilities and mineral processing facilities. The rate of mineral development predicted for the emissions inventory is based on mineral potential and may result in overestimating of emissions for this category. For example, the rate of uranium mining development predicted for the emissions calculations is independent of the availability of local processing facilities. The actual permitting and construction of a local uranium processing facility could have a significant effect on actual uranium mineral development over the life of the plan.

Lands and Realty – Rights of Way

Emissions generating activities associated with rights-of-way include construction activities for communication sites, transmission lines, and non-oil and gas pipelines. The GJFO predicts very little activity within the planning area over the life of the plan for these activities. A total of six projects with an average of two acres of disturbance per project were assumed as the level of development for this category. This level of development is not expected to vary by alternative or increase over the life of the plan. Estimated emissions are predicted to be very low for all alternatives and are not expected to contribute to significant air quality impacts.

Livestock Grazing

Emissions generating activities associated with this category include primarily construction activities in support of grazing operations. Construction and maintenance of reservoirs, springs, wells, pipelines, and fences generate fugitive dust and combustion emissions from construction equipment. Estimated emissions are based on animal unit months from cattle grazing permits. Grazing activities are expected to stay the same as the base year over the life of the plan for this alternative. Livestock grazing activities are predicted to decrease slightly for Alternatives B and C and stay the same for Alternative D. Estimated

emissions from this category are predicted to be very low for all alternatives and are not expected to contribute to significant air quality impacts.

Comprehensive Travel and Transportation Management
Emissions generating activities associated with this category include fugitive dust from recreational road construction and maintenance, fugitive dust from OHV use, and combustion emissions from OHV use. Estimated emissions from these activities were calculated based on vehicle miles traveled and associated miles of road for recreational vehicles including all-terrain vehicles, dirt motorcycles, and snowmobiles. The GJFO has established traffic counters at several key points of access for off road recreation. Projected growth in OHV use over the life of the plan was calculated based on actual increase in OHV recreation visits over the 2003-2010 period. The magnitude of estimated volatile organic compound emissions predicted for this category has the potential to contribute to ozone formation. Estimated fugitive dust emissions could result in increased ambient concentrations of particulate matter and impacts on visibility.

Vegetation – Prescribed Fire and Mechanical Treatment
Emissions generating activities associated with the category included smoke from prescribed fires and combustion emissions from mechanical equipment used to manage vegetation and wildlife habitat. Estimated emissions were calculated based on historical acres burned and treated in the planning area. Moderate growth was assumed for each alternative in accordance with the management goals for that alternative. Decreases in emissions of all pollutants from this category were predicted over the life of the plan due to decreased activity under Alternative A vegetation management actions. However, the magnitude of emissions from prescribed fire has the potential to result in impacts on visibility, ozone formation, and human and wildlife health.

Alternative B
Total emissions for Alternative B are estimated to be greater than Alternative A and C and lower than Alternative D. This is due primarily to the higher reasonably foreseeable development rate predicted for oil and gas activities than for Alternatives A or C but lower rate than Alternative D. The development rate for coal mining activities is lower than Alternative A and D and the same as Alternative C. Estimated emissions for Alternative B increase over the base year for all pollutants due to increases in oil and gas development, solid minerals mining, and OHV use. **Tables 4-6 and 4-7**, Estimated Annual Emissions by Activity Alternative B – Project Year 10 and Project Year 20, respectively, show the estimated emissions for each pollutant from each emission generating activity analyzed for Alternative B.

Fluid Leasable Minerals – Oil and Gas
Oil and gas development predicted for Alternative B is based on a reasonably foreseeable development rate using the maximum annual number of federal

Table 4-6
Estimated Annual Emissions by Activity
Alternative B – Project Year 10

Alternative B - Year 10 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	1,061	1,261	976	104	50	53	117
Oil and Gas - Shale	246	551	562	62	27	26	13
Fluid Minerals Total	**1,307**	**1,811**	**1,538**	**167**	**77**	**79**	**130**
Coal	4	10	154	24	7	0	0
Sand and Gravel	0	2	3	58	7	0	0
Uranium	29	203	364	587	187	7	3
Solid Minerals Total	**33**	**215**	**521**	**668**	**201**	**7**	**3**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	254	416	3	1,348	141	0	25
Vegetation –Prescribed Fire and Mechanical Treatment	33	212	121	263	52	4	3
Other Activities Total	**287**	**629**	**126**	**1,615**	**193**	**4**	**29**
TOTAL	1,627	2,655	2,185	2,450	471	89	162

Table 4-7
Estimated Annual Emissions by Activity
Alternative B – Project Year 20

Alternative B - Year 20 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	1,048	1,105	650	88	42	45	128
Oil and Gas - Shale	312	656	534	70	26	49	16
Fluid Minerals Total	**1,360**	**1,761**	**1,184**	**158**	**68**	**95**	**144**
Coal	4	10	154	24	7	0	0
Sand and Gravel	0	2	3	58	7	0	0
Uranium	58	406	727	1,173	375	13	6
Solid Minerals Total	**62**	**418**	**884**	**1,255**	**389**	**14**	**6**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	254	416	3	1,348	141	0	25
Vegetation –Prescribed Fire and Mechanical Treatment	33	212	121	263	52	4	3
Other Activities Total	**287**	**629**	**126**	**1,615**	**193**	**4**	**29**
TOTAL	1,709	2,808	2,195	3,028	649	112	179

wells drilled in the planning area in a single year over the last twenty years. Estimated emissions from oil and gas activities were based on a development level equivalent to 780 new BLM wells and associated drilling, completion, gas

treatment, and compression activities over the life of the plan. Estimated emissions from 704 existing base year BLM wells and associated decline over a twenty year period were also included in the estimated emissions calculations. **Appendix O** includes additional details on the assumptions used in calculating emissions from oil and gas activities for this alternative.

Alternative B estimated emissions for oil and gas development are based on the following assumptions:

- Drill rig and completion engines that meet Tier II engine emission standards as defined in 40 CFR Part 89 through Year 10 and then phase in of engines that meet Tier IV engine emission standards as defined in 40 CFR Part 1039 by Year 20;
- Fugitive dust control from pad, road, and pipeline construction using frequent watering and speed control with an assumed control efficiency of 50 percent;
- Control of waste gas from well stimulation and completion assuming 90 percent capture of all vented emissions then 25 percent sent to flare and 75 percent sent to "green completion;"
- 50 percent of drilling/completion fluids are delivered and disposed of by truck and 50 percent through overland pipeline;
- 50 percent of well pad tank and gas treatment fugitive emissions are captured and flared; and
- 50 percent disposal of produced water and condensate is by truck and 50 percent through liquids gathering system.

Estimated emissions from oil and gas development are predicted to increase for all pollutants over the base year for this alternative due to the increased level of development. Comparisons between short term (Year 10) and long term (Year 20) emissions show that emissions can be improved over the life of the plan with the implementation of control strategies listed above. For example, the comparison showed that the phased in use of Tier IV diesel engines by Year 20 reduced NO_x and volatile organic compound emissions by approximately 40 percent and particulate matter emissions by over 75 percent over the use of Tier II engines assumed initially for the estimated development rate assumed in the two scenarios.

Similar to Alternative A, the magnitude of emissions estimated for pollutants from oil and gas activities has the potential to impact air quality under this alternative. NO_x and volatile organic compound emissions have the potential to contribute to increased ozone formation within the region. NO_x and particulate matter emissions have the potential to contribute to visibility degradation and increased atmospheric deposition with the region. Emissions of hazardous air

pollutants could potentially result in localized increased risk of impacts on human health.

Solid Minerals – Coal, Uranium, Sand and Gravel

Estimated emissions for solid mineral development activities for Alternative B include underground coal mining, uranium and vanadium surface mining, and sand and gravel sales. The potential for the development of underground coal mining operations is predicted to be significantly less than Alterative A due to leasable minerals management actions included in this alternative. Solid mineral development and emissions estimates over the life of the plan for this alternative include the following assumptions:

- Development of one large underground coal mine (estimated production rate of 8 million tons per year) in the first five years of the plan;
- Development of up to 20 small uranium/vanadium mines over the life of the plan;
- Decline in sales of sand and gravel by 75 percent;
- Fugitive dust control from construction activities using frequent watering and speed control with an assumed control efficiency of 50 percent.

Emissions from solid mineral mining are expected to increase for all pollutants over the base year in both Year 10 and Year 20 of the plan but increases are lower than Alternative A. The magnitude of predicted NO_x, PM_{10}, and $PM_{2.5}$ emissions has the potential to impact air quality from these activities. Fugitive dust emissions have the potential to contribute to localized increase in particulate matter concentrations and impacts on visibility. NO_x emissions have the potential to contribute to increased ozone formation and NO_x and $PM_{2.5}$ could contribute to visibility degradation and increases in atmospheric deposition.

Lands and Realty – Rights of Way

Estimated emissions and impacts on air quality are predicted to be the same as Alternative A for this category.

Livestock Grazing

Estimated emissions and the potential for associated impacts on air quality are expected to decrease from the base year and be slightly lower for this alternative than for Alternative A due to lower permitted animal unit months and other Livestock Grazing management actions included for this alternative.

Comprehensive Travel and Transportation Management
Estimated emissions and impacts on air quality are predicted to be slightly lower for this alternative than for Alternative A due to road closures and other travel management actions included for this alternative.

Vegetation – Prescribed Fire and Mechanical Treatment
Estimated emission and impacts on air quality are predicted to be the same as Alternative A for this category.

Alternative C
Total estimated emissions for Alternative C are predicted to be the lowest of the four alternatives. This is due primarily to the lower reasonably foreseeable development rate for oil and gas development compared with Alternatives A, B, and D and the lower solid minerals development rate compared with Alternatives A and D. Alternative C also includes additional emission controls and strategies for oil and gas development compared with Alternative A.

Estimated emissions for Alternative C decrease compared to the base year for all pollutants except particulate matter. The decreases can be attributed to declining production from existing oil and gas wells, more stringent regulatory controls on future oil and gas development, decreased OHV activity, decreased use of prescribed fire, and decreases in sand and gravel sales and livestock grazing over the life of the plan. Estimated emissions for Alternative C increase over the base year for PM_{10} and $PM_{2.5}$ due to increased surface mining operations. **Tables 4-8 and 4-9**, Estimated Annual Emissions by Activity Alternative C – Project Year 10 and Project Year 20, respectively, show the estimated emissions for each pollutant from each emission generating activity analyzed for Alternative C.

Fluid Leasable Minerals – Oil and Gas
Estimated emissions from oil and gas development for Alternative C were calculated using a reasonably foreseeable development rate based on historical development rates for federal wells within the planning area over the last twenty years. Estimated emissions from oil and gas activities were based on a development level equivalent to 220 new BLM wells and associated drilling, completion, gas treatment, and compression activities over the life of the plan. Estimated emissions from 704 existing base year BLM wells and associated decline over a twenty year period were also included in the estimated emissions calculations. **Appendix O** includes additional details on the assumptions used in calculating emissions from oil and gas activities for this alternative.

The same level of oil and gas development was predicted for Alternatives A and C. However, different levels of emissions controls were assumed in each of these two alternatives. Alternative A controls reflect compliance with regulatory standards and continuation of current technology implementation in the field. Alternative C controls reflect the resource protection goals of this

Table 4-8
Estimated Annual Emissions by Activity
Alternative C – Project Year 10

Alternative C - Year 10 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	590	734	598	54	26	36	51
Oil and Gas - Shale	60	158	125	13	5	8	4
Fluid Minerals Total	**650**	**892**	**723**	**67**	**31**	**45**	**55**
Coal	4	10	154	24	7	0	0
Sand and Gravel	0	2	3	58	7	0	0
Uranium	29	203	364	587	187	7	3
Solid Minerals Total	**33**	**215**	**521**	**668**	**201**	**7**	**3**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	219	360	3	1,166	122	0	22
Vegetation –Prescribed Fire and Mechanical Treatment	28	197	103	217	44	3	3
Other Activities Total	**247**	**558**	**107**	**1,386**	**166**	**3**	**25**
TOTAL	930	1,665	1,350	2,121	399	55	83

Table 4-9
Estimated Annual Emissions by Activity
Alternative C – Project Year 20

Alternative C - Year 20 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	341	355	215	27	14	16	37
Oil and Gas - Shale	78	187	113	18	7	15	5
Fluid Minerals Total	**419**	**542**	**328**	**45**	**21**	**31**	**42**
Coal	4	10	154	24	7	0	0
Sand and Gravel	0	2	3	58	7	0	0
Uranium	58	406	727	1,173	375	13	6
Solid Minerals Total	**62**	**418**	**884**	**1,255**	**389**	**14**	**6**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	219	360	3	1,166	122	0	22
Vegetation –Prescribed Fire and Mechanical Treatment	28	197	103	217	44	3	3
Other Activities Total	**247**	**558**	**107**	**1,386**	**166**	**3**	**25**
TOTAL	728	1,518	1,319	2,686	576	48	73

alternative and incorporate more stringent strategies. Alternative C estimated emissions for oil and gas development are based on the following assumptions:

- Drill rig and completion engines that meet Tier IV engine emission standards as defined in 40 CFR Part 1039;
- Fugitive dust control from pad, road, and pipeline construction using frequent watering, chemical dust suppressants, and speed control with an assumed control efficiency of 80 percent;
- Control of waste gas from well stimulation and completion assuming 100 percent capture of all vented emissions then 20 percent sent to flare and 80 percent sent to "green completion;"
- 50 percent of drilling/completion fluids are delivered and disposed of by truck and 50 percent through overland pipeline
- 50 percent of field compression is electrified;
- 80 percent of well pad tank and gas treatment fugitive emissions are captured and flared;
- 50 percent disposal of produced water and condensate is by truck and 50 percent through liquids gathering system.

Estimated emissions from oil and gas development are predicted to decrease for all pollutants over the base year for this alternative. Decreases in emissions are predicted based on the lower development rates compared with Alternatives B and D, decline in production from existing wells, and the implementation of regulatory emission controls and emission control strategies on new development.

Estimated emissions are also predicted to decrease compared with Alternative A, even though the predicted development levels are the same for these two alternatives. Comparisons between estimated emissions from oil and gas development between Alternatives A and C show the potential effectiveness of emission control strategies at the predicted level of development for these two alternatives. The same level of activity for drilling and completion operations was assumed for Alternatives A and C. However, Tier II engines were assumed for all years for Alternative A while for Alternative C, Tier IV diesel engines were assumed for Year 10 and Tier IV diesel-electric generator sets were assumed for Year 20. This allowed for a comparison of the effectiveness of improved engine technology over the life of the plan. The comparison showed that the use of Tier IV diesel engines reduced NO_x and volatile organic compound emissions by approximately 40 percent and particulate matter emissions by over 75 percent over the use of Tier II engines for the estimated development rate used in the two alternatives. The comparison also showed that the phased in use of Tier IV diesel-electric generator sets could reduce NO_x, volatile organic compound, and particulate matter emissions by approximately 80 percent over Tier II engines. Fugitive dust control with

chemical suppressants, watering, and speed control was estimated to reduce particulate matter emissions under Alternative C by approximately 40 percent compared with Alternative A. The electrification of small in-field compressors was assumed to be feasible for approximately 50 percent of the estimated compression requirements for this alternative. This showed a reduction in volatile organic compound emissions of approximately 40 percent, and NO_x, carbon monoxide, and particulate matter reductions of less than 20 percent compared with Alternative A. Capture and control of miscellaneous volatile organic compound sources including tanks, dehydrators, pneumatic devices, and venting were shown to reduce volatile organic compounds and hazardous air pollutants emissions by approximately 50 percent between the two alternatives.

Although emissions are predicted to decrease from base year levels over the life of the plan, the magnitude of emissions estimated for some pollutants from oil and gas activities for this alternative has the potential to impact air quality similar to those described under Alternative A. However, Alternative C includes emission reduction measures in addition to those included in Alternative A so the magnitude of potential impacts is expected to be less. A comparison of estimated emissions between Alternatives A and C shows that improved engine technology (Tier II vs. Tier IV) can reduce predicted emissions of NO_x, volatile organic compounds, $PM_{2.5}$, and hazardous air pollutants by about one half for drilling and completion engines. Liquids gathering and delivery systems for drilling water, produced water, and condensate reduce fugitive dust and combustion emissions from truck traffic as well as fugitive volatile organic compound emissions from well pad storage of these liquids. Capture and control of volatile organic compound emissions from tanks and other well pad equipment can reduce volatile organic compound emissions significantly and illustrate that in-field centralization of gas and product treatment and storage facilities should be encouraged so that equipment can be sized to effectively control emissions.

Solid Minerals – Coal, Uranium, Sand and Gravel

Estimated emissions for solid mineral development activities for Alternative C include underground coal mining, uranium and vanadium surface mining, and sand and gravel sales. Management actions related to solid minerals development and levels of development are the same as Alternative B. Estimated emissions and potential impacts from this category are predicted to be the same as for Alternative B.

Lands and Realty – Rights of Way

Estimated emissions and impacts on air quality are predicted to be the same as Alternative A for this category.

Livestock Grazing

Estimated emissions and the potential for associated impacts on air quality are expected to decrease from the base year and be slightly lower for this

alternative than for Alternatives A and B due to lower permitted animal unit months and other livestock grazing management actions included for this alternative.

Comprehensive Travel and Transportation Management
Estimated emissions and associated impacts on air quality are expected to decrease from the base year for this category and be lower than Alternatives A or B due to closure of some routes and open areas for OHV use.

Vegetation – Prescribed Fire and Mechanical Treatment
Estimated emissions and impacts on air quality from this category are expected to decrease from the base year and be similar to but slightly lower than Alternative A due to decreased use of prescribed fire and mechanical treatments under the management actions for this alternative.

Alternative D
Total estimated emissions for Alternative D are predicted to be the highest of the four alternatives. This is due primarily to the highest reasonably foreseeable development rate predicted for oil and gas activities than all alternatives and a higher level of potential solid minerals development than Alternatives B and C and the same increased level of OHV use as predicted for Alternative A. Estimated emissions for Alternative D increase significantly from the base year for all analyzed pollutants. Increases in emissions are similar to those for Alternative A for all source categories except oil and gas development. **Tables 4-10 and 4-11**, Estimated Annual Emissions by Activity Alternative D – Project Year 10 and Project Year 20, respectively, show the estimated emissions for each pollutant from each emission generating activity analyzed for Alternative D.

Fluid Leasable Minerals – Oil and Gas
Estimated emissions from oil and gas development for Alternative D were calculated based on the Reasonably Foreseeable Development Scenario for Oil and Gas, Grand Junction Field Office, Colorado (BLM 2012a). This document evaluated the geologic potential of oil and gas reservoirs underlying the planning area. The geologic potential along with other significant factors, including economics, technology, physical limitations on access, existing or anticipated infrastructure, and transportation were taken into account to estimate a future oil and gas development scenario for a period of twenty years from the base year. Estimated emissions from oil and gas activities were based on a development level equivalent to 3,938 new BLM wells and associated drilling, completion, gas treatment, and compression activities over the life of the plan. Estimated emissions from 704 existing base year BLM wells and associated decline over a twenty year period were also included in the estimated emissions calculations. **Appendix O** includes additional details on the assumptions used in calculating emissions from oil and gas activities for this alternative.

Table 4-10
Estimated Annual Emissions by Activity
Alternative D – Project Year 10

Alternative D - Year 10 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	3,435	3,901	2,752	344	166	137	439
Oil and Gas - Shale	1,324	2,963	3,021	332	144	135	72
Fluid Minerals Total	**4,759**	**6,863**	**5,773**	**676**	**310**	**272**	**511**
Coal	6	21	217	60	19	0	1
Sand and Gravel	1	9	14	231	27	0	0
Uranium	29	203	364	587	187	7	3
Solid Minerals Total	**36**	**232**	**594**	**878**	**234**	**7**	**4**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	295	484	4	1,569	164	0	29
Vegetation –Prescribed Fire and Mechanical Treatment	39	230	144	321	61	4	4
Other Activities Total	**334**	**715**	**149**	**1,894**	**225**	**4**	**33**
TOTAL	5,130	7,811	6,516	3,448	769	283	548

Table 4-11
Estimated Annual Emissions by Activity
Alternative D – Project Year 20

Alternative D - Year 20 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	4,633	4,835	2,696	386	183	194	576
Oil and Gas - Shale	1,681	3,535	2,867	375	139	260	86
Fluid Minerals Total	**6,313**	**8,371**	**5,563**	**761**	**323**	**454**	**662**
Coal	7	18	269	42	12	0	1
Sand and Gravel	1	9	14	231	27	0	0
Uranium	58	406	727	1,173	375	13	6
Solid Minerals Total	**66**	**432**	**1,010**	**1,446**	**414**	**14**	**7**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	364	597	5	1,937	202	0	36
Vegetation –Prescribed Fire and Mechanical Treatment	39	230	144	321	61	4	4
Other Activities Total	**403**	**828**	**150**	**2,262**	**264**	**4**	**40**
TOTAL	6,783	9,631	6,723	4,469	1,001	472	709

Alternative D estimated emissions for oil and gas development are based on the following assumptions:

- Drill rig and completion engines that meet Tier II engine emission standards as defined in 40 CFR Part 89 through Year 10 and then

phase in of engines that meet Tier IV engine emission standards as defined in 40 CFR Part 1039 by Year 20;

- Fugitive dust control from pad, road, and pipeline construction using frequent watering and speed control with an assumed control efficiency of 50 percent;
- Control of waste gas from well stimulation and completion assuming 90 percent capture of all vented emissions then 25 percent sent to flare and 75 percent sent to "green completion;"
- 50 percent of drilling/completion fluids are delivered and disposed of by truck and 50 percent through overland pipeline;
- 50 percent of well pad tank and gas treatment fugitive emissions are captured and flared; and
- 50 percent disposal of produced water and condensate is by truck and 50 percent through liquids gathering system.

The reasonably foreseeable potential for oil and gas development for Alternative D is five times greater than Alternative B and 17 times greater than Alternatives A and C. The estimated emissions for oil and gas development under this alternative reflect this substantially higher level of development. The magnitude of NO_x and volatile organic compound emissions would likely contribute to increased concentrations of ozone formation and has the potential to contribute to adverse impacts associated with ozone formation. The phased in use of Tier IV diesel engines by Year 20 was shown to reduce NO_x and volatile organic compound emissions by approximately 40 percent and particulate matter emissions by over 75 percent compared to the use of Tier II engines initially selected for this alternative. Ambient concentrations of NO_x, sulfur dioxide, $PM_{2.5}$, and volatile organic compounds could be increased due to emissions from this level of development. NO_x, sulfur dioxide, and particulate matter emissions have the potential to contribute to visibility degradation and increased atmospheric deposition with the region. Emissions of hazardous air pollutants could potentially result in localized increased risk of impacts on human health.

Solid Minerals – Coal, Uranium, Sand and Gravel

Estimated emissions for solid mineral development activities for Alternative D are the same as Alternative A. Estimated emissions and associated impacts on air quality from this category are the same as for Alternative A

Lands and Realty – Rights of Way

Estimated emissions and impacts on air quality are predicted to be the same as Alternative A for this category.

Livestock Grazing

Estimated emissions and impacts on air quality are predicted to be the same as Alternative A for this category.

Comprehensive Travel and Transportation Management
Estimated emissions and impacts on air quality are predicted to be the same as Alternative A for this category.

Vegetation – Prescribed Fire and Mechanical Treatment
Estimated emissions from this category are predicted to decrease from the base year due to management actions that limit the use of prescribed fire. However the management actions are less restrictive for this alternative than Alternatives A, B, and C and emissions are slightly higher. Potential impacts on air quality are the same as for Alternative A.

Cumulative
The Cumulative Impact Analysis Area (CIAA) used to analyze potential impacts on air quality includes the planning area and adjacent BLM field office RMP planning areas in Colorado. The CIAA was extended beyond the planning area to include reasonably foreseeable oil and gas development from adjacent areas that have the potential to affect or be affected by air quality in the GJFO planning area. In addition, the cumulative analysis included reasonably foreseeable oil and gas development for private and fee (i.e. non-federal) minerals within the planning area.

The analysis of potential cumulative impacts was based on an assessment of estimated cumulative future emissions for each alternative from the following categories:

- BLM actions within the planning area estimated for Year 20;
- Non-federal oil and gas development within the planning area estimated for Year 20;
- Cumulative (federal and non-federal) oil and gas development from the White River Field Office Draft RMP estimated for each alternative for the maximum year of that plan;
- Cumulative (federal and non-federal) oil and gas development from the Colorado River Valley Field Office Draft RMP estimated for each alternative for the maximum year of that plan;
- Actual emissions for 2008 compiled by CDPHE for Mesa and Garfield counties.

The CDPHE compiles a statewide emissions inventory of air pollutants from several source categories every three years as required by EPA. The most recent statewide emissions inventory available was compiled for 2008 actual emissions. The 2008 emissions data for Mesa and Garfield counties as well as statewide emissions were obtained from EPA's National Emissions Inventory (EPA 2011). Emissions estimates for non-federal oil and gas activities within the planning area were calculated based on data from the Reasonably Foreseeable Development Scenario for Oil and Gas, Grand Junction Field Office, Colorado

(BLM 2012a). For cumulative impacts associated with non-oil and gas mineral development within the planning area (i.e. coal and uranium mining) as well as salable mineral activities, it was assumed that 100 percent of these actions would occur on federal mineral estate (i.e., no additional emissions from non-BLM actions) and the cumulative emissions for these categories have been included in the project emissions estimates. Emissions data for oil and gas development activities for adjacent BLM field offices were obtained from the Draft RMP/EIS, Colorado River Valley Field Office (BLM 2011).

BLM actions combined with non-federal oil and gas development within the planning area are expected to increase emissions of air pollutants in the planning area over the life of the plan. **Table 4-12**, Annual Emissions Summary for BLM Actions and Non-BLM Oil and Gas Development within the Grand Junction Planning Area, shows the total estimated emissions from BLM actions combined with non-federal oil and gas development activities predicted to occur within the planning area over the life of the plan. **Table 4-13**, Comparison of Annual Emissions from BLM Actions and Non-Federal Oil and Gas Development to Annual Statewide Emissions – Year 20, shows the estimated emissions for BLM actions and non-federal oil and gas development within the planning area as compared with the CDPHE statewide emissions for the maximum year of development (Year 20). Additional details for BLM and non-federal oil and gas emissions within the planning area are included in **Appendix O**. Total cumulative emissions from BLM and non-federal actions and anticipated emissions from other source categories in Mesa and Garfield counties combined with existing background concentrations of air pollutants have the potential to cause or contribute to adverse impacts within the planning area and affected areas outside of the planning area. Elevated levels of PM_{10} and $PM_{2.5}$ background concentrations measured within the planning area, and elevated levels of winter ozone concentrations measured adjacent to the planning area in conjunction with estimated future cumulative emission increases may result in increased ambient concentrations of these pollutants as well as impacts on visibility, atmospheric deposition, and human health. **Table 4-14**, Annual Emissions Summary for Cumulative Emissions - Year 20, shows the total estimated cumulative emissions for the five categories listed above by alternative for Year 20 of the plan. This year incorporates maximum oil and gas development potential for the GJFO, White River Field Office, and Colorado River Valley Field Office RMP planning areas.

Cumulative impacts on air quality are anticipated to be the least under Alternative C due to proposed surface management actions, lower predicted development, and stricter emissions controls. Cumulative estimated emissions under Alternatives A and B are similar and could result in air quality impacts. Cumulative estimated emissions under Alternative D include maximum oil and gas development predictions for the GJFO, White River Field Office, and Colorado River Valley Field Office RMP planning areas. Alternative D cumulative

Table 4-12
Annual Emissions Summary for BLM Actions and Non-BLM Oil and Gas Development within the Grand Junction Planning Area

Alternative	Year	Emissions Category	Annual Emissions (tons/year)						
			VOC	CO	NOx	PM10	PM2.5	SO2	HAPs
A	Year 10	BLM Actions	1,054	1,835	1,513	2,790	485	55	99
		Non-federal Oil and Gas	2,713	3,309	2,922	294	138	144	248
	Year 20	BLM Actions	934	1,811	1,608	3,705	695	49	98
		Non-federal Oil and Gas	2,860	3,322	2,728	323	149	177	264
B	Year 10	BLM Actions	1,627	2,655	2,185	2,450	471	89	162
		Non-federal Oil and Gas	2,572	3,308	2,921	294	138	144	235
	Year 20	BLM Actions	1,709	2,808	2,195	3,028	649	112	179
		Non-federal Oil and Gas	2,652	3,321	2,356	289	126	177	244
C	Year 10	BLM Actions	930	1,665	1,350	2,121	399	55	83
		Non-federal Oil and Gas	2,439	3,232	2,525	238	112	144	222
	Year 20	BLM Actions	731	1,518	1,319	2,686	576	48	73
		Non-federal Oil and Gas	2,512	3,169	1,899	261	120	177	231
D	Year 10	BLM Actions	5,130	7,811	6,516	3,448	769	283	548
		Non-federal Oil and Gas	8,313	10,138	7,930	937	443	377	884
	Year 20	BLM Actions	6,783	9,631	6,723	4,469	1,001	472	709
		Non-federal Oil and Gas	11,144	12,690	7,864	1,074	482	598	1,143

Table 4-13
Comparison of Annual Emissions from BLM Actions and Non-Federal Oil and Gas Development to Annual Statewide Emissions – Year 20

Pollutant	BLM Actions and Non-Federal Oil and Gas Estimated Emissions (tons/year)	2008 Colorado Statewide Emissions [a] (tons/year)	% Contribution to Statewide Emissions
Base Year			
PM_{10}	2,854	338,799	0.84%
$PM_{2.5}$	582	83,948	0.69%
NOx	8,965	310,056	2.89%
SO_2	300	70,096	0.43%
CO	7,052	1,249,864	0.56%
VOC	3,874	937,576	0.41%
Alternative A - Year 20			
PM_{10}	4,028	338,799	1.19%
$PM_{2.5}$	844	83,948	1.01%
NOx	4,336	310,056	1.40%
SO_2	226	70,096	0.32%
CO	5,133	1,249,864	0.41%
VOC	3,794	937,576	0.40%
Alternative B - Year 20			
PM_{10}	3,316	338,799	0.98%
$PM_{2.5}$	775	83,948	0.92%
NOx	4,551	310,056	1.47%
SO_2	289	70,096	0.41%
CO	6,129	1,249,864	0.49%
VOC	4,361	937,576	0.47%
Alternative C - Year 20			
PM_{10}	2,947	338,799	0.87%
$PM_{2.5}$	696	83,948	0.83%
NOx	3,218	310,056	1.04%
SO_2	225	70,096	0.32%
CO	4,686	1,249,864	0.37%
VOC	3,227	937,576	0.34%
Alternative D - Year 20			
PM_{10}	5,542	338,799	1.64%
$PM_{2.5}$	1,483	83,948	1.77%
NOx	14,586	310,056	4.70%
SO_2	1,070	70,096	1.53%
CO	22,322	1,249,864	1.79%
VOC	17,927	937,576	1.91%

Source: 2008 National Emissions Inventory (EPA, 2011b)

Table 4-14
Annual Emissions Summary for Cumulative Emissions - Year 20

Alternative	Cumulative Emissions Category	Annual Emissions - Year 20 (tons/year)						
		VOC	CO	NOx	PM10	PM2.5	SO2	HAPs
A	BLM actions - Grand Junction planning area	934	1,811	1,608	3,705	695	49	98
	Non-federal oil and gas - Grand Junction planning area	2,860	3,322	2,728	323	149	177	264
	Cumulative oil and gas White River Field Office	19,295	4,545	2,468	4,724	580	9	1,317
	Cumulative oil and gas Colorado River Valley Field Office	15,325	3,646	1,915	8,837	906	4	1,902
	Mesa and Garfield County	78,049	67,585	16,075	10,498	3,477	3,063	3,846
	Total	116,463	80,908	24,794	28,087	5,807	3,301	7,427
B	BLM actions Grand Junction planning area	1,709	2,808	2,195	3,028	649	112	179
	Non-federal oil and gas - Grand Junction planning area	2,652	3,321	2,356	289	126	177	244
	Cumulative oil and gas White River Field Office	14,073	8,322	4,285	2,099	364	17	1,609
	Cumulative oil and gas Colorado River Valley Field Office	10,716	2,125	1,130	328	53	3	1,382
	Mesa and Garfield County	78,049	67,585	16,075	10,498	3,477	3,063	3,846
	Total	107,199	84,160	26,040	16,241	4,668	3,372	7,261
C	BLM actions Grand Junction planning area	728	1,518	1,319	2,686	576	48	73
	Non-federal oil and gas - Grand Junction planning area	2,498	3,169	1,899	261	120	177	229
	Cumulative oil and gas White River Field Office	21,926	13,388	6,780	4,079	627	28	2,522
	Cumulative oil and gas Colorado River Valley Field Office	10,716	2,125	1,130	328	53	3	1,382
	Mesa and Garfield County	78,049	67,585	16,075	10,498	3,477	3,063	3,846
	Total	113,917	87,784	27,203	17,852	4,852	3,319	8,052
D	BLM actions Grand Junction planning area	6,783	9,631	6,723	4,469	1,001	472	709
	Non-federal oil and gas - Grand Junction planning area	11,144	12,690	7,864	1,074	482	598	1,143
	Cumulative oil and gas White River Field Office	27,373	13,116	6,610	4,843	766	37	2,546
	Cumulative oil and gas Colorado River Valley Field Office	15,590	3,874	2,037	663	95	5	2,045
	Mesa and Garfield County	78,049	67,585	16,075	10,498	3,477	3,063	3,846
	Total	138,938	106,896	39,309	21,547	5,821	4,175	10,290

impacts are predicted to be the greatest of the four alternatives and most likely to contribute to adverse impacts on air quality. Identified air quality issues include the following:

- Potential cumulative emissions of carbon monoxide, and sulfur dioxide could cause ambient concentrations of these pollutants to increase slightly, but would be unlikely to exceed air quality standards. Ozone, nitrous oxide, and particulate matter concentrations could be an issue of concern during the life of the plan, particularly under Alternative D which includes maximum predicted oil and gas development. As part of its adaptive management strategy to manage air resources, the BLM has committed to conducting regional air quality modeling to assess future impacts from cumulative oil and gas development. In addition, BLM may perform quantitative analyses of potential concentrations, including air quality modeling, when specific projects are proposed.

  Potential cumulative emissions of NOx, sulfur dioxide, and particulate matter under Alternatives A, B, and C are likely to have minimal impacts on atmospheric deposition, including total nitrogen deposition, total sulfur deposition, and precipitation pH, would likely stay about the same and would be unlikely to exceed levels of concern. Potential cumulative emissions under Alternative D have the potential to result in increased nitrogen and sulfur loadings and may contribute towards impacts in sensitive areas and lakes.

- Potential cumulative emissions of NO_x, sulfur dioxide, and $PM_{2.5}$ could result in impacts on visibility to stay about the same or degrade slightly under Alternatives A, B, and C. Visibility degradation in Class I areas downwind of the planning area could be an issue of concern under Alternative D due to maximum oil and gas development.

Greenhouse Gases and Climate Change

Concentrations of certain gases in the earth's atmosphere have been identified as being effective at trapping heat reflected off the earth's surface thereby creating a "greenhouse effect." As concentrations of these greenhouse gases increase, the earth's surface warms, the composition of the atmosphere changes, and global climate is affected. Concentrations of greenhouse gases have increased dramatically in the earth's atmosphere in the past century. Anthropogenic (man-made) sources and human activities have been attributed to these increases particularly for carbon dioxide, methane, nitrous oxide, and fluorinated gases (EPA 2010b).

The EPA has determined that six greenhouse gases are air pollutants and subject to regulation under The Clean Air Act; carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Of these

greenhouse gases, carbon monoxide, methane, and nitrous oxide are commonly emitted by the types of activities included in this analysis, while the remaining three greenhouse gases are emitted in extremely small quantities or are not emitted at all. Greenhouse gas emissions from management actions and activities were estimated for each alternative in this analysis for the following pollutants:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)

As the major component of natural gas, methane emissions from underground mining operations and oil and gas exploration and development can be considerable. Emissions of carbon dioxide and nitrous oxide from fossil fuel combustion and fire can also be of concern. This analysis quantified emissions of carbon dioxide, methane, and nitrous oxide from the same management actions and activities for each alternative as for the criteria pollutants.

A greenhouse gas's ability to contribute to global warming is based on its longevity in the atmosphere and its heat-trapping capacity. In order to aggregate greenhouse gas emissions and assess their contribution to climate change, the EPA has assigned each greenhouse gas a global warming potential that is used to calculate carbon dioxide equivalents (CO_{2eq}). The carbon dioxide equivalent for each greenhouse gas is calculated by multiplying the quantity of emissions by the global warming potential for that greenhouse gas. Total carbon dioxide equivalent emissions for all greenhouse gases are then determined by adding the carbon dioxide equivalent emissions of each greenhouse gas. Global warming potentials used for greenhouse gas emission calculations and reporting are CO_2 = 1, CH_4 = 21, and N_2O = 310. Carbon dioxide equivalents were then converted to million metric tonnes, the typical reporting unit for greenhouse gas emissions. **Table 4-15**, Estimated Annual Greenhouse Gas Emissions Summary for BLM Actions within the Planning Area, shows the estimated annual emissions of the greenhouse gases for each alternative.

Greenhouse gas emissions are estimated to increase for all alternatives over estimated base year emissions. Alternative A shows increases of greenhouse gas emissions from the base year by approximately five times in the short term and six times in the long term. Alternatives B and C show increases over the base year by approximately four times in the short term and the long term. Alternative D shows increases over the base year by approximately seven times in the short term and ten times in the long term. Coal mining activities are predicted to be the largest contributor to greenhouse gas emissions for all alternatives followed by oil and gas development. Coal mining greenhouse gas emissions are primarily from fugitive methane emissions. The largest sources of greenhouse gas emissions within the oil and gas sector include carbon dioxide

Table 4-15
Estimated Annual GHG Emissions Summary for BLM Actions within the Grand Junction Planning Area

Total Estimated Emissions by Alternative (tonnes per year)					
Scenario	**CO2**	**CH4**	**N2O**	**CO2e**	***CO2eq (million metric tonnes)***
Base Year	351,875	8,383	7	530,150	*0.53*
Alternative A - Project Year 10	284,014	103,459	7	2,458,925	*2.46*
Alternative B - Project Year 10	430,379	87,483	9	2,270,264	*2.27*
Alternative C - Project Year 10	274,797	84,042	8	2,042,006	*2.04*
Alternative D - Project Year 10	1,286,339	125,051	18	3,918,040	*3.92*
Alternative A - Project Year 20	230,752	140,412	6	3,181,364	*3.18*
Alternative B - Project Year 20	457,014	88,196	9	2,311,897	*2.31*
Alternative C - Project Year 20	218,886	82,362	6	1,950,436	*1.95*
Alternative D - Project Year 20	1,761,121	177,549	25	5,497,517	*5.50*

emissions from natural gas compressors and drill rig engines, and fugitive methane emissions from wellhead equipment, pneumatic devices and tanks.

Table 4-16, Greenhouse Gas Emissions from BLM Actions as a Percentage of Colorado Statewide Greenhouse Gas Emissions, shows the comparison of greenhouse gas emissions from BLM actions for each of the alternatives to a statewide inventory of greenhouse gas emissions completed in 2007. The inventory was compiled for the CDPHE by the Center for Climate Strategies and was based on actual emissions for 2005 and projected emissions for 2010 and 2020. Greenhouse gas emissions estimated for each of the alternatives comprise between 1 percent and 3 percent of statewide greenhouse gas emissions. As another means of comparison, the total estimated greenhouse gas emissions estimated for Alternative B (Preferred Alternative) are approximately equivalent to 2.6 times the reported carbon dioxide emissions from the Nucla Power Plant located in Montrose county for 2008 (EPA 2012a). The total estimated greenhouse gas emissions for Alternative B (preferred) of 2.27 million metric tonnes are approximately equal to 0.03 percent of the total US 2008 greenhouse gas emissions of 7,048 million metric tonnes (EPA 2012b).

Several activities contribute to the phenomena of climate change, including emissions of greenhouse gas (especially carbon dioxide and methane) from fossil fuel development, large wildland fires and activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and reflectivity (albedo). It is important to note that greenhouse gas will have a

Table 4-16
GHG Emissions from BLM Actions as a Percentage of Colorado Statewide GHG Emissions

Grand Junction Planning Area		Colorado Statewide Inventory [a]		% Contribution
Scenario	Estimated GHG Emissions ($MMt\ CO_{2eq}$)	Year	Estimated GHG Emissions ($MMt\ CO_{2eq}$)	BLM GHGs to Colorado GHGs
Base Year	0.53	Actual Estimated 2005	116	0.46%
Alternative A - Year 10	2.46	Projected 2020	148	1.67%
Alternative A - Year 20	3.18			
Alternative B - Year 10	2.27	Projected 2020	148	1.54%
Alternative B - Year 20	2.31			
Alternative C - Year 10	2.04	Projected 2020	148	1.38%
Alternative C - Year 20	1.95			
Alternative D - Year 10	3.92	Projected 2020	148	2.66%
Alternative D - Year 20	5.50			

[a] *Source: Colorado Greenhouse Gas Inventory and Reference Case Projections 1990-2020 (CCS 2007)*

sustained climatic impact over different temporal scales. For example, recent emissions of carbon dioxide can influence climate for 100 years.

It may be difficult to discern whether global climate change is already affecting resources in the analysis area of the plan. It is important to note that projected changes are likely to occur over several decades to a century. Therefore many of the projected changes associated with climate change may not be measurably discernible within the reasonably foreseeable future. Existing climate prediction models are global or continental in scale; therefore they are not appropriate to estimate potential impacts of climate change on the planning area. The current state of the science involves calculating potential quantities of greenhouse gases that may be added to the atmosphere from a particular activity. However, tools to analyze or predict how global or regional climate systems may be affected by a particular activity or activities within the planning area are not currently available. Assessing the impacts of greenhouse gas emissions on global climate change requires modeling on a global scale which is beyond the scope of this analysis. Potential impacts on climate change are influenced by greenhouse gas emission sources from around the globe and it is not possible to distinguish the impacts on global climate change from greenhouse gas emissions originating from the planning area.

4.3.2 Soil Resources

This section discusses impacts on soils from proposed management actions of other resources and resource uses. Existing conditions are described in **Section 3.2.4**, Soil Resources. Impacts on soil resources from implementation of each alternative are summarized in the subsections that follow.

Direct and indirect impacts from resource programs on soil resources are generally mitigated by avoiding or minimizing the impact to the degree practicable using stipulations (e.g., NSO and CSU). The various management

actions and allowable use decisions outlined in **Chapter 2** and stipulations described in **Appendix B** emphasize this approach for maintaining, improving, and conserving soil resources. Impacts that cannot be avoided would at least be minimized by the application of COAs, BMPs, and standard operating procedures (SOPs; see **Appendix H**).

Impacts on soil resources can result from a number of causes, including livestock grazing, recreation, mineral resource activities, renewable energy development, and road construction. Impacts on soil resources include compaction, composition alteration, and erosion. The intensity and extent of impacts on soil resources are determined in part by the type and location of the surface-disturbing activities and surface occupancy. For example, soil erosion from roads depends on physical soil factors, road or trail grade and position on the landscape, road design factors, traffic type and volumes, and the effectiveness of drainage maintenance. Impacts on soil resources can also be affected by any applicable stipulations (**Appendix B**) and plans of operations that address site-specific environmental concerns and require mitigation to stabilize soil, to prevent unnecessary erosion, and to revegetate disturbed surfaces. Impacts on soil resources are described below.

Surface-disturbing activities and surface occupancy can impact soil resources by destroying biological soil crusts and desert pavement. Where present, biological soil crusts could be crushed during surface disturbance. Underlying soils would no longer be protected from wind and water erosion. The destruction of biologic soil crusts reduces soil surface resistance to erosion, increasing soil loss and sediment transport in these areas.

Surface-disturbing activities and surface occupancy can impact soil resources by compacting soil. In some cases, soil compaction aids in plant establishment and growth. However, too much compaction decreases water infiltration rates and gas exchange rates. Decreased gas exchange rates can cause aeration problems, induce nitrogen and potassium deficiency, and negatively impact root metabolism, all stressing agents of vegetation, which is a key component of soil stabilization. As soil compaction increases, the soil's ability to support vegetation diminishes because the resulting increase in soil strength and change in soil structure (loss of porosity) inhibit root system growth and reduce water infiltration. As vegetative cover, water infiltration, and soil stabilizing crusts are diminished or disrupted, the surface water runoff rates increase, further accelerating rates of soil erosion.

Mixing of soil horizons can also result from surface-disturbing activities, as well as loss of the A horizon, which is the top layer of the soil horizon or the topsoil, via such erosional forces as wind and water. Mixing of topsoil and subsoil and loss of the A horizon remove surface cover for erosion control and organic matter inputs for nutrient recycling. The result is decreased soil productivity in

the long term, inhibiting revegetation, decreasing soil reclamation potential, and increasing suitability for noxious and invasive species.

Surface-disturbing activities and surface occupancy that remove desirable plant communities can impact soil resources. Because plants stabilize the soil, the loss of plants increases the potential for soil erosion by water and wind. The erosion of soil diminishes soil productivity. Furthermore, the movement of soil during erosion mixes soil, thereby altering soil chemistry and composition. Soil resources, especially on steep slopes and in fragile soil areas, are susceptible to impacts from surface disturbance and compaction, which can lead to accelerated erosion, soil loss, and reduced productivity.

Surface-disturbing activities and removal of effective ground cover (vegetation and litter accumulation) can impact soil resources by altering the reproductive capabilities of desirable vegetative communities. Alteration of the reproductive capabilities of desirable vegetative communities by livestock, for example, can increase the potential for undesirable plant species (noxious or invasive weeds) to become established. These species may lack soil stabilizing characteristics, compared to desirable plant species.

Surface disturbance associated with livestock grazing (hoof action) can also improve soil health. Impacts can occur when grazing animals help incorporate seeds into soil surfaces. Another example of an impact that can improve soil resources is where the soil surface becomes pocked from animals' hoofs. The pocked surface can help trap seeds and moisture essential for establishing desirable vegetation. Pocking also can increase surface roughness in disturbed areas, slowing erosion associated with surface water runoff. The impacts on soil resources from hoofs vary by soil type, slope, aspect, site potential, and intensity/type of livestock use (for example, trailing versus extended grazing).

Impacts on soil resources related to planned and unplanned wildland fires are complex and involve changes in nutrient cycling, water infiltration and runoff, and erosion potential (Moody et al. 2008; Martin and Moody 2001; Moody and Martin 2001). Impacts are a function of the severity of the burn, whether the vegetation community is adapted to fire, the fire condition class of the vegetation community, and the condition of soils before the burn. Impacts include soil erosion by wind and water, changes in soil structure and chemistry, and soil compaction and displacement. Effective fire prescriptions on planned fires, effective suppression tactics on unplanned wildfires, and other surface-disturbing tactics to suppress fires can minimize or mitigate some of these impacts.

Methods of Analysis

Indicators of impacts on soil resources include the following:

- Declining soil surface health, with soils either unable to support vegetation and crusts or soils that are not up to the potential for a

particular ecological site (e.g., vegetation type, diversity, density, and vigor); and

- The inability to meet Colorado Standards for Public Land Health.

All land uses would conform to Colorado Standards for Public Land Health, which describe conditions needed to sustain public land health and relate to all uses of the public lands. Standard 1 addresses soil resources and is incorporated as a goal. Environmental consequences resulting from proposed management action or allowable use decisions are analyzed based on their ability to contribute to help maintain, to achieve, or to hinder meeting Standard 1.

Impact discussions under Effects Common to All Alternatives and Alternatives A through D are based on the general descriptions of soil impacts presented here. General impacts are discussed first based on uses that cause surface disturbance and compaction; then impacts are discussed based on brief overviews of potential impacts from roads and trails, travel, mineral development, livestock grazing, utility lines, fire, and changes in vegetation communities. A brief listing of other soil impacts is also presented.

The analysis includes the following assumptions:

- Soil resources would be managed to meet Standard 1 of the Colorado Standards for Public Land Health; and
- Soils would be managed to minimize erosion and maintain soil productivity.

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources in the planning area, a literature review, and information provided by experts in the BLM or other agencies. Impacts are based on the design of the alternatives under consideration, and effects are quantified where possible. In the absence of quantitative data, best professional judgment prevailed.

Effects Common to All Alternatives

Primary impacts on soil resources are anticipated to result from surface disturbance associated with travel and transportation management, motorized/mechanized forms of recreation, mineral development, livestock grazing, alteration of native/desirable vegetative communities, ROWs/land use authorizations, and fire management actions. Resource management actions that minimize, preclude, or stipulate surface-disturbing actions, such as those associated with special management areas (e.g., ACECs, SRMAs), lands with wilderness characteristics, water, WSRs, fish and wildlife, and special status species would help maintain or improve soil conditions. As possible, impacts on soils are presented in the order listed in this paragraph in the following subsections. Minor impacts on soils from other resources also are described where applicable.

Each of the alternatives would maintain the goal that upland soils meet Standard 1, including maintaining soil moisture necessary for optimal plant growth and vigor, while minimizing surface runoff and soil erosion. Management actions will focus on maintaining or improving soil health. Maintenance or improvement of soil health will help maintain or improve proper function and condition of vegetative communities and watersheds within the planning area.

Under all alternatives, surface disturbance associated with existing roads and trails, construction of new roads and trails, or increased access and maintenance activities would impact soil resources. Impacts will be mitigated using BMPs for road and trail design, layout, construction, and maintenance.

Where allowed, development of coal resources would involve impacts on soils from infrastructure (e.g., roads, railways, waste piles, water pipelines) and subsidence (caused by mining minerals). Land subsidence would impact soil resources by establishing new drainage patterns, which could cause erosion. Dewatering from wet coal seams could impact soils depending on the rate and volume of water being discharged.

Impacts on soils from the development of fluid mineral (e.g., oil and gas, tar sands, and geothermal resources), locatable mineral, mineral material, and non-energy leasable mineral development could include erosion; alteration of runoff intensity, timing, and volume; soil contamination; mixing of soil horizons; soil compaction; and weed infestations in disturbed areas. Stipulations designed to protect other resources would indirectly protect soil resources from erosion, compaction, alterations to natural drainage patterns, and modifications to timing and intensity of runoff from these areas, or other related impacts. **Appendix B**, Stipulations Applicable to Fluid Mineral Leasing and Other Surface-disturbing Activities, includes the full list of stipulations that would restrict surface disturbances. Proposed mineral withdrawals to protect bats could also prevent surface-disturbing impacts on soils.

Emissions associated with mineral development/energy production could contribute airborne pollutants under all alternatives. Deposition of airborne pollutants could contaminate soils, impairing vegetation function and condition, which could increase the potential for bare ground, resulting in erosion and future fugitive dust production.

Livestock grazing would continue within the planning area under all alternatives. The types of impacts on soil resources from grazing are consistent throughout all alternatives. However, the severity of these impacts would vary greatly depending on grazing intensity, season of use, climatic conditions, and range site potential. Under all alternatives, soil conditions and land health would be evaluated when allotment management plans are required. Actions under each alternative that would allow periods of rest, as needed, in livestock grazing allotments would help elevate effective ground cover and promote higher rates of litter accumulation. Increasing litter and ground cover would reduce erosion

from overland flow and allow water to infiltrate more efficiently into soils, improving soil moisture and reducing erosion potential. Increased soil moisture also would help establish and maintain desirable plant species, which also reduces erosion potential.

High-severity fires remove vegetation and soil surface cover, drastically increasing the potential for soil erosion by wind and water. These fires also change soil structure and chemistry, resulting in the potential development of hydrophobic layers that increase post-fire runoff. Use of heavy equipment for surface-disturbing fire suppression tactics can cause soil compaction and displacement, and chemical retardant can alter soil chemistry. Effective fire prescriptions on planned fires, effective suppression tactics on unplanned wildfires, and other surface-disturbing tactics to suppress fires can minimize or mitigate some of these impacts.

Proposed vegetation management would affect soil resources. The condition of soil resources is intricately tied to the condition of vegetation resources within the planning area. Goals under all alternatives are to meet Colorado Standards for Public Land Health and to improve and maintain vegetation resources, which would benefit soils by reducing the likelihood of erosion, desertification, and related impacts on soil resources. Managing riparian habitat to meet Public Land Health Standard 2 and managing plant and animal communities to meet Public Land Health Standard 3 would improve soil health.

In situations where sediment control structures, commonly referred to as check dams, are causing excessive erosion, restoration may be necessary. Restoration may include notching or removal of the structure entirely, as well as revegetating the affected area.

Special status species and fish and wildlife habitat improvement projects aimed at restoring natural vegetative communities or fire regimes would improve the stability and condition of soil resources by improving vegetative cover and enhancing soil moisture. Habitat improvement projects involving stock tanks or other water developments would affect the distribution of livestock/wildlife. Some areas could receive less traffic and positively impact soil resources, where other areas (near water) could experience heavier grazing and negatively impact soil resources.

Under all alternatives, the Badger Wash ACEC would be maintained as a study area which would help evaluate soil erosion and sediment and salt delivery to surface waters in the Lower Colorado River Basin. This area would be designated to protect rare plants and used as a hydrologic study area involving paired watersheds. The ungrazed watersheds in the study area would be closed to grazing under all alternatives. The information gained in this ACEC could benefit soil management throughout the planning area.

Each of the alternatives would manage wild horses (*Equus ferus*) to the appropriate management level (AML) in the LBCWHR, which would prevent overuse and potential impacts on soils, such as erosion and compaction.

Implementing management for the following resources would have negligible or no impact on soil resources and are therefore not discussed in detail: paleontology; lands with wilderness characteristics; national trails; and national, state, and BLM byways.

Alternative A

Overall, proposed resource management actions and resource uses under Alternative A would impact soils. The most substantial impacts would come from the large extent of the planning area that would be open to cross-country travel and intensive motorized use (**Tables 4-19**, Acres of Travel Management Designations for Motorized Use by Soil Type under Alternative A, and **4-20**, Miles of Roads and Trails by Soil Type under Alternative A), which would result in loss of vegetation, destruction of soil crusts, and destabilization of surface soils. The degree of impacts on soil resources from motorized recreation is most severe in or near existing high use areas. Impacts from motorized recreation would however not be isolated to these existing high use areas and would have the potential to occur throughout the planning area. Similar impacts on soil resources could result from intensive non-motorized recreation (bike, horse, foot). However, many of these impacts would be centered on existing travel facilities (e.g. roads, trails, campgrounds) that typically experience higher user volumes. Impacts on soils from intensive non-motorized uses in these areas would be expected to grow as do the number or recreationists. Alternative A also would leave large areas open to mineral development with few NSO and CSU stipulations (**Table 4-19**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative) to protect resources, which would have a substantial impact on soil resources. The likely level of mineral development would result in a progressive increase in the amount and severity of soil disturbance. The impacts of mineral development on soils are described in detail at the beginning of this section. Under Alternative A, soil surface health could decline, being able to support less vegetation and biological soil crust. Soil productivity would be expected to decline over time as user-created routes and diffuse off-road use increased.

Under Alternative A, there would be fewer targeted management actions to facilitate recreation experiences in SRMAs. As a result, more dispersed recreation would occur under this alternative, including non-motorized and motorized uses. Under this alternative, 445,400 acres would continue to be open to cross-country motorized use and 12,500 acres to intensive motorized use, resulting in impacts on soils described at the beginning of this section. Approximately 35,300 acres would continue to be permanently closed to motorized use (and motorized and mechanized use would be limited to existing ways in the WSAs). Because recreational use would not be managed and

marketed in specific areas, it would occur throughout the planning area. The combination of these factors likely would result in soil impacts from recreational use being more widely distributed throughout the planning area, including areas with fragile soils, steep slopes, or otherwise less suitable soils.

Seasonal travel limitations on 106,200 acres would continue to limit erosion during sensitive times of the year. (Criteria used for selection of area and route designations can be found in **Appendix M**, Travel Management Plan.) Impacts on soils where roads or trails could be expanded through cross-country travel are described at the beginning of this section. Under Alternative A, 11,400 acres of Mancos Shale mapped areas and 10,600 acres of saline soils would continue to be open to intensive motorized use. Another 257,600 acres of fragile soils, 1,800 acres of Mancos Shale mapped areas, 75,700 acres of saline soils, and 179,000 acres of steep slopes would be open to cross-country motorized use (see **Table 4-17**, Acres of Travel Management Designations for Motorized Use by Soil Type under Alternative A). Total roads and trails use by road and trail designation is shown in **Table 4-18**, Miles of Roads and Trails by Soil Type under Alternative A. These values include designated roads and trails, those roads and trails without a use designation, and roads and trails that are proposed for closure and rehabilitation.

Management of soil resources would continue to limit disturbance when soils are saturated or frozen and would determine soil suitability to support surface-disturbing projects. Impacts that could be avoided would be minimized by the application of COAs, BMPs, and SOPs (**Appendix H**). NSO stipulations NSO-1 and NSO-3, which were developed specifically to address soils, would continue to protect soils from surface-disturbing impacts. The acres of stipulations that were developed for soil resources, as well as the total acres of stipulations by alternative are presented in **Table 4-19**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative. Alternative A would include

Table 4-17
Acres of Travel Management Designations for Motorized Use by Soil Type under Alternative A

Travel Management Designations	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Closed to Motorized Use	100	3,400	2,900	0	10,200
Motorized Vehicles Limited to Designated Routes	85,200	41,100	70,200	26,400	65,100
Motorized Vehicles Limited to Existing Routes	137,700	113,500	148,100	7,400	90,600
Open to Intensive Motorized Use	0	11,400	10,600	8,100	1,600
Open to Cross-country Motorized Use	257,600	1,800	75,700	0	179,000
Total	**480,600**	**171,200**	**307,500**	**41,900**	**346,500**

Source: BLM 2010a
Note: soil types may overlap in certain areas.

Table 4-18
Miles of Roads and Trails by Soil Type under Alternative A

Roads and Trails with Motorized Use	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Undesignated	849	905	1,038	129	177
Designated for Full-sized Motorized Vehicles	21	102	109	2	5
Designated for Full-sized Motorized Vehicles (Seasonal Limitations*)	3	1	1	0	0
Designated for Vehicles Under 50 Inches in Width	0	3	5	0	1
Designated for Vehicles Under 50 Inches in Width (Seasonal Limits*)	0	0	0	0	0
Designated for Motorcycle, Mechanized, Foot, and Horse Travel	0	42	42	0	2
Designated for Mechanized, Foot, and Horse Travel	1	21	18	0	4
Designated for Mechanized and Foot Travel	0	0	0	0	1
Designated for Foot and Horse Travel	1	0	0	0	1
Designated for Mechanized Travel	0	0	0	0	0
Designated for Foot Travel	1	0	0	0	1
Designated for Administrative/Permitted Use	10	31	40	2	3
Designated for Closure and Rehabilitation	16	7	17	3	4
Total	**886**	**1,105**	**1,253**	**133**	**195**

Source: BLM 2010a
* Winter Closure (December 1 through May 1)
Notes: soil types may overlap in certain areas. Under Alternative A, mechanized, horse, and foot travel are only subject to route designations in Bangs Canyon SRMA RMZs 1, 2, and 3.

Table 4-19
Areas of Stipulations for Soil Resources and All Stipulations by Alternative

Stipulation	Description	Alt A	Alt B	Alt C	Alt D
Stipulations for Soil Resources					
NSO-1	Soils in the Baxter/Douglas Slump Area	53,100	0	0	0
NSO-1	Soils in the Plateau Area	900	0	0	0
NSO-3	Steep Slopes (40 Percent or Greater)*	318,200	0	0	0
NSO-9	Fragile Soils (Slump Areas)	0	54,500	0	0
NSO-10	Fragile Soils	0	0	481,600	0
NSO-11	Steep Slopes Greater than or Equal to 40 Percent	0	347,700	347,700	347,700
CSU-5	Fragile Soils	0	481,600	0	0
CSU-6	Mapped Mancos Shale and Saline Soils	0	355,500	355,500	355,500
CSU-7	Natural Slopes (25 to 40 Percent)	0	173,100	173,100	0

Table 4-19
Areas of Stipulations for Soil Resources and All Stipulations by Alternative

Stipulation	Description	Alt A	Alt B	Alt C	Alt D
All Stipulations					
Total NSOs	Combined for all resources	433,000	614,000	858,000	497,800
Total CSUs	Combined for all resources	98,800	656,200	664,400	471,500
Total TLs	Combined for all resources	266,200	517,300	507,200	487,900

Source: BLM 2010a
* Acreage was not calculated using GIS and thus differs from the other alternatives.

433,000 acres of NSO stipulations, which would protect soil resources from surface disturbances, soil erosion, and compaction.

Under Alternative A, 300,700 acres of the planning area would continue to be acceptable for coal leasing and development, 964,800 acres would be open to fluid mineral development, 433,000 acres would be open to leasing subject to NSO stipulations, 74,100 acres would be open to leasing subject to CSU stipulations, 233,000 acres would be open to leasing subject to TL stipulations. Approximately 1,047,100 acres would be open to locatable mineral development, and 787,100 acres would be open to mineral material disposal. The impacts of these activities on soils are described in detail at the beginning of this section.

Because of lands and realty management, some areas would be unsuitable for utility development and therefore would be excluded from surface disturbance. Some areas would be identified as sensitive to development and would be protected, minimizing soil loss and erosion, as described at the beginning of this section. Development and use of seven public utility corridors would reduce the total areas of disturbance and corresponding potential for soil impacts.

Surface disturbances, shading impacts on vegetation, and changes in soil stability and erosion potential could accompany solar and wind development and related infrastructure, as described at the beginning of this section.

Under Alternative A, approximately 542,700 acres would be unsuitable for timber harvest, and harvest would be prohibited in riparian areas, in woodlands on steep slopes, and in slump hazard areas. Small clear cuts would be allowed in specific areas. These limitations would minimize the impacts of forest management on soil resources by minimizing surface disturbances, soil compaction from heavy machinery, and the associated road network, which would include staging areas for equipment and areas used for log decks. Limiting timber harvests also would reduce impacts on soils from spills or leaks of engine fuels, lubricants, or coolants, which would contaminate soils.

Under Alternative A, 978,600 acres would be open for livestock grazing, resulting in impacts as described under Impacts Common to All Alternatives.

Under Alternative A, 28,900 acres would be managed as ACECs (see **Table 2-1**, Comparative Summary of Alternatives). Impacts on soils from surface disturbance, described at the beginning of this section, would be minimized in these areas, as surface-disturbing activities would be limited.

The objective of VRM Class I is to retain the existing character of the landscape, and so in these areas large-scale surface disturbances (i.e., levels of change to the characteristic landscape that would attract attention) are precluded. These areas are protective of soil resources, which can be impacted by surface disturbances. Alternative A would include 27,100 acres of VRM Class I.

Emphasis on managing riparian areas to meet Public Land Health Standard 2 would involve continuing PFC riparian assessments to determine the health of these habitats. Additional riparian monitoring tools, such as Multiple Indicator Methods for monitoring riparian habitats, may also be utilized to evaluate riparian condition. Based on PFC determinations, BLM would implement appropriate mitigation measures to allow riparian habitats to meet or move towards meeting Standard 2. This approach would help protect soils from accelerated rates of erosion in riparian areas.

Water resources management could continue to impact soil resources under Alternative A. Sediment and salinity control structures in Indian Wash and Leach Creek, if properly maintained, could reduce soil erosion. These structures were built to minimize salt and sediment contributions to the Colorado River and to help with flood control. Other water resource actions under Alternative A include NSO-1, CSU-6, and LN-17, designed to maintain or improve existing water quality and protect the municipal watersheds that provide domestic water for the cities of Palisade and Grand Junction. These stipulations would minimize impacts on soils. Stream stabilization work along 63 miles of critically eroding stream channels would stabilize soils in and adjacent to those areas.

Management of streams as eligible WSRs would provide indirect protection of soil resources because actions would not be permitted that would impact free-flowing nature, ORVs, or preliminary classifications (i.e., wild, scenic, or recreational). WSR designation may also attract more recreationists, increasing potential to degrade soils near these streams in increased visitation

The lack of interpretation and environmental education activities in the decision area could continue to result in user actions that could degrade soil resources.

Alternative B

Overall, proposed resource management actions under Alternative B would protect soils. Compared to Alternative A, the reduction in open routes and the limited extent of areas open to intensive use would minimize related soil impacts. In addition, more areas would be closed to mineral development than under Alternative A, and more acres would be limited by NSO and CSU stipulations to protect resources, which would minimize related soil impacts.

Alternative B would result in little overall change to soil health. Soil surface health could decline locally where disturbed, but soil productivity is not expected to decline over time. With active monitoring, mitigation, and reclamation, this alternative would meet the intent of Public Land Health Standard 1.

Under Alternative B, recreation users would be directed toward the 78,300 acres of SRMAs (78 percent fewer acres than under Alternative A), concentrating impacts on soils in those areas and reducing impacts throughout the rest of the planning area. Under this alternative, areas currently open to cross-country motorized use would be closed, leaving 187,900 acres closed to motorized use (5.3 times more acres than under Alternative A) and 5,400 acres open to cross-country motorized and mechanized travel (57 percent fewer acres than under Alternative A). Areas open to intensive travel could experience soil compaction, destruction of soil crusts and desert pavement, soil erosion, spread of invasive species, and dust production, as described at the beginning of this section. In all other areas motorized and mechanized recreationists would be limited to designated roads and trails, or the area would be closed to such use. Because travel would be managed and marketed in specific areas, potential effects outside of those areas would be limited throughout the rest of the planning area. Impacts on soils in intensive use areas would increase with increasing use, but because soil impacts from recreational use would be localized to these specific areas, they could be monitored and mitigated more efficiently. Impacts on soil resources outside of intensive use areas would be expected to be reduced from current conditions as a result of comprehensive travel management under alternative B.

Motorized and mechanized seasonal travel limitations on 69,800 acres (35 percent fewer acres than under Alternative A, though year-round closures would increase 5.3 times) would limit erosion during sensitive times of the year. Under Alternative B, 5,200 acres of Mancos Shale mapped areas, 4,900 acres of saline soils, and 170 acres of steep soils would be open to all modes of travel (see **Table 4-20**, Acres of Travel Management Designations by Soil Type under Alternative B). Total roads and trails use by road and trail designation is shown in **Table 4-21**, Miles of Roads and Trails by Soil Type under Alternative B. These values include designated roads and trails, those roads and trails without a use designation, and roads and trails that are proposed for closure and rehabilitation.

Implementing the BMPs and COAs listed in **Appendix H** would help protect soils throughout planning area. COAs are site-specific and enforceable requirements that would be included in approved Applications for Permit to Drill or Sundry Notices. Stipulations developed specifically to address soils, including NSO-9, NSO-11, CSU-5, CSU-6, and CSU-7, would help protect soils from surface-disturbing impacts. The number of acres associated with

Table 4-20
Acres of Travel Management Designations by Soil Type under Alternative B

Travel Management Designations	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Closed to Motorized Travel	62,900	6,700	26,800	1,600	80,500
Limited to Designated Routes for Motorized Travel (Includes Seasonal Limitations*)	411,300	160,100	276,700	40,400	267,100
Open to Intensive Motorized Travel	0	5,200	4,900	0	170
Closed to Mechanized Travel	62,300	5,900	25,100	1,600	69,500
Limited to Designated Routes for Mechanized Travel	411,900	160,900	278,400	40,400	278,100
Open to Cross-country Mechanized Travel	0	5,200	4,900	0	170
Closed to Horse Travel	800	0	300	0	230
Designated to Limited Routes for Horse Travel	1,900	800	1,700	20	9,700
Open to Cross-country Horse Travel	471,500	171,200	306,400	42,000	337,870
Closed to Foot Travel	0	0	0	0	0
Designated to Limited Routes for Foot Travel	1,900	800	1,700	20	9,700
Open to Cross-country Foot Travel	472,300	171,200	306,700	42,000	338,100
Total	**1,896,900**	**688,000**	**1,233,600**	**168,080**	**1,391,200**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1), Spring Limitations (March 1-June 20, May 15-June 15, and March 1-May 15), and routes open only during rifle hunting season
Note: soil types may overlap in certain areas.

Table 4-21
Miles of Roads and Trails by Soil Type under Alternative B

Roads and Trails	Fragile Soils	Mancos Shale	Saline Soils	Steep Slopes
Designated for Full-sized Motorized Vehicles	142	452	501	21
Designated for Full-sized Motorized Vehicles (Seasonal Limitations*)	103	10	28	27
Designated for Administrative/Permitted Use	25	6	19	6
Designated for Vehicles Under 50 Inches in Width	14	1	1	1
Designated for Vehicles Under 50 Inches in Width (Seasonal Limits**)	1	45	47	0
Designated for Motorcycle, Mechanized, Foot, and Horse Travel	3	24	23	1
Designated for Mechanized, Foot, and Horse Travel	5	0	0	0
Designated for Mechanized and Foot Travel	18	0	12	2
Designated for Foot and Horse Travel	0	0	0	0
Designated for Mechanized Travel	1	1	0	0
Designated for Foot Travel	354	190	223	47
Designated for Closure and Rehabilitation	123	416	444	20
Total	**789**	**1,145**	**1,298**	**125**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1), Spring Limitations (March 1-June 20, May 15-June 15, and March 1-May 15), and routes open only during rifle hunting season
Note: soil types may overlap in certain areas.

stipulations developed specifically to protect soil resources by alternative are outlined in **Table 4-19**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative. Alternative B would include 614,000 acres of total NSO stipulations (42 percent more acres than under Alternative A), which would protect soil resources from surface disturbance and associated impacts. BMPs must be approved by the Authorized Officer prior to any surface disturbance.

Under Alternative B, 253,400 acres of the planning area (16 percent fewer acres than under Alternative A) would be acceptable for coal leasing, 878,700 acres would be open to fluid mineral development, 809,000 acres would be open to consideration for mineral material disposal, and 567,500 acres would be open to consideration of non-energy leasable mineral prospecting and development. However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area. The impacts of these activities on soils are described in detail at the beginning of this section.

As described under Effects Common to All Alternatives, emissions associated with mineral development/energy production could contribute airborne pollutants, which could contaminate soils, impair vegetation function and condition, and increase erosion and future fugitive dust production. Alternative B would require drill rig engines to meet Tier 2 emission standards, regardless of when they begin operation. These actions would indirectly improve soil health by reducing airborne soil contaminants (nitrogen oxides, hydrocarbons, and particulate matter) and related losses in vegetative cover.

Proposed vegetation management actions under Alternative B, described in **Chapter 2**, would improve soil health. Restoration and revegetation, especially focused on reducing pinyon-juniper (*Pinus edulis*, *Juniperus osteosperma*) encroachment and cheatgrass-dominated landscapes, would improve soil health by providing more stability and resistance to erosion. This focus on soil stability and resistance to erosion through vegetation management would help soils meet Standard 1 of the BLM's Colorado Standards for Public Land Health. Specific erosion control measures in greasewood (*Sarcobatus vermiculatus*) communities would minimize accelerated soil erosion. Impacts on soils would be minimized under Alternative B through management prescriptions developed to restrict surface-disturbing activities during extended droughts.

Under lands and realty management, fragile soils and steep slopes would be managed as ROW avoidance areas, minimizing soil loss and erosion and promoting soil stability. Use of six corridors for facilities would reduce the total areas of disturbance and corresponding potential for soil impacts. Alternative B would include 2,600 acres of wind and 12,200 acres of solar emphasis areas and 9,200 acres of Solar Energy Zones (SEZs) that are entirely within the solar emphasis areas boundary (no similar action under Alternative A). As described

at the beginning of this section, surface disturbances, shading impacts on vegetation, and changes in soil stability and erosion potential could accompany solar and wind development and related infrastructure. Acquiring additional riparian areas could allow for better soil management, and acquiring water rights to improve vegetative cover would improve soil health.

The special status species and fish and wildlife management actions under Alternative B that could affect soil resources are as follows. Management actions to improve habitat, including ACECs (e.g., Dolores River Riparian ACEC, Palisade ACEC, Roan and Carr Creeks ACEC) and NSO and CSU stipulations, would limit impacts on soil health in these sensitive areas. Explicitly minimizing impacts from resource uses like ROWs or recreation in locations with core conservation populations of special status plant species would also minimize impacts on soils. Impacts from mechanical vegetation and habitat alterations such as roller chopping and disking, which cause surficial disturbances and increased short-term erosion potential, for Gunnison and greater sage-grouse would be minimized by implementing BMPs. Closure of the Lynx Analysis Unit to wood product sales and harvest (including Christmas tree harvest) would prevent related surface disturbances and soil compaction. Managing specific areas as ROW exclusion or avoidance areas to protect habitat (i.e., Ant Research Station, Owl Banding Station, several wildlife emphasis areas) also would minimize surface disturbances and localized commitment of soil resources to permanent structures such as wind turbines or solar infrastructure. Under Alternative B, domestic sheep (*Ovis aries*) grazing would be prohibited in occupied bighorn sheep *(Ovis canadensis Canadensis, Ovis canadensis nelson, and Ovis canadensis mexicana)* habitat. This would improve soil health by minimizing localized soil compaction, rerouting of runoff along animal trails, and disturbances to vegetative cover created by improper grazing techniques. Concentrating ROWs to already-disturbed areas would minimize new disturbances on soil resources.

Under Alternative B, approximately 203,100 acres would be closed to wood product sales and/or harvest (not including Christmas tree harvest) (63 percent fewer acres than under Alternative A), including areas identified as unsuitable for timber harvest based on other resource concerns. Small clear cuts would be allowed in specific areas. Where clear cuts occur, these limitations would minimize the impacts of forestry on soil resources by reducing surface disturbances, soil compaction from heavy machinery, and the associated road networks, staging areas for equipment and areas used for log decks. No large-scale forestry product collection areas would be located on steep slopes or fragile soils, which would minimize impacts on soil resources or unwanted runoff. BMPs contained in **Appendix H** would provide additional mitigation against forestry-related impacts.

The impacts of wildland fire management are described at the beginning of this section. Alternative B would promote mechanical treatments on a site-specific

basis and implement them to achieve resource objectives. While short-term reductions in protective vegetative cover could elevate erosion potential over a brief period of time, these actions are anticipated to have an overall positive impact on soil resources, as burn intensity of unplanned fire would be reduced. This outcome would minimize impacts on soil resources from severe wildfire, as described at the beginning of this section.

Proposed soils management under Alternative B, including requiring professional geotechnical engineering and reclamation plans on fragile soils and steep slopes when site conditions warrant, would protect and improve soil health. In open areas, monitoring and identifying thresholds for evaluating vulnerability to erosional processes and using the best available science to limit erosion and sedimentation/salt loading to the Colorado River. Identifying, avoiding, and mitigating impacts on biologic soil crusts would improve soil health. Managing fragile soils, Mancos shale mapped areas, and saline soils as ROW avoidance areas would mitigate impacts on soils in those particularly sensitive areas. Avoiding motorized travel off of designated routes, over fragile soils, and over saturated soils would help prevent impacts on soil resources.

Under Alternative B, 106,000 acres would be managed as ACECs (3.7 times more acres than under Alternative A). Impacts on soils, described at the beginning of this section, would be minimized in these areas because of limits on surface-disturbing activities.

As described under Alternative A, large-scale surface disturbances, which would also impact soil resources, would not occur in areas classified as VRM Class I. Alternative B would include 98,500 acres of VRM Class I (3.7 times more acres than under Alternative A).

As described under Alternative A, the emphasis on managing riparian areas to meet Public Land Health Standard 2 would involve continuing PFC riparian assessments to determine the health of these habitats. Based on PFC determinations, BLM would implement appropriate mitigation measures to allow riparian habitats to meet or move towards meeting Standard 2. This approach and stipulations protecting riparian areas would help protect soils from accelerated rates of erosion in riparian areas. Additional specific mitigation measures listed under Alternative B in Chapter 2 would reduce surface-disturbing activities, which would reduce impacts on sensitive riparian soils.

Restrictions proposed to protect water resources would also contribute to improved soil health. Examples include closing river corridors of the Colorado, Dolores, and Gunnison Rivers to mineral materials sales and non-energy mineral leasing and development, which would help protect soils in these areas from erosion, compaction, and contamination; establishing buffer zones to major rivers, streams possessing lotic riparian attributes, definable streams, and lentic riparian areas that would minimize or heavily stipulate disturbances; and restricting seismic operations near springs and perennial streams. CSU

stipulations in municipal watersheds, which would heavily stipulate surface-disturbing actions in these areas also would benefit soil resources, as would establishing a ROW exclusion in the high sensitivity area for the Palisade municipal watershed. Improving water quality to achieve delisting of 303(d) (water quality-impaired) streams also would benefit soils, particularly for streams with salinity issues or those listed for selenium or sedimentation impairments where monitoring, mitigation, and reclamation would focus on vegetative health and soil stabilization. Removing nonfunctional structures such as sediment basins, ponds, and associated structures and implementing erosion control/soil stabilization measures would improve soil health locally. For soils in riparian areas, requiring professionally engineered design, construction, maintenance, and reclamation plans to mitigate riparian damage would protect soils in those areas.

Management of the Dolores River as suitable for WSR designation would provide indirect protection of soil resources because actions would not be permitted that would impact free-flowing nature or ORVs. The ROW avoidance also could minimize potential impacts on soils.

Under Alternative B, management of cultural resources could impact soils. Soil resources would be protected from disturbance by expansion of surface use restrictions in the Indian Creek area for cultural resources. In addition, protections related to scientific, public, conservation, and traditional uses also would protect soil resources from impacts. Managing the integrity of cultural resources outside of sensitive site areas and mitigation of cultural impacts could prevent impacts on soil resources by limiting surface disturbances.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of soil resources within the decision area. This could result in increased protective efforts by the general public.

Alternative C

Overall, proposed resource management actions under Alternative C would be the most protective of soil resources. The closure of the planning area to cross-country travel and the limited motorized use acreages (**Tables 4-22**, Acres of Travel Management Designations by Soil Type under Alternative C, and **4-23**, Miles of Roads and Trails by Soil Type under Alternative C) would substantially limit related impacts on soils. In addition, more areas would be closed to mineral development than under any other alternative, and more acres would be limited by NSO and CSU stipulations (**Table 4-19**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative) to protect resources, which would minimize related soil impacts. Alternative C would result in improvements to soil health. Soil surface health could decline locally where disturbed, especially in areas of mineral development, but soil productivity is

Table 4-22
Acres of Travel Management Designations by Soil Type under Alternative C

Travel Management Designations	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Closed to Motorized Travel	200,900	8,000	77,300	14,600	163,600
Limited to Designated Routes for Motorized Travel (Includes Seasonal Limitations*)	273,300	163,900	231,200	23,700	
Open to Intensive Motorized Travel	0	0	0	0	0
Closed to Mechanized Travel	200,300	7,600	75,600	14,600	159,700
Limited to Designated Routes for Mechanized Travel	273,900	164,300	232,900	27,400	188,000
Open to Cross-country Mechanized Travel	0	0	0	0	0
Closed to Horse Travel	800	0	300	0	230
Designated to Limited Routes for Horse Travel	10,100	8,300	15,900	400	12,300
Open to Cross-country Horse Travel	463,300	163,600	292,300	41,600	335,200
Closed to Foot Travel	0	0	0	0	0
Designated to Limited Routes for Foot Travel	10,100	8,300	15,900	400	12,300
Open to Cross-country Foot Travel	464,100	163,600	292,600	41,600	335,400
Total	**1,896,800**	**687,600**	**1,234,000**	**168,000**	**1,390,900**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1) and Spring Limitations (March 1-June 20, May 15-June 15, and March 1-May 15)
Note: soil types may overlap in certain areas.

Table 4-23
Miles of Roads with Motorized Use by Soil Type under Alternative C

Roads and Trails with Motorized Use	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Designated for Full-sized Motorized Vehicles	71	358	364	12	21
Designated for Full-sized Motorized Vehicles (Seasonal Limitations*)	26	5	12	5	2
Designated for Vehicles Under 50 Inches in Width	1	2	2	0	2
Designated for Vehicles Under 50 Inches in Width (Seasonal Limits**)	57	0	9	16	7
Designated for Motorcycle, Mechanized, Foot, and Horse Travel	0	34	36	0	2
Designated for Mechanized, Foot, and Horse Travel	2	24	22	0	5
Designated for Mechanized and Foot Travel	0	0	0	0	1
Designated for Foot and Horse Travel	16	0	8	3	10
Designated for Mechanized Travel	0	0	0	0	0
Designated for Foot Travel	1	1	0	0	4

Table 4-23
Miles of Roads with Motorized Use by Soil Type under Alternative C

Roads and Trails with Motorized Use	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Designated for Administrative/Permitted Use	384	201	266	54	57
Designated for Closure and Rehabilitation	231	669	718	37	80
Total	**789**	**1,294**	**1,437**	**127**	**191**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1) and Spring Limitations (March 1-June 20, May 15-June 15, and March 1-May 15)
** Includes the following: Winter Limitation (December 1-May 1), Spring Limitations (May 15-June 15, and March 1-May 15), and routes open only during rifle hunting season
Note: soil types may overlap in certain areas.

expected to increase over time. This alternative would meet the intent of Public Land Health Standard 1.

Impacts on soils from proposed management for interpretation and environmental education, riparian resources, and cultural resources would be the same as those described under Alternative B.

Under Alternative C, non-motorized recreationists (e.g., hikers, cyclists, equestrians) and motorized recreationists would be directed toward the 60,000 acres of SRMAs (83 percent fewer acres than under Alternative A), concentrating impacts on soils in those areas and reducing impacts throughout the rest of the planning area. Recreational use would be limited to designated trails in specific areas, limiting potential impacts. As described under Alternative B, impacts on soils would increase in SRMAs with increasing use, but because impacts would be localized to specific areas, they could be monitored, mitigated, and reclaimed more efficiently. Under Alternative C, quiet recreational uses with fewer impacts on soil resources would be emphasized.

Under Alternative C, 379,500 acres (10.8 times more acres than under Alternative A) would be permanently closed to motorized use. In addition, seasonal motorized travel limitations on 50,100 acres (2.1 times fewer acres than under Alternative A, though many seasonally closed areas would be closed year-round under this alternative) would limit erosion during sensitive times of the year. None of the planning area would be open to cross-country motorized use (see **Table 4-22**, Acres of Travel Management Designations by Soil Type under Alternative C). Total roads and trails use by road and trail designation is shown in **Table 4-23**, Miles of Roads and Trails by Soil Type under Alternative C. These values include designated roads and trails, those roads and trails without a use designation, and roads and trails that are proposed for closure and rehabilitation.

Stipulations to protect soils that are described under Alternative B also would apply under Alternative C. Additional stipulations to protect other resources

would protect soils from surface-disturbing impacts. Alternative C would include 858,000 acres of NSO stipulations on federal mineral estate (see **Table 4-19**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative), which would protect soil resources from surface disturbance, as described at the beginning of this section.

Under Alternative C, 251,200 acres would be acceptable for coal leasing (16 percent fewer acres than under Alternative A), 58,200 acres would be unacceptable for coal leasing (59 percent more acres than under Alternative A), 506,700 acres would be open to fluid mineral development (48 percent fewer acres than under Alternative A), 609,400 acres would be open to consideration for mineral material disposal (20 percent fewer acres than under Alternative A), and 298,600 acres would be open to consideration of non-energy leasable mineral prospecting and development (no similar action under Alternative A). However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area. The impacts of these activities on soils are described in detail at the beginning of this section.

As described under Effects Common to All Alternatives, emissions associated with mineral development/energy production could contribute airborne pollutants, which could contaminate soils, impair vegetation function and condition, and increase erosion and future fugitive dust production. Alternative C would require drill rig engines to meet Tier 4 emission standards, regardless of when they begin operation. Implementing this comprehensive program would improve soil health by reducing airborne soil contaminants (nitrogen oxides, hydrocarbons, and particulate matter) and minimizing related losses in vegetative cover.

Proposed vegetation management under Alternative C would have similar impacts on soil resources as those described under Alternative B. Alternative C would more actively reduce noxious and invasive species and restore native plant communities, and more actively focus on controlling cheatgrass (*Bromus tectorum*), which would improve soil health, as described at the beginning of this section. Alternative C would limit the use of mechanical treatments to create openings within dense stands, which would result in fewer short-term impacts on soils from the disturbance, but could lead to more high-intensity fires in dense stands and fewer long-term soil health improvements from vegetation restoration.

Impacts on soils from lands and realty would be the same as those described under Alternative B, except that Alternative C would include 5,300 acres of solar emphasis areas (57 percent fewer acres than under Alternative B) and no SEZs. Approximately 6,900 fewer acres of solar emphasis area would allow fewer impacts on soils because surface disturbances, shading impacts on

vegetation, and changes in soil stability and erosion potential could accompany solar development and related infrastructure, as described under Alternative A.

Impacts on soils from special status species and fish and wildlife would be the same as those described under Alternative B, except that Alternative C would include more areas (52,100 more acres) as ROW avoidance areas or exclusion areas for habitat, which would reduce impacts from ROWs on soils. Alternative C would designate upland habitats within the drainage area of live water as part of priority habitats, which could result in increased monitoring and management of soil resources in those upland areas. Prohibiting domestic sheep grazing in bighorn sheep habitat would minimize those related impacts on soils (described under Alternative B).

The types of impacts from forestry management would be the same as described under Alternative B, except that Alternative C would close approximately 435,300 acres to wood product sales and/or harvest (2.1 times more acres than under Alternative B). More areas closed to harvest would translate into fewer impacts on soils.

The types of impacts from wildland fire management would be the same as described under Alternative B, but prioritizing planned and unplanned fire to meet resource objectives could limit the options available to choose vegetation type treatments that reduce impacts on soil resources.

Proposed soil resource management under this alternative would protect soil resources, as described under Alternative B, except that Alternative C would include no areas open for cross-country motorized or mechanized use. As described at the beginning of this section, intensive use can result in accelerated soil erosion and compaction, as well as changes in vegetative cover, alterations to natural drainage patterns, and modifications to timing and intensity of runoff from these areas, which are damaging to overall soil health and may lead to increased spread of noxious or invasive species. Not allowing intensive use under this alternative would therefore avoid related impacts on soils.

Under Alternative C, 168,000 acres would be managed as ACECs (5.8 times more acres than under Alternative A). Impacts on soils, described at the beginning of this section, would be minimized in these areas because of limits on surface-disturbing activities.

As described under Alternative A, large-scale surface disturbances, which would also impact soil resources, would not occur in areas classified as VRM Class I. Alternative C would include 100,100 acres of VRM Class I (3.7 times more acres than under Alternative A).

In addition to the impacts from water resources management disclosed under Alternative B, Alternative C also would close municipal watersheds to livestock

grazing, which would avoid the grazing impacts discussed at the beginning of this section in those watersheds.

Management of 99.5 miles of streams as eligible WSRs would provide indirect protection of soil resources because actions would not be permitted that would impact free-flowing nature or preliminary classifications (i.e., wild, scenic, or recreational). The ROW exclusion and avoidance areas also could minimize potential impacts on soils. WSR designation could also result in increased recreational use which may degrade soil resources near these streams.

Alternative D

Impacts on soils from proposed management of riparian resources and interpretation and environmental education under this alternative would be the same as those described under Alternative B.

Under Alternative D, motorized and non-motorized recreation users would be directed toward the 79,000 acres of SRMAs (78 percent fewer acres than under Alternative A), concentrating impacts on soils in those areas and reducing impacts throughout the rest of the planning area. Under this alternative, some areas currently open to cross-country motorized use would be closed, leaving 10,200 acres open to intensive use (18 percent fewer acres than under Alternative A). Because travel would be managed and marketed in specific areas, potential effects outside of those areas would be limited. As described under Alternative B, impacts on soils would increase in SRMAs with increasing use, but because impacts would be localized to specific areas, they could be monitored, mitigated, and reclaimed more efficiently. Recreational use in the decision area would be marketed nationally and internationally under Alternative D, which would likely increase visitor numbers, with corresponding increases in soil impacts from recreational uses.

Seasonal motorized and mechanized travel limitations on 54,700 acres (2 times fewer acres than under Alternative A) would limit erosion during sensitive times of the year. In addition, 111,300 acres would be permanently closed to motorized use (3.2 times more acres than under Alternative A) (see **Table 4-24**, Acres of Travel Management Designations by Soil Type under Alternative D). As described at the beginning of this section, where roads or trails would be expanded, soil compaction, vegetation crushing, alteration to natural drainage patterns, and modification to timing and intensity of runoff from these areas would occur. Under Alternative D, 9,300 acres of Mancos Shale mapped areas, 9,100 acres of saline soils, and 600 acres of steep soils would be open to all modes of travel. Total roads and trails use by road and trail designation is shown in **Table 4-25**, Miles of Roads and Trails by Soil Type under Alternative D. These values include designated roads and trails, those roads and trails without a use designation, and roads and trails that are proposed for closure and rehabilitation.

Table 4-24
Acres of Travel Management Designations by Soil Type under Alternative D

Travel Management Designations	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Closed to Motorized Travel	39,800	4,800	25,200	300	47,600
Limited to Designated Routes for Motorized Travel (Seasonal Limitations*)	434,300	157,900	274,200	41,800	299,400
Open to Intensive Motorized Travel	0	9,300	9,100	0	600
Closed to Mechanized Travel	39,200	4,000	23,500	300	43,600
Limited to Designated Routes for Mechanized Travel	434,900	158,700	275,900	41,800	303,400
Open to Cross-country Mechanized Travel	0	9,300	9,100	0	600
Closed to Horse Travel	800	0	300	0	200
Designated to Limited Routes for Horse Travel	2,000	800	3,100	20	4,400
Open to Cross-country Horse Travel	471,300	171,200	305,100	42,100	343,000
Closed to Foot Travel	0	0	0	0	0
Designated to Limited Routes for Foot Travel	2,000	800	3,100	20	4,400
Open to Cross-country Foot Travel	472,100	171,200	305,400	42,100	343,200
Total	**1,896,400**	**688,000**	**1,234,000**	**168,500**	**1,390,400**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1), Spring Limitations (May 15-June 15, and March 1-May 15), and routes open only during rifle hunting season
Note: soil types may overlap in certain areas.

Table 4-25
Miles of Roads and Trails by Soil Type under Alternative D

Roads and Trails with Motorized Use	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Designated for Full-sized Motorized Vehicles	415	615	697	51	77
Designated for Full-sized Motorized Vehicles (Seasonal Limitations*)		14	31	33	12
Designated for Vehicles Under 50 Inches in Width	38	6	18	9	5
Designated for Vehicles Under 50 Inches in Width (Seasonal Limits**)	19	3	3	10	2
Designated for Motorcycle, Mechanized, Foot, and Horse Travel	9	62	67	1	7
Designated for Mechanized, Foot, and Horse Travel	3	22	25	1	9
Designated for Mechanized and Foot Travel	7	0	1	1	2

Table 4-25
Miles of Roads and Trails by Soil Type under Alternative D

Roads and Trails with Motorized Use	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Designated for Foot and Horse Travel	17	1	10	3	11
Designated for Mechanized Travel	0	0	0	0	0
Designated for Foot Travel	1	1	0	0	2
Designated for Administrative/Permitted Use	91	129	141	16	39
Designated for Closure and Rehabilitation	61	206	210	3	17
Total	**661**	**1,059**	**1,203**	**128**	**183**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1), Spring Limitations (May 15-June 15, and March 1-May 15), and routes open only during rifle hunting season
** Includes the following: Winter Limitation (December 1-May 1), and Spring Limitations (March 1-Jun 20, May 15-June 15, and March 1-May 15)
Note: soil types may overlap in certain areas.

Stipulations CSU-4 and NSO-10 were developed specifically to address soils, and would help protect soils from surface-disturbing impacts. As described under Alternative A, **Table 4-19**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative, lists acres of stipulations developed for soil resources for all alternatives. Alternative D would include 497,800 acres of NSO stipulations on federal mineral estate (15 percent more acres than under Alternative A), which would help protect soil resources from surface disturbances, as described at the beginning of this section.

Under Alternative D, 265,600 acres of the decision area would be acceptable for coal leasing (12 percent fewer acres than under Alternative A), 961,400 acres would be open to fluid mineral development (1 percent fewer acres than under Alternative A), 349,700 acres would be open to leasing subject to NSO stipulations (19 percent fewer acres than under Alternative A), 433,000 acres would be open to leasing subject to CSU stipulations, and 405,900 acres would be open to leasing subject to timing limitation stipulations (74 percent more acres than under Alternative A), 906,100 acres would be open to consideration for mineral material disposal (14 percent more acres than under Alternative A), and 925,400 acres would be open to consideration of non-energy leasable mineral prospecting and development (no similar action under Alternative A). However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area. The impacts of these activities on soils are described in detail at the beginning of this section.

As described under Effects Common to All Alternatives, emissions associated with mineral development/energy production could contribute airborne pollutants, which could contaminate soils, impair vegetation function and condition, and increase erosion and future fugitive dust production. Alternative

D would not require drill rig engines to meet Tier 2 or 4 emission standards. Airborne soil contaminants (nitrogen oxides, hydrocarbons, and particulate matter) would not be reduced, which would not improve soil health by minimizing related losses in vegetative cover.

The types of impacts on soils from wildland fire management under Alternative D would be similar to Alternatives B and C, in that all three alternatives share the same objectives of restoring natural fire regimes. However, Alternative D would allow unplanned fire for resource benefit on 96,000 acres (857,400 fewer acres than under Alternatives B and C). Manual and mechanical treatments would be priorities above using planned and unplanned fires to meet resource objectives. The long term effect of using unplanned wildfire to manage vegetation densities on fewer acres could increase the potential for larger, high-severity fires that can damage soils.

Proposed vegetation management under this alternative would affect soil resources as described under Alternative B, except that instead of maintaining and restoring vegetation to provide soil stability and resistance to erosion, Alternative D would focus vegetative treatments on increased forage. In the short term, increased forage would provide additional vegetative cover, improving soil health, but in the long term, increased grazing of that forage could result in soil compaction and increased erosion. Careful monitoring of land health and implementation of BMPs would reduce potential impacts on soils from increased livestock grazing.

Under lands and realty management, the use of eight corridors for facilities would reduce the total areas of disturbance and corresponding potential for soil impacts. Alternative D would include 3,700 acres of wind emphasis areas (42 percent more acres than under Alternative B), 36,300 acres of solar emphasis areas (2 times more acres than under Alternative B), and 9,200 acres of SEZs that are entirely within the solar emphasis areas boundary. As described under Alternative A, surface disturbances, shading impacts on vegetation, and changes in soil stability and erosion potential could accompany solar and wind development and related infrastructure.

Impacts on soils from special status species and fish and wildlife would be similar to those described under Alternative B, except that Alternative D would not specify areas as ROW avoidance or exclusion areas (which minimize soil impacts) for habitat. Alternative D also would not consolidate ROWs in wildlife emphasis areas to already disturbed areas, which would not minimize new disturbances to soil resources. Like Alternative C, Alternative D would avoid domestic sheep grazing inside of bighorn sheep habitat, which could reduce the potential for impacts (described under Alternative B).

The impacts of forestry management on soils would be the same as under Alternative B, except that Alternative D would close approximately 108,600 acres to wood product sales and/or harvest (not including Christmas trees).

This would result in 80 percent less acres than Alternative A. Only limited wood product sales and/or harvest would be allowed in riparian areas, where soils are sensitive to disturbances.

Proposed soil resource management actions under this alternative would protect soil resources, as described under Alternative B, except that Alternative D would not specifically avoid impacts on biological soil crusts. Without focused monitoring, surface-disturbing activities could damage biological soil crusts directly or through accelerated soil erosion and runoff. In addition, Alternative D would not limit seismic activity, require engineering plans for work in riparian areas, or identify the high sensitivity area in the Palisade municipal watershed as a ROW exclusion area, all of which could increase the likelihood for impacts on soil resources.

Under Alternative D, 33,200 acres would be managed as ACECs (15 percent more acres than under Alternative A). Impacts on soils, described at the beginning of this section, would be minimized in these areas because of limits on surface-disturbing activities.

As described under Alternative A, large-scale surface disturbances, which would also impact soil resources, would not occur in areas classified as VRM Class I. Alternative D would include 96,500 acres of VRM Class I (3.6 times more acres than under Alternative A).

Impacts on soils from proposed cultural resource management under this alternative would be the same as described Alternative B, except that 1,180 fewer acres (a 49 percent decrease) would be protected near Indian Creek under Alternative D, resulting in greater potential for surface disturbances that could impact soil resources.

Overall, proposed resource management actions and resource uses under Alternative D would impact soils. The most substantial impacts would come from areas open to intensive use, with the related impacts on soils. Alternative D would leave large areas open to mineral development with fewer NSO and CSU stipulations to protect resources than under Alternatives B or C (**Table 4-19**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative), which would result in substantial impacts on soil resources. The likely level of mineral development also would result in related impacts on soils. Under Alternative D, soil surface health could decline where disturbed, which would result in soils that were less able to support vegetation and biological soil crust. Implementation of the required BMPs and COAs could mitigate declines in soil productivity over time, though this alternative would likely require extensive monitoring, mitigation, and reclamation to meet Public Land Health Standard 1.

Cumulative

The CIAA used to analyze cumulative impacts on soils includes the entire planning area. Surface-disturbing activities occurring within the planning area are not expected to affect soil resources outside of the planning area.

Combined with the proposed management actions, cumulative impacts on soil resources could present challenges to meeting Public Land Health Standard 1 under Alternatives A or D. Impacts on soil resources would not be as substantial under Alternative D when compared to Alternative A. In part because of the required implementation of BMPs and COAs protective of soil resources on BLM-administered public lands, cumulative effects in the planning area are not likely to affect soil health as substantially under Alternatives B or C. Alternative C would provide the greatest protection of soil resources, followed by Alternative B.

Additional mineral development, including oil and gas, uranium and vanadium, coal, and other minerals, could cause localized impacts on soils, as described under the Effects Common to All Alternatives. Intensive mechanical vegetation treatments likely have and would continue to impact soils resources locally, but they would increase vegetation cover, and thus soil health, over the long term. Past livestock grazing has impacted soil resources. As described in **Chapter 3**, active management of grazing allotments has led to improvements in soil health over time.

An important trend in the planning area is rapidly increasing recreational use. This growth in recreation on public lands is due to local population growth, as well as the area's reputation as a national and international recreation destination. All forms of recreational activities can increase potential for erosion, sedimentation, gully creation, biologic soil crust damage, and riparian and upland vegetation damage. Recreation activities may also directly and indirectly impact water quality due to erosion and sediment production potential. However, the significance of such impacts varies with the nature and degree of disturbance as well as site specific environmental conditions. Typically larger disturbances in sensitive areas represent greater potential to damage soils and vegetation, degrade water quality, and impair overall watershed function and condition than smaller disturbances in less sensitive areas.

Public Law 98-569 includes direction to BLM for development of a comprehensive program for minimizing salt contributions from lands under its management. Colorado's Grand Valley is recognized as the largest non-point source of salinity in the Upper Colorado River Basin and much of the lands currently open to all modes of travel are situated in areas mapped to be highly erodible (i.e., fragile) or saline. The cumulative erosion in these areas resulting from a dispersed, expanding, unmaintained, and in many cases poorly designed route system would be considered a nonpoint source of pollution.

Recent drought and potential climate change resulting in more frequent future droughts could decrease vegetative cover, increasing the potential for soil erosion, desertification, and fugitive dust production. Furthermore, increased fugitive dust production could elevate the severity of dust-on-snow events triggering earlier melt-out, earlier peak stream flows, and increasing water consumption through transpiration and evaporative processes. As a result, soil moisture in areas reliant on snow melt or flooding would be depleted earlier in the season stressing vegetation. These additional stresses to vegetative communities could contribute towards vegetative loss and/or establishment of less desirable species.

4.3.3 Water Resources

This section discusses impacts on water resources from proposed management actions of other resources and resource uses. Existing conditions concerning water resources are described in **Section 3.2.5**, Water Resources.

The mandate to manage public land for multiple uses requires the BLM to consider land uses that have the potential to degrade water quality, destabilize natural stream morphologic conditions, impair sustainability of water resources (water quantity), alter groundwater aquifer properties, and modify natural stream hydrographs. Minimizing such impacts is a theme common to all of the alternatives.

Water quality is influenced by both natural and human factors. Water quality concerns created by natural conditions are hard to control. In general, water quality in the planning area is typically good in reaches of streams where riparian vegetation is good and streams are fed directly by snowmelt, precipitation, and shallow ground water. As water flows downstream, biological, physical, and chemical parameters deteriorate water quality.

Water quality impacts can result from a number of causes, including transport of eroded soils into streams due to improper livestock grazing, introduction of waste matter into streams from domestic livestock and wildlife, poorly designed and/or maintained stream crossings, route proliferation, as well as energy and mineral development. Potential energy and mineral development impacts relate to both the transport of soil eroded from roads and developed areas, and the potential for release of chemical pollutants into area ponds, streams, tributaries, or unconfined aquifers.

Surface-disturbing activities can result in removal of essential soil stabilizing agents such as vegetation, soil crusts, litter, and woody debris. These soil features function as living mulch by retaining soil moisture and discouraging annual weed growth (Belnap et al. 2001). Loss of one or more of these agents increases potential erosion and sediment transport to water bodies, leading to water quality degradation. Surface-disturbing activities can also lead to soil compaction, which decreases infiltration rates and elevates potential for

overland flow. Overland flow can increase erosion and sediment delivery potential to area water bodies, leading to water quality degradation.

Surface-disturbing activities can elevate production of fugitive dust which may then be deposited over snow. Dust-covered snow can have albedo (reflectivity) values as low as 0.35, doubling the amount of absorbed solar radiation versus clean snow. Research and simulations based on observations in the Senator Beck Basin Study Area near Silverton, Colorado indicate that excess dust on snow (versus pre-1800 conditions) increased the rate of snowmelt and advanced the timing of meltout by about 3 to 4 weeks (Painter et al. 2007). Furthermore, results of studies conducted by Painter and others indicate that annual runoff at Lees Ferry is reduced by five percent under current dust conditions. Primary contributing factors for decreased run-off were identified as follows:

1. Greater absorption of energy during snowmelt causes more of the snow to sublimate directly into the atmosphere.
2. Earlier meltout exposes the ground surface to sunlight and warmth, which both allow more evaporation of water directly from the soil, and extends the growing season for plants that then can transpire additional water. It is this combined increase in evapotranspiration that appears to have the most impact on stream flow.

The effects of dust on snow may extend beyond alteration of natural hydrographs and increased water consumption. Soil moisture in areas reliant on snow melt or flooding would likely be depleted earlier in the season stressing vegetation. These additional stresses to vegetative communities could contribute towards vegetative loss and/or establishment of less desirable species which may not possess adequate soil stabilizing characteristics. As a result, potential soil erosion and stream sedimentation would be increased causing water quality degradation.

Surface-disturbing activities occurring in areas of low reclamation potential (e.g., "fragile soils," slopes greater than 40 percent, soils derived from Mancos shale) or sensitive areas such as stream channels, floodplains, and riparian habitats are at higher risk for erosion. Disturbance in these areas creates greater potential for erosion and sediment delivery to surface waters, thereby degrading water quality.

Surface-disturbing activities within stream channels, floodplains, and riparian habitats are more likely to alter natural morphologic stability and floodplain function. Morphologic destabilization and loss of floodplain function cause accelerated stream channel/bank erosion, increased sediment supply, dewatering of near-stream alluvium, loss of riparian habitat, loss of fish habitat, and deterioration of water quality (Rosgen 1996). Alteration or removal of riparian habitats can reduce the hydraulic roughness of the bank and increase flow

velocities near the bank (National Research Council 2002). Increased flow velocities near the bank can cause accelerated erosion, decreasing water quality.

Surface disturbance can alter natural drainage patterns. Runoff critical to recharging and sustaining locally important aquifers, springs/seeps/fens, wetlands, and associated riparian/xeririparian habitats is redirected elsewhere. As a result, these sensitive areas can be dewatered, compromising vegetative health and vigor while also degrading proper function and condition of the watershed.

Subsurface disturbances can alter natural aquifer properties (e.g., enhance hydraulic conductivity of existing fractures, breach confining units, and change hydraulic pressure gradients), which can increase potential for contamination of surface and groundwater resources. Furthermore, alteration of natural aquifer properties can result in dewatering of locally important fresh water sources (e.g., groundwater, springs, seeps, fens, and streams).

Surface water runoff is dependent on both natural factors and land management. Natural factors include climate, geology and soils, slope, channel conditions, and vegetation type and density. Land use or management actions that alter these natural factors play a role in altering surface water runoff. Such actions include grading or compacting soils for new roads or well pads, and management prescriptions that alter the type or density of vegetation.

Reductions in water flow can have adverse impacts on the ecology of a watershed, its recreational potential, the availability of drinking water and water for other uses, and groundwater quality and quantity. Water quality impacts from reduced water supplies include increased water temperatures, ph levels, and alkaline levels. Reductions in water supply could result from consumptive uses of surface water or tributary groundwater sources that do not result in return of the water to the basin. Examples include reduced flood frequency and magnitude (limiting near stream alluvial recharge potential) caused by peak flow diversions, evaporative loss from new surface water features, evapotranspiration from irrigation of vegetation, injection into deep wells, or use in drilling fluids that are later disposed outside of the basin.

Activities beneficial to water resources are primarily defined as improving conditions by enhancing or restoring degraded water quality or by reducing ongoing groundwater depletion. Road maintenance that includes installing stormwater controls and replacing improperly sized and designed culverts are beneficial to water resources. Changing grazing patterns in riparian areas and modifying recreation uses in sensitive watersheds further benefit water quality and geomorphic function of streams. Management actions regarding closure or avoidance of specific areas or restrictions of disturbance are considered protective of environmental conditions and so are also regarded as beneficial. Mitigation measures also reduce the impacts on water resources associated with ongoing or future activities.

Methods of Analysis

Indicators of impacts on water resources include the following:

- Alteration of the physical characteristics of streams, springs/seeps/fens, wetlands, riparian areas, and groundwater aquifers to a point in which these resources are not properly functioning and/or sustainable;
- Sustainable yield of groundwater resources cannot be obtained;
- Meet state and federal water quality standards for surface and groundwater; and
- Impaired water quality to a degree that could affect the survival rate of downstream aquatic or riparian species.

Every management action that directly or indirectly has the potential to alter aquifer properties, water quality, water quantity, and the natural hydrograph can have accompanying temporary and/or permanent impacts on water resources. The discussion of impacts on water resources includes the effects of surface- and subsurface-disturbing actions on water quality, water quantity, and cumulative watershed health.

The analysis includes the following assumptions:

- The degree of impact attributed to any one disturbance or series of disturbances would be influenced by several factors, including proximity to drainages, proximity to existing groundwater wells, location within the watershed, time and degree of disturbance, reclamation potential of the affected area, existing vegetation, precipitation, and mitigating actions applied to the disturbance.
- New transportation facilities would be properly designed (BLM minimum standards).
- Surface-disturbing actions related to fluid mineral development would comply with Gold Book surface operating standards (and subsequent updates).
- In general, the shallower the depth to water, the more susceptible an aquifer is to contamination. Mineral development is the primary activity with a potential to impact shallow groundwater quality and quantity. Locations in the planning area with depths to groundwater of less than 100 feet or unconfined aquifers are considered the most likely to be impacted by mineral development. Unconfined aquifers or aquifers with water table elevations of 100 feet below ground surface are more vulnerable to leaks and/or spills of contaminants at the surface. However, groundwater at greater depths is vulnerable to mine dewatering, casing failure, contamination resulting from enhanced hydraulic conductivity caused by fracturing and drilling,

and contamination caused by chemicals utilized in the fracturing and drilling processes.

Effects Common to All Alternatives

The BLM would continue to manage the LBCWHR (35,200 acres) to accommodate an AML of 90 to 150 wild horses. The AML would be adjusted so as to not degrade range conditions, which include water resources. For example, maintaining the horse herd at the AML would prevent overgrazing, minimizing the loss of vegetative cover. Maintaining vegetative cover would limit erosion, thereby limiting stream sedimentation during stormwater runoff. These indirect impacts would continue under all alternatives, because there would be no change in management actions.

Wildland fire can result in substantial water resource impacts in a short period of time. Fire can reduce soil infiltration rates, resulting in reduced water retention potential of the affected soils and more runoff following precipitation and snowmelt. Loss of vegetation also contributes to these effects. Fires also create openings where snow and ice accumulate to greater depths than in forested areas. These openings can produce high runoff during short periods of rapid thawing, resulting in soil erosion and high peak flows. Excessive sediment delivery to stream channels can result in water quality impacts for long periods of time, while sediment-clogged channels can cause flooding. Similarly, chemical products of wood combustion are carried into streams with runoff.

The BLM would continue to use surface water as a source of water for fire suppression activities. Because surface water sources for fire suppression are not specified, the primary general impacts on surface water sources used for fire suppression include the lowering of surface water levels and the loss of water for groundwater recharge.

In situations where sediment control structures, commonly referred to as check dams, are causing excessive erosion, restoration may be necessary. Restoration may include "notching" or removal of the structure entirely, as well as revegetating the affected area.

Potential impacts from coal, locatable mineral, mineral material, and non-energy leasable mineral activities and development would include the release of pollutants capable of contaminating surface water during stormwater runoff or contaminating aquifers during groundwater recharge. Mineral activities and developments could also alter drainage patterns, which would affect stream hydrographs and water supplies. Discharge of mine water can alter water chemistry and impair natural stream morphologic conditions.

Management under all alternatives could impact rates of soil erosion and therefore could affect water quality, water quantity, and the hydraulic characteristics of streams. BMPs are interventions designed to minimize the impacts of human activities on water quality and quantity caused by discharge of

sediment or chemical constituents. The BLM would implement BMPs designed to minimize the impacts of human activities on water quality and quantity. Since the effectiveness of BMPs vary, and since they are seldom 100 percent effective, the net impact on water quality and quantity that would result from activities that produce chemical contaminants to soils, or that affect soil erosion rates, would depend on the type, duration, and amount of activity. Stipulations designed to protect other resources would indirectly protect water resources from erosion, sedimentation, changes in runoff, or other related impacts. **Appendix B**, Stipulations Applicable to Fluid Mineral Leasing and Other Surface-disturbing Activities, includes the full list of stipulations that would restrict surface disturbances that cause impacts on water resources. Appendix A, Figures, displays areas subject to management actions for ROWs, travel management, minerals, and other resources and uses discussed in the following analysis.

The acreages of perennial stream habitat potentially impacted by travel management actions under each alternative are shown in **Table 4-26**, Travel Management Impacts on Perennial Stream Habitat.

Implementing management for paleontology would have a negligible impact on water resources and is therefore not discussed in detail.

Table 4-26
Travel Management Impacts on Perennial Stream Habitat

Actions	Acres of Perennial Stream Habitat Impacted			
	Alternative A	Alternative B	Alternative C	Alternative D
Open to All Modes of Travel within 100 Feet of Perennial Streams	2,200	0	0	0
Closed to Motorized Vehicles within 100 Feet of Perennial Streams	100	800	1,900	200
Limited to Existing Routes for Motorized Vehicles within 100 Feet of Perennial Streams	1,200	0	0	0
Limited to Designated Routes for Motorized Vehicles within 100 Feet of Perennial Streams	1,200	4,000	3,000	4,600
Seasonal Limitations for Motorized Vehicles within 100 Feet of Perennial Streams	400	300	200	300

Source: BLM 2010a

Alternative A

The BLM would continue general activities to maintain or improve water quality, natural stream morphologic conditions, sustainability of water resources (water quantity), groundwater aquifer properties, and natural stream hydrographs. For

example, the BLM would continue stream stabilization work, which would minimize deposition of sediment in streams and help maintain natural stream morphologic stability. These direct impacts would maintain or improve water resource conditions.

Under Alternative A, BLM would continue to manage 234,900 acres of ROW exclusion areas and 441,400 acres of ROW avoidance areas in the planning area. Those activities and developments capable of affecting water resources would not occur in exclusion areas and would be limited in avoidance areas. ROW actions that could release pollutants capable of contaminating surface water during runoff events or contaminating aquifers during groundwater recharge would not occur or would be limited. Also, ROW actions that could alter drainage patterns and recharge rates for groundwater, which affect stream hydrographs and water supplies, would not occur or would be limited. On the 385,100 acres not managed as exclusion or avoidance areas, there would be fewer management actions implemented to prevent these impacts from occurring. The severity of these direct and indirect impacts would vary, depending on the different types of ROW activities, intensity of development, and site-specific geomorphic conditions.

There would continue to be 96,500 acres of federal mineral estate closed to fluid mineral leasing and 1,134,600 acres of federal mineral estate open to fluid mineral leasing (refer to **Table 2-1**). By managing lands as closed to fluid mineral leasing, actions would not occur that could release pollutants capable of contaminating surface water during runoff events, or contaminating aquifers during groundwater recharge. Also, actions would not occur that could alter drainage patterns, which affect stream hydrographs and water supplies. However, by managing lands as open to fluid mineral leasing, there is the potential for these impacts to occur in areas of fluid minerals development. The severity of these direct and indirect impacts would vary, depending on the different types of fluid mineral leasing activities and the intensity of development, as well as the type and volume of contaminants released to the environment.

There would continue to be 433,000 acres where NSO stipulations would be applied (refer to **Table 2-1**). The NSO stipulations would protect water resources either directly or indirectly. By prohibiting use or occupancy of the land surface, associated actions capable of affecting water resources would not occur, unless allowed by an exception, in areas with this stipulation. Actions would not occur that could release pollutants capable of contaminating surface water during runoff events, or contaminating aquifers during groundwater recharge. Also, actions that could alter drainage patterns, which affect stream hydrographs and water supplies, would not occur. In areas not managed as NSO (or areas of NSO where exceptions are granted), there is the potential for these impacts to occur in areas of minerals development. Practices such as directional or horizontal drilling, that access resources from outside the boundary of an NSO stipulation, could impact water resources. In addition,

impacts from down-hole operations (e.g., well completion, hydraulic fracturing) would still occur. The severity of these impacts would vary depending on the different types of mineral leasing activities and intensity of development.

There would continue to be 74,100 acres where CSU stipulations would be applied (refer to **Table 2-1**). The CSU stipulations would protect water resources either directly or indirectly. By constraining use or occupancy of the land surface, associated actions capable of affecting water resources would be limited. Actions that could release pollutants capable of contaminating surface water during runoff events or contaminating aquifers during groundwater recharge would be limited. Also, actions that could alter drainage patterns, which affect stream hydrographs and water supplies, would be limited. However, by not constraining use or occupancy of the land surface, there would be fewer management actions to prevent these impacts from occurring. The severity of these impacts would vary, depending on the different types of surface-disturbing activities and intensity of development.

The BLM would continue to apply LN-17: Palisade Municipal Watershed, wherein the lessee is notified that the lease contains the privately owned surface of the Town of Palisade, located within the town's designated watershed, and is covered by a Watershed Protection Ordinance. The ordinance would continue to influence activities and developments in a manner appropriate to protecting the Palisade Municipal Watershed. Applying LN-17 would help maintain water resource conditions in the watershed.

Under Alternative A, fluid mineral well bores and storage and use of hazardous chemicals would not be limited near domestic water wells or in Water Intake Zone 3. These activities could contaminate water resources from the use of hazardous chemicals that could infiltrate or percolate into domestic and municipal water resources if a spill or other accident were to occur. If these types of accidents became common, they could compromise existing water resource conditions given reasonably foreseeable development in the future.

There would be no specific management actions under Alternative A to restore and maintain healthy, productive plant communities of native and other desirable species at self-sustaining population levels commensurate with the species' and habitats' potentials. By not restoring plant communities, the soil surface remains exposed and, consequently, susceptible to erosion. Soil erosion during runoff events and mineral constituents of eroded parent material affect surface water by depositing sediment in streams and other water bodies, thereby affecting water quality and stream morphology. Exposed soil also allows wind to more easily erode soil and deposit it on the surface of snow. Soil covering the surface of snow affects the melting rate and timing of meltout, thereby altering stream hydrographs and water availability to downstream users.

The BLM would continue to manage 28,900 acres of ACECs for purposes that directly or indirectly affect water resources. Management of ACECs would

indirectly affect water resources through the management for other special resource values, such as vegetation. Vegetation helps filter contaminants from runoff, contributes to soil stabilization, and is an important component to flood-plain function in riparian/xeririparian areas. Under Alternative A, BLM would not designate additional ACECs, and there would be no additional protection of water resources from ACEC management.

Alternative A would continue to provide minimal management actions specific to protecting riparian areas or dry washes, both of which are important components of watershed health. Impacts on riparian areas may include trampling of vegetation and soil disturbance by livestock grazing, recreation activities, or motorized use. These types of alterations to riparian areas would destabilize stream banks and reduce water storage capacity and releasing capability of these areas. The large water storage capacity of alluvial deposits and stabilizing characteristics of riparian zones buffers the movement of water from upland areas into streams. Instead of allowing water to flow directly into streams following a rainstorm or snowmelt, healthy riparian areas hold and store water and are critical in sustaining the proper function and condition of stream channels and floodplains. Throughout the year, this water seeps slowly into adjacent streams, providing water for base flow in area streams. The indirect impacts described above would limit the ability of riparian areas to perform these beneficial functions.

The BLM would continue to manage 542,700 acres as unsuitable for forest harvest (refer to **Table 2-2**), and would continue to prohibit timber and woodland harvesting in riparian areas. This would protect vegetative cover, thereby limiting erosion and sedimentation during runoff events. Increased sedimentation can degrade water quality and result in increased width/depth ratios in stream channels. Increased width/depth ratios can cause increased lateral stream bank erosion and further sedimentation to streams (Rosgen 1996). These management actions would help maintain water resource conditions.

The BLM would continue to utilize prescribed fires in order to meet land and resource management objectives. Prescribed burn areas would be susceptible to erosion and increased sedimentation in water bodies because of the lack of vegetative cover and loss of woody debris and biologic soil crusts. Reduced fire intensity associated with planned fire reduces the potential for post-fire erosion because not all soil-stabilizing characteristics are consumed. However, unlike unplanned wildfire, the BLM would avoid burning areas adjacent to surface water in order to limit impacts on water resources. Also, restoration of burned areas would include enhancing plant communities, which would help protect water resources in the long term. These indirect impacts would threaten water resource conditions in the short term and maintain or improve water resource conditions in the long term.

There would continue to be 48,600 acres closed to livestock grazing and 978,600 acres open to livestock grazing. Improper grazing has the potential to accelerate erosion rates and nutrient loads to surface water from trampled vegetation and soil compaction. As a result, contaminants such as nutrients and bacteria could wash directly into receiving waters from surface water runoff in grazed areas. These effects could occur in areas open to historic grazing. Stream banks would also continue to be sheared by livestock using these areas. This would result in changes to the natural stream morphology and its functions. The severity of these indirect impacts would vary, depending on season of use, type of livestock, intensity of livestock grazing, and climatic conditions. However, in lands closed to future livestock grazing, these types of water resource impacts would not occur.

The BLM would continue to implement BMPs, including periodic rest periods in areas open to grazing, to maintain plant vigor and health. This would minimize impacts on land and watershed health from overuse, reducing the impacts on water resources from grazing. Continuing to allow grazing use in limited precipitation zones would require more intensive management in these areas. Without proper management, this could reduce vegetative cover, resulting in accelerated sedimentation, nutrient loads, and bacteria into surface waters from increased erosion rates, alteration of timing of snow meltout due to increases in dust, increased evaporation, increased sublimination, increased evapotranspiration; and recharge impacts on local water-bearing units from decreased infiltration rates.

Under Alternative A, 35,300 acres would continue to be managed as closed to motorized use (and motorized and mechanized use would be limited to existing ways in WSAs), while the remainder of the decision area would be designated as Open (intensive: 12,500 acres; cross-country: 445,400 acres) or Limited (limited to designated routes: 225,500 acres; limited to existing routes: 342,700 acres; seasonal limitations: 106,200 acres). Within areas of open and limited use, potential impacts on water resources would continue from recreational use, and could increase due to increased motorized vehicle use of existing roads, trails, and cross-country travel. Foot and horse travel would continue to be limited to designated routes on 6,200 acres, limiting impacts in those areas.

The effects of recreational activities on water quality can include sedimentation (deposited solids), turbidity (suspended solids), disrupted soil crusts, and reduced vegetation cover. Removal of vegetation can lead to increased amounts and velocities of runoff, accelerating the rates at which sediments and other debris are eroded from cross country or intensive use areas and flushed to downslope aquatic systems. Pollutants associated with deposition of motorized vehicle emissions and spills of petroleum products may be absorbed by sediments and plant material, or dissolved in runoff. Once mobilized, these contaminants may enter aquatic systems (Ouren et al. 2007). The severity of these impacts would vary, depending on the different types (e.g., dirt

motorcycles, dune buggies, sand rails, jeeps, four-wheel drive vehicles, snowmobiles, and ATVs) and intensity of motorized use.

In areas closed to recreational use, natural drainage patterns would be preserved, and excessive erosion of uplands as well as stream channels and banks would be reduced. This would help preserve the natural stream morphologic conditions. Closed areas would not experience soil structure disturbance and disruption/removal of vegetation. This would limit erosion, sedimentation, and contamination of water bodies.

There would continue to be 300,700 acres acceptable for further coal leasing and development, and 36,700 acres in the coal resource development potential area identified as unacceptable for further consideration of leasing and development. Coal mining activities capable of affecting water resources would not occur in those areas identified as unacceptable. In acceptable areas, as described at the beginning of this section, coal mining activities and developments could impact water resources, including sedimentation, contamination, and alteration of water quality, stream morphology, and aquifer characteristics. The severity of these indirect impacts would vary, depending on the different types and intensities of coal activities and development.

By managing lands as closed to locatable, salable, and leasable minerals, impacts on water resources from associated mineral activities and developments would not occur in those areas. However, as described at the beginning of this section, by managing lands as open to locatable, salable, and leasable minerals, there is the potential for these impacts to occur in areas with mineral activities, including sedimentation, contamination, and alteration of surface and subsurface water bodies. The severity of these indirect impacts would vary, depending on the different types of locatable, salable, and leasable activities and intensity of development. Impacts from non-energy leasable minerals would be limited to the only part of the decision area known to have potential for non-energy leasable minerals, the 2,800-acre potash potential area in Sinbad Valley.

There would continue to be 20,100 acres withdrawn from mineral entry and zero acres with petition to withdraw from locatable mineral exploration or development. By withdrawing land, impacts on water resources from associated mineral activities and developments would not occur in those areas. However, by not withdrawing land, there is the potential for impacts on water resources to occur in these areas from mineral activities. The severity of these indirect impacts would vary, depending on the different types of locatable mineral activities and intensity of development.

There would be 14 stream segments along 99.5 miles of river segments crossing BLM-administered public land identified as eligible for inclusion in the NWSRS (see **Appendix C**, Wild and Scenic River Suitability Report). The BLM would continue to manage the eligible segments according to interim protective management guidelines. The guidelines specify that BLM cannot take any actions

that would degrade the outstandingly remarkable values, degrade the free-flowing nature of the segment, degrade water quality that is necessary to support the outstandingly remarkable values, or change the classification of the segment (level of development). These guidelines would contribute to maintaining water resource conditions in these 14 segments only. Identifying streams as eligible for WSR designations could attract recreation which has potential to degrade water quality when river-based recreation results in removal of streamside vegetation.

The lack of interpretation and environmental education activities in the decision area could result in user actions that could degrade water resources.

Alternative B

Under Alternative B, the BLM would implement specific actions related to protecting and monitoring water quality and quantity. These actions would maintain or improve water quality, natural stream morphologic conditions, sustainability of water resources (water quantity) (refer to **Table 2-2**), groundwater aquifer properties, and natural stream hydrographs.

Similar to Alternative A, the BLM would implement LN-1: Source Water Protection Areas, requiring the lessee to implement special protective measures for water resources and to collaborate with municipalities to comply with applicable municipal watershed plans. In addition, the Grand Junction and Palisade municipal watersheds would be closed to fluid mineral leasing. Compared to Alternative A, these special protective measures under Alternative B would result in fewer impacts on water resources in municipal watersheds from fluid minerals activities.

Under Alternative B, there would be 204,200 acres managed as ROW exclusion areas (18 percent fewer acres than under Alternative A) and 740,900 acres managed as ROW avoidance areas (68 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A. The intensity and severity of impacts would depend on the type of activity or development, and the type or condition of water resources occurring in these areas.

There would be 182,700 acres closed to fluid mineral leasing (89 percent more acres than under Alternative A) and 878,700 acres open to fluid mineral leasing (9 percent fewer acres than under Alternative A). The types of impacts from fluid mineral leasing would be the same as those described under Alternative A, but would occur over a smaller area. The intensity and severity of impacts would depend on the type of activity or development, and the type or condition of water resources occurring in these areas.

Oil and gas operations near domestic water supplies using a groundwater well or spring would be restricted and appropriate design features or conditions of approval would be developed in order to avoid contaminating water resources.

Therefore, impacts from fluid mineral development on domestic drinking water supplies using a well or spring would not be expected.

Under Alternative B, NSO stipulations would be applied on 614,000 acres (42 percent fewer acres than under Alternative A) of federal mineral estate. The types of impacts would be the same as those described under Alternative A; however, NSO stipulations would be applied on more acres under Alternative B.

Under Alternative B, CSU stipulations would be applied on 656,200 acres of federal mineral estate (note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate). The types of impacts would be the same as those described under Alternative A.

Unlike Alternative A, BLM would implement specific management actions to restore plant communities and revegetate areas under Alternative B. By restoring more plant communities and revegetating more areas, a larger soil surface area would be covered and, consequently, would be less susceptible to erosion as sedimentation to water bodies would be reduced. This would provide greater opportunities to maintain and improve water resource conditions.

Under Alternative B, 13 ACECs on 106,000 acres (3.7 times more acres than under Alternative A) would be designated. The types of impacts would be the same as under Alternative A, but would occur over a larger area.

Compared to Alternative A, the BLM would implement more actions to protect and monitor riparian vegetation. The BLM would also give priority for riparian management to areas identified as special status species habitat and those riparian areas not meeting PFC and riparian communities rated as Functional at Risk (FAR). The types of impacts would be the same as under Alternative A, but the additional management actions under Alternative B would provide more opportunities to protect water resources from activities such as recreational travel, livestock grazing, and fluid mineral development.

Under Alternative B, the BLM would close approximately 203,100 acres (63 percent fewer acres than under Alternative A) to wood product sales and harvest (not including Christmas tree harvest), and would prohibit timber and woodland harvesting in riparian areas. In addition, specific forest/woodland management plans would be developed for eight forestry zones to accomplish resource objectives and prevent adverse impacts. Although more acres would be closed under Alternative A, Alternative B would provide more opportunities to protect water resources from forestry activities through implementing specific forest/woodland management plans.

The types of impacts from wildland fire management would be the same as under Alternative A, except that more acres would be potentially treated, moving vegetation communities toward desired conditions, which would better protect soil resources and increase water quality. Alternative B would have the broadest range of treatments for hazardous fuels, allowing for those treatments that would limit adverse impacts on water resources. In addition, the BLM would design ESR treatment actions based on the severity of the wildfire impacts, further increasing protection of water resources from impacts related to wildfires.

Under Alternative B, BLM would manage 24,400 acres for wilderness characteristics. Management prescriptions would provide protection of the relevant and important values found in these areas and would include actions such as ROW exclusion and avoidance areas, travel restrictions (e.g., closed to motorized travel, limiting mechanized travel to designated routes), and closure to mineral development (subject to valid existing rights). These restrictions on surface-disturbing activities would provide protection for water resources in and adjacent to these areas.

Under Alternative B, 66,000 acres would be closed to livestock grazing (36 percent more acres than under Alternative A). The types of impacts from livestock grazing would be the same as those described under Alternative A, but would occur over a smaller area. Grazing would be permitted in the Grand Junction and Palisade municipal watersheds. Proper management of grazing in these watersheds would mitigate erosion and loss of vegetative cover that would cause increased run-off, erosion, and contamination of municipal water resources.

Under Alternative B, the BLM would also limit grazing use in limited precipitation zones (176,800 acres) to manage the compatibility of grazing activities with environmental conditions. This action would provide additional measures to reduce indirect impacts on water resources from grazing.

The types of impacts from motorized travel designations would be the same as those described under Alternative A. However, unlike Alternative A, there would be no areas open to cross-country for all modes of travel. In addition, there would be 5,400 acres open to cross-country motorized use (57 percent fewer acres than under Alternative A), 187,900 acres closed to motorized vehicle use (5.3 times more acres than under Alternative A), and 868,000 acres where motorized travel is limited to designated routes (3.9 times more acres than under Alternative A). Furthermore, within 100 feet of perennial streams, there would be more acres designated as closed to motorized use and as limited to designated routes for motorized vehicles (refer to **Table 4-26**, Travel Management Impacts on Perennial Stream Habitat). Thus, motorized travel under Alternative B would have fewer impacts on water resources than under Alternative A due to fewer areas disturbed or contaminated (water

quality) by motorized use. Impacts from travel management under Alternative B would be further reduced by implementing comprehensive route designations for mechanized travel (e.g., allowing intensive mechanized travel on only 5,400 acres and limiting mechanized travel to designated routes on 897,500 acres). Foot and horse travel would be limited to designated routes on 24,600 acres (four times more acres than under Alternative A) while cross-country use would be allowed in the remainder of the decision area (except for a prohibition on horse travel in the 1,300-acre Pyramid Rock ACEC). The types of impacts would be the same as described under Alternative A.

Within the coal resource development potential area there would be 253,400 acres identified as acceptable for further coal leasing and development (14 percent fewer acres than under Alternative A). Alternative B would also identify 56,000 acres as unacceptable for further consideration of leasing and development (34 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would occur over a smaller area.

The types of impacts from locatable and salable minerals would be the same as those described under Alternative A. However, Alternative B would petition to withdraw 20,700 acres from mineral entry (versus zero acres under Alternative A). There would also be 809,000 acres open for consideration for mineral material (salables) disposal on a case-by-case basis (3 percent more acres than under Alternative A), and 252,400 acres closed to mineral material (salables) disposal (8 percent fewer acres than under Alternative A).

Under Alternative B, opportunities would be provided for non-energy leasable exploration and development on 567,500 acres (there is no similar action under Alternative A). Applying NSO stipulations would reduce the potential impacts on water resources by prohibiting surface-disturbing activities. Alternative B would also close 493,900 acres in sensitive areas to non-energy leasable mineral exploration and development, which would increase opportunities to reduce impacts on water resources in these areas (there is no similar action under Alternative A).

Under Alternative B, the BLM would determine that all eligible stream segments are not suitable for inclusion in the NWSRS, with the exception of a portion of the Dolores River determined to be suitable. Streams segments determined to be not suitable would be released from interim management protection afforded to eligible segments. The portion of the Dolores River determined to be suitable would continue to be managed under interim management guidelines, which provide standards for ongoing protection of river-related values. Designation, by Congress, of portions of the Dolores River as a WSR could result in increased recreational use that may lead to minor reductions in water quality.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of water resources within the decision area. This could result in increased protective efforts by the general public.

Alternative C

Compared to Alternative A, the BLM would implement more actions related to protecting and monitoring water quality and quantity. These actions would maintain or improve water quality, natural stream morphologic conditions, sustainability of water resources (water quantity), groundwater aquifer properties, and natural stream hydrographs. Overall, compared to Alternative A, there would be more proactive actions to maintain or improve surface water and groundwater resources under Alternative C.

Unlike Alternative A, the BLM would not implement an LN pertaining to municipal watersheds and source water protection areas for the Palisade and Grand Junction municipal watersheds. However, the Palisade and Grand Junction municipal watersheds would be closed to future fluid mineral leasing; LNs applicable to fluid mineral leasing would not be necessary. The types and severity of impacts on water resources from fluid minerals activities and development in municipal watersheds would be similar to Alternative A, but would occur over a smaller area.

Under Alternative C, there would be 365,800 acres managed as ROW exclusion areas (39 percent more acres than under Alternative A) and 627,000 acres managed as ROW avoidance areas (42 percent more acres than under Alternative A). As a result, the types of impacts from ROW actions would be the same as those described under Alternative A, but would occur over fewer acres.

There would be 554,700 acres closed to fluid mineral leasing (5.7 times more acres than under Alternative A) and 506,700 acres open to fluid mineral leasing (48 percent fewer acres than under Alternative A). The types of impacts would be the same as under Alternative A, but would occur over a smaller area.

Developing appropriate design features or conditions of approval for oil and gas operations near domestic water supplies using a groundwater well or spring would result in the same impacts on domestic water supplies as described under Alternative B.

Under Alternative C, NSO stipulations would be applied on 858,000 acres of federal mineral estate (98 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would occur over 248,300 fewer acres.

Under Alternative C, CSU stipulations would be applied on 664,400 acres of federal mineral estate (note that because many CSU stipulations under

Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate). The types of impacts would be the same as those described under Alternative A.

Unlike Alternative A, the BLM would implement specific management actions to restore plant communities and revegetate areas under Alternative C. By restoring more plant communities and revegetating more areas, a larger soil surface area would be covered and, consequently, would be less susceptible to erosion and sedimentation than under Alternative A. This would provide greater opportunities to maintain and improve water resource conditions.

Under Alternative C, the BLM would designate 23 ACECs on 168,000 acres (4.8 times more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A. However, by protecting over 139,300 more acres of ACECs compared to Alternative A, Alternative C would provide more opportunities to protect water resources from surface-disturbing activities.

The BLM would close approximately 435,300 acres (20 percent fewer acres than under Alternative A) to wood product sales and harvest (not including Christmas tree harvest), and prohibit timber and woodland harvesting in riparian areas. As under Alternative B, specific forest/woodland management plans would be developed for eight forestry zones to accomplish resource objectives and prevent adverse impacts. Although more acres would be closed under Alternative A, Alternative C would provide more opportunities to protect water resources from forestry activities by implementing specific forest/woodland management plans.

The types of impacts from wildland fire management would be the same as described under Alternative A, except that more acres would be potentially treated, moving vegetation communities more in line with the historic range of variability, which would better protect soil resources and increase water quality. As under Alternative B, the BLM would design ESR treatment actions based on the severity of the wildfire impacts, further increasing protection of water resources from impacts related to wildfires. Unlike under Alternative B, there would be restrictions on some treatment types, limiting the choices for selecting a treatment type that would most limit impact to water resources.

Under Alternative C, the BLM would manage 171,200 acres for wilderness characteristics (7 times more acres than under Alternative B; there is no similar action under Alternative A). The types of impacts would be the same as under Alternative B, but over an additional 146,800 acres.

Under Alternative C, the BLM would close 440,400 acres to livestock grazing (84 percent more acres than under Alternative A). As a result, the types of impacts from livestock grazing would be the same as described under Alternative A, but would occur over a smaller area. Grazing would not be

permitted in the Grand Junction and Palisade municipal watersheds. This would prevent erosion and loss of vegetative cover that could cause increased run-off, erosion, and contamination of municipal water resources.

Similar to Alternative A, the BLM would implement rest periods on disturbed areas in order to protect land and watershed health. However, under Alternative C the BLM would also limit grazing use in limited precipitation zones (344,300 acres) to manage the compatibility of grazing activities with environmental conditions. These actions would provide additional measures to reduce indirect impacts on water resources from grazing. The impacts would be the same as those described under Alternative B, but would occur in limited precipitation zones across the entire decision area, not just in the Grand Valley and Kannah Creek management zones.

The types of impacts from comprehensive travel designations would be the same as those described under Alternative A but would occur over a smaller area because cross-country motorized and mechanized travel would be prohibited; 379,500 acres would be closed to motorized use (10.8 times more acres than under Alternative A); and motorized use would be limited to designated routes on 681,900 acres (3 times more acres than under Alternative A). This alternative would also be the most restrictive for mechanized travel, closing 367,000 acres (2.3 times more acres than under Alternative B; Alternative A does not include decision area-wide designations for mechanized travel). Furthermore, within 100 feet of perennial streams, there would be more acres designated as closed to motorized use and as limited to designated routes for motorized vehicles (refer to **Table 4-26**, Travel Management Impacts on Perennial Stream Habitat). Thus, Alternative C would have fewer impacts on water resources than Alternative A due to fewer areas disturbed or contaminated (water quality) by recreational travel.

Within the coal resource development potential area there would be 251,200 acres identified as acceptable for further coal leasing and development (26 percent fewer acres than under Alternative A). Alternative C would also identify 58,200 acres as unacceptable for further consideration of leasing and development (37 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would occur over a smaller area.

The types of impacts from locatable and salable minerals would be the same as those described under Alternative A, but additional restrictions mean the impacts would occur over a smaller area. Alternative C would petition to withdraw 45,100 acres from mineral entry (2.2 times more acres than under Alternative B). There would also be 609,400 acres open for consideration for mineral material (salables) disposal on a case-by-case basis (20 percent fewer acres than under Alternative A), and 452,000 acres closed to mineral material (salables) disposal (57 percent more acres than under Alternative A).

Under Alternative C, opportunities would be provided for non-energy leasable exploration and development on 298,600 acres (the fewest acres of any action alternative; there is no similar action under Alternative A). Applying NSO stipulations would reduce the potential impacts on water resources by prohibiting surface-disturbing activities. Alternative C would also close 762,900 acres in sensitive areas to non-energy leasable mineral exploration and development, which would increase opportunities to reduce impacts on water resources in these areas (the most acres of any action alternative; there is no similar action under Alternative A).

The BLM would determine that 14 stream segments (99.5 miles of stream segments crossing BLM-administered public land) as suitable for inclusion in the NWSRS (see **Appendix C**). Segments determined to be suitable would continue to be managed under interim management guidelines, which provide standards for ongoing protection of river-related values. The stream segments would receive the same level of management protection as under Alternative A, but BLM's land use plan would contain a specific recommendation that the segments be designated into the NWSRS. Designation of these stream segments as WSRs could result in increased recreational use that may lead to minor reductions in water quality.

Under Alternative C, the types of impacts from interpretation and environmental education would be the same as those described under Alternative B.

Alternative D

Alternative D would result in greater buffer widths for disturbance near hydrologic features and include an NSO stipulation within major river corridors. These protections would be greater than under Alternative A. However, Alternative D does less to protect upland watershed conditions as no stipulations for "fragile soils" or slump areas exist. As a result, the function and condition of upland watersheds as well as water quality would be more vulnerable to degradation under Alternative D than under Alternative A. Similar to Alternative A, the BLM would implement LN-2: Municipal Watersheds and Source Water Protection Areas, requiring the lessee to implement special protective measures for water resources and to collaborate with municipalities to comply with applicable municipal watershed plans. Compared to Alternative A, there would be more special protective measures under Alternative D, resulting in fewer impacts on water resources from fluid minerals activities in municipal watersheds.

Under Alternative D, there would be 104,100 acres managed as ROW exclusion areas (56 percent fewer acres than under Alternative A) and 80,500 acres managed as ROW avoidance areas (82 percent fewer acres than under Alternative A). As a result, the types of impacts from ROW actions would be

the same as those described under Alternative A, but would occur over more acres.

There would be 100,500 acres of federal mineral estate closed to fluid mineral leasing (4 percent more acres than under Alternative A) and 1,130,700 acres open to fluid mineral leasing (1 percent fewer acres than under Alternative A). The types of impacts would be the same as under Alternative A.

The type of impacts on drinking water supplies using water wells would be similar to those described under Alternative A.

Under Alternative D, there would be one percent fewer acres where NSO stipulations would be applied than under Alternative A. The types of impacts would be the same as those described under Alternative A, but would occur over 7,000 more acres.

CSU stipulations would be applied on 471,500 acres of federal mineral estate under Alternative D (note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison with Alternative A is not considered accurate). The types of impacts would be the same as those described under Alternative A.

Under Alternative D, the BLM would manage 5 ACECs on 33,200 acres (13 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would occur over an additional 4,400 acres.

The BLM would close approximately 108,600 acres (80 percent less than Alternative A) to wood product sales and/or harvest (not including Christmas tree harvest), and prohibit timber and woodland harvesting in riparian areas. Similar to Alternative B, specific forest/woodland management plans would be developed for eight forestry zones to accomplish resource objectives and prevent adverse impacts. Although more acres would be closed under Alternative A, Alternative D would provide more opportunities to protect water resources from forestry activities by implementing specific forest/woodland management plans.

Compared to Alternative A, the BLM would implement more actions to protect and monitor riparian vegetation. The BLM would also give priority for riparian management to areas identified as special status species habitat and those riparian areas not meeting PFC and FAR. By protecting more riparian areas from surface-disturbing activities, Alternative D would provide more opportunities than Alternative A to protect water resources from activities such as recreational travel, livestock grazing, and fluid mineral development.

The types of impacts from wildland fire management would be the same as Alternative A, except that more acres would be potentially treated, moving

vegetation communities toward ecological site potential, which would better protect soil resources and increase water quality. Unplanned ignitions for resource benefit would be allowed in fewer areas, which could lead to larger, more severe wildfires. Similar to Alternative B, the BLM would design ESR treatment actions based on the severity of the wildfire impacts, further increasing protection of water resources from impacts related to wildfires.

The types of impacts from livestock grazing would be the same as those described under Alternative A; however, there would be 49,900 acres closed to livestock grazing under Alternative D (3 percent more acres than under Alternative A). The minimal decrease in areas available to livestock grazing would result in a slight decrease in the potential for impacts on water resources. As under Alternative B, grazing would be permitted in the Grand Junction and Palisade municipal watersheds. Proper management of grazing in these watersheds would mitigate erosion and loss of vegetative cover that would cause increased run-off and contamination of municipal water resources.

As under Alternative A, the BLM would implement rest periods on disturbed areas in order to protect land and watershed health. Also, the BLM would limit grazing use in limited precipitation zones on a case-by-case basis to manage the compatibility of grazing activities with environmental conditions. The types of impacts from this limitation would be the same as those described under Alternative B, but Alternative D would consider limitations on a case-by-case basis, rather than in a defined geographic area.

The types of impacts from comprehensive travel designations would be the same as those described under Alternative A. However, unlike Alternative A, there would be no areas open to cross-country motorized use and there would be 10,200 acres open to cross-country motorized and mechanized use (18 percent fewer acres than under Alternative A). In addition, motorized travel would be limited to designated routes on 939,900 acres (4.2 times more acres than under Alternative A) and there would be 111,300 acres closed to motorized vehicle use (3.2 times more acres than under Alternative A). This alternative would prohibit mechanized travel on 98,000 acres (38 percent fewer acres than under Alternative B; Alternative A does not include decision area-wide designations for mechanized travel). Furthermore, within 100 feet of perennial streams, there would be more acres designated as closed to motorized use and as limited to designated routes for motorized vehicles (refer to **Table 4-26**, Travel Management Impacts on Perennial Stream Habitat). Thus, Alternative D would have fewer impacts on water resources than Alternative A due to fewer areas disturbed or contaminated (water quality) by recreational travel.

Within the coal resource development potential area there would be 265,600 acres identified as acceptable for further coal leasing and development (12 percent fewer acres than under Alternative A). Alternative D would also

identify 43,800 acres as unacceptable for further consideration of leasing and development (19 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would occur over a smaller area.

Under Alternative D, there would be 906,100 acres open for consideration for mineral material (salables) disposal on a case-by-case basis (14 percent more acres than under Alternative A), and 155,300 acres closed to mineral material (salables) disposal (40 percent fewer acres than under Alternative A). The types of impacts from salable minerals would be the same as those described under Alternative A, but would occur over a larger area.

Under Alternative D, opportunities would be provided for non-energy leasable exploration and development on 925,400 acres (the most acres of any action alternative; there is no similar action under Alternative A). Applying NSO stipulations would reduce the potential impacts on water resources by prohibiting surface-disturbing activities. Alternative D would also close 136,000 acres in sensitive areas to non-energy leasable mineral exploration and development, which would increase opportunities to reduce impacts on water resources in these areas (the least acres of any action alternative; there is no similar action under Alternative A). However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area.

Under Alternative D, the BLM would determine that 14 streams segments are not suitable for designation into the NWSRS. This decision would release the 14 segments from interim management protection that is afforded to eligible stream segments. This action would result in reduced direct protection for river-related values. However, certain values may be directly or indirectly protected by land use prescriptions in this plan, such as prescription related to water resources, riparian resources, recreation resources, and wildlife resources.

Under Alternative D, the types of impacts from interpretation and environmental education would be the same as those described under Alternative B.

Cumulative

The CIAA used to analyze cumulative impacts on water quality and watershed resources extends outside of the planning area, following fourth-order watershed boundaries. The CIAA also includes the Colorado River downstream to the US/Mexico border because BLM manages the resource to limit salinity delivery into the river based on the Colorado River Basin Salinity Control Act. Fourth-order watersheds were used as the basic unit of analysis because impacts from most management actions proposed under the RMP and other existing activity plans are not expected to have cumulative, hydrologic influence

beyond this scale. Given that the hydrologic influence of the surrounding area is primarily focused in the stream channels and that delineation of the CIAA was based on watershed boundaries, the area of analysis is sufficient. The hydrologic influence of the planning area on areas outside the planning area is primarily the result of hydrograph alteration and quality of the water flowing from the area.

Potential cumulative impacts on water resources in the planning area would result from alteration of functional vegetative communities and could lead to increased runoff and sediment/contaminant delivery. Activities with impacts on water resources include management actions attributed to the alteration of natural vegetative communities (e.g., pinyon-juniper invasion and cheatgrass), historic grazing practices, surface-disturbing actions in areas of low reclamation potential, conversion of native rangelands to irrigated agricultural lands (on non-BLM lands), improper maintenance of transportation facilities, spills/leaks of substances used to develop mineral resources, and recreational use. These activities cause surface disturbances by removing vegetation cover, displacing and compacting soils, and altering soil structure and chemistry. The result is exposed surfaces that increase the potential for runoff and erosion, which delivers sediment and contaminants to nearby waterways. Sedimentation in waterways can cause changes in water chemistry as well as geomorphic adjustments that could have negative effects on stream function.

Urban growth and development is anticipated to have impacts on water quantity and water quality. The demand for water is anticipated to increase with urban expansion. Water right applications for waters flowing from or through BLM-administered public lands are also expected to rise, along with the demand. Additionally, demand and use of water flowing to BLM-administered lands is expected to continue to rise. This includes water used on USFS and private lands upstream of BLM lands in the West and East Creek, Roan Creek, Granite Creek, and Dolores River drainages. Impacts on quantity could affect wildlife habitat (e.g., riparian areas and wetlands, aquatic habitat, wildlife, water quality, and fisheries. Major water projects being initiated by counties and cities could have impacts on the Colorado River and other tributaries. Dust accumulating on snow is also estimated to cost the river an additional 800,000 acre-feet of water lost annually, or five percent of its annual flow (Painter 2010). Cumulatively, the overall water diversions would be anticipated to have impacts on the Colorado River Compact. Loss of vegetation and disturbed soils associated with construction and development projects would leave denuded surfaces susceptible to soil detachment and transport during runoff. Increased runoff and erosion following runoff events and mass wasting could further deliver sediment and contaminants to nearby waterways. In addition, agricultural runoff would introduce nutrients, pesticides, and herbicides to shallow groundwater and adjacent hydrologic features.

The development of solar energy resources may result in indirect impacts on water supply in the CIAA. While photovoltaic technologies require little-to-no

water for operation, solar thermal technologies require large amounts of cooling water to condense vapor back into liquid. Identifying solar energy emphasis areas within the decision area does not limit development projects to one type of technology over another, and so the potential for such water impacts does exist. If photovoltaic projects are developed and electricity is produced that replaces other highly-water-consumptive power generation technologies such as coal-fired and natural gas-fired power plants, then there would be a net decrease in regional water consumption. While the development of solar resources would require water within the CIAA to be used, particularly during the construction phase, overall, the implementation of these technologies would reduce water consumption on a per-megawatt basis at the regional level.

Unavoidable water quality impacts would include temporary increases in suspended load in flowing streams as a result of culvert installation, vehicle use of low-water crossings, and livestock, wildlife, and wild horse use of stream banks and wetlands; permitted channel fills resulting from construction of oil and gas pads, roads, and pipelines; and the introduction of nutrients from irrigation practices occurring on private lands. Water quantity impacts would include water withdrawals for livestock use, oil and gas and other mineral resource exploration, development and production, and watering of roads for dust mitigation. Dust on snow resulting from fugitive dust production outside of the planning area would continue to impact the timing of meltout and the quantity of water available for downstream users.

Reasonably foreseeable future actions (**Table 4-1**) on federal, state, private, and other lands within and adjacent to the planning area that could have an effect on water resources include energy and minerals development, vegetation management, livestock grazing, recreation and visitor use, lands and realty, roadway development, water diversions, spread of noxious/invasive weeds, wildland fires, spread of forest insects and diseases, drought, and climate change. Without proper mitigation, BMPs, and comprehensive planning, these activities could have similar impacts, as described above.

Under all alternatives, water resources would be protected due to management in accordance with the Clean Water Act, the Colorado River Salinity Control Act, the Fundamentals of Rangeland Health and Standards and Guidelines for Grazing Administration, and other applicable state and federal water quality standards. Site-specific mitigation and BMPs for surface-disturbing activities would further reduce impacts on water resources. Adherence to these standards would reduce many of the impacts from future actions. In addition, existing and proposed stipulations designed to protect water resources would minimize sediment and contaminant delivery potential by preventing or limiting surface-disturbing activities in proximity to sensitive areas such as hydrologic features, designated municipal watersheds and source water protection areas, and domestic wells. Stipulations and limitations for other resources (e.g., fisheries, riparian) that prevent or limit surface-disturbing activities would

provide additional protection for water resources. Furthermore, TLs could protect water resources by limiting or preventing surface-disturbing activities during times of the year when saturated soil conditions exist or when precipitation and runoff are frequent (e.g., winter, spring).

Stipulations designed to protect water resources vary by alternative, as do stipulations for other resources that provide additional protection for water resources. Under all alternatives, the BLM would continue to oppose water right applications that could affect water quantity on BLM-administered public lands or that could injure existing water rights for maintenance of habitat, wildlife, water quality, and fisheries.

Alternative actions that allow the least amount of soil disturbance, loss of vegetation, energy and minerals development, recreational use, and roadway/transportation facilities development would be the least impactful on water resources. Also, alternative actions that have the most restoration of plant communities, revegetation, and protected areas (such as ACECs or WSRs) would have the most beneficial cumulative impacts on water resources.

4.3.4 Vegetation

This section discusses impacts on vegetation, forests and woodlands, rangelands, riparian areas, and weeds from proposed management actions of other resources and resource uses. Existing conditions concerning vegetation are described in **Section 3.2.6**, Vegetation.

Methods of Analysis

This analysis focuses on those management alternatives or actions that have the potential for physical disturbance of vegetation and rangelands, loss of habitat, and loss or disturbance of riparian/wetland areas or their functioning condition in the planning area. BLM has incorporated management actions, when necessary, to reduce otherwise significant impacts on vegetation, forests and woodlands, and riparian areas.

The effects of management actions on vegetation, forests and woodlands, rangelands, and riparian/wetland areas may vary widely, depending on a variety of factors such as the type of soils, aspect, precipitation, soil moisture, topography, and plant reproductive characteristics. Surface disturbance removes existing vegetation and can increase opportunities for noxious weeds and invasive species establishment, reducing vegetation diversity, production, and desirable plant cover. Indirectly, this could reduce the ecological health of rangelands and forest and woodland areas. Increasing surface disturbance could also increase erosion rates and decrease riparian/wetland functioning conditions. Concentrating surface disturbance can isolate associated impacts on the area of concentration while effectively reducing those impacts over a larger geographic area. Reducing the size of surface disturbance would reduce associated impacts.

Impacts on vegetation resources also vary depending on the seral stage and composition of vegetation communities, which are classified as rangelands, forests and woodlands, or riparian/wetland areas. These classifications are based on the major species found in the vegetation types listed in **Chapter 3**. The composition of a plant community changes over time as a result of interactions with factors such as climate, resource uses, and disturbance. In many cases, the potential composition of these units differs from the existing composition. Consequences to vegetation diversity, which include structure, productivity, vigor, percent cover, density, and species composition, were based on likely changes relative to movement toward desired vegetation conditions. In the absence of quantitative data, best professional judgment was used, and impacts are sometimes described using ranges of potential impacts or in qualitative terms, if appropriate. This section is organized by broad categories of vegetation communities: general vegetation and desired plant communities; riparian and wetland vegetation; forest and woodland vegetation; and weeds. As such, the section reflects the organization of the vegetation management actions in **Chapter 2**.

Indicators of impacts on vegetation, rangelands, forests and woodlands, and riparian/wetland areas include the following:

- Any action or event that would remove a vegetation community's unique attributes or ability to support other resource values.
- Any unmitigated loss of wetlands or wetland function.
- PFC cannot be attained or maintained as a minimum physical state, or the Colorado BLM Standard 2 for Public Land Health cannot be obtained as a result of the management actions.
- Management actions or activities that accelerate erosion and runoff and thereby alter the physical characteristics of wetland and riparian vegetation.
- Replacement or substantial invasion of native communities with noxious and invasive weeds to the degree that such invasions cannot be successfully controlled or change the character of the native communities.

The analysis includes the following assumptions:

- Vegetation management actions are aimed at achieving or trending towards achieving BLM Colorado Standards for Public Land Health.
- Adequate forage would be available for current wildlife, livestock, and wild horse population objectives.
- All plant communities would be managed toward achieving a mix of species composition, cover, and age classes across the landscape.

- Woodland communities not available for commercial harvest would increase in age and cover with reduced composition and cover of understory species.
- The degree of impact attributed to any one disturbance or series of disturbances would be influenced by several factors, including location in the watershed; the type, time, and degree of disturbance; existing vegetation; precipitation; and mitigating actions applied to the disturbance.
- Noxious and invasive weeds would continue to be introduced and spread as a result of ongoing vehicle traffic in and out of the planning area, recreational activities, wildland fire, wildlife and livestock grazing and movements, and surface-disturbing activities.
- Weed and pest control would be carried out in coordination with the appropriate county weed and pest control district and owners of adjacent property.
- Activities that would disturb soils could cause erosion, loss of topsoil, and soil compaction, which could affect the ability of vegetation to regenerate. Further, surface-disturbing activities could increase dust, which could cover existing vegetation and impair plant photosynthesis and respiration. Resulting impacts could include lowered plant vigor and growth rate, altered or disrupted pollination, and increased susceptibility to disease.
- NSO stipulations would provide the greatest protection to vegetation communities by prohibiting surface-disturbing activities in these areas. This would prevent disturbance to vegetation caused by fluid mineral development. CSU stipulations would provide slightly less protection to vegetation communities, since surface-disturbing activities would be allowed and vegetation could be disturbed or removed. However, CSU stipulations could protect vegetation in certain instances by requiring special operational constraints or by moving the surface-disturbing activity to protect a certain resource.
- Ecological health and ecosystem functioning depend on a number of factors, including vegetative cover, species diversity, nutrient cycling and availability, water infiltration and availability, and percent cover of weeds.
- Climatic fluctuation would continue to influence the health and productivity of plant communities on an annual basis.
- Short-term effects would occur over a timeframe of two years or less and long-term effects would occur over longer than two years.
- BLM would comply with the Colorado Statewide Strategic Plan for Control and Eradication of Noxious and Invasive Weeds.

Effects Common to All Alternatives

General Vegetation and Desired Plant Communities

The type, abundance, and distribution of vegetation communities within the decision area would be affected under all alternatives. However, implementation of any alternative would not completely eliminate a plant species, plant community, or seral stage. As described below, changes to vegetation would be caused by the following three types of disturbances: 1) disturbance from casual use; 2) disturbance from permitted activities; and 3) changes to vegetation condition.

Disturbance from casual use. Substantial analysis and planning is used to determine the locations and types of casual use activities that would occur, such as recreation, motorized vehicle use, and use of authorized and unauthorized routes. However, these uses are not subject to site-specific environmental review and monitoring requirements, and vegetation impacts would not be apparent until after damage has occurred. Examples of impacts on vegetation and desired plant communities from casual use include trampling from humans and animals, vegetation removal, fragmentation of vegetation communities, increased dust, soil compaction, and increased likelihood for weed introduction or spread. Increased soil compaction damages the soil structure and decreases the pore size in smaller-particle soils, which would decrease infiltration rates and soil moisture and increase erosion or surface runoff. Impacts are more likely to occur in easily accessible areas, where visitation would be high, and in areas open to cross-country travel. Fewer impacts on vegetation would occur along designated routes because past and current use has already impacted these areas, although further impacts could still occur. Once discovered, BLM would mitigate impacts to the extent practicable and feasible through such measures as closures or use restrictions.

Air resource management actions would require drill rigs to meet specific emission standards. Emission requirements for drill rigs vary by alternative. However, contributions to airborne pollutants would occur under all alternatives. Deposition of airborne pollutants could contaminate soils, impairing vegetation function and condition.

BLM on-site management of recreation, as well as designation and closure of travel routes, could prevent impacts. For example, where recreation is managed within an SRMA, and to a lesser extent ERMAs, rules and guidelines would limit or control activities through specialized management tools such as designated campsites, permits, area closures, and limitations on number of users and duration of use. Impacts would vary depending on the SRMA, as each SRMA would be managed for certain recreation outcomes and setting prescriptions. Impacts on vegetation would be concentrated in these areas but would limit more extensive, widespread impacts, and would reduce fragmentation of vegetative communities throughout the decision area.

Disturbance from permitted activities. Permitted, surface-disturbing activities (e.g., mineral exploration and development, ROWs) could result in removal of desired plant communities, fragmentation of vegetation communities, loss of habitat for pollinators, and conversion of areas to an earlier seral stage, which could change vegetation community succession and reduce desired plant communities. The remaining vegetation could have reduced vigor or productivity due to mechanical damage, soil compaction, and dust. Soil compaction would inhibit natural revegetation in areas without active reclamation efforts and would reduce plant vigor, which would make plants more susceptible to disease, drought, or insect attack. In most cases soils in reclaimed areas would be ripped and seeded during interim or final reclamation. Vegetation loss is caused by road construction and use, facility construction and placement, construction of well pads and pipelines, and construction within ROWs. Placement of subsurface or temporary facilities in highly degraded areas may benefit vegetation if more desirable species become established following reclamation. These species can introduce a native seed source back into areas where noxious and invasive species dominate the landscape. Some desired vegetation communities such as salt desert shrub, lower elevation sagebrush, and black brush take longer to recover from disturbance; impacts on these communities would be greater than for other desired vegetation communities such as mountain shrub or high elevation sagebrush, which generally respond more favorably to disturbance. ROW avoidance and exclusion areas would be identified to reduce or avoid impacts on vegetation. ROW corridors would be delineated to concentrate placement of large linear facilities and other ROW development in less sensitive areas and reduce the total acreage of vegetation disturbance.

The amount of land that is open to fluid mineral leasing or other mineral use is not necessarily indicative of the number of acres that would be directly disturbed. Where NSO, CSU, and TL stipulations are applied, surface disturbance would be limited. Stipulations that would be applied under each alternative are presented in **Table 2-2**. The reasonably foreseeable development scenario predicts that over 13,000 acres of short-term disturbance would occur from drilling, roads, and pipelines, and over 4,000 acres of long-term disturbance would occur from operation of new wells by 2028.

Federal oil and gas regulations prevent the BLM from applying new or additional lease stipulations that would be developed through this planning effort to existing leases. However, federal regulations do allow the BLM to apply other protection measures in conjunction with planning and implementing oil and gas projects. For example, BLM has the discretion to require additional restrictions on surface operations when supported by scientific analysis. All mitigation and/or conservation measures not already required as stipulations would be analyzed in a site-specific NEPA document, and incorporated, as appropriate, into COAs of the permit, plan of development, and/or other use authorizations.

Changes to vegetation condition. Changes to vegetation condition could occur from vegetation and weed treatments; riparian restoration; forest and woodland treatments and harvest; wildlife, wild horse, and livestock browsing and grazing; special status species and wildlife habitat enhancements; fire; fuels treatments; and range improvements. Overall, the BLM would aim to achieve or trend toward achieving Public Land Health Standard 3, Healthy Productive Plant and Animal Communities, which would improve ecosystem function, vegetation diversity, and soil stability. Over the long term, vegetation and habitat treatments would increase productivity and vigor in most plant communities by removing decadent and thick stands of vegetation, increasing the percent cover of desirable plant species, improving ecological health, and reducing erosion.

Overutilization of vegetation and desired plant communities via wild horses, wildlife, or livestock could occur, leading to reduced plant vigor, which would change vegetation structure and species composition. Impacts from wild horses would be localized within the LBCWHR. Impacts would vary depending on the extent of removal, type of vegetation impacted, and length of the grazing period. In general, the more acres that are open to grazing under a given alternative, the greater the risk for negative impacts. Under all alternatives, if overutilization were to occur, BLM would adjust AUMs and/or use for livestock or the AML for wild horses and implement additional measures such as range improvements or wild horse gathers as necessary and feasible, to reduce impacts. With proper utilization, wild horses and livestock also have the potential to positively impact vegetation by mitigating or reversing the impacts listed above.

Unplanned fire ignitions could cause short- or long-term damage to vegetation depending on the seral stage and vegetative community affected, extent, and severity of the fire. In the short term, fire and fuels treatments remove vegetation and cause bare areas to be more susceptible to soil loss or weed invasion. In the long term, wildland and prescribed fires and fuels treatments reduce dense vegetation, create vegetation mosaics and promote vertical stratification, improve herbaceous understory, and return nutrients to the soil. Often, fire and fuels treatments result in improved vegetation diversity and ecosystem function and lower the risk for an uncharacteristically large or severe wildfire. Emergency stabilization and rehabilitation efforts can help stabilize soils and reestablish desirable plant communities.

Management actions that restrict surface-disturbing activities would help retain existing vegetation diversity and seral succession. Such management actions include stipulations to protect water, soil, wildlife, special status species, visual resources, and cultural resources; closure of areas to fluid mineral leasing; restrictions within special designation areas; and route closures or restrictions. In general, VRM Classes I and II, which preserve or retain the existing character of the landscape, would restrict surface-disturbing activities and retain vegetation. Areas managed as VRM Class III or IV would be subject to actions that allow for greater landscape modification and therefore greater surface

disturbance. LNs and COAs would be applied where necessary to protect resources. However, certain areas such as WSAs would prohibit certain types of vegetation manipulation, which could prevent desired plant communities from expanding within these areas. Under all alternatives, four WSAs would be managed on 96,500 acres.

Land exchanges, disposals, and acquisitions could reduce the fragmentation of BLM-administered public land in the planning area. This could improve BLM's ability to implement management actions that would result in increased vegetation diversity, ecological health, and attainment of Colorado Standards for Public Land Health.

Riparian and Wetland Vegetation

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, livestock often use riparian and wetland areas in the summer for water and shade, which may cause greater impacts on these areas by concentrating livestock use. Over the long term, vegetation treatments would help improve or maintain riparian functioning condition by removing invasive plants (e.g., Russian olive *[Elaeagnus angustifolia]* and tamarisk *[Tamarix* spp.*]*). Range improvements that attract livestock away from riparian and wetland areas would also be beneficial by reducing livestock use of these areas. Under all alternatives, BLM would focus on compliance with Public Land Health Standard 2, Riparian Systems. The primary goal of the management actions would be to maintain proper function and to improve riparian and wetland areas that are functioning at risk or not functioning.

Land exchanges, disposals, and acquisitions could improve BLM's ability to improve riparian and wetland functioning condition by reducing fragmentation of land ownership in riparian areas throughout the planning area. Land acquisitions would also place riparian areas under BLM management. This would allow for potential vegetation treatments and other land management actions aimed at repairing and/or maintaining riparian function and condition.

Forest and Woodland Vegetation

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, fuels projects and firewood collection would likely improve the health and structure of pinyon-juniper communities by removing dead and dying wood. In addition, unplanned ignitions, depending on the fire's extent and severity, could have long-term positive or negative effects on old-growth forest by altering age class and seral stage. The definition of old-growth pinyon-juniper woodlands is described in **Section 3.2.6**, Vegetation.

Significant Plant Communities

Direct and indirect impacts on significant plant communities from management actions would be similar to those described above for vegetation. However, because significant plant communities tend be rare, and smaller in size, impacts would be greater. Surface disturbing activities would have adverse, direct, and

long term impacts. Due to the small and often pristine nature of these communities, adverse impacts would occur if surface disturbing activities resulted in plant loss, weed invasion, or a change in species composition or diversity.

Weeds

In general, management actions that restrict surface-disturbing activities would reduce the likelihood of weed invasion throughout the decision area.

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, impacts from casual use include increased likelihood for weed introduction and spread by transport of weed seeds from recreation users, equipment, and vehicles. In general, the more acres with designated routes in the decision area, the greater the likelihood of weed introduction or spread.

Surface disturbance caused by permitted activities could increase the likelihood for weed introduction and spread. In particular, ROWs are linear and may extend for many miles, increasing the potential for weeds to be introduced or spread over large distances. Reclamation and weed management requirements as part of stipulations and/or COAs would reduce this impact.

Some activities such as vegetation treatments and planned and unplanned fire would result in a short-term increase in the likelihood for weed introduction or spread by disturbing soil and removing vegetation. In addition, the increase in soil nutrients following fire may favor some invasive plant species. By stabilizing soils and reestablishing native vegetation, ESR efforts can help prevent weed spread and invasion. In some instances, unplanned fire in lower-elevation sagebrush and salt desert shrub communities could have long-term effects by causing conversion of these fire-intolerant areas to cheatgrass or other invasive annuals. These invasive species can change the fire regime, potentially affecting adjacent desired vegetation communities.

Weed control and prevention measures would help to reduce the cover of weeds in the planning area and prevent the introduction and spread of weeds over the long term. The herbicide use protocols and standard operating procedures as described in the Programmatic EIS for Vegetation Treatments Using Herbicides would be followed to reduce impacts on non-target vegetation from herbicide treatments.

If managed improperly, livestock can contribute to the spread of weeds by transporting weed seeds in their coat or manure. In general, the more acres that are open to grazing under a given alternative, the greater the risk for impacts. If impacts from grazing were discovered, BLM would modify grazing practices by changing AUMs or by using livestock exclosures. Furthermore, the construction and maintenance of range improvements could lead to an increase in weeds from surface disturbance as well as from contaminated equipment

used for construction and maintenance. In some cases, livestock can be used to control certain weed species.

Land exchanges, disposals, and acquisitions could improve BLM's ability to treat and prevent weed invasion by reducing fragmentation of land ownership throughout the planning area. Conversely, acquisition of parcels impacted by noxious and invasive species will affect BLM's capacity to restore and maintain land health standards.

In WSAs, weed treatments may be limited to non-motorized methods, which could limit BLM's ability to treat weeds if a large weed infestation were discovered in a WSA.

Implementing management for the following resources would have negligible or no impact on vegetation and are therefore not discussed in detail: paleontology; national trails; national, state, and BLM byways; Native American tribal uses; public health and safety; socioeconomics; and environmental justice.

Alternative A

General Vegetation and Desired Plant Communities

In general, Alternative A would rely on management guidance that would not reflect current conditions and issues and would lack a landscape-level approach to land planning. Inadvertent impacts on vegetation may result from implementing this alternative.

Soil and water protections through the use of NSO and CSU stipulations would protect vegetation from surface-disturbing activities. Determining soil suitability for surface-disturbing activities would help maintain adequate vegetative cover where vegetation would be sensitive to removal.

The lack of comprehensive planning for vegetation, fish and wildlife, and special status species would result in vegetation and habitat management that is applied on a case-by-case basis and which would not give BLM the authority to implement or enforce certain management actions. Protection for vegetation and habitats would occur, and management flexibility would allow BLM to adaptively manage resources. Vegetation and weed treatments and range improvements would be carried out, which would improve vegetation conditions and trend toward achieving land health standards.

Fire management under Alternative A would utilize mechanical treatments and prescribed fire for resource benefit, but would be limited in the use of unplanned fire. Treatments and fire would allow for some short-term disturbance to vegetation and long-term improvement in vegetation health and productivity.

Areas managed as VRM Class I and II on 159,200 acres, as well as stipulations to protect visual resources, would indirectly protect vegetation by limiting or prohibiting development and other surface-disturbing activities in these areas, as described under Effects Common to All Alternatives.

Sale and harvest of forestry products would not be permitted in areas managed as unsuitable for forest product harvest. In addition, clear cuts would be discouraged, reducing impacts on vegetation; however, impacts could still occur, as these areas could still support sale of forestry products.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives. Range improvements would be used to improve vegetative conditions, and BLM would manage 978,600 acres as open and 48,600 acres as closed to grazing under this alternative.

The types of impacts from recreation under Alternative A would be the same as those described under Effects Common to All Alternatives. Under Alternative A, BLM management of SRMAs and ERMAs would continue to struggle to accommodate current and future levels of recreation, which could lead to an increase in impacts on vegetation as population and recreation use increase. Four SRMAs and IRMAs would be managed on 358,300 acres, and one ERMA would be managed on 703,100 acres under this alternative. Note that planning guidance and definitions of recreation management areas in Alternative A are different than those in Alternatives B, C and D (see **Section 3.3.4**).

The types of impacts from motorized use under Alternative A would be the same as those described under Effects Common to All Alternatives; cross-country travel motorized use would be allowed on 445,400 acres, and 12,500 acres would be open to intensive motorized use. The likelihood of impacts would be reduced on 35,300 acres that would be closed to motorized use (and in the WSAs, where motorized and mechanized use would be limited to existing ways).

BLM would continue to manage 441,400 acres as sensitive to public utility development and 234,900 acres as unsuitable for public utilities, which would protect vegetation and minimize impacts from lands and realty disturbances in these areas.

Under Alternative A, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would continue to manage 300,700 acres as acceptable for coal leasing. Areas unacceptable for coal leasing on 36,700 acres, as well as stipulations on open lands, would reduce vegetation impacts from coal mining on these lands.

Under Alternative A, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to

All Alternatives, and BLM would continue to manage 1,134,600 acres of federal mineral estate as open to fluid mineral leasing. Areas closed to fluid mineral leasing on 96,500 acres, as well as stipulations on open lands, would reduce vegetation impacts from fluid mineral leasing on these lands. NSO stipulations would be applied on 433,000 acres and CSU stipulations would be applied on 74,100 acres, which would reduce the impact of fluid mineral development on vegetation.

Five ACECs would be managed on 28,900 acres; within these areas vegetation would be protected through such measures as limiting travel to designated routes, closing areas to motorized use, managing areas as unsuitable for or sensitive to ROWs, and applying NSO stipulations.

The lack of interpretation and environmental education activities in the decision area could result in user actions that could degrade vegetation resources and desired plant communities.

Riparian and Wetland Vegetation

In addition to the impacts described previously for *General Vegetation and Desired Plant Communities*, timber and woodland harvest would be discouraged in riparian and wetland areas, which would maintain or improve functioning condition throughout the decision area. However, lack of firewood gathering in specific areas could allow fuel loads to accumulate and increase susceptibility to wildfire.

Under Alternative A, an NSO stipulation would be applied on 6,145 acres of riparian vegetation, and 3,000 acres would be managed for aquatic riparian vegetation. In these areas, riparian vegetation would be improved or protected.

Over time, recreation would have increasing impacts on riparian and wetland areas, as regional population and subsequent recreation use increases. Under Alternative A, 3,500 acres of riparian vegetation would be open to all modes of travel, 5,400 acres would be either limited to existing or limited to designated routes for motorized travel, and 700 acres would be seasonally closed to motorized travel.

Under Alternative A, 14 river segments would be managed as eligible for the NWSRS. Interim protective management guidelines would help to prevent or reduce impacts on riparian and wetland vegetation in these areas.

Forest and Woodland Vegetation

Under Alternative A, as described previously, there would be no forest and woodland management plans to guide BLM forestry practices in specific areas.

Weeds

In addition to the impacts described previously for *General Vegetation and Desired Plant Communities*, over time, recreation would have increasing impacts on weed

spread. This is because users and vehicles would introduce and spread weeds throughout the decision area, and population and recreation use would increase.

Lands and realty management actions, as described previously for *General Vegetation and Desired Plant Communities,* would reduce the likelihood of weed spread throughout the decision area.

The lack of interpretation and environmental education activities in the decision area could result in user actions that could introduce or spread weeds.

Alternative B

General Vegetation and Desired Plant Communities
Under Alternative B, the BLM would implement protective management measures for vegetation and stipulations and restrictions to reduce impacts from resource uses. Furthermore, BLM would prioritize desired plant communities as a focus of vegetation management.

Protections such as BMPs and COAs described in **Appendix H** would be applied for soil and water resources. These measures could include requiring detailed engineering and reclamation plans, protecting biological soil crusts and municipal watersheds, applying stipulations, and reducing salt, sediment, and selenium. These actions would reduce impacts from surface-disturbing activities by maintaining topsoil and native seed banks and reducing erosion.

Vegetation management under Alternative B would emphasize improving and restoring vegetation. Seasonal limitations on grazing in the salt desert shrub community would allow native perennials a chance to recover. In addition, fires would be suppressed in salt desert shrub communities. Sagebrush communities would be managed to restore habitat connectivity and function by reducing pinyon-juniper encroachment, achieving multiple sagebrush age classes, reducing the total area of disturbance of new roads, upgrading existing roads to reduce the need for new roads, and encouraging utility development in existing corridors. Mountain shrub communities would be improved by using fire and vegetation treatments to create openings within dense stands. Post-treatment, in all vegetation communities, grazing would be deferred or excluded, where necessary, for a minimum of two growing seasons. This would affect vegetation in the long term through improved biodiversity, increased cover of desired plant species, reduced fragmentation, and restrictions on associated activities that could degrade desired plant communities. In the short term, vegetation treatments would often remove dense, decadent, and woody vegetation as well as weeds, which would cause impacts until desired vegetation were to establish. Adaptive drought management actions, such as restrictions on surface disturbance, travel, and recreation, plus changes in grazing management, would improve vegetative health by reducing impacts from dust, erosion, desertification, and topsoil loss.

Similarly, fish and wildlife and special status species management under Alternative B would improve and protect vegetation and increase cover of desired plant communities. This would be achieved through applying stipulations, identifying ROW avoidance and exclusion areas, identifying travel and recreation restrictions and closures, identifying habitat improvements and wildlife emphasis areas, and designating ACECs. Proper management of wildlife, particularly big game (in coordination with CPW), would prevent over-browsing and damage to vegetation and desired plant communities. Measures would be implemented to avoid habitat fragmentation, which would result in more contiguous vegetation and maintenance or improvement of ecosystem functions.

Management of vegetative communities within the LBCWHR would emphasize seral stages that would provide optimum forage for wild horses while meeting land health standards.

Under Alternative B, BLM would have increased opportunities to use naturally ignited, unplanned fire as a natural disturbance regime to meet resource objectives. Using a variety of fuel treatment methods would have short-term effects on vegetation through vegetation manipulation or removal. In the long term, these activities may prevent uncharacteristically large or intense wildfires that could damage large expanses of vegetation. ESR treatments would help to reestablish vegetation and reduce topsoil loss from erosion.

The types of impacts from visual resources management would be the same as those described under Alternative A. However, under Alternative B, 518,600 acres (3.3 times more acres than under Alternative A) would be managed as VRM Class I and II.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives. BLM would manage 961,100 acres (2 percent fewer acres than under Alternative A) as open and 66,000 acres (36 percent more acres than under Alternative A) as closed to grazing under this alternative. In addition, BLM would require periodic rest and limited grazing in lower elevation communities, as well as a minimum of two growing seasons of rest following vegetation treatments. This would prevent overgrazing and would provide undisturbed growth and development of forage plants during critical or sensitive growth periods, resulting in increased vegetative production, vigor, seed production, litter accumulation, and seedling establishment. Improved vigor and reproduction capabilities would allow desired vegetation to compete more favorably with weedy species.

The types of impacts from recreation would be the same as those described under Effects Common to All Alternatives. BLM would manage three SRMAs on 78,300 acres (78 percent fewer acres than under Alternative A) and seven ERMAs on 175,500 acres (75 percent fewer acres than under Alternative A). Certain SRMAs or portions of SRMAs would be closed to fluid mineral leasing

or would have stipulations on surface-disturbing activities applied, which would protect vegetation.

Cross-country motorized use would be allowed on 5,400 acres (57 percent fewer acres than under Alternative A) within the decision area, which could cause the types of impacts described above for casual use under Effects Common to All Alternatives. Areas closed to motorized use on 187,900 acres (5.3 times more acres than under Alternative A) and limited to designated routes on 868,000 acres (3.9 times more acres than under Alternative A) would reduce the likelihood of these impacts. Measures would be implemented to reduce fugitive dust, which would minimize impacts on vegetation and desired plant communities.

Identifying 740,900 acres (68 percent more acres than under Alternative A) of ROW avoidance and 204,200 acres (18 percent fewer acres than under Alternative A) of ROW exclusion areas would reduce impacts on vegetation as described under Effects Common to All Alternatives. Furthermore, encouraging the use of designated utility corridors, managing six corridors for utilities and facilities, and managing solar and wind emphasis areas on 14,800 acres would concentrate impacts on vegetation and reduce widespread impacts and fragmentation. Development of solar and wind projects would remove vegetation in the short term, and solar projects would likely have long-term effects on vegetation. For all projects, revegetation planning would be required.

Under Alternative B, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 253,400 acres (16 percent fewer acres than under Alternative A) within the coal potential development area as acceptable for coal leasing. Areas within the coal potential development area unacceptable for coal leasing on 56,000 acres (52 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce vegetation impacts from coal mining on these lands.

Under Alternative B, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 878,700 acres (9 percent fewer acres than under Alternative A) as open to fluid mineral leasing. Areas closed to fluid mineral leasing on 182,700 acres (89 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce vegetation impacts from fluid mineral leasing on these lands. Of the acres open to fluid mineral leasing, NSO stipulations would be applied on 429,100 acres (one percent fewer acres than under Alternative A) and CSU stipulations would be applied on 563,500 acres (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate).

Under Alternative B, 20,700 acres would be petitioned for withdrawal from locatable mineral exploration or development (no acres would be petitioned under Alternative A). If withdrawn, these areas would provide additional protection to vegetation from surface-disturbing activities.

Thirteen ACECs would be managed on 106,000 acres (2.7 times more acres than under Alternative A), and these would be closed to wood harvest, mineral material sales, and non-energy leasable mineral exploration and development. Other restrictions include travel route closures or limitations, identification of ROW avoidance or exclusion areas, recreation restrictions, stipulations, and managing areas as closed to fluid mineral leasing. As such, vegetation would generally be protected from surface disturbance within these areas.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of vegetation resources within the decision area. This could result in increased protective efforts by the general public.

Riparian and Wetland Vegetation

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, applying NSO and CSU stipulations around major river corridors and managing riparian areas and major river corridors as ROW avoidance areas with special stipulations would protect riparian vegetation and reduce impacts from surface-disturbing activities. Actions such as modifying recreation use and prohibiting firewood harvest would be taken to reduce impacts on riparian areas. BLM would also try to reduce fragmentation of riparian areas by acquiring properties, if necessary, and would subject these areas to BLM protection measures.

Riparian areas within the Dolores River Canyons SRMA could be impacted by increased visitation and designated camping. Other recreation uses would likely remain limited in the riparian corridor. East Creek may also be impacted by increased visitation and use due to its proximity to Grand Junction and the surrounding bouldering and rock climbing opportunities in the area. Where recreation causes impacts on riparian areas such that land health standards are not met, management would modify recreation use accordingly.

Comprehensive route designations under Alternative B would help reduce impacts on riparian vegetation. There would be 2,300 acres of riparian areas closed to motorized vehicles (0 acres would be closed under Alternative A), 7,100 acres where motorized vehicles would be limited to designated routes (3.2 times more acres than under Alternative A), and 600 acres with seasonal closures for motorized vehicles (14 percent fewer acres than under Alternative A). Restrictions to mitigate riparian impacts would be applied on routes in riparian areas if monitoring reveals that impacts are occurring, per the Travel and Transportation Management Plan (**Appendix M**).

Under Alternative B, several ACECs would be maintained or designated to protect riparian and wetland vegetation, including the Dolores River Riparian, Roan and Carr Creeks, and Unaweep Seep ACECs. The types of impacts would be the same as those described under *General Vegetation and Desired Plant Communities*. Interim protective management guidelines for the portions of the Dolores River determined suitable for inclusion in the NWSRS would provide similar protections to riparian vegetation in this area.

Forest and Woodland Vegetation

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, BLM would aim to maintain the current acreage of old-growth pinyon and juniper. In addition, old-growth woodlands would be managed as ROW avoidance areas, and a CSU stipulation would be applied, which would protect these areas from surface-disturbing activities.

Under Alternative B, using planned and unplanned fire, as well as a variety of fuel treatments, would assist in managing for multiple age classes in non-old-growth forest and woodland areas.

Under Alternative B, activity level plans would be developed for certain areas to ensure that forestry actions meet vegetation objectives. Forestry management areas would cover 1,061,400 acres. Aspen *(Populus tremuloides)* treatments would be focused on stimulating regeneration. Impacts would include improved forest health, diversity, and achievement of multiple age classes for species such as pinyon-juniper and aspen. Douglas fir *(Pseudotsuga menziesii)*, spruce *(Picea engelmannii)*, and ponderosa pine *(Pinus ponderosa)* would be managed to improve stand health and resilience to natural disturbance.

Significant Plant Communities

Applying CSU stipulations on significant plant communities would be implemented to protect significant plant communities. These stipulations would allow for relocation of proposed surface disturbing activities by more than 200 meters, thereby avoiding, and protecting, occupied habitat and habitat necessary for the maintenance or recovery of the communities. In addition to CSU stipulations, most significant plant communities would indirectly benefit from the implementation of NSO stipulations for other resources.

Weeds

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, soil and water protections would decrease the likelihood of weed spread by maintaining topsoil and native seed banks and reducing vegetation disturbance and clearing.

Recreation management under Alternative B would emphasize management of SRMAs and ERMAs, which would concentrate recreation facilities and visitor use. As such, while visitor use is expected to increase, thus increasing weed

vectors, weeds may be easier to manage since use would be concentrated in discrete areas.

Alternative C

General Vegetation and Desired Plant Communities

The types of impacts on general vegetation and desired plant communities from management for soil resources, water resources, biological resources, fire, alternative energy development, and interpretation and environmental education would be the same as those described previously under Alternative B. Alternative C would focus management on improving vegetation for special status species habitat, which would improve and protect desired plant communities throughout the decision area. In addition, Alternative C emphasizes the use of fire over mechanical treatments.

The types of impacts from visual resources management would be the same as those described under Alternative A. However, under Alternative C, BLM would manage 654,000 acres (4.1 times more acres than under Alternative A) as VRM Class I and II.

The types of impacts from grazing management would be the same as those described under Alternative B. However, under Alternative C, BLM would manage 586,600 acres (4 percent fewer acres than under Alternative A) as open and 440,400 acres (84 percent more acres than under Alternative A) as closed to grazing. In addition, BLM would require periodic rest and limited grazing on more areas, which would allow plants to recover and prevent overgrazing, as described under Alternative B.

The types of impacts from recreation management would be the same as those described under Alternative B, but under Alternative C the BLM would manage two SRMAs on 60,000 acres (84 percent fewer acres than under Alternative A) and zero ERMAs. Although Alternative C has less emphasis on marketing recreation within the planning area, use would likely increase proportionate to population growth, and BLM would have a reduced capacity to concentrate use in areas managed for recreation. As such, more dispersed impacts on vegetation may result from equestrian, mechanized, or foot-based travel.

Areas open to cross-country motorized use would be eliminated under Alternative C, which would prevent the types of impacts described under Effects Common to All Alternatives. Areas closed to motorized use on 379,500 acres (10.8 times more acres than under Alternative A) and limited to designated routes on 681,900 acres (3 times more acres than under Alternative A) would reduce the likelihood of impacts on vegetation and desired plant communities. Measures would be implemented to reduce fugitive dust, which would benefit vegetation communities.

Managing 627,000 acres as ROW avoidance (42 percent more acres than under Alternative A) and 365,800 acres as ROW exclusion areas (39 percent more acres than under Alternative A) would reduce impacts on vegetation as described under Effects Common to All Alternatives. Furthermore, the types of impacts from management for utility corridors would be similar to those described under Alternative B. However, under Alternative C, the BLM would require, as practical, the use of delineated utility corridors for large linear facilities, manage six corridors for utilities and facilities, and manage solar and wind emphasis areas on 7,900 acres (47 percent fewer acres than under Alternative B).

Under Alternative C, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 251,200 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing. Areas unacceptable for coal leasing on 58,200 acres (58 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce vegetation impacts from coal mining on these lands.

Under Alternative C, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 506,700 acres (48 percent fewer acres than under Alternative A) as open to fluid mineral leasing. Areas closed to fluid mineral leasing on 554,700 acres (5.7 times more acres than under Alternative A), as well as stipulations on open lands, would reduce vegetation impacts from fluid mineral leasing on these lands. NSO stipulations would be applied on 302,900 acres (30 percent fewer acres than under Alternative A) and CSU stipulations would be applied on 326,800 acres (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate).

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B. However, under Alternative C, 45,100 acres (2.2 times more acres than under Alternative B) would be petitioned for withdrawal.

The types of impacts from ACEC management would be the same as those described under Alternative B. However, under Alternative C, BLM would manage 23 ACECs on 168,000 acres (5.8 times more acres than under Alternative A).

Riparian and Wetland Vegetation

The types of impacts on riparian and wetland vegetation from casual use, permitted activities, and changes to vegetation conditions would be the same as those described under Alternative B, but would occur over a smaller area. Under Alternative C, motorized and mechanized travel would be limited to designated routes on 5,300 acres (2.4 times more acres than under Alternative

A) of riparian vegetation, closed on 4,100 acres (0 acres would be closed under Alternative A), and 400 acres (43 percent fewer acres than under Alternative A) would be seasonally closed to motorized travel. If monitoring indicates that impacts are occurring, BLM would alter management to mitigate impacts.

Under Alternative C, several ACECs would be designated to protect riparian and wetland vegetation, such as the Colorado River Riparian, Coon Creek, Dolores River Riparian, Hawxhurst Creek, Roan and Carr Creeks, and Unaweep Seep ACECs (**Table 2-2**). Furthermore, 14 WSR segments covering 99.5 miles would be suitable for inclusion in the NWSRS (**Table 2-2**). ACEC management and interim protective guidelines for WSRs would protect riparian and wetland vegetation from disturbance in these areas through the use of stipulations and ROW exclusion and avoidance areas.

Forest and Woodland Vegetation

The types of impacts on forest and woodland vegetation from casual use, permitted activities, and changes to vegetation conditions would be the same as those described previously under Alternative B. However, under Alternative C, BLM would place a greater emphasis on increasing the acreage of old-growth pinyon-juniper woodlands. Furthermore, BLM would close the greatest acreage to wood harvest. These actions would help to maintain late seral forest vegetation over the long term.

Significant Plant Communities

Applying CSU stipulations on significant plant communities would be implemented to protect significant plant communities. These stipulations would allow for relocation of proposed surface disturbing activities by more than 200 meters, thereby avoiding, and protecting, occupied habitat and habitat necessary for the maintenance or recovery of the communities. In addition to CSU stipulations, most significant plant communities would indirectly benefit from the implementation of NSO stipulations for other resources.

Weeds

The types of impacts from casual use, permitted activities, and changes to vegetation conditions on weeds would be the same as those described previously under Alternative B. With its greater conservation emphasis and potentially reduced amount of surface-disturbing activities, there would likely be less potential for weed introduction or spread under Alternative C.

Alternative D

General Vegetation and Desired Plant Communities

The types of impacts on general vegetation and desired plant communities from management for soil resources, water resources, biological resources, alternative energy development, and interpretation and environmental education would be the same as those described previously under Alternative B. However, Alternative D would emphasize vegetation management for commodities and

resource uses, as well as maintenance of vegetation conditions. While BLM would comply with all laws and regulations, there would be less focus on resource protection and improvement or restoration of vegetation under Alternative D. There would also be fewer measures to reduce or limit surface-disturbing activities, such as fewer NSO, CSU, and TL stipulations, as well as ROW avoidance and exclusion areas.

Alternative D allows less flexibility in the management of unplanned ignitions because more suppression would be required as a result of allowing increased resource extraction under this alternative than under Alternatives B and C. As a result, BLM would have fewer opportunities to use fire as a natural disturbance regime to meet resource objectives. This could lower biodiversity and vegetative health and vigor, increase cover of decadent plants, and prevent achieving land health standards. Limiting the use of fire would also lead to hazardous fuels buildup that creates conditions for larger, more severe wildfires.

The types of impacts from visual resources management would be the same as those described under Alternative A. However, under Alternative D, 333,900 acres would be managed as VRM Class I and II (2.1 times more acres than under Alternative A).

The types of impacts from grazing would be the same as those described under Alternative B, but under Alternative D the BLM would manage 977,200 acres (less than 1 percent fewer acres than under Alternative A) as open and 49,900 acres (3 percent more acres than under Alternative A) as closed to livestock grazing. The primary focus of range improvements would be to improve livestock forage and not necessarily desired plant communities. As such, the desired plant community could shift to include more forage species and less diversity of native plant species. Further, limitations on grazing, such as requiring periodic rest or seasonal restrictions, would be applied on a case-by-case basis, which could allow for impacts on vegetation and desired plant communities in certain locations.

The types of impacts from recreation would be similar to those described under Alternative B, but under Alternative D the BLM would manage six SRMAs on 79,000 acres (78 percent fewer acres than under Alternative A) and six ERMAs on 61,900 acres (91 percent fewer acres than under Alternative A). Alternative D would place the greatest emphasis on recreation and visitation within the planning area. Since use would likely increase at a rate greater than local population growth (as a result of increased marketing), BLM would have a reduced capacity to concentrate use in areas managed for recreation. As such, more dispersed impacts on vegetation may result.

A total of 10,200 acres (18 percent fewer acres than under Alternative A) would be open to cross-country motorized use, which could cause the types of impacts described above for casual use under Effects Common to All Alternatives. Areas closed to motorized use on 111,300 acres (3.2 times more

acres than under Alternative A) and limited to designated routes on 939,900 acres (4.2 times more acres than under Alternative A) would reduce the likelihood of these impacts. Measures would be implemented to reduce fugitive dust, which would benefit vegetation and desired plant communities.

Managing 80,500 acres (82 percent fewer acres than under Alternative A) as ROW avoidance and 104,100 acres (56 percent fewer acres than under Alternative A) as ROW exclusion areas would limit impacts on vegetation as described under Effects Common to All Alternatives. Alternative D would manage eight corridors for facilities and utilities and 40,000 acres (2.7 times more acres than under Alternative B) as solar and wind emphasis areas. These actions could result in more habitat fragmentation and vegetation removal.

Under Alternative D, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 265,600 acres (12 percent fewer acres than under Alternative A) as acceptable for coal leasing. Areas unacceptable for coal leasing on 43,800 acres (19 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce vegetation impacts from coal mining on these lands.

Under Alternative D, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 1,130,700 acres of federal mineral estate (1 percent fewer acres than under Alternative A) as open to fluid mineral leasing. Federal mineral estate closed to fluid mineral leasing on 100,500 acres (4 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce vegetation impacts from fluid mineral leasing on these lands. NSO stipulations would be applied on 400,900 acres (seven percent fewer acres than under Alternative A), and CSU stipulations would be applied on 455,800 acres (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate).

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B. However, under Alternative D, 1,300 acres (94 percent fewer acres than under Alternative B) would be petitioned for withdrawal.

Five ACECs would be managed on 33,200 acres (15 percent more acres than under Alternative A), and these would be managed as described under Alternative B, providing protections to vegetation.

Riparian and Wetland Vegetation

The types of impacts on riparian and wetland vegetation from casual use, permitted activities, and changes to vegetation conditions would be the same as those described previously under Alternative B. Alternative D would provide

slightly less protection to riparian areas around major river corridors, require less stringent design, construction, maintenance, and reclamation plans, and apply ROW avoidance and CSU stipulations around riparian and wetland areas. Timber and woodland harvest would be allowed on a case-by-case basis, which could introduce surface disturbance and vegetation removal in riparian areas. Riparian areas would not benefit from WSR protections under Alternative D, as no segments would be managed as eligible or suitable for inclusion in the NWSRS.

Under Alternative D, motorized and mechanized travel would be limited to designated routes on 8,600 acres (3.9 times more acres than under Alternative A) of riparian areas, closed on 600 acres (0 acres would be closed under Alternative A), and 600 acres (14 percent fewer acres than under Alternative A) would be seasonally closed to motorized travel. If monitoring indicates that impacts are occurring, BLM would alter management to mitigate impacts.

Forest and Woodland Vegetation

The types of impacts on forest and woodland vegetation from casual use, permitted activities, and changes to vegetation conditions would be the same as those described previously under Alternative B. Alternative D would emphasize mid-seral pinyon-juniper forest and woodlands for harvest and treatment. This would likely prevent the expansion of old-growth forest communities.

Significant Plant Communities

Applying CSU stipulations on significant plant communities would be implemented to protect significant plant communities. In addition to CSU stipulations, most significant plant communities would indirectly benefit from the implementation of NSO stipulations for other resources.

Weeds

The types of impacts on weeds from casual use, permitted activities, and changes to vegetation conditions would be the same as those described previously under Alternative B. In general, the increased disturbance associated with Alternative D would result in the greatest potential for weed introduction and spread.

Cumulative

The CIAA used to analyze cumulative impacts on vegetation extends outside the planning area, following fourth-order watershed boundaries that completely or partially overlap the planning area. The fourth-order watersheds were used as the basic unit of analysis because the scope of cumulative influence would be at the watershed scale and is not expected to extend beyond this scale. Noxious weeds can also be dispersed into the planning area by upstream waterways and carried downstream from the planning area.

Past, present, and reasonably foreseeable future actions and conditions within the CIAA that have affected and will likely continue to affect vegetation include

mineral exploration and development, forestry, grazing, recreation, road construction, ROWs (including large transmission lines or pipelines), weed invasion and spread, prescribed and wildland fires, land planning efforts, vegetation treatments, habitat improvement projects, insects and disease, and drought. Many of these activities create conditions that cause or favor other vegetation changes. For example, wildland fire causes vegetation removal, which makes affected areas more susceptible to weed invasion and soil erosion. Drought conditions reduce vegetative health, which makes vegetation prone to insect infestation or disease. In general, resource use activities have cumulatively caused vegetation removal, fragmentation, weed spread, soil compaction, and erosion, whereas land planning efforts and vegetation and weed treatments have countered these effects by improving vegetative connectivity, productivity, diversity, and health.

Climate change within the CIAA could cause an increase or decrease in temperatures and precipitation, which would affect soil conditions, vegetative health, and water availability. Such changes would alter the conditions to which vegetative communities are adapted, potentially creating conditions that could favor certain species or communities, weeds, or pests.

Under the proposed RMP and alternatives, impacts on vegetation would be minimized to the extent practical and feasible through restrictions; stipulations; closures to mineral exploration and development, recreation, and motorized travel; COAs; and by concentrating development in previously disturbed areas. Vegetative conditions would be improved through treatments, weed prevention and control, habitat improvements, use of prescribed and wildland fire, forestry management, and proper grazing practices. In general, all alternatives would work toward achieving land health but would differ in the time and methods used to reach that goal. Since Alternative D would emphasize more resource use and development, impacts on vegetation would be more likely to occur under this alternative. As a result, Alternative D could significantly contribute to cumulative impacts on vegetation. In contrast, the incremental contribution of Alternatives A, B, and C to cumulative impacts on vegetation is expected to be less than significant.

4.3.5 Fish and Wildlife

This section discusses impacts on fish and wildlife habitat from proposed management actions of other resources and resource uses. Habitat types are described in **Section 3.2.6**, Vegetation. Existing conditions concerning fish and wildlife and descriptions of habitat requirements for various species are described in **Section 3.2.7**, Fish and Wildlife.

Methods of Analysis

Impacts on fish and wildlife and their habitats include the following:

- Disturbance and/or loss of plant communities, food supplies, cover, breeding sites, and other habitat components necessary for

population maintenance used by any species to a degree that would lead to substantial population declines.

- Disturbance and/or loss of seasonally important habitat (e.g., critical for overwintering or successful breeding) to a degree that would lead to substantial population declines.
- Interference with a species movement pattern that decreases the ability of a species to breed or overwinter successfully to a degree that would lead to substantial population declines.

Impacts specific to aquatic species and their habitats include the following:

- Sediment and Turbidity—Increased sediment loading in waters containing sediment-intolerant fish species, loss of recruitment, stress, habitat alteration, and habitat loss.
- Habitat Alteration—Changes in habitat that make it nonfunctional for select species or more conducive to competitive species.
- Loss or Reduction of Streamside Vegetation/Cover—Increased temperatures, stress, reduced productivity, and impacts on food webs.
- Water Quality Alteration—Actions that alter important water quality parameters, including pH, dissolved oxygen, temperature, hardness, alkalinity/salinity, and turbidity.
- Water Depletions—Loss of physical habitat, changes in water quality, sediment accumulation, habitat alteration, loss of habitat complexity, or food source reduction.
- Potential direct mortalities to aquatic wildlife from motorized travel.

The analysis includes the following assumptions:

- If monitoring reveals that mitigation is unsuccessful in precluding significant impacts, immediate measures to prevent further impacts would be implemented as appropriate to the species affected prior to the accumulation of impacts to a level of significance.
- Disturbance of a key or critical component of a species habitat would be detrimental, with the degree of detriment dependent on the importance of the habitat component to the maintenance of the population.
- Wildlife habitat needs vary substantially by species. It is generally true, however, that healthy and sustainable wildlife populations can be supported where there is a diverse mix of plant communities with multiple seral stages to supply structure, forage, cover, and other specific habitat requirements. Managing for a diverse mix of

plant communities is thus an important component of managing for a diversity of species.

- Habitat conditions and quality are directly linked to the health, vigor, and cover of vegetative communities, particularly desired plant communities that fish and wildlife species depend on, as well as soil conditions and water quality and quantity.
- Impacts on populations that exceed the current carrying capacity that would not reduce those populations below the carrying capacity would not be considered significant.
- Impacts on terrestrial wildlife from displacement depend on the location, extent, timing, or intensity of the disruptive activity. Furthermore, impacts from displacement would be greater for wildlife species that have limited habitat or a low tolerance for disturbance.
- NSO stipulations would provide the greatest protection to fish and wildlife and their habitats by prohibiting surface-disturbing activities in these areas. This would prevent disturbance to species and habitats caused by fluid mineral development and would prevent direct impacts on species as described below. CSU stipulations would provide slightly less protection to fish and wildlife and their habitats, since surface-disturbing activities would be allowed and species and habitats could be disturbed. However, CSU stipulations could protect fish and wildlife and their habitats in certain instances by requiring special operational constraints or by moving the surface-disturbing activity to protect fish and wildlife. Timing limitations would protect certain fish and wildlife species during time periods when species would be most sensitive to disturbance, such as during nesting, spawning, and wintering periods.
- Habitat would be managed in coordination with CPW herd objectives and species-specific plans.
- Currently, sufficient habitat exists to maintain CPW data analysis unit objectives for game species across the GJFO.
- Human disturbance would displace wildlife beyond the actual disturbance footprint, although some wildlife may adapt over time depending on the nature of the disturbance and the species being impacted.
- Short-term effects would occur over a timeframe of two years or less and long-term effects would occur over longer than two years.
- In the context of this analysis, the term "avoidance" means reduced use and does not imply a complete absence of use by wildlife.

Management actions with potentially significant impacts on fish and wildlife habitat include resource uses that result in surface disturbance and disruptive activities, such as energy and minerals, lands and realty, and travel management. Management actions with potential to enhance fish and wildlife habitat include special management areas and management of soils, water, vegetation, and fish and wildlife for preservation, maintenance, and enhancement of current ecosystem values.

Effects Common to All Alternatives

Types of Impacts

Many activities could impact species or habitats through disturbance, direct habitat loss and reduced habitat effectiveness, habitat modification and degradation, habitat fragmentation, direct mortality, habitat avoidance, and interference with movement patterns. Impacts associated with certain activities are discussed below in greater detail under each habitat type and alternative.

Disturbance. Disturbances are events that disrupt ecological systems; they may occur naturally or be human-induced. The effects of disturbances are determined in large part by their intensity, duration, frequency, timing, and the size and shape of the area affected, as well as the species that are affected. For example, human disturbance near raptor nests can result in the abandonment of the nest, high nestling mortality from overheating, chilling, or dehydration when adults are flushed from the nest and young are exposed, premature fledging, and reduced access to resources (Gutzwiller et al. 1998).

Direct habitat loss. Direct habitat loss occurs when life-sustaining conditions are lost. For example, removing vegetation affects wildlife by reducing the extent or quality of habitat in terms of food cover and reducing structure for nesting and other uses. While closure and reclamation of disturbed areas can eventually restore lost habitat values, it may require years or decades for recovery to pre-disturbance structure and function.

Reduced habitat effectiveness. Habitat effectiveness is the comparison of the habitat and disturbance components that reflects an area's actual ability to support certain species of wildlife. The amount of habitat actually available to wildlife is called "effective habitat," and reductions in the amount of effective habitat can greatly exceed any direct habitat loss. Increasingly, there is a need to understand and predict the consequences of habitat alterations. Several studies have found that habitat effectiveness is reduced near roads and developed areas (Reed et al. 1996, Ruediger et al. 2006).

Habitat modification and degradation. Changes in habitat are generally less obvious and less severe than losses of habitat but can be substantial, especially if small impacts accumulate across large areas. Examples include removal of too much forage by domestic livestock, invasions of weeds, degradation of water quality, and removal of tree cover during harvesting. A habitat treatment

changes habitat and can be beneficial; it is an important tool in wildlife habitat management. Examples include use of prescribed fires to stimulate new growth on older woody vegetation and thinning of overly dense shrubs to enhance forage production.

Habitat fragmentation. Habitat fragmentation is the disruption of large, continuous blocks of habitat into less continuous habitat by, for example, clearing land and converting vegetation from one type to another. These effects generally have more of an impact on wide-ranging species such as pronghorn *(Antilocapra americana)* than on species with a small geographic home range such as ground squirrels. Tracts of fragmented habitat could separate wildlife into smaller populations, potentially making them more vulnerable to predation, drought, or disease, and potentially limiting genetic diversity. Furthermore, fragmentation would create more edge habitat, which increases predation and the likelihood of invasive, nonnative species invasion, lowering the habitat value of the area.

Direct mortality. Direct mortality can result in areas of increasing human use due to collisions with vehicles, electrocution of raptors on utility lines, or inadvertent trampling of reptiles. In the case of oil and gas development, wildlife mortality associated with petroleum pollution has also been reported. Human activities can cause the direct mortality of animals and over the long term can affect the population numbers, sex ratios, area densities, and population structure.

Habitat avoidance. Direct disturbance to a species and possibly its habitat can affect its use of BLM lands. Avoidance or displacement occurs when wildlife make proportionately less use of particular areas despite the presence of the physical habitat. The result is a de facto loss of habitat because avoided areas meet no survival needs.

Some species are more tolerant of human activity than others. Species such as big game must adapt to human-related disturbances to some degree, especially on winter ranges that have been altered by human uses. However, virtually all species have some threshold of disturbance above which they would avoid or abandon utilization of an area.

Interference with movement patterns. Human-induced impacts can also affect wildlife by altering important daily or seasonal movement patterns. These patterns may be altered through shifts to avoid human activity, to avoid crossing open areas that provide inadequate cover, or to circumvent some physical barrier (e.g., fences and steep road cuts). This type of impact is not as much of an issue for small mammals or reptiles that do not move across large areas or for some birds that easily avoid them. Even without the need for these regular movements, most terrestrial wildlife tend toward some population dispersal as young seek new habitats to occupy. This is important to the species to ensure

that suitable habitat is occupied and to facilitate gene exchange between distinct populations.

All Fish and Wildlife Habitats

Fish and wildlife habitats on BLM lands within the decision area would be affected under all alternatives, and the condition of habitats is directly linked to vegetation conditions, water quality and quantity, and progression towards land health standards (**Section 4.3.4**, Vegetation, and **Section 4.3.3**, Water Resources).

Changes to fish and wildlife habitats would be caused by the following three types of disturbances: 1) disturbance from casual use; 2) disturbance from permitted activities; and 3) changes to habitat condition.

Substantial analysis and planning is used to determine the locations and types of casual use activities that would occur, such as recreation, motorized vehicle use, and use of authorized and unauthorized routes. However, these uses are not subject to site-specific environmental review and monitoring requirements, and impacts on habitats or species would not be apparent until after damage has occurred. Examples of impacts on fish and wildlife from casual use include habitat loss, fragmentation, or degradation; mortality or injury of animals; sedimentation of waterways; increased turbidity; decreased water quality; disturbance to species during sensitive or critical periods in their life cycle such as spawning, nesting, or denning; short-term displacement; and long-term habitat avoidance by species that are sensitive to noise or human presence such as raptors. Some species may adapt to disturbances over time and could recolonize disturbed habitats. Impacts are more likely to occur in easily accessible areas, where visitation would be high, and in areas open to intensive motorized use. Impacts would still occur in areas limited to designated routes due to noise disturbance, human presence, potential for weed spread and habitat degradation, and the potential for injury or mortality to wildlife from vehicle collisions. In general, the more acres of routes that are designated in the planning area, the greater the likelihood of habitat fragmentation and disturbance to species and habitats.

Both short-term, loud noise (such as from vehicles or construction) and long-term, low-level noise (such as from industrial uses such as oil and gas development) has been documented to cause physiological effects, including increased heart rate, altered metabolism, and a change in hormone balance (Radle 2007). Determining the effect of noise is complicated because different species and individuals have varying responses, and certain species rely more heavily on acoustical cues than others (Radle 2007; Barber et al. 2009). Impacts would be both short and long term, depending on the type and source of noise.

On-site management of recreation and motorized activity and designation and closure of travel routes could prevent or reduce impacts. For example, where recreation is managed within an SRMA, and to a lesser extent ERMAs, rules and

guidelines would limit or control activities through specialized management tools such as designated campsites, permits, area closures, and limitations on duration of use. Seasonal closure of routes would prevent impacts on species during sensitive or critical times of the year, such as during winter or birthing. Impacts would vary depending on the SRMA, as each SRMA would be managed for certain recreation outcomes and setting prescriptions. Impacts on fish and wildlife habitats would be concentrated in these areas but are expected to reduce impacts in other areas.

Closing areas to recreational target shooting would result in reduced risk of lead poisoning and elevated lead concentrations in tissues of bird species that utilize these areas (USGS 2009).

Permitted, surface-disturbing activities (e.g., mineral exploration and development, ROWs) would result in short-term direct impacts through mortality, injury, displacement, and noise or human disturbance caused by increased vehicle traffic and use of heavy machinery. Displacement of species could increase competition for resources in adjacent habitats. Over the long term, these activities would remove and fragment habitats due to road development and use, facility construction and placement, creation of well pads and pipelines, and construction within ROWs. Species could avoid developed areas over the long-term, or may adapt and recolonize sites after construction. ROW avoidance and exclusion areas would be identified to reduce or avoid habitat impacts, and utility corridors would be used to concentrate utility and facility development and reduce the total acreage of habitat disturbance and fragmentation.

Roads, mineral development, and off-road recreation have been shown to affect terrestrial wildlife, particularly big game species (Wisdom et al. 2004; Rowland et al. 2004; Trombulak and Frissell 2000). Impacts include those stated previously, such as weed spread, sedimentation, reduced water quality, habitat degradation, injury or mortality, and noise. Other impacts include increased movement rates and probabilities of flight response (Wisdom et al. 2004) and increased daily movements and home range (Rowland et al. 2004). Such increases in movement and stress levels would cause individuals to expend more energy, which could impact reproductive success or susceptibility to mortality, predation, or disease. Species have also been shown to avoid habitat adjacent to disturbance extending to distances of over a mile (Wyoming Game and Fish Department 2010). Mule deer *(Odocoileus hemionus)* were less likely to occupy areas in close proximity to well pads than those farther away, and no evidence of well pad acclimation occurred over time (Sawyer et al. 2006). Mule deer were less likely to use habitat within 1.7 to 2.3 miles of well pads, suggesting that indirect habitat loss may be substantially greater than direct habitat losses (Sawyer et al. 2006). Other studies have found the average distances from well pads and roads to areas of high winter use by mule deer were 0.44 to 2.3 miles and 0.27 to 0.6 mile, respectively (Sawyer et al. 2006).

Hebblewhite (2008) conducted a meta-analysis of over 160 studies and found an average 0.6-mile avoidance response from human disturbance, with the greatest avoidance in summer. Powell (2003) found that elk *(Cervus canadensis)* avoided areas less than 0.3-mile from human development in the fall, winter, and spring. It is important to note that average avoidance distances do not correspond to total habitat loss, as some deer and elk will use habitats closer to disturbances depending on individual responses. Impacts are greater in areas with high densities of well pads, roads, and facilities and areas of high traffic (Wyoming Game and Fish Department 2010).

Studies of elk suggest that road closures may benefit wildlife by reducing energy expenditure, increasing the amount of effective habitat, improving diet quality, and decreasing vulnerability of elk during the hunting season (Rowland et al. 2004).

Bird mortality and/or injury could occur from collision or electrocution with transmission lines and other ROW structures. ROW development in areas where there are existing ROWs would reduce impacts, since resident birds may have adapted to the existing ROWs. COAs such as requiring flight diverters or following Avian Power Line Interaction Committee guidelines would be applied to new ROW applications to reduce impacts. Wind energy may also cause direct impacts on birds and bats, including blade strikes, barotrauma (injury or mortality caused by rapid or excessive pressure changes), habitat loss, and displacement. Indirect impacts may include introduction of invasive vegetation that results in alteration of fire cycles; increase in predators or predation pressure; decreased survival or reproduction of the species; and decreased habitat effectiveness. The amount of land that is open to fluid mineral leasing or other mineral use is not necessarily indicative of the number of acres of habitat that would be directly disturbed. Areas managed under NSO, CSU, and TL stipulations would limit surface disturbance and associated impacts in certain areas. The reasonably foreseeable development scenario predicts that over 13,000 acres of short-term disturbance would occur from drilling, roads, and pipelines, and over 4,000 acres of long-term disturbance from operation of new wells. Under all alternatives, 1,047,100 acres would be open to locatable mineral exploration or development, and 20,100 acres would be withdrawn from mineral entry.

Federal oil and gas regulations prevent the BLM from applying new or additional lease stipulations that would be developed through this planning effort to existing leases. However, federal regulations do allow the BLM to apply other protection measures in conjunction with planning and implementing oil and gas projects. For example, BLM has the discretion to require additional restrictions on surface operations when supported by scientific analysis. All mitigation/conservation measures not already required as stipulations would be analyzed in a site-specific NEPA document, and incorporated, as appropriate, into COAs of the permit, plan of development, and/or other use authorizations.

Birds and other wildlife species may be impacted by oil field waste pits, as they are attracted to oil-covered ponds. Potential impacts include the following:

- Entrapment in oil, causing wildlife to drown;
- Mortality or illness from preening feathers or cleaning fur that is covered with oil;
- Cold stress and potential resulting mortality if oil damages the insulating properties of feathers or fur;
- Increased susceptibility to disease or predation; or
- Reduced hatching success of eggs (USFWS 2000).

Changes to habitat conditions could occur from vegetation and weed treatments; forest and woodland treatments and harvest; wildlife, wild horse, and livestock browsing and grazing; special status species and wildlife habitat enhancements; fire; fuels treatments; and range improvements. Overall, the BLM would aim to achieve or trend toward achieving Public Land Health Standards 2: Riparian Systems, and 3: Healthy Productive Plant and Animal Communities, which would improve habitat values for fish and wildlife. Over the short term, vegetation, fire, and weed treatments would remove habitat, and impacts would occur until the desired habitat was established. Over the long term, vegetation and habitat treatments would increase habitat structural and compositional diversity, increase cover and nesting habitat, prevent sedimentation of waterways, and retain riparian and wetland habitats. Depending on the extent and severity, fire can improve habitat for some species in the long term.

Under all alternatives, measures to reduce the introduction and spread of invasive fish and wildlife species and disease transmission within the planning area would improve fish and wildlife habitat quality. It is anticipated that as the population and associated recreation increase, management of invasive fish and wildlife species and disease would need to be more aggressive to halt their spread.

If managed improperly, overutilization of forage by wild horses or livestock could occur, leading to increased competition with wildlife for forage, and potentially reduced cover and nesting habitat for other species. Livestock could also spread weeds, which would degrade habitats. Wildlife could be displaced from their habitats, which could increase competition for resources in adjacent habitats. Impacts from wild horses would be localized within the LBCWHR. Impacts would vary depending on the extent of removal, type of vegetation impacted, and length of the grazing period. In general, the more acres that are open to grazing under a given alternative, the greater the risk for impacts. Livestock may degrade riparian areas, which could impact riparian-dependent, aquatic, and fish species. Under all alternatives, if overutilization were to occur, the BLM would adjust AUMs and/or use for livestock or the AML for wild horses and implement additional measures such as range improvements or wild

horse gathers, as necessary and feasible, to reduce impacts. Some range improvement projects provide forage, water sources, and habitat for a variety of wildlife species.

Unplanned fire ignitions could cause short- or long-term damage to habitats depending on the seral stage affected, extent, and severity of the fire. In the short term, fire removes nesting and cover habitat and leaves bare areas that provide little habitat value and could erode to cause sedimentation of waterways. Fire could displace species from suitable habitat, which could increase competition for resources in adjacent habitats. In the long term, wildland and prescribed fires, as well as fuels treatments, improve habitat by increasing structural diversity. In some portions of the field office the fire return interval has been altered due to invasive species (e.g., cheatgrass) and in these areas vegetation diversity and wildlife habitat suitability has been decreased due to the frequent fire return interval which appears to support a monoculture of cheatgrass. Often, fire and fuels treatments lower the risk for an uncharacteristically large or severe wildfire that would destroy a large acreage of wildlife habitats.

Management actions that restrict surface-disturbing activities would reduce impacts such as habitat removal, fragmentation, and human disturbance. Management action would include stipulations to protect water, soil, wildlife, special status species, lands with wilderness characteristics, and cultural resources; visual resources management; closure of areas to fluid mineral leasing; restrictions within special designation areas (WSAs and ACECs); and route closure or restrictions. In general, VRM Classes I and II, which preserve or retain the existing character of the landscape, would restrict surface-disturbing activities, reduce direct impacts on fish and wildlife, and retain habitats. Areas managed as VRM Class III or IV would be subject to actions that allow for greater landscape modification and therefore greater surface disturbance. LNs and COAs would be applied where necessary to protect resources.

ACECs provide protection to fish and wildlife species and habitats in several ways. They are typically withdrawn from locatable mineral entry, managed as ROW exclusion or avoidance areas, and restricted from a net increase in travel routes. These special management prescriptions provide broad protection from habitat fragmentation and loss of potential habitat.

Criteria would be used to guide land exchanges, disposals, and acquisitions, which could reduce the fragmentation of BLM-administered public land in the planning area. This could improve BLM's ability to implement management actions that would result in improved habitats, undisturbed fish and wildlife populations, and attainment of land health standards.

Sagebrush Habitats

The types of impacts on sagebrush habitats from casual use, permitted activities, and changes to habitat condition common to all alternatives would be similar to those described for *All Fish and Wildlife Habitats*. Wildlife dependent on this vegetation type for all or part of their life cycle are often highly susceptible to fragmentation as described above.

Salt Desert Shrub Habitats

The types of impacts on salt desert shrub habitats from casual use, permitted activities, and changes to habitat condition common to all alternatives would be similar to those described for *All Fish and Wildlife Habitats*. These vegetation types are more susceptible to invasion and dominance by weedy species than high-elevation sagebrush or forested habitat types.

Forest and Woodland Habitats

The types of impacts on forest and woodland habitats from casual use, permitted activities, and changes to habitat condition common to all alternatives would be similar to those described for *All Fish and Wildlife Habitats*.

River and Stream Habitats

Sediment and Turbidity. Actions that increase sediment loading into streams can impact sediment-intolerant aquatic species in many ways. Increased sediments in the stream environment reduce dissolved oxygen, raise stream temperature, and can cover spawning/rearing areas, thereby reducing the survival of fish embryos and juveniles (US Forest Service 2000). Excessive sedimentation can also fill in important pool habitats, reducing their depth and making them less usable by fish and other aquatic organisms. Impacts would be greater on sediment-intolerant species.

A number of sublethal effects on resident trout may also occur as a result of sedimentation, including avoidance behavior, reduced feeding and growth, and physiological stress (Waters 1995). Over the long term, increased sediment loading reduces primary production in streams (US Forest Service 2000). Reduced macroinvertebrate productivity and diversity results when excessive sediment fills in the spaces between stream substrates needed by these aquatic invertebrates. Food webs can be altered as sediment-intolerant macroinvertebrates are replaced by sediment-tolerant species. Reduction in stream productivity can disrupt the food chain and result in reduced food sources for resident fish species. Suspended sediment causes turbidity within streams, which can impact species that need clear water in which to successfully capture prey, such as trout.

Where actions or activities include roads or pipelines, there is high risk of sediment impacts. Roads increase surface runoff and sedimentation and, where they cross water bodies, often require in-channel structures such as culverts

and bridges that remove aquatic habitat and may be barriers to fish passage (Bryant 1981; Barrett et al. 1992).

Amphibians that require clear ponds in which to breed can be impacted by increased sediment and turbidity. Egg masses can be covered by sediment, which impacts productivity, and tadpoles can have reduced feeding efficiency caused by prolonged turbidity.

Habitat Alteration. Stream channel and stream bank alterations can affect aquatic species in many ways. Mechanisms for impact on stream channels include channel relocation, diking, riprapping, and fine sediment input at levels greater than the stream can efficiently or effectively move. Actions that affect stream banks can result in soil compaction, increased erosion, and subsequent widening of stream channels. Stream widening results in a loss of habitat complexity and diversity and reduced water depths, which can reduce available habitat and cause increased stream temperatures. Increased temperatures can affect fish by increasing physiological stress, reducing feeding, and increasing susceptibility to disease. Stream bank alteration also exposes bare soils, which provides for points of invasion by weedy species and increases the risk of further erosion of the stream bank. Actions that increase the amount of soil exposed to the erosive effects of water will increase sediment loading and turbidity. This can alter feeding by fish that require water clarity to forage and capture prey. Actions that cause soil compaction result in decreased vegetation cover, less vigorous root systems, and more exposure of the soil surface to erosion (Burton et al. 2008). Reduced flows can result in buildup of sediment and alter channels by narrowing them and reducing habitat complexity for some species.

Amphibians can be impacted by alteration of limited breeding pond habitats and overwinter habitats. Many species aestivate (burrow into stream bank, pond, or soil substrates during summer). Activities that disturb ground have the potential to disrupt amphibians and result in direct mortality. Breeding ponds can be drained or lowered in volume or have shorelines altered that can impact breeding sites and limit productivity.

Loss or Reduction of Streamside Vegetation Cover. Loss or reduction of streamside riparian vegetation can alter the nutrient dynamics of the aquatic ecosystem. In areas where riparian vegetation has been depleted or lost, a shift in energy inputs from riparian organic matter to primary production by algae and vascular plants has been predicted (Minshall et al. 1989) and observed (Spencer et al. 2003). The increased solar radiation that results from the loss of streamside (or poolside) vegetation causes temperatures, light levels, and autotrophic production (i.e., plants and algae) to increase. This change in a stream's food web can alter the composition of food and thus energy sources that are available to resident fishes and aquatic invertebrates. Terrestrial insect diversity and productivity also decreases with reductions in streamside

vegetation, which also affects food availability for resident fish. Increased stream temperatures affect trout by reducing their growth efficiency and increasing their likelihood of succumbing to disease.

Prolonged and excessive utilization of streamside/riparian vegetation can also result in increased peak flows as vegetation is not sufficient in root mass, size, or abundance to sufficiently slow stream velocities. In addition, the loss of streamside vegetation reduces water percolation and infiltration, leading to unnaturally high and frequent runoff. This can result in accelerated bank erosion and sloughing, increased siltation, elevated stream temperatures, widened and braided stream channels, and loss of overhanging banks, all of which are important factors affecting trout productivity in a given stream (Gardner 1950; Armour 1977; Behnke 1979a, b; Claire and Storch 1977; Glinski 1977; Kaufman et al. 1983).

Loss of shoreline vegetation at amphibian breeding sites can reduce shade and increase water temperature. Reduced food sources can also result with the loss or reduction of riparian vegetation. Reduced vegetation can allow for more sediment to enter breeding sites as the filtering properties are reduced. Reduced cover can also increase predation, as amphibians occupy areas with less hiding cover and are more exposed to predators.

Water Depletions. Stream and river flows and reservoir and pond volumes are generally climate dependent, but water diversions and impoundments play a large role with regard to localized flow regimes and water volumes of streams, rivers, and ponds. The primary actions and activities that result in water depletions include construction of water impoundments (stock ponds, reservoirs), water diversions for agricultural and domestic uses, water use associated with natural gas development, and fire suppression. Reduced water flow or volume directly correlates to a loss of wetted habitat for fish and amphibians.

Reduced flow can result in increased water temperatures, reduced food supplies, reduced habitat complexity and diversity, and a loss of carrying capacity. Important microhabitats such us spawning bars and pools can be lost or altered. Reduced flows can result in habitat fragmentation and limit movement of cutthroat between preferred habitats. Holding habitats (pools) can be reduced in size and become less useable by fish or amphibians. Fish that congregate in limited pool habitats for long periods can incur increased stress and susceptibility to disease.

Breeding ponds that lose water volume can become unusable by amphibian species. Increased predation can result due to less wetted habitat available for evading predators. Reduced pond volumes can cause increased risk of anoxia (severe oxygen depletion) for northern leopard frogs *(Rana pipiens)*.

Water Quality Alteration. The effects of changes in water quality are well documented on aquatic species. For example, trout prefer cold water, neutral pH, and high dissolved oxygen levels in which to thrive. With increased nutrient input and limited summer and fall stream flows, eutrophication can result. This is the condition in which the increase of mineral and organic nutrients has reduced the dissolved oxygen levels within the stream, producing an environment that favors plant life over animal life. In other words, the mineral and organic nutrient levels being inputted into these streams are greater than the streams can dilute or carry through the system. The symptoms of this are often large algae blooms. This further depletes oxygen levels and reduces habitat quality for resident fish.

Such activities as natural gas development, road use, and other construction can alter water quality through spills, leaks, or vehicular accidents. Where these could occur near occupied fish and amphibian habitat, impacts would be acute and could result in direct mortality. Use of chemicals for weed treatments, fire suppression, or other vegetation management could impact aquatic species and their habitats by overspray and drift to nontarget areas and habitats. This can result in direct mortality, reduced feeding, loss of prey species, and habitat avoidance. Grazing by cattle has also been reported to affect water quality (Buckhouse and Gifford 1976), water chemistry (Jefferies and Klopatek 1987), and water temperature (Van Velson 1979). The changes are subtle over time (Elmore and Beschta 1987) but tend to have a profound effect on aquatic ecosystems (Kauffman and Krueger 1984).

Chemicals and pollutants have the potential to impact the four endangered fishes (Colorado pikeminnow *[Ptychocheilus lucius]*, razorback sucker *[Xyrauchen texanus]*, humpback chub *[Gila cypha]*, bonytail *[Gila elegans]*) as well as the three BLM sensitive fishes (flannelmouth sucker *[Catostomus latipinnis]*, bluehead sucker *[Catostomus discobolus]*, and roundtail chub *[Gila robusta]*). All of these fish are long-lived species. Roundtail chub can live up to eight years, bluehead sucker and flannelmouth sucker up to and beyond 20 years, humpback chub and Colorado pikeminnow up to 30 years, and bonytail and razorback sucker up to 50 years. Thus the exposure time is long and potential for bioaccumulation (e.g., accumulation of harmful substance) of certain constituents is high for these fish.

Impacts from chemicals and pollutants include accidental spills of petroleum products and hazardous materials, and high selenium concentration in the water and food chain. Accidental spills of hazardous material into critical habitat can cause immediate mortality when lethal toxicity levels are exceeded. In addition, hazardous materials can cause fish to become sick, induce stress, impact reproductive success, and impact important food resources.

BLM authorized actions at the highest risk of larger scale accidental spills of hazardous materials include ROW authorizations for pipeline construction and subsequent use, ROWs that allow for the transport of hazardous substances,

and natural gas development (e.g., drilling, fracking, production, & transport). Standard measures are in place in ROW grants/authorizations and via onshore regulations to limit the potential for these accidents. To further limit risk and to reduce potential negative impacts, spill prevention and contingency plans would be required for large scale operations.

Selenium is a natural trace element that is a component of certain sedimentary deposited soils, primarily Mancos shale a common formation in parts of western, Colorado. This compound presents a problem when soils containing it become saturated. Upon saturation, selenium is leached into nearby waterways. In the larger rivers, it becomes concentrated and accumulates in low to zero velocity habitats such as backwaters and enters the food chain. Historic agricultural practices in particular have resulted in both the Gunnison and Colorado rivers having higher than desired levels of selenium. Selenium concentrations of 4.9-7.0 µg/g dry weight in whole body fish from the Colorado River basin have been among the highest in the nation (Hamilton et al. 2002). Selenium bioaccumulates in fish tissue primarily via the consumption of food resources that contain elevated levels of the compound. Colorado pikeminnow are especially at risk given their piscivorous (fish eating) nature. High selenium levels can affect reproduction and recruitment. Research has shown that selenium from the female's diet is incorporated into eggs, and high concentrations may result in reduced production of viable eggs, and/or post-hatch mortality due to metabolism of egg selenium by developing larval fish (deformities and altered physiology) (Lemly 2002; Sorensen 1991). Tissue samples taken from Colorado pikeminnow in the Colorado River near Grand Junction, CO showed selenium levels to be above the recommended toxicity threshold of 4 parts per million (ppm) dry weight (DW) in the majority of fish (Osmundson et al. 2000). Non endangered fish collected in the Gunnison River basin in the early 1990's had a mean selenium concentration of 7.1 ppm DW. Other studies have documented selenium levels and effects and assessed risk from contamination on these endangered fish (Hamilton and Waddell 1994; Stephens and Waddell 1998; Hamilton 1999; Hamilton et al. 2005 I; Hamilton et al. 2005 II; Hamilton et al. 2005 III).

Associated with BLM management, any activities that would disturb identified Mancos shale soils and make them available for transport via erosion or sedimentation into water would likely increase selenium levels in nearby streams and rivers. In addition, irrigation practices, stock ponds, produced water pits, or other water related developments in Mancos shale soils associated with water storage or transport, could result in selenium leaching and increased selenium levels in waters containing these fish. The Controlled Surface Use stipulation (CSU-4) proposed under all the action alternatives, as well as select SOPs and BMPs in **Appendix H** would substantially reduce the risks of increasing selenium levels in the Gunnison and Colorado rivers and reduce exposure risk of this compound to resident special status fishes.

In areas where the Colorado Standards for Public Land Health are not currently being met, and livestock grazing is causing direct negative impacts at specific locations on select streams containing sediment-intolerant aquatic species, the Colorado Standards for Public Land Health ensure that sufficient residual vegetation in upland and riparian areas remains to protect soils and stream banks from wind and water erosion and to maintain stream stability.

Under all alternatives, improved water quality would benefit fish and aquatic species. Stipulations and meeting Public Land Health Standards 1 and 2 could minimize impacts on runoff timing or other hydrograph changes and enhance recharge of alluvial aquifers that provide base flows. This would improve water quantity and quality for fish and promote healthy riparian communities, an important source of stream shade and fish habitat.

Unmitigated or unplanned impacts on fisheries and aquatic wildlife under all alternatives would be most likely to occur from casual use activities. While permitted activities could cause removal of riparian or overhanging vegetation, erosion, and sedimentation, impacts would be mitigated through restrictions within riparian areas, wetlands, and waterways.

Riparian and Wetland Habitats

Stipulations and meeting Public Land Health Standards 1 and 2 would promote healthy riparian communities.

Unmitigated or unplanned impacts on riparian habitats under all alternatives would be most likely to occur from casual use activities. While permitted activities could cause removal of riparian or overhanging vegetation, impacts would be mitigated through restrictions within riparian areas and wetlands. Furthermore, since riparian areas and waterways are popular recreation spots, increased demand for access to these areas is expected as the population increases.

Barren Habitats

The types of impacts on barren habitats from casual use, permitted activities, and changes to habitat condition common to all alternatives would be similar to those described for *All Fish and Wildlife Habitats*.

Implementing management for the following resources would have negligible or no impact on fish and wildlife and are therefore not discussed in detail: air quality; paleontology; national trails; national, state, and BLM byways; Native American tribal uses; public health and safety; socioeconomics; or environmental justice.

Alternative A

All Fish and Wildlife Habitats

In general, Alternative A would rely on management guidance that would not reflect current conditions and issues, and would lack a landscape-level approach to land planning. For example, wildlife emphasis areas would not be managed under Alternative A, which would make it harder to effectively and efficiently manage for wildlife, as species are dispersed throughout the planning area and wildlife emphasis areas would not be prioritized for protection.

Soil and water protections through the use of NSO and CSU stipulations in areas with saturated or frozen soils would protect fish and wildlife and their habitats from the effects of surface-disturbing activities. Determining soil suitability for surface-disturbing activities would help maintain habitat where vegetation would be sensitive to removal and would reduce the likelihood of erosion and sedimentation of waterways.

The lack of comprehensive planning for vegetation, fish and wildlife, and special status species would result in habitat management that is applied on a case-by-case basis and which would not give BLM the authority to implement or enforce certain management actions. Protection for vegetation and fish and wildlife habitats would occur, and management flexibility would allow BLM to adaptively manage resources. NSO, CSU, and TL stipulations are presented in **Appendix B**, and these would help protect fish, wildlife, and their habitats. Vegetation and weed treatments and range improvements would be implemented, which would improve habitat conditions and trend toward achieving Colorado Standards for Public Land Health.

The types of impacts from invasive species and disease transmission under Alternative A would be the same as those described under Effects Common to All Alternatives.

Fire management under Alternative A would rely on prescribed fire for resource benefit and would be limited in the use of unplanned fire. This would allow for some short-term disturbance to habitats and species and long-term improvement in habitat health and productivity, as described under Effects Common to All Alternatives.

Areas managed as VRM Class I and II on 159,200 acres, as well as stipulations to protect visual resources, would indirectly protect fish and wildlife and their habitats by limiting or prohibiting surface-disturbing activities in these areas.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives. Range improvements would be used to improve habitat conditions, which would reduce potential impacts on habitats and fish and wildlife populations over the long term. BLM would manage

978,600 acres as open and 48,600 acres as closed to grazing under this alternative.

The types of impacts from recreation, such as from roads and displacement, would be the same as those described under Effects Common to All Alternatives. Under Alternative A, BLM management of SRMAs and ERMAs would continue to be insufficient to accommodate current and future levels of recreation, which could lead to an increase in impacts on fish and wildlife and their habitats as population and recreation use increase. Recreation would not be focused away from wildlife areas, so there would be a greater likelihood of impacts on wildlife. Four SRMAs and IRMAs would be managed on 358,300 acres, and one ERMA would be managed on 703,100 acres under this alternative.

Large portions of the decision area would be open to motorized use under this alternative, with many important fish and wildlife areas not avoided. Furthermore, cross-country travel would be allowed on 445,400 acres and intensive motorized use on 12,500 acres within the decision area, which could cause the types of impacts described above for casual use under Effects Common to All Alternatives. Areas limited to existing routes and designated routes on 568,200 acres would have fewer impacts but could still disturb fish and wildlife from noise and human presence. Areas closed to motorized use on 35,300 acres (and in WSAs, where motorized and mechanized use would be limited to existing ways) would reduce the likelihood of these impacts. Leaving large areas open to cross-country travel is likely to result in more habitat fragmentation and greater impacts on wildlife than any of the following 3 alternatives.

Lands and realty management actions would identify 441,400 acres as sensitive to public utility development and 234,900 acres as unsuitable for public utility development. This would protect habitats or minimize impacts from disturbance in these areas. BLM would manage seven corridors for utility and facility development.

Under Alternative A, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 300,700 acres as acceptable for coal leasing. Areas unacceptable for coal leasing on 36,700 acres, as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from coal mining on these lands.

Under Alternative A, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would continue to manage 1,134,600 acres of federal mineral estate as open to fluid mineral leasing. Areas closed to fluid mineral leasing on 96,500 acres, as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from fluid mineral leasing on these

lands. NSO stipulations would be applied on 433,000 acres and CSU stipulations would be applied on 74,100 acres, which would reduce the impact of fluid mineral development on fish and wildlife and their habitats.

Five ACECs (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon, and Unaweep Seep) would be managed on 28,900 acres, which would protect fish and wildlife and their habitats through such measures as limiting travel to designated routes, closing areas to motorized use, managing areas as unsuitable for ROWs, and applying NSO stipulations.

The lack of interpretation and environmental education activities in the planning area could result in user actions that could degrade fish and wildlife habitats.

In addition to those effects discussed under *All Fish and Wildlife Habitats*, the following habitat-specific effects would occur within implementation of Alternative A.

Sagebrush Habitats
The types of impacts on sagebrush habitats from casual use, permitted activities, and changes to habitat condition under Alternative A would be the same as those described under *All Fish and Wildlife Habitats*.

Salt Desert Shrub Habitats
The types of impacts on salt desert shrub habitats from casual use, permitted activities, and changes to habitat condition under Alternative A would be the same as those described under *All Fish and Wildlife Habitats*.

Forest and Woodland Habitats
The types of impacts on forest and woodland habitats from casual use, permitted activities, and changes in habitat condition under Alternative A would be the same as those described under *All Fish and Wildlife Habitats*. While wildlife areas would be excluded from commercial forestry under Alternative A, impacts on habitat would occur in other areas due to habitat removal, human presence and disturbance, use of vehicles and heavy machinery, noise, and increased likelihood for soil erosion.

In addition, cavity-rich portions of aspen stands would not be cut under this alternative. This action would help maintain habitat for species that nest in or otherwise use tree cavities.

Riparian and Wetland Habitats
In addition to the impacts described under *All Fish and Wildlife Habitats*, fourteen river segments would be managed as eligible for inclusion in the NWSRS. Interim protective management guidelines would help to protect or reduce impacts on riparian habitats and riparian-dependent species in these areas.

River and Stream Habitats

The types of impacts on river and stream habitats from casual use, permitted activities, and changes to habitat condition under Alternative A would be the same as those described under *All Fish and Wildlife Habitats*. WSR impacts would be similar to those described under *Riparian and Wetland Habitats*. In addition, direct protection to fish and aquatic species would occur where fish are an ORV for a WSR-eligible segment.

While wildlife areas would be excluded from commercial forestry under Alternative A, impacts on rivers and streams would occur in other areas due surface-disturbing activities, which would increase the likelihood for soil erosion and sedimentation of waterways as well as degradation of water quality.

Barren Habitats

In addition to the impacts described under *All Fish and Wildlife Habitats*, grazing management under Alternative A could cause impacts on bighorn sheep *(Ovis canadensis)* by allowing domestic sheep grazing in allotments on a case-by-case basis. Where allotments occur in occupied bighorn sheep habitat, there would be the potential for disease transmission between domestic and bighorn sheep.

Alternative B

All Fish and Wildlife Habitats

Under Alternative B, the BLM would establish eleven wildlife emphasis areas on 170,500 acres (no wildlife emphasis areas are identified under Alternative A) to protect areas with high wildlife value and significance. This strategy would allow BLM to focus their wildlife management efforts in the areas that would be most effective to preserve and protect fish and wildlife. While the emphasis in these areas is largely on protecting habitat for big game, cutthroat trout, and sage-grouse, other species would benefit from the protections and restrictions that would be implemented. Examples of management actions that would be applied in wildlife emphasis areas include stipulations on surface-disturbing activities, ROW avoidance and exclusion areas, travel closures and seasonal restrictions, and recreation restrictions. When a wildlife emphasis area is neither a ROW avoidance nor exclusion area, BMPs would be applied to minimize habitat fragmentation.

Vegetation management under Alternative B would emphasize improving and restoring vegetation and would thus improve habitats. Actions would be implemented to reduce fragmentation, and treatments that would provide for the natural range of variation and seral stages within each vegetation type would support a higher diversity of wildlife species over the long term. Fencing modifications would help enhance pronghorn movement throughout the decision area. In addition, adaptive drought management actions would prevent surface-disturbing activities and associated impacts. Adaptive drought management actions would also require BLM to coordinate with CPW for big

game herd control to maintain sustainable levels of big game and prevent overbrowsing.

Similarly, fish and wildlife and special status species management under Alternative B would improve and maintain habitat throughout the decision area, and stipulations to reduce surface-disturbing activities would reduce the likelihood of impacts on fish and wildlife. Fish and wildlife stipulations and restrictions include a CSU in high value and crucial wildlife habitat, managing the Ant Research Site as a ROW exclusion area, managing the Owl Banding Station as a ROW avoidance area, and applying a CSU on deer and elk migration and movement corridors. Stipulations and ACECs to protect special status species would indirectly protect other fish and wildlife species as well. Eleven ACECs (totaling 106,000 acres) would be designated under this alternative: Atwell Gulch, Badger Wash, Dolores River Riparian, Juanita Arch, The Palisade, Pyramid Rock, Roan and Carr Creeks, Rough Canyon, Sinbad Valley, South Shale Ridge, and Unaweep Seep. An NSO would be applied to these areas.

Under Alternative B, the BLM would have increased opportunities to use planned and unplanned fire as a natural disturbance regime to meet resource objectives. Using a variety of fuel treatments would have short-term effects on wildlife and habitats through vegetation removal, increased likelihood of erosion and sedimentation, human presence, and the potential for habitat avoidance. In the long term, these activities would reduce the likelihood of uncharacteristically large or intense wildfires that could damage large expanses of habitat or kill or displace wildlife. In addition, the condition of upland vegetation would be improved, which would benefit both terrestrial and aquatic wildlife. Over the short and long terms, fuel treatments could increase forage quality and quantity for some species. ESR treatments would help to reestablish vegetation and restore habitat for wildlife.

The types of impacts from visual resources management would be the same as those described under Alternative A, but under Alternative B, 518,600 acres (3.3 times more acres than under Alternative A) would be managed as VRM Class I and II.

There would be three units managed for wilderness characteristics covering 24,400 acres under Alternative B. Since fish and wildlife resources are a feature that contributes to an area's wilderness character, fish and wildlife within these units would be managed to maintain that character. Examples of management within lands managed for wilderness characteristics include closure to motorized and mechanized travel (with an exception for mechanized travel on the Pickett Trail within the Maverick Unit), and wood cutting; identification of ROW exclusion areas; closure to mineral materials and non-energy leasables; no fluid mineral leasing; and applying NSO stipulations.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives. BLM would manage 961,100 acres (2

percent fewer acres than under Alternative A) as open to grazing and 66,000 acres (36 percent more acres than under Alternative A) as closed to grazing. If properly managed, grazing would not conflict with the fish and wildlife and habitat resource objectives in these areas. Increases in forage availability would be allocated to meet the greatest need; depending on the circumstances, these allocations could include wildlife. In addition, BLM would require periodic rest and limited grazing in lower elevation communities, as well as a minimum of two growing seasons of rest following vegetation treatments. This would prevent overgrazing and would allow for habitats to recover.

The types of impacts from recreation, such as from roads and displacement, would be the same as those described under Effects Common to All Alternatives. Under Alternative B, the BLM would manage three SRMAs on 78,300 acres (78 percent fewer acres than under Alternative A) and seven ERMAs on 175,500 acres (75 percent fewer acres than under Alternative A). Planning within SRMAs under Alternative B would consider wildlife concerns. Certain SRMAs or portions of SRMAs would be closed to fluid mineral leasing or would have stipulations on surface-disturbing activities applied, which would protect fish and wildlife and their habitats from disturbance.

Cross-country motorized use would be allowed on 5,400 acres (57 percent fewer acres than under Alternative A), which would allow the types of impacts on wildlife habitat that are described under Effects Common to All Alternatives, but over a smaller area. Areas closed to motorized use on 187,900 acres (5.3 times more acres than under Alternative A) and limited to designated routes on 868,000 acres (3.8 times more acres than under Alternative A) would reduce the likelihood of impacts. Impacts on wildlife would still occur from disruption caused by motorized vehicles (e.g., noise, human presence). Under Alternative B, motorized and mechanized travel would be restricted from December 1 to May 1 to protect big game species on 69,800 acres. This would reduce disturbance to big game species during winter when additional stressors could impact survival, and would reduce the likelihood of fatal vehicle collisions with big game.

Managing 740,900 acres (68 percent more acres than under Alternative A) as ROW avoidance and 204,200 acres (18 percent fewer acres than under Alternative A) as ROW exclusion areas would reduce impacts on habitats and fish and wildlife as described under Effects Common to All Alternatives. (The remaining acres would be available for utilities development.) In addition, the Ant Research Site would be a ROW exclusion area, and the Owl Banding Station would be a ROW avoidance area. Furthermore, encouraging the use of delineated utility corridors, managing six corridors for utilities and facilities, and managing solar and wind emphasis areas on a total of 14,800 acres within the planning area would concentrate impacts on fish and wildlife and habitats and reduce widespread impacts and fragmentation. By concentrating development in corridors, BLM would also reduce hazards to wildlife such as bird collision and

electrocution that would be caused by having transmission lines spread throughout the decision area.

Development of solar and wind projects would remove habitat and potentially disturb, kill, injure, or displace species in the short term during construction. Over the long term, wind facilities pose collision hazards for birds and bats, and solar projects would remove habitats. Solar projects would also be fenced, which would exclude some species, particularly larger mammals such as big game. As a result, species could avoid or be excluded from solar and wind energy areas over the long term. Under Alternative B, BLM would reduce impacts from solar development in the 2 Road solar emphasis area and SEZ by applying special mitigation to be compatible with pronghorn migration.

Under Alternative B, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 253,400 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing. Areas unacceptable for coal leasing on 56,000 acres (52 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from coal mining on these lands.

Under Alternative B, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 878,700 acres (9 percent fewer acres than under Alternative A) as open to fluid mineral leasing. Areas closed to fluid mineral leasing on 182,700 acres (89 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from fluid minerals development on these lands. On lands open to fluid mineral leasing, NSO stipulations would be applied on 382,200 acres (16 percent fewer acres than under Alternative A), and CSU stipulations would be applied on 527,500 acres (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate). Stipulations to protect big game, such as a CSU in deer and elk migration and movement corridors, NSO in elk calving sites, and TL in big game winter range, would reduce impacts from surface-disturbing activities and development such as those described under Effects Common to All Alternatives.

Under Alternative B, 20,700 acres would be petitioned for withdrawal from locatable mineral exploration or development (no acres would be petitioned under Alternative A). If withdrawn, these areas would provide additional protection to fish and wildlife and habitats from surface-disturbing activities.

Thirteen ACECs would be managed on 106,000 acres (2.7 times more acres than under Alternative A), and these would be closed to wood harvest, mineral material sales, and non-energy leasable mineral exploration and development. Other restrictions include travel route closures or limitations, managing the

areas as ROW avoidance or exclusion, recreation restrictions, surface disturbance stipulations, and managing areas as closed to fluid mineral leasing. As such, fish and wildlife and their habitats would generally be protected from surface disturbances and associated impacts within these areas.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of fish and wildlife resources within the planning area. This could result in increased protective efforts by the general public.

In addition to those effects discussed under *All Fish and Wildlife Habitats*, the following habitat-specific impacts would occur with implementation of Alternative B.

Sagebrush Habitats

Sagebrush communities would be improved and maintained through vegetation treatments, avoiding planned and unplanned wildland fire in low-elevation cheatgrass-infested communities, prioritizing winter sage-grouse (greater and Gunnison) habitat for treatment and restoration, developing restoration plans in non-functioning habitat, reducing pinyon-juniper encroachments, increasing habitat connectivity, and managing for age class diversity. Wildlife that rely on these habitats would directly and indirectly be affected by these management actions in the short and long term. Stipulations to protect special status species that use sagebrush habitats (see **Section 4.3.6**, Special Status Species) would reduce surface disturbance in the areas where they are applied. In addition, a suite of management actions would be implemented to conserve Gunnison and greater sage-grouse *(Centrocercus urophasianus)* (see **Section 4.3.6**, Special Status Species), which would directly benefit other sagebrush-dependent species.

Salt Desert Shrub Habitats

Salt desert shrub habitats would be improved and maintained through fire suppression, grazing management, erosion control in greasewood communities, and prioritization of cheatgrass treatments. BLM would require periodic rest and limited grazing in lower elevation communities, as well as a minimum of two growing seasons of rest following vegetation treatments. This would prevent overgrazing and would allow forage to recover. Stipulations to protect special status species that use salt desert shrub habitats would reduce surface disturbance in the areas where they are applied.

Forest and Woodland Habitats

Old-growth pinyon-juniper woodlands would be managed to maintain their current acreage, and a CSU would be applied in all old-growth forests and woodlands and would reduce direct impacts from surface-disturbing activities. Other forest types such as ponderosa pine, Douglas fir, aspen, and spruce/fir would be managed to increase resilience to disease and diversity in age classes

and species composition. These actions would help provide habitat for a diversity of forest and woodland-dependent species.

Under Alternative B, activity level plans would be developed for certain areas to manage for healthy forests and woodlands. Over the long term, this would maintain important wildlife habitat, provide habitat diversity and multiple age classes, and prevent erosion and sedimentation of waterways. Short-term impacts could occur, depending on the timing of management actions and the species and habitats that are affected. Impacts would be greater on species that are sensitive to disturbance or human presence, such as nesting birds.

Riparian and Wetland Habitats

Mature riparian forest would be conserved and mitigation measures would be implemented to reduce impacts on riparian habitats, such as locate/relocate travel routes, recreation restrictions, and closure to mineral materials sales and non-energy mineral leasing and development. Management actions and stipulations would be applied to protect special status species. These measures would also reduce direct disturbance to riparian- and wetland-dependent wildlife. In addition, an NSO stipulation would be applied around riparian and wetland areas and around major river corridors, which would reduce the likelihood of effects on riparian and wetland habitat and associated species.

Fish and aquatic resources have been identified as an ORV for the Dolores River in the Wild and Scenic River Eligibility Report. Under Alternative B, a portion of the Dolores River is determined to be suitable for inclusion in the NWSRS. Interim management guidelines for suitable river segments would assist in protection of riparian and wetland habitats by preventing degradation of shorelines, water quality, and the free-flowing nature of the suitable stream segments. In addition, river and stream habitats along the Dolores River would be further protected under Alternative B by making it a ROW avoidance area and applying a CSU stipulation. As a result, impacts from surface-disturbing activities, including soil compaction, noise disturbance, and vegetation trampling would be reduced.

River and Stream Habitats

Water protective measures would have a greater impact on fish and aquatic wildlife compared to terrestrial wildlife. Actions to maintain water quantity, including securing water rights and acquiring parcels adjacent to waterways, would improve habitat for fish and aquatic wildlife by maintaining existing in-stream flows. Similarly, water quality protections and enhancements would improve habitat by reducing selenium, maintaining and/or restoring surface and groundwater quality, and meeting designated beneficial uses. Surface disturbance stipulations around wetland and riparian areas and major river corridors would reduce the likelihood of erosion and sedimentation of waterways, as well as maintain riparian vegetation that is an important element in stream and river

habitats. Vegetation management would complement these actions by protecting and enhancing riparian areas, including mature riparian forest.

Fish and aquatic resources have been identified as an ORV for the Dolores River in the Wild and Scenic Rivers Eligibility Report. Under Alternative B, a portion of the Dolores River is determined to be suitable for inclusion in the NWSRS. Interim management guidelines for suitable river segments would assist in protection of river and stream habitats by preventing degradation of shorelines, water quality, and the free-flowing nature of the suitable stream segments. In addition, river and stream habitats along the Dolores River would be further protected under Alternative B by making it a ROW avoidance area and applying a CSU stipulation.

In general, management actions under Alternative B would prevent the spread of nuisance aquatic organisms through such measures as treating equipment used within or near perennial water sources and removing aquatic competitors from active native aquatic breeding grounds. These measures would reduce impacts caused by these species, such as changes to the food web and water conditions. However, recreation in the Dolores River SRMA may increase the likelihood for the introduction or spread of nuisance aquatic organisms.

Barren Habitats

The types of impacts on barren habitats from casual use, permitted activities, and changes in habitat condition under Alternative B would be the same as those described under *All Fish and Wildlife Habitats*. Under Alternative B, domestic sheep grazing would be prohibited on allotments within occupied bighorn sheep habitat and permitted outside of occupied habitat on a case-by-case basis as long as detailed criteria were met. In addition, BLM would consider closure of caves and other structures used by bats to prevent the spread of white nose syndrome. These actions would reduce the likelihood of disease transmission in the areas where they are applied. Stipulations to protect special status species would also benefit other wildlife species where these are applied.

Alternative C

All Fish and Wildlife Habitats

The types of impacts on fish and wildlife from management for soil resources, water resources, invasive species and disease transmission, wild horses, wildland fire management, forestry, and interpretation and environmental education would be the same as those described under Alternative B. In addition, Alternative C would focus management on improving vegetation for special status species habitat, which would benefit other wildlife in these desired plant communities. The BLM would manage thirteen wildlife emphasis areas on 145,500 acres (21 percent fewer acres than under Alternative B), though other wildlife emphasis areas under Alternative B would be managed as ACECs under Alternative C, thereby protecting habitats in those areas.

Under Alternative C, a variety of stipulations would be applied and twenty ACECs would be designated to protect special status species habitats and populations (see **Section 4.3.6**, Special Status Species), which would also protect other fish and wildlife habitats and populations.

The types of impacts from visual resources management would be the same as those described under Alternative A, but under Alternative C, the BLM would manage 654,000 acres (4.1 times more acres than under Alternative A) as VRM Class I and II.

The types of impacts from lands with wilderness characteristics would be the same as those described under Alternative B, but under Alternative C, 12 units would be managed for wilderness characteristics on 171,200 acres (7 times more acres than under Alternative B). Direct protections would occur on 4,200 acres where the Maverick unit overlaps with the Casto wildlife emphasis area.

The types of impacts from grazing management would be the same as those described under Alternative B, but under Alternative C, BLM would manage 586,600 acres (4 percent fewer acres than under Alternative A) as open to grazing and 440,400 acres (84 percent more acres than under Alternative A) as closed to grazing. The remainder would be unallotted. In addition, BLM would require periodic rest and limit grazing on more areas, which would allow forage to recover and would limit the possibility of overgrazing. Grazing management would allocate increases in forage availability to wildlife species, which could allow for increases in carrying capacity for browsers in certain areas.

The types of impacts from recreation, such as from roads and displacement, would be the same as those described under Alternative B, but under Alternative C the BLM would manage two SRMAs on 60,000 acres (84 percent fewer acres than under Alternative A) and zero ERMAs. Although Alternative C provides fewer structured opportunities for recreation within the planning area, use would likely increase in proportion to population growth, and the BLM would have a reduced capacity to concentrate use in areas managed for recreation under this alternative.

No areas would be open to cross-country motorized use under Alternative C, which would prevent such impacts as those described under Effects Common to All Alternatives. Areas closed to motorized use on 379,500 acres (10.8 times more acres than under Alternative A) and limited to designated routes on 681,900 acres (3 times more acres than under Alternative A) would reduce the likelihood of direct impacts on habitats. Impacts on wildlife would still occur from disruption caused by motorized vehicles (e.g., noise, human presence).

Managing 627,000 acres (42 percent more acres than under Alternative A) as ROW avoidance and 365,800 acres (39 percent more acres than under Alternative A) as ROW exclusion areas would reduce impacts on fish and wildlife as described under Effects Common to All Alternatives. Furthermore,

requiring the use of delineated utility corridors, managing six corridors for utilities and facilities, and managing solar and wind emphasis areas on a total of 7,900 acres (47 percent fewer acres than under Alternative B) within the decision area would have the types of impacts as described under Alternative B, except there would be no SEZs. Pronghorn mitigation in the 2 Road solar emphasis area would apply to both pronghorn migration and winter use.

Under Alternative C, lands that contain big game critical and severe winter range would be retained, ensuring that habitat for these species is kept under BLM management.

Under Alternative C, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 251,200 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing. Areas unacceptable for coal leasing on 58,200 acres (58 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from coal mining on these lands.

Under Alternative C, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 506,700 acres (48 percent fewer acres than under Alternative A) as open to fluid mineral leasing. Areas closed to fluid mineral leasing on 554,700 acres (5.7 times more acres than under Alternative A), as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from fluid mineral leasing on these lands. NSO stipulations would be applied on 858,000 acres of federal mineral estate (98 percent more acres than under Alternative A), and CSU stipulations would be applied on 664,400 acres of federal mineral estate (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate).

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B, but under Alternative C, 45,100 acres (2.2 times more acres than under Alternative B) would be petitioned for withdrawal.

Twenty-three ACECs would be managed on 168,000 acres (5.8 times more acres than under Alternative A) under this alternative, providing protection to habitats and fish and wildlife as described under Alternative B.

In addition to those effects discussed under *All Fish and Wildlife Habitats*, the following habitat-specific effects would occur with implementation of Alternative C.

Sagebrush Habitats

Vegetation management in sagebrush habitats would be similar to those described under Alternative B. More cheatgrass treatments would be implemented under Alternative C, which would reduce infestations and restore native perennials over a greater area. Special status species management actions that would affect sagebrush species would be similar to those described under Alternative B, but Alternative C would apply additional protections, such as NSO stipulations for the nest sites of many raptor species, which would give more protection to other fish and wildlife species and habitats (see **Section 4.3.6**, Special Status Species).

Salt Desert Shrub Habitats

The types of impacts on salt desert shrub habitats from casual use, permitted activities, and changes in habitat condition under Alternative C would be the same as those described under *All Fish and Wildlife Habitats*. More cheatgrass treatments would be implemented under Alternative C, which would reduce infestations and restore native perennials over a greater area.

Forest and Woodland Habitats

Forest and woodland management would emphasize maintaining and expanding old-growth pinyon-juniper, which would provide habitat for wildlife that depend on this late seral vegetation community, such as increased cavities for nesting birds.

Riparian and Wetland Habitats

Fourteen segments that are eligible under the WSR Act, covering 99.5 miles, would be determined suitable for inclusion in the NWSRS. The interim management guidelines for suitable stream segments would assist in the protection of riparian and wetland habitats by preventing degradation of any resource that is essential for supporting the fish and recreation values identified on the Dolores River. There would also be additional protective measures for special status species than under Alternative B, including those that are associated with riparian and wetland habitats.

River and Stream Habitats

Management for aquatic invasive species would be similar to that described under Alternative B. The types of impacts on river and stream habitats from casual use, permitted activities, and changes in habitat condition would be the same as those described under *All Fish and Wildlife Habitats*, but there would be additional protections for river and stream habitats under Alternative C. For example, fourteen WSR segments, covering 99.5 miles, would be suitable for inclusion in the NWSRS. These would provide direct protection to fish and aquatic wildlife where they are an ORV. The interim protective guidelines as well as the use of stipulations and ROW exclusion and avoidance would protect waterways, riparian areas, and fish and aquatic wildlife from disturbance in these areas.

Barren Habitats

The types of impacts on barren habitats from casual use, permitted activities, and changes in habitat condition under Alternative C would be the same as those described under *All Fish and Wildlife Habitats*. The types of impacts from prohibiting domestic sheep grazing on allotments within both potential and occupied bighorn sheep habitat would be the same as described under Alternative B, but would occur over a larger area because Alternative B allows domestic sheep grazing on allotments within potential bighorn sheep habitat.

Alternative D

All Fish and Wildlife Habitats

The types of impacts on fish and wildlife from management for soil resources, water resources, invasive species and disease transmission, wild horses, wildland fire management, forestry, and interpretation and environmental education would be the same as those described under Alternative B, but Alternative D would emphasize management for commodities and resource uses, as well as maintenance of habitat conditions. While the BLM would comply with all laws and regulations, there would be less focus on resource protection through wildlife emphasis areas and ACECs and improvement or habitat restoration under Alternative D. There would also be fewer measures to reduce or limit surface-disturbing activities, such as fewer NSO, CSU, and TL stipulations, as well as ROW avoidance and exclusion areas. Stipulations are presented in **Table 2-1**. Under Alternative D, the BLM would manage one wildlife emphasis area (Roan and Carr Creeks) on 33,400 acres (82 percent fewer acres than under Alternative B). Other sensitive fish and wildlife areas would not be protected by a core area and would be at risk for impacts from uses and activities. Impacts would likely be dispersed throughout the decision area.

With its focus on commodities, Alternative D would allow the BLM to have fewer opportunities to use wildfire as a natural disturbance regime to meet resource objectives. This could lower biodiversity and vegetative health and vigor, increase cover of decadent (old and overgrown) plants, and prevent achieving land health standards. This would degrade fish and wildlife habitat in some areas.

The types of impacts from visual resources management would be the same as those described under Alternative A, but under Alternative D, 333,900 acres would be managed as VRM Class I and II 2.1 times more acres than under Alternative A).

No lands with wilderness characteristics would be managed for wilderness characteristics under Alternative D. Protections such as those described under Alternative B would not be applied in these areas.

The types of impacts from grazing would be the same as those described under Alternative B, but under Alternative D, BLM would manage 977,200 acres (less

than 1 percent fewer acres than under Alternative A) as open to grazing and would close 49,900 acres (3 percent more acres than under Alternative A). Limitations on grazing such as requiring periodic rest or seasonal restrictions would be applied on a case-by-case basis, which could allow for impacts on habitats and fish and wildlife in certain locations. In addition, increases in forage availability would be allocated to livestock, which would not allow for the expansion of carrying capacity for wildlife that utilize the same forage.

The types of impacts from recreation, such as from roads and displacement, would be the same as those described under Alternative B, but under Alternative D the BLM would manage six SRMAs on 79,000 acres (78 percent fewer acres than under Alternative A) and six ERMAs on 61,900 acres (91 percent fewer acres than under Alternative A). Alternative D would manage the fewest acres as SRMAs, while emphasizing recreation and visitation within the planning area. Since use would likely increase at a rate greater than local population growth (because of increased marketing), BLM would have a reduced capacity to concentrate use in areas managed for recreation. As such, more dispersed impacts on habitats and fish and wildlife may result.

Cross-country motorized use would be allowed on 10,200 acres (18 percent fewer acres than under Alternative A) under Alternative D, which would allow impacts on wildlife habitat that are described under Effects Common to All Alternatives. Areas closed to motorized use on 111,300 acres (3.2 percent more acres than under Alternative A) and limited to designated routes on 939,900 acres (4.2 times more acres than under Alternative A) would reduce the likelihood of impacts. Impacts on fish and wildlife would still occur from disruption caused by motorized vehicles (e.g., erosion, sedimentation, noise, human presence).

Managing 80,500 acres (82 percent fewer acres than under Alternative A) as ROW avoidance and 104,100 acres (56 percent fewer acres than under Alternative A) as ROW exclusion areas would reduce impacts on fish and wildlife as described under Effects Common to All Alternatives. The Ant Research Site would be a ROW avoidance area, which would reduce the likelihood for impacts in this area. Alternative D would put less emphasis on using utility corridors, and would manage eight corridors for utilities and facilities and 40,000 acres (1.7 times more acres than under Alternative B) as solar and wind emphasis areas. These actions could result in habitat fragmentation, degradation, and hazards to wildlife from transmission lines in previously undisturbed areas.

Under Alternative D, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 265,600 acres (12 percent fewer acres than under Alternative A) as acceptable for coal leasing. Areas unacceptable for coal leasing on 43,800 acres (19 percent more acres than under Alternative A),

as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from coal mining on these lands.

Under Alternative D, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 1,130,700 acres of federal mineral estate (1 percent fewer acres than under Alternative A) as open to fluid mineral leasing. Federal mineral estate closed to fluid mineral leasing on 100,500 acres (4 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from fluid mineral leasing on these lands. NSO stipulations would be applied on 497,800 acres of federal mineral estate (15 percent more acres than under Alternative A) and CSU stipulations would be applied on 471,500 acres of federal mineral estate (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate).

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B, but under Alternative D, 1,300 acres (94 percent fewer acres than under Alternative B) would be petitioned for withdrawal.

Five ACECs would be managed on 33,200 acres (15 percent more acres than under Alternative A), and these would be managed similar to Alternative B, although they would provide fewer protections to habitat and fish and wildlife.

In addition to those effects discussed under *All Fish and Wildlife Habitats*, the following habitat-specific effects would occur with implementation of Alternative D.

Sagebrush Habitats

Sagebrush communities would be maintained through vegetation treatments, prioritizing winter sage-grouse (greater and Gunnison) habitat for treatment and restoration, reducing pinyon-juniper encroachments, increasing habitat connectivity, and managing for age class diversity. Fire would be allowed in low-elevation sagebrush with reseeding, which would help to reduce the likelihood of cheatgrass infestation. Less stringent stipulations would be applied under Alternative D compared with Alternatives B and C. Therefore, Alternative D could allow for greater fragmentation and general habitat loss.

Salt Desert Shrub Habitats

Salt desert shrub habitats would be maintained through fire suppression, grazing management, and erosion control in greasewood communities. Less stringent special status species stipulations would be applied under Alternative D compared with Alternatives B and C, which could allow for impacts on wildlife species within this habitat type.

Forest and Woodland Habitats

Forest and woodland management would focus on management for mid seral pinyon-juniper. As a result, there could be more disturbance in this habitat type from harvest and treatment, which would impact pinyon-juniper-dependent species.

Riparian and Wetland Habitats

The types of impacts on riparian and wetland habitats from casual use, permitted activities, and changes in habitat condition under Alternative D would be the same as those described under *All Fish and Wildlife Habitats*. Vegetation management would be similar to that described under Alternative B, although firewood harvest would be allowed in riparian areas. Stipulations for special status species would be less stringent compared with Alternatives B and C, which could allow for some impacts on other fish and wildlife species within this habitat type.

Under Alternative D, no segments would be managed as eligible or suitable under the WSR Act. Impacts on river-related values, including riparian and wetland habitats, may occur because there will be no standard for protection of those values. BLM may protect those values through other land use prescriptions and stipulations in this RMP.

River and Stream Habitats

The types of impacts on river and stream habitats from casual use, permitted activities, and changes in habitat condition under Alternative D would be the same as those described under *All Fish and Wildlife Habitats*. BLM would prioritize and implement management actions to achieve desired future conditions of rivers and streams. Management for aquatic invasive species would be similar to that described under Alternative B.

Under Alternative D, no segments would be managed as eligible or suitable under the WSR Act. Impacts on river-related values, including river and stream habitats, may occur because there will be no standard for protection of those values. BLM may protect those values through other land use prescriptions and stipulations in this RMP.

Barren Habitats

Domestic sheep grazing would be avoided on allotments within occupied bighorn sheep habitat, which would reduce the likelihood of disease transmission in these areas. Domestic sheep grazing could be permitted outside of occupied habitat, which could allow for a low risk of disease transmission, as individual bighorn sheep can roam outside the mapped occupied range.

Cumulative

The CIAAs used to analyze potential impacts on wildlife and fisheries vary by species. The CIAAs for terrestrial wildlife are composed of the game management units that intersect the planning area. The CIAA for greater sage-

grouse includes habitat polygons of the Parachute-Piceance-Roan population that intersect the planning area (identified in the 2008 Parachute-Piceance-Roan Greater Sage-grouse Conservation Plan). The CIAA for Gunnison sage-grouse *(Centrocercus minimus)* includes the Pinyon Mesa population boundary (identified in the 2000 Pinyon Mesa Gunnison Sage-grouse Conservation Plan). The CIAA for fisheries covers the same area as the CIAA for water resources. It extends outside the planning area, following fourth-order watershed boundaries.

Cumulative impacts on fish and wildlife are related to those described above for vegetation, since vegetative communities provide the habitat for wildlife species and can affect habitat for fish species (e.g., riparian vegetation). Past, present, and reasonably foreseeable future actions and conditions within the CIAA that have affected and will likely continue to affect fish and wildlife include mineral exploration and development, residential and industrial development, forestry, grazing, recreation, road construction, water diversion and withdrawals, weed invasion and spread, prescribed and wildland fires, land planning efforts, vegetation treatments, habitat improvement projects, insects and disease, and drought. Many of these activities change habitat conditions, which then cause or favor other habitat changes. For example, wildland fire removes habitat, and affected areas are more susceptible to weed invasion, soil erosion, and sedimentation of waterways, all of which degrade habitats. In general, resource use activities have cumulatively caused habitat removal, fragmentation, noise, increased human presence, and weed spread. Land planning efforts and vegetation, habitat, and weed treatments have offset some of these effects by improving habitat connectivity, productivity, diversity, and health.

Climate change could cause an increase or decrease in temperatures and precipitation, which would affect soil conditions, vegetative health, and water flows and temperature. Such changes would alter habitat conditions, potentially creating conditions that could favor certain species or communities, weeds, or pests.

Under the proposed plan and alternatives, impacts on fish and wildlife would be minimized to the extent practicable and feasible through restrictions, stipulations, closures to mineral exploration and development, recreation, and motorized travel, COAs, and by concentrating development in previously disturbed areas. In those alternatives with wildlife emphasis areas, fish and wildlife management would be improved by concentrating management efforts in certain high-value areas. Habitat conditions would be improved through treatments, weed prevention and control, acquisition of water rights, use of prescribed and wildland fire, forestry management, and grazing management. Since Alternative D would emphasize more resource use and development, impacts on fish and wildlife and habitats would be more likely to occur under this alternative. As a result, Alternative D could significantly contribute to cumulative impacts on fish and wildlife and their habitats. In contrast, the

incremental contribution of Alternatives A, B, and C to cumulative impacts on fish and wildlife and habitats is expected to be less than significant.

4.3.6 Special Status Species

This section discusses impacts on special status species (including federally listed species and BLM sensitive species) and state-listed species, from proposed management actions of other resources and resource uses. Existing conditions concerning special status species are described in **Section 3.2.8**, Special Status Species.

Methods of Analysis

Although data on currently occupied locations and habitats within the planning area are available, the data are neither complete nor comprehensive concerning all special status species known to occur and potential habitat that might exist. Known and potential special status species and currently occupied and potential habitat locations were considered in the analysis; however, the potential for species to occur outside of these areas was also considered and, as a result, some impacts are discussed in more general terms.

Impacts on special status species would primarily result from unmitigated surface disturbance such as cross-country motorized travel, wildfires, wildfire suppression activities, erosion, unauthorized collection or poaching, and trampling, including displacement of individuals due to human activities. Direct and indirect impacts on special status species result from any surface-disturbing activity or alteration to occupied habitats. All federal actions would comply with ESA consultation requirements. All implementation actions would be subject to further special status species review before site-specific projects are authorized or implemented. Standard federal protections and BLM policy protecting threatened, endangered, and sensitive species would be expected to reduce the potential impacts from permitted activities. If adverse impacts were identified, mitigation measures, including avoidance, would typically be implemented to minimize or eliminate the impacts.

Impacts on special status species and their habitats include the following:

- Violation of the ESA, Bald and Golden Eagle Protection Act, MBTA, or applicable state laws or BLM regulations (e.g., BLM Manual 6840 and related Instruction Memorandum).
- Harm, harassment, or adverse effects on any federally listed threatened or endangered species or federally proposed or candidate species.
- Destruction or deterioration of federally listed threatened or endangered species' or federally proposed or candidate species' habitat, migration corridors, breeding areas, or designated or proposed critical habitat.

- Decreased population viability or contribution to the need for a federal listing of any federal candidate species or BLM sensitive species.
- Loss of habitat function or habitat value in BLM sensitive species habitats.

Indicators of impacts on special status species include the following:

- Location, type, and intensity of disturbances relative to currently occupied or potential special status species habitat.
- Extent of disturbance and amount of habitat removed.
- Tolerance of a given special status species to disturbance.
- Road density and distance of roads from special status species habitat.
- Conflict with BLM Handbook H1740-2, Integrated Vegetation Management.
- Likelihood for an activity to cause a special status species population to drop below self-sustaining numbers or cause a substantial loss or disturbance to habitat.
- Likelihood for adverse effects on a federally listed or proposed species, as defined under the ESA.
- Likelihood for an activity to contribute to the need to list any BLM sensitive or federal candidate species.

The analysis includes the following assumptions:

- Because of the large number of special status species, it was determined that the most effective way to disclose impacts at the programmatic level would be to analyze the impacts on the habitat cover types used by these species (see **Chapter 3** for species and habitat descriptions). Accordingly, for the purposes of analysis, the special status species described in **Chapter 3** are grouped here by habitat type (**Table 4-27**, Special Status Species Grouped by Status and Habitat). Direct and indirect impacts on species were still analyzed and are generally discussed under *All Habitats and Special Status Species* headers.
- The analysis presented is largely qualitative due to the lack of data or uncertainty in existing data on certain special status species' occurrences, for example, many of the BLM sensitive plant species. Furthermore, since many special status species may potentially use habitats that are currently unoccupied and populations fluctuate, any quantitative analysis of occupied habitat would underestimate

Table 4-27
Special Status Species Grouped by Status and Habitat

Species Name	Sagebrush	Salt Desert Shrub	Forest and Woodland	Riparian and Wetland	Rivers and Streams	Barren
Federally listed species						
Mexican spotted owl[1]			X			
Canada lynx[1]			X			
Southwestern willow flycatcher[2, 3]				X		
Greenback cutthroat trout[1]				X	X	
Colorado pikeminnow[2]				X	X	
Razorback sucker[2]				X	X	
Bonytail[2]				X	X	
Humpback chub[2]				X	X	
Colorado hookless cactus[1]	X	X				X
DeBeque phacelia[1]						X
Parachute penstemon[1]						X
Federal candidate species						
Greater sage-grouse	X					
Gunnison sage-grouse[3]	X					
Western yellow-billed cuckoo[3]				X		
Bald and Golden Eagle Protection Act species						
Bald eagle[3]				X		
Golden eagle[3]	X	X				X
BLM sensitive species						
Great Basin spadefoot				X	X	X
Long-nosed leopard lizard		X				
Midget faded rattlesnake	X	X	X			X
Brewer's sparrow[3]	X					
Burrowing owl[3]		X				
Ferruginous hawk[3]		X				
Kit fox		X				
White-tailed prairie dog		X				
Jones' bluestar	X	X				X
Horseshoe milkvetch	X	X				
Grand Junction milkvetch		X				
Ferron milkvetch		X				
Fisher Tower's milkvetch		X				
Grand buckwheat		X				
Canyonlands biscuitroot		X				
Narrow-stem gilia		X				
Grand Junction suncup		X				
Tufted green gentian		X				
Northern goshawk			X			

Table 4-27
Special Status Species Grouped by Status and Habitat

Species Name	Sagebrush	Salt Desert Shrub	Forest and Woodland	Riparian and Wetland	Rivers and Streams	Barren
Naturita milkvetch			X			
Aromatic Indian breadroot			X			
Dolores River skeleton plant		X	X			
Boreal toad				X		
Canyon treefrog					X	
Northern leopard frog				X	X	
Milk snake		X	X	X		
American white pelican				X	X	
Long-billed curlew[3]		X		X		
White-faced ibis				X		
Western snowy plover[3]					X	
Great Basin silverspot				X		
Colorado river cutthroat trout					X	
Roundtail chub				X	X	
Bluehead sucker				X	X	
Flannelmouth sucker				X	X	
American peregrine falcon[3]						X
Desert bighorn sheep						X
Spotted bat				X		X
Fringed myotis	X		X	X		X
Townsend's big-eared bat		X	X	X		X
Big free-tailed bat		X	X	X		X
DeBeque milkvetch						X
San Rafael milkvetch						X
Gypsum Valley cateye						X
Osterhout cryptanth	X		X			X
Kachina daisy						X
Piceance bladderpod						X
Roan Cliffs blazingstar						X
Eastwood's monkeyflower				X		
Sun-loving meadowrue						X
USFWS Birds of Conservation Concern[4]						
Cassin's finch			X			
Flammulated owl			X			
Grace's warbler			X			
Gray vireo			X			
Juniper titmouse			X			
Lewis' woodpecker			X			
Pinyon jay			X			
Prairie falcon						X

[1] Federal threatened species
[2] Federal endangered species
[3] Also a USFWS Birds of Conservation Concern species
[4] Includes those USFWS Birds of Conservation Concern that are not BLM Sensitive species

potential impacts on special status species. Where appropriate, acreages from **Table 2-1** are included to show a comparison between alternatives.

- Under all alternatives, no decision would be approved in this RMP revision or authorized on BLM lands that would jeopardize the continued existence of special status species that are listed, proposed, or candidates for listing as threatened or endangered. Implementation of the special status species program is directed at preventing the need for listing of BLM sensitive species under the ESA, protecting special status species, and improving their habitats to a point where their special status recognition is no longer warranted.
- Ground-disturbing activities could lead to modification (positive or negative) of habitat and/or loss or gain of individuals, depending on the amount of area disturbed, nature of the disturbance, the species affected, and the location of the disturbance.
- NSO stipulations would provide the greatest protection to special status species and their habitats by prohibiting surface-disturbing activities in these areas. This would prevent disturbance to species and habitats caused by fluid mineral development and would prevent direct impacts on species, as described below. CSU stipulations would provide slightly less protection to special status species and their habitats since surface-disturbing activities would be allowed and species and habitats could be disturbed. However, CSU stipulations could protect special status species and their habitats in certain instances by requiring special operational constraints or by moving the surface-disturbing activity to protect special status species. Timing limitations would protect certain special status species during periods when species would be most sensitive to disturbance, such as during nesting and spawning and wintering periods.
- Changes in air, water, and habitat quality could lead to direct impacts and could have cumulative impacts on species survival.
- Road density in a given area (watershed) and the distance of roads from special status species habitat provides an indication of the potential for impacts on special status species. For fish and aquatic wildlife, roads are a measure of lands available for accelerated water transport and potential erosion and off-site sediment transport. For special status plants, roads also contribute to increasing exposure to dust, reducing pollinator habitat and providing a niche for the invasion of noxious weeds. However, the actual impacts and degree of impacts are dependent on additional variables, such as the class of road (dirt, gravel, paved), type and frequency of maintenance, road condition (rutted, bar ditched, properly drained), the type of

vegetation between the road and occupied or suitable habitat, the topography, the ecological condition of the suitable or occupied habitat, and soil characteristics.

- Impacts on special status species would be more significant than impacts on common species because population viability is already uncertain for special status species.
- Implementation-level actions would be further assessed at an appropriate spatial and temporal scale and level of NEPA analysis. Additional field inventories would likely be needed to determine whether any special status species could be present in the project area.
- The USFWS would be consulted for any actions that have a potential to affect federally listed species.
- BMPs and standard operating procedures, outlined in **Appendix H**, are used for analysis purposes and would be implemented to reduce impacts on special status species. These are subject to modification based on subsequent guidance.
- Short-term effects would occur over a timeframe of two years or less and long-term effects would occur over longer than two years.

Because special status species have specific habitat requirements and often thrive in a particular microhabitat, disturbance to the species or their habitat could result in population declines, which could affect survivability of local populations. Specific habitat requirements, population trends in the planning area, and factors affecting population trends in the planning area are detailed in **Section 3.2.8**. Relevant recovery plans or conservation strategies, and the biological assessment prepared for this RMP under ESA Section 7 requirements, are also described in **Chapter 3**. Three general categories of disturbance would be anticipated to be the most influential on special status species and their habitat: 1) disturbances from casual use; 2) disturbances from permitted activity; and 3) changes in habitat condition such as from fire or weed invasion.

Effects Common to All Alternatives

Types of Impacts – Fish and Wildlife

The types of impacts that could occur on special status fish and wildlife species would be similar to those described in **Section 4.3.5**, but their effects would be magnified because of the species' rarity.

Types of Impacts – Plants

The types of impacts that could occur on special status plant species include loss of vigor or reduced reproductive success, changes in habitat structure, competition, loss of pollinators or pollinator habitat, soil compaction, erosion or sedimentation, alteration of hydrologic conditions, and changes in fire regime.

Loss of Vigor or Reduced Reproductive Success. Trampling and contact with chemicals may not always result in direct mortality but can cause a reduction in vigor that affects the ability of the plant to reproduce and sustain the population. Herbivory (consumption of inflorescences, seeds, or vegetative parts of special status plants) can result in reduced reproductive success, or in some cases, death. Dust deposition on special status plants may reduce photosynthetic ability or the ability of pollinators to transfer pollen between plants.

Changes in Habitat Structure. A canopy cover of shrubs offers habitat characteristics that appear to be favorable for the germination and establishment of several special status plant species, such as Colorado hookless cactus *(Sclerocactus glaucus)*. Shrubs may provide protection for some special status plants from herbivory or trampling and may provide improved moisture availability or reduced moisture loss under the canopy. Surface-disturbing activities that significantly reduce the percent canopy cover of shrubs may allow increased herbivory or moisture loss, resulting in decreased vigor or mortality of special status plants. Increases in canopy cover may not always be beneficial, as some special status plant species require more open habitats.

Competition. Changes in species composition also affect special status plant populations. Proliferation of noxious weeds or other invasive plants may render habitat unsuitable by outcompeting special status plants for water and nutrients or by preventing seedling germination and establishment. Occupied Colorado hookless cactus habitat that is dominated by cheatgrass appears to inhibit germination of seedling cactus, thereby threatening the long-term viability of these populations. In some cases, increases in canopy cover and density of native species, particularly grasses, can compete with special status plants for limited water and nutrients.

Other special status plant species, such as the Parachute penstemon *(Penstemon debilis)*, DeBeque phacelia *(Phacelia submutica)*, and Gypsum Valley cateye *(Cryptantha gypsophila)*, thrive in environments where competition is low. Increases in vegetative cover (following disturbances such as fire or mechanical treatments or seeding) may cause competition with special status plants, resulting in decreased vigor or mortality.

Loss of Pollinators or Pollinator Habitat. Actions that disturb pollinators or destroy their habitat can have a detrimental impact on special status plant species. Long-term loss of pollinators can reduce the reproductive ability of these plant species and affect maintenance and genetic diversity of populations.

Soil Compaction. Soil compaction resulting from heavy equipment or vehicle travel may reduce soil pore size and water infiltration, thereby inhibiting maintenance or establishment of special status plants.

Erosion or Sedimentation. Special status plants may be washed away or have roots exposed by erosion from surface-disturbing activities, such as blading or

bulldozing of roads. Special status plants may be buried by sedimentation resulting from disturbances that occur upslope of special status plant populations.

Alteration of Hydrologic Conditions. Some special status plant species that are dependent on seasonally flooded environments, subirrigated soils, or seeps may be adversely affected by changes in water flow.

Changes in Fire Regime. Changes in species composition, either within special status plant habitat, or in adjacent plant communities, may alter the natural fire regime to which the plants are adapted. Cheatgrass, a highly flammable annual grass, may drastically increase the fire frequency in special status plant habitat, affecting the survivability and viability of the population.

Together, these impacts could lead to fewer and more fragmented special status populations that are more at risk for extirpation due to reduced habitat quality, diminished reproductive ability, and altered fire regime. Impacts on special status plants from implementation of the RMP are summarized by alternative in the following subsections.

All Habitats and Special Status Species

Many of the impacts on special status species would be similar to those described previously in **Section 4.3.4**, Vegetation and **Section 4.3.5**, Fish and Wildlife. Similar impacts include those from recreation, comprehensive travel and transportation management, mineral resource and ROW developments, and changes to habitat conditions. In general, special status species would be more sensitive to habitat fragmentation, development, or changes in habitat conditions, as populations are often already highly fragmented, require specific microhabitats, and are especially sensitive to disturbance and human presence. Furthermore, the more acres managed for dispersed recreation, open to motorized use, and open to mineral and ROW development, the greater the impacts on special status species and habitats. In addition, lease stipulations to protect special status species would be applied under all alternatives, though the degree of protection varies by alternative (**Appendix B**). Sage-grouse preliminary priority habitat (PPH) would not be acceptable for coal leasing under all alternatives.

Soil and water protections, through the use of NSO and CSU stipulations that overlap areas with saturated or frozen soils, would protect currently occupied and undetected special status species habitat and populations from the effects of surface-disturbing activities. Determining soil suitability for surface-disturbing activities would help maintain habitat where vegetation would be sensitive to removal and would reduce the likelihood of erosion and sedimentation of waterways.

Under all alternatives, soil and vegetation management and protection would impact special status species' habitats and could directly affect special status

species. Management to improve and protect soil and vegetation conditions throughout the planning area would improve vegetative and stream cover, reduce the likelihood for erosion and sedimentation, maintain seed banks, and support special status plant species. Most vegetation treatments would not affect special status species, as they are designed to avoid occupied special status species habitat. Improved vegetative conditions would improve habitat for special status wildlife by providing more opportunities for nesting, roosting, cover, and forage over the long term. In the short term, vegetation treatments could remove potential breeding, nesting, roosting, or foraging habitat or increase the potential for weed spread. Impacts would be more likely to occur on previously undiscovered populations, since all special status species known to occur would be considered prior to implementing vegetation treatments. In addition, human disturbance and noise associated with the use of heavy equipment for vegetation removal could temporarily displace special status bird, bat or mammal species from foraging, breeding, roosting, and nesting habitats.

In general, management actions under Alternatives B, C and D would prevent the spread of wildlife diseases such as white nose syndrome, since BLM would consider closure of caves and other structures used by bats, as well as temporary closures in case of an outbreak or threat of an outbreak.

Unplanned wildfires could destroy known and undiscovered special status plant populations, depending on the location and severity. In certain circumstances, the special status plant seed bank could be destroyed through denaturing or lost by erosion. In addition, depending on the extent, location, severity, and seral stage affected, fire would have short-term impacts on special status wildlife by removing habitat for some species or by destroying streamside cover. In the long term, habitat for late seral-dependent species such as Mexican spotted owl *(Strix occidentalis lucida)* and Canada lynx *(Lynx canadensis)* may be lost, but habitat for other species may be improved through removal of decadent vegetation, improved vegetative health, and increased structural diversity.

Increased human activity and noise associated with wildland fire suppression and prescribed fire in areas occupied by special status species would affect nesting, breeding, foraging, or roosting behavior. Important habitats could be altered because of the use of heavy equipment, hand tools, and noise associated with intensive human activity. However, there is also a risk of habitat loss in areas where wildland fire suppression is absent or limited due to the increased potential for large and more severe wildfires. This in turn is balanced by the fact that a large fire could require extensive suppression operations, such as extensive staging areas and fire-line construction, that could themselves result in long-term effects on special status species and their habitats. Smaller fires that would require less extensive suppression operations would generally avoid these long-term effects.

If managed improperly, livestock grazing could have impacts on special status plants, including federally threatened Colorado hookless cactus and DeBeque phacelia, by trampling, soil compaction, and weed spread. This could cause injury or mortality to special status plants or degrade potential or occupied habitats. Impacts would go undetected if grazed areas have not been previously inventoried for special status plant species. Overgrazing could remove forage and cover that would otherwise be used by special status wildlife, creating competition for resources. Proper grazing techniques could minimize impacts. If properly managed, grazing would not conflict with special status species conservation.

Closing areas to recreational target shooting would result in reduced risk of lead poisoning and elevated lead concentrations in tissues of special status bird species that utilize these areas (USGS 2009).

WSAs would provide indirect protection to special status species and potential or occupied habitats through closure to fluid mineral leasing and NSO stipulations.

Under all alternatives, ACECs would be designated to protect special status species. ACECs provide protection to special status species and habitats in several ways. They are typically withdrawn from locatable mineral entry, managed as ROW exclusion or avoidance areas, and restricted from a net increase in travel routes. Specific management for each ACEC under each alternative is presented in **Table 2-2** and is described below under each alternative. These special management prescriptions provide broad protection from habitat fragmentation and loss of potential habitat. In general, the greater the acreage managed as ACECs, the greater the protection from surface disturbance that would be provided to special status species.

Sagebrush Habitats and Species

Similar to terrestrial wildlife in **Section 4.3.5**, many special status wildlife species avoid development, recreation, and roads. While the long-term impacts of fluid minerals development are unclear (Connelly et al. 2000), recent studies have shown effects from these activities on special status species. Greater sage-grouse is a well-researched species on this topic. Impacts include reduced nest initiation rates (Lyon and Anderson 2003), avoidance of developed areas and increases in movement (Lyon and Anderson 2003; Holloran 2005; Crompton 2005; Doherty et al. 2008), reduced attendance of males at lek sites (Holloran 2005; Walker et al. 2007; Crompton 2005), and reduced survivorship (Crompton 2005). Impacts occur in lekking, nesting, brood rearing, and winter habitat (Crompton 2005; Doherty et al. 2008), and negative effects have been shown to occur from 0.5 mile to 4 miles away from oil and gas development (Walker et al. 2007; Naugle et al. 2009). It is possible that sage-grouse may repopulate developed areas after oil and gas operation ends, but long-term studies have not yet been conducted. It is also possible that similar effects would

occur to other special status species such as mountain plover *(Charadrius montanus)*. Under all alternatives, BLM would require avoidance of sensitive special status species habitats by lessees, and would apply stipulations and/or COAs to minimize impacts, though the type of stipulation would vary by alternative.

Under all alternatives, a Lease Notice would be applied in Colorado hookless cactus habitat, and botanical inventories may be required before surface-disturbing operations are approved. The implementation-level inventory would be used to prepare special design and construction measures to reduce the impacts of surface disturbance on the Colorado hookless cactus.

Salt Desert Shrub Habitats and Species

The types of impacts on salt desert shrub habitats from casual use, permitted activities, and changes in habitat condition common to all alternatives would be similar to those described in Section 4.3.5 for *All Fish and Wildlife Habitats*.

Forest and Woodland Habitats and Species

The types of impacts on forest and woodland habitats from casual use, permitted activities, and changes in habitat condition common to all alternatives would be similar to those described in Section 4.3.5 under *All Fish and Wildlife Habitats*.

Riparian and Wetland Habitats and Species

The types of impacts on riparian habitats from casual use, permitted activities, and changes in habitat condition common to all alternatives would be similar to those described in Section 4.3.5, Fish and Wildlife under *Riparian and Wetland Habitats and Species*.

River and Stream Habitats and Species

The types of impacts on river and stream habitats from casual use, permitted activities, and changes in habitat condition common to all alternatives would be similar to those described in Section 4.3.5, Fish and Wildlife under *River and Stream Habitats and Species*.

Barren Habitats and Species

Cliff-nesting raptors such as peregrine falcons *(Falco peregrinus)* and golden eagles *(Aquila chrysaetos)*, which occur or could occur in these areas, would receive protection in the Palisade and Sewemup Mesa WSAs from management actions associated with those WSAs. Special status plant species that inhabit barren areas (**Table 4-27**), such as Parachute penstemon, DeBeque phacelia, DeBeque milkvetch *(Astragalus debequaeus)*, Roan Cliffs blazingstar *(Mentzelia rhizomata)*, and sun-loving meadowrue *(Thalictrum heliophilum)*, would also be protected for the same reason.

Implementing management for the following resources would have negligible or no impact on special status species and are therefore not discussed in detail: air

quality; cultural resources; paleontology; wild horses; national, state, and BLM byways; Native American tribal uses; public health and safety; socioeconomics; or environmental justice.

Alternative A

General Special Status Species

In general, Alternative A would rely on outdated management guidance that would not reflect current conditions and issues, and would lack a landscape-level approach to land planning. Impacts would be similar to those described in **Section 4.3.4** and **Section 4.3.5**. Known special status species populations would be protected; impacts would be more likely to occur on previously undiscovered special status species populations.

The lack of comprehensive planning for vegetation, fish and wildlife, and special status species would result in habitat management that is applied on a case-by-case basis and that would not give the BLM the authority to implement or enforce certain management actions. Protection for known special status species and currently occupied habitats would occur, and management flexibility would allow the BLM to adaptively manage resources. NSO stipulations would be applied on 1,300 acres in the Badger Wash, Pyramid Rock, and Unaweep Seep ACECs to protect threatened, proposed, candidate, and sensitive plants. In addition, a TL stipulation would be applied around bald eagle *(Haliaeetus leucocephalus)* and peregrine falcon seasonal habitats. A Lease Notice would require lessees to submit a plan for avoidance or mitigation of impacts in black-footed ferret and Colorado hookless cactus habitat. An intensive inventory may be required. These stipulations would directly protect special status species. Indirect protection to potential or occupied special status species habitat would occur from other NSO, CSU, and TL stipulations, as listed in **Appendix B**. Vegetation and weed treatments and range improvements would be implemented, which would improve habitat conditions and trend toward achieving land health standards.

Fire management under Alternative A would utilize mechanical treatments and prescribed fire for resource benefit, but would be limited in the use of unplanned fire. This would cause some short-term disturbance to special status species habitats and populations and long-term improvement in habitat health and productivity, as described under Effects Common to All Alternatives.

Areas managed as VRM Class I and II on 159,200 acres, as well as stipulations to protect visual resources, would indirectly protect known and undetected special status species populations and currently occupied and potential habitats by limiting or prohibiting surface-disturbing activities in these areas.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives and in **Section 4.3.4** and **Section 4.3.5**. Range improvements would be used to improve vegetation and habitat

conditions, which in most cases would reduce potential impacts on special status species habitats and populations over the long term. BLM would manage 978,600 acres as open and 48,600 acres as closed to grazing under this alternative.

Under Alternative A, BLM management of SRMAs, IRMAs, and ERMAs would continue to be insufficient to accommodate current and future levels of recreation, which could lead to an increase in impacts on special status species habitats and populations as population and recreation use increase. Impacts could occur where the Rough Canyon ACEC, designated to protect Gunnison sage-grouse, the canyon treefrog *(Hyla arenicolor)*, and Grand Junction milkvetch *(Astragalus linifolius)*, overlaps with the Bangs Canyon SRMA. The overlapping RMZ would be focused to support the ACEC, which would minimize impacts. If impacts occurred, BLM would change management within the SRMA to help protect special status species. Four SRMAs would be managed on 358,300 acres and one ERMA would be managed on 703,100 acres under this alternative.

Cross-country travel would be allowed on 445,400 acres, and intensive motorized use would be allowed on 12,500 acres within the decision area. This could cause impacts on habitats and known and undiscovered populations through surface disturbance, noise, erosion, sedimentation, and the potential for weed spread (see **Section 4.3.4** and **Section 4.3.5**, for more details). Areas limited to existing routes and designated routes on 568,200 acres would have fewer impacts but could still disturb special status wildlife from noise and human presence. Areas closed to motorized use on 35,300 acres (and in WSAs, where motorized and mechanized use would be limited to existing ways) would reduce the likelihood of these impacts.

Lands and realty management actions would identify 441,400 acres of ROW avoidance and 234,900 acres of ROW exclusion areas, as well as areas unsuitable for or sensitive to utility development. This would protect habitats or minimize impacts from disturbance in these areas. The BLM would manage seven corridors for utility and facility development.

Under Alternative A, the BLM would manage 300,700 acres as acceptable for coal leasing, causing impacts such as habitat removal, fragmentation, weed spread, and direct injury or mortality to special status species (see **Section 4.3.4** and **Section 4.3.5** for more details). Areas unacceptable for coal leasing on 36,700 acres would prevent habitat and special status species impacts from coal extraction on these lands.

Under Alternative A, the BLM would manage 1,134,600 acres of federal mineral estate as open to fluid mineral leasing, causing impacts such as habitat removal, fragmentation, weed spread, and direct injury or mortality to special status species (see **Section 4.3.4** and **Section 4.3.5** for more details). Areas closed to fluid mineral leasing on 96,500 acres, as well as stipulations on open lands, would prevent habitat and special status species impacts from mineral

development on these lands. NSO stipulations would be applied on 433,000 acres and CSU stipulations would be applied on 74,100 acres, which would reduce the impact of fluid mineral development on special status species.

Five ACECs would continue to be managed on 28,900 acres: Badger Wash, The Palisade, Pyramid Rock, Rough Canyon, Unaweep Seep. In these areas, special status species would receive direct protection through such measures as closing areas to motorized use, managing areas as unsuitable for ROWs, and applying NSO stipulations.

In addition to those effects discussed under *General Special Status Species*, the following habitat-specific effects would occur with implementation of Alternative A.

Sagebrush Habitats

The types of impacts on sagebrush habitats from casual use, permitted activities, and changes in habitat condition under Alternative A would be the same as those described in Section 4.3.5 under *All Fish and Wildlife Habitats*. In addition, decisions for livestock grazing, lands and realty, mineral resources, and travel management would impact greater sage-grouse PPH and Preliminary General Habitat (PGH), as shown in **Table 4-28**, Impacts on Greater Sage-Grouse Habitat, Alternative A.

Table 4-28
Impacts on Greater Sage-Grouse Habitat, Alternative A

Resource	PPH (acres)	PGH (acres)
Livestock Grazing		
Open	5,400	8,700
Closed	0	0
Lands and Realty		
ROW avoidance	200	3,900
ROW exclusion	0	100
Mineral Resources		
Fluid minerals – open	5,600	8,900
Fluid minerals – closed	0	0
Mineral materials - open	4,800	7,300
Mineral materials - closed	800	1,600
Travel Management		
Open to all modes of travel	5,600	6,400
Seasonal closure for motorized vehicles	0	2,500

Salt Desert Shrub Habitats

The types of impacts on salt desert shrub habitats from casual use, permitted activities, and changes in habitat condition under Alternative A would be the same as those described in Section 4.3.5 under *All Fish and Wildlife Habitats*.

Forest and Woodland Habitats and Species
While special status species habitat would be excluded from commercial forestry under Alternative A, impacts on potential habitat or undiscovered populations could occur due to habitat removal, human presence and disturbance, use of vehicles and heavy machinery, noise, and potential for weed spread.

Riparian and Wetland Habitats and Species
Forestry impacts would be similar to those described under *All Fish and Wildlife Habitats* in **Section 4.3.5**.

Fourteen river segments would be managed as eligible for inclusion in the NWSRS. Interim protective management guidelines would help to protect or reduce impacts on riparian habitats and special status species which rely on these habitats, such as the federally endangered Southwestern willow flycatcher *(Empidonax traillii extimus)*, cutthroat trout *(Oncorhynchus clarkii)* and other special status aquatic species, ESA candidate western yellow-billed cuckoo *(Coccyzus americanus occidentalis)*, and BLM sensitive Eastwood's monkeyflower *(Mimulus eastwoodiae)*, in these areas.

River and Stream Habitats and Species
Forestry impacts would be similar to those described for *Riparian and Wetland Habitats and Species*. Surface-disturbing activities would increase the likelihood for soil erosion and sedimentation of waterways as well as degradation of water quality, which would impact sediment intolerant species, such as cutthroat trout, more than sediment tolerant species.

WSR impacts would be similar to those described for *Riparian and Wetland Habitats and Species*. In addition, direct protection of special status fish and aquatic species would occur where fish are an ORV for a WSR-eligible segment.

Barren Habitats
The types of impacts on barren habitats from casual use, permitted activities, and changes in habitat condition under Alternative A would be the same as those described in **Section 4.3.5** under *All Fish and Wildlife Habitats*.

Alternative B

General Special Status Species
Under Alternative B, the BLM would implement more protective management measures for special status species, including applying NSO, CSU and TL stipulations, and managing areas as ROW avoidance and exclusion. By prioritizing desired plant communities, managing wildlife emphasis areas, and designating ACECs, the BLM would be able to focus their habitat management efforts in the areas that would be most effective to preserve and protect habitats. Special status species would benefit directly and indirectly from these management actions.

Vegetation management under Alternative B would emphasize improving and restoring vegetation and special status species habitats. Actions would be implemented to reduce fragmentation. In addition, treatments that would provide for plant diversity and a variety of seral stages within each vegetation type would support a higher diversity of wildlife species over the long term. Adaptive drought management actions would prevent surface-disturbing activities and associated impacts during periods of extreme to exceptional drought.

Fish and wildlife management would improve and maintain habitat throughout the decision area, and applying stipulations to reduce surface-disturbing activities would prevent impacts on special status species. Fish and wildlife stipulations and restrictions include applying a CSU in high value and crucial wildlife habitat, managing the Ant Research Site as a ROW exclusion area, managing the Owl Banding Station as a ROW avoidance area, and applying a CSU on deer and elk migration and movement corridors. Managing 170,500 acres of wildlife emphasis areas (no wildlife emphasis areas are identified under Alternative A) would protect known and undiscovered populations of special status species and potential habitat that occur in these areas through restrictions and stipulations (see **Section 4.3.5**).

Special status species management under Alternative B would protect known and potential locations of special status plant species and special status wildlife species from surface-disturbing activities. A variety of stipulations would be applied to protect habitats and populations, including a TL for migratory bird habitat. NSO stipulations would be applied within 200 meters of current and historically occupied and suitable habitat for threatened, endangered, proposed, and candidate plant species. In addition, CSU stipulations may require special design, construction, and implementation measures within 100 meters (328 feet) and relocation of activities within 200 meters (656 feet) of occupied habitat for BLM sensitive species and habitat necessary for species recovery. A Lease Notice would require biological inventories in areas of currently occupied or suspected habitat of special status species, and mitigation measures would be developed, if necessary. These stipulations would provide more protection for special status species than would Alternative A, which would have few stipulations for special status species. Eleven ACECs (totaling 106,000 acres) would be designated to protect special status species and would be protected by an NSO stipulation: Atwell Gulch, Badger Wash, Dolores River Riparian, Juanita Arch, The Palisade, Pyramid Rock, Roan and Carr Creeks, Rough Canyon, Sinbad Valley, South Shale Ridge, and Unaweep Seep.

Under Alternative B, BLM would have increased opportunities to use fire as a natural disturbance regime to meet resource objectives. Using a variety of fuel treatments would have short-term effects on special status species habitat through crushing and vegetation removal as well as increasing the likelihood of erosion and sedimentation. Increased human presence during fuel treatments

could temporarily affect species by increasing the potential for habitat avoidance. In the long term, these activities would prevent uncharacteristically large or intense wildfires that could damage large expanses of habitat or kill or displace known or undiscovered populations of special status species. In addition, the condition of upland vegetation would be improved, which would benefit both terrestrial and aquatic special status species. ESR treatments would help reestablish vegetation and restore habitat for wildlife.

The types of impacts from visual resources management would be the same as those described under Alternative A. Under Alternative B, 518,600 acres 3.3 times more acres than under Alternative A) would be managed as VRM Class I and II.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives. BLM would manage 961,100 acres (2 percent fewer acres than under Alternative A) as open and 66,000 acres (36 percent more acres than under Alternative A) as closed to grazing under this alternative. If properly managed, grazing would not conflict with special status species conservation. In addition, BLM would require periodic rest and limited grazing in lower elevation communities, as well as a minimum of two growing seasons of rest following vegetation treatments. This would prevent overgrazing and would allow for forage to recover.

Under Alternative B, three units on 24,400 acres would be managed for wilderness characteristics. Since special status species are a feature that contributes to an area's wilderness character, special status species within these units would be managed to maintain that character. Management would be similar to that described in **Section 4.3.5**.

The types of impacts from recreation would be the same as those described under Effects Common to All Alternatives. Impacts from overlap of the Rough Canyon ACEC and Bangs SRMA would be the same as described under Alternative A. Generally, SRMAs and ERMAs would avoid currently occupied habitats for special status species (except for Castle Rock ERMA), but in some locations, dispersed recreation would be located close to special status species habitats. In these areas, BLM would employ adaptive management to protect special status species if impacts were to occur. Impacts would be more likely to occur in areas that have not been previously inventoried for special status species.

In general, travel routes would be planned to avoid special status species habitats, particularly within ACECs (see **Section 4.5.3**, Areas of Critical Environmental Concern). This would help minimize impacts from travel, such as disturbance to vegetation, erosion, sedimentation, reduction in water quality, noise, human presence, habitat fragmentation, and weed invasion.

Under Alternative B, many special status species habitats, such as those where NSO and CSU stipulations would be applied, would also be ROW avoidance or exclusion areas (**Appendix B**). Encouraging the use of delineated utility corridors, managing six corridors for utilities and facilities, and managing solar and wind emphasis areas on 14,800 acres within the decision area would concentrate impacts away from special status species and reduce widespread impacts and habitat fragmentation. By concentrating development in corridors, BLM would also reduce hazards such as bird collision and electrocution that would be caused by having transmission lines spread throughout the decision area.

Development of solar and wind projects would remove habitat and potentially disturb, kill, injure, or displace special status species in the short term during construction. Over the long term, wind facilities pose hazards for special status birds and bats, and solar projects would remove habitats over the long term. Solar projects would also be fenced, which would exclude some terrestrial wildlife species. As a result these projects could represent a long term total habitat removal for special status species.

Under Alternative B, the BLM would manage 253,400 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing, causing the types of impacts described above for mineral development under Effects Common to All Alternatives. Areas unacceptable for coal leasing on 56,000 acres (52 percent more acres than under Alternative A) would prevent special status species impacts from mineral development on these lands.

Under Alternative B, BLM would manage 878,000 acres (9 percent fewer acres than under Alternative A) as open to fluid mineral leasing, causing the types of impacts described above for mineral development under Effects Common to All Alternatives. Areas closed to fluid mineral leasing on 182,700 acres (89 percent more acres than under Alternative A), as well as stipulations on open lands, would minimize habitat and special status species impacts from mineral development on these lands. On lands open to fluid mineral leasing, NSO stipulations would be applied on 382,200 acres (16 percent fewer acres than under Alternative A) and CSU stipulations would be applied on 527,500 acres (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), which would reduce the impact of fluid mineral development on special status species.

Thirteen ACECs would be managed on 106,000 acres (3.7 times more acres than under Alternative A). These would be closed to wood harvest, mineral materials sales, and non-energy leasable mineral exploration and development. Other restrictions include travel route closures or limitations, ROW avoidance or exclusion areas, recreation restrictions, surface disturbance stipulations, and fluid mineral leasing closures. As such, known and undiscovered populations of

special status species would be protected from surface disturbance and associated impacts within these areas.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of special status species and their habitats throughout the decision area. This could result in increased protective efforts by the general public.

In addition to those effects discussed under *General Special Status Species*, the following habitat-specific impacts would occur with implementation of Alternative B.

Sagebrush Habitats and Species

Sagebrush communities would be improved and maintained through vegetation treatments, avoiding planned and unplanned wildland fire in low-elevation cheatgrass-infested communities, prioritizing winter sage-grouse (greater and Gunnison) habitat for treatment and restoration, developing restoration plans in non-functioning habitat, reducing pinyon-juniper encroachments, increasing habitat connectivity, and managing for age class diversity. Special status species that rely on these habitats, including ESA candidates greater and Gunnison sage-grouse (**Table 4-27**), would directly and indirectly be affected by these management actions in the short and long term. Actions to reduce pinyon-juniper woodland invasion of upper elevation sagebrush communities would benefit special status wildlife species such as greater sage-grouse and Brewer's sparrow *(Spizella breweri)* that require open sage parks. The types of impacts from vegetation treatments would be similar to those described under Effects Common to All Alternatives.

Special status species management actions that would affect sagebrush species include NSO, CSU, and TL stipulations for raptors. Specifically, a CSU and TL stipulation would be applied around ferruginous hawk *(Buteo regalis)* nests and red-tailed hawk *(Buteo jamaicensis)* nests, an NSO and TL around golden eagle nests, a TL around burrowing owl *(Athene cunicularia)* burrows and nest sites, a CSU around other raptor nest sites, an NSO around active kit fox *(Vulpes macrotis)* dens, an NSO around occupied white-tailed prairie dog *(Cynomys leucurus)* towns, and an NSO around all identified midget faded rattlesnake *(Crotalus oreganus concolor)* and Great Basin spadefoot *(Spea intermontana)* breeding and denning sites. These stipulations would provide more protection for special status species than would Alternative A, which would have few stipulations for special status species that rely on sagebrush habitats. In addition, prairie dog relocation would only occur where disease transmission is not a concern.

A suite of management actions would be implemented to conserve Gunnison and greater sage-grouse under Alternative B, including habitat improvement, habitat protection, and mineral leasing stipulations and prohibitions. Nesting, brood-rearing, and lek habitat would be improved, and vegetation management

actions in sagebrush would aim to conserve, enhance, and restore sage-grouse habitats. Raptor perches would be removed or modified in PPH to reduce predation, and a sage-grouse-safe design would be required for all fences in PPH. In addition, the Roan and Carr Creek, Glade Park, and Sunnyside wildlife emphasis areas would be managed for sage-grouse habitat. There would be a number of range management actions, such as authorizing new water developments when PPH would benefit and designing new structural range improvements to benefit PPH.

Stipulations and mineral leasing restrictions for sage-grouse include closure of all occupied Gunnison sage-grouse habitat to fluid mineral leasing; TL in occupied winter habitat; NSO for leks, nesting, and early brood-rearing habitat (with a four-mile buffer); CSU for nesting and early brood-rearing habitat (with a four-mile buffer); and TL within four miles of leks. All areas within a 0.6-mile radius of leks would be ROW exclusion areas, and sage-grouse occupied habitat and areas within 4 miles of leks would be ROW avoidance areas. There would be no PPH within ROW corridors. Quantitative impacts on greater sage-grouse habitat under Alternative B are presented in **Table 4-29**, Impacts on Greater Sage-Grouse Habitat, Alternative B. Fewer acres of PPH would be open to livestock grazing and more acres of PPH and PGH would be closed compared to Alternative A. In addition, more acres would be managed as ROW avoidance and exclusion under Alternative B. However, more acres of PPH and PGH would be impacted by mineral resources management under Alternative B.

Together, the habitat management actions and use restrictions under Alternative B would help conserve, enhance, and restore sage-grouse habitat within the GJFO.

National, scenic, and historic trails management under Alternative B could impact special status plant species, particularly the Colorado hookless cactus. Portions of the Old Spanish Trail route overlap with occupied habitat for this species, and impacts such as trampling could occur if users go off the trail.

Salt Desert Shrub Habitats and Species

Since many of the species that use salt desert shrub habitats also use sagebrush habitats, many of the impacts would be similar to those described previously for sagebrush habitats and species. Several species such as kit fox, white-tailed prairie dog, and burrowing owl primarily use salt desert shrub habitats. Under Alternative B, stipulations would be applied to protect these species and habitats. These include an NSO stipulation within 200 meters of active kit fox dens and within active white-tailed prairie dog towns. A TL stipulation would be required within 0.25-mile of active burrowing owl nest sites and burrows. These stipulations would provide more protection for special status species than would Alternative A, which would not have any stipulations for special status species that primarily use salt desert shrub habitats.

Table 4-29
Impacts on Greater Sage-Grouse Habitat, Alternative B

Resource	PPH (acres) (percent change from Alt A)	PGH (acres) (percent change from Alt A)
Livestock Grazing		
Open	5,200 (-3.7 percent)	8,700 (0 percent)
Closed	200[1]	100[1]
Lands and Realty		
ROW avoidance	4,900 (+ 2,400 percent)	8,600 (+120 percent)
ROW exclusion	600[1]	0[1]
Mineral Resources		
Fluid minerals – open	5,600 (+1.8 percent)	8,900 (0 percent)
Fluid minerals – closed	0[1]	0[1]
Mineral materials - open	5,200 (+8.3 percent)	8,100 (+11 percent)
Mineral materials - closed	400 (-50 percent)	800 (-50 percent)
Travel Management[2]		
Closed to motorized and mechanized vehicles	400	800
Limited for motorized and mechanized vehicles	5,200	8,100

[1]Quantitative comparisons were not made when one of the values was zero.
[2]Acres would not be closed or limited to motorized and mechanized vehicles under Alternative A, thus there are no quantified comparisons.

Salt desert shrub habitats would be improved and maintained through fire suppression, grazing management, erosion control in greasewood communities, and prioritization of cheatgrass treatments.

Forest and Woodland Habitats and Species

Old-growth pinyon-juniper woodlands would be managed to maintain their current acreage, and a CSU would be applied in all old-growth forests and woodlands, which would reduce impacts from surface-disturbing activities. Other forest types such as ponderosa pine, Douglas fir, aspen, and spruce/fir would be managed to increase resilience to disease and diversity in age classes and species composition. Special status species that rely on these habitats, such as federally threatened Mexican spotted owl and Canada lynx (**Table 4-27**), would directly and indirectly be affected by these management actions in the short and long term. Impacts from vegetation treatments would be similar to those described under Effects Common to All Alternatives.

A TL stipulation would be applied around goshawk nest sites, and wood product sales and/or harvest (including Christmas tree harvest) and over-snow motorized travel would be closed within lynx habitat in the Lynx Analysis Unit.

Under Alternative B, activity level plans would be developed for certain areas to manage for healthy forests and woodlands. Over the long term, this would maintain important special status species habitat, provide habitat diversity and multiple age classes, and prevent erosion and sedimentation of waterways. Short-term impacts could occur, depending on the timing of management actions and the species and habitats that are affected. Impacts would be greater on special status species that are sensitive to disturbance or human presence, such as nesting birds or denning lynx.

Riparian and Wetland Habitats and Species

Under this alternative, mature riparian forest would be conserved, which would benefit riparian-dependent special status species, including ESA candidate western yellow-billed cuckoo, delisted bald eagle, and special status aquatic species (**Table 4-27**). In addition, mitigation measures would be implemented to reduce impacts on riparian habitats, such as locate/relocate travel routes, recreation restrictions, and closure to mineral materials sales and non-energy mineral leasing and development. Riparian areas that are identified as special status species habitat would be given priority for management, and an NSO stipulation would be applied around riparian areas, protecting federally listed species like the Colorado pikeminnow, razorback sucker, bonytail, and humpback chub.

Special status species management would apply CSU and TL stipulations around osprey and Swainson's hawk *(Buteo swainsoni)* nest sites, NSO and TL stipulations around bald eagle nest sites, a TL around bald eagle winter roost sites, and an NSO within all identified canyon treefrog, northern leopard frog, and boreal toad *(Bufo boreas boreas)* breeding and denning sites. These stipulations would provide more protection for special status species than would Alternative A, which would have few stipulations for special status species that use riparian and wetland habitats. Management plans to restore or improve yellow-billed cuckoo habitat would be implemented, and migratory pathways of waterfowl and shorebirds, as well as currently occupied breeding and denning sites of upland nesting shorebirds, would be protected.

Under Alternative B, a portion of the Dolores River would be determined suitable for inclusion in the NWSRS. Interim management guidelines and management measures for these segments would help to protect or reduce impacts on riparian habitats and special status species, such as the federally endangered Southwestern willow flycatcher, ESA candidate western yellow-billed cuckoo, special status aquatic species, and BLM sensitive Eastwood's monkeyflower in this area.

River and Stream Habitats and Species

In general, management actions under Alternative B would prevent the spread of nuisance aquatic organisms through such measures as treating equipment used within or near perennial water sources and removing aquatic competitors

from active native aquatic breeding grounds. These measures would reduce impacts caused by these species, such as changes to the food web and water conditions. However, recreation in the Dolores River SRMA may increase the likelihood for the introduction or spread of nuisance aquatic organisms.

Special status species management under Alternative B would designate three ACECs for special status fish (see **Table 2-2**). In addition, BLM would prioritize and implement management actions to achieve desired future conditions of rivers and streams and improve river otter *(Lontra canadensis)* habitat. In the short term, these actions could increase the potential for erosion and sedimentation of waterways, which would affect sediment intolerant species, such as cutthroat trout. Stipulations would directly protect special status fish, such as a TL for coldwater sport and native fish (including federally listed and BLM sensitive species), and NSO and CSU around the Colorado, Gunnison, and Dolores Rivers. These stipulations would provide more protection for special status species than would Alternative A, which would not have any stipulations for special status species that use river and stream habitats.

WSR impacts would be similar to those described under *Riparian and Wetland Habitats and Species*. In addition, direct protection of special status fish and aquatic species would occur where fish are an ORV for a WSR-eligible segment.

Barren Habitats and Species

Disease transmission prevention measures, such as considering closure of caves and other structures used by bats, would help to protect special status bats from white nose syndrome in the areas where they are applied.

For DeBeque phacelia and parachute penstemon, NSO stipulations would be applied within 200 meters (656 feet) of current and historically occupied and suitable habitat, which would reduce impacts from surface-disturbing activities on these species. In addition, CSU and TL stipulations would be applied around peregrine and prairie falcon nests, and an NSO would be applied around special status bat species' roost sites and winter hibernacula. These stipulations would provide more protection for special status species than would Alternative A, which would have few stipulations for special status species that use barren habitats. In addition, a ROW exclusion area would be identified around all parachute penstemon occupied habitat.

Alternative C

General Special Status Species

The types of impacts from BLM management would be the same as those described previously under Alternative B except where differences are indicated below. Under Alternative C, the BLM would implement the most protective management measures for special status species and stipulations and restrictions to reduce impacts from resource uses.

Fish and wildlife management would be similar to that described under Alternative B. Wildlife emphasis areas would be managed on 145,500 acres (21 percent fewer acres than under Alternative B), though many of the acres not managed as wildlife emphasis areas under Alternative C would be managed as ACECs, thereby maintaining fish and wildlife protections.

As under Alternative B, adaptive drought management actions would prevent surface-disturbing activities and associated impacts during periods of extreme to exceptional drought.

Under Alternative C, a variety of stipulations would be applied to protect special status species habitats and populations. Many of these would be the same as under Alternative B. Some examples are the NSO stipulation within 200 meters (656 feet) of current and historically occupied and suitable habitat for threatened, endangered, proposed, and candidate species and a Lease Notice requiring inventories and mitigation measures. An additional stipulation would be an NSO within 200 meters of current and historically occupied and suitable habitat for BLM sensitive plant species. As a result, the stipulations under Alternative C would provide the greatest protection for special status species compared to all other alternatives. Twenty-three ACECs, covering 168,000 acres, would be designated to directly protect special status species: Atwell Gulch, Badger Wash, Colorado River Riparian, Coon Creek, Dolores River Riparian, Glade Park – Pinyon Mesa, Gunnison River Riparian, Hawxhurst Creek, John Brown Canyon, Juanita Arch, The Palisade, Plateau Creek, Prairie Canyon, Pyramid Rock, Reeder Mesa, Roan and Carr Creeks, Rough Canyon, Sinbad Valley, South Shale Ridge, and Unaweep Seep.

The types of impacts from visual resources management would be the same as those described under Alternative A. Under Alternative C, BLM would manage 654,000 acres (4.1 times more acres than under Alternative A) as VRM Class I and II.

The types of impacts from grazing management would be the same as those described under Alternative B. Under Alternative C, BLM would manage 586,600 acres (4 percent fewer acres than under Alternative A) as open and 440,400 acres (84 percent more acres than under Alternative A) as closed to grazing. In addition, BLM would require periodic rest and limited grazing on more areas, which would allow plants to recover and prevent overgrazing as described under Alternative B.

The types of impacts from lands with wilderness characteristics management would be the same as those described under Alternative B. Under Alternative C, 12 units on 171,200 acres (7 times more acres than under Alternative B) would be managed for wilderness characteristics.

The types of impacts from recreation would be the same as those described under Alternative B. Although Alternative C has fewer opportunities for

marketing recreation within the decision area, use would likely increase in proportion to population growth, and the BLM would have a reduced capacity to concentrate use in areas managed for recreation. As a result, special status species could be potentially impacted. In recreation areas, BLM would adaptively manage (e.g., implement minimization measures) to protect special status species if impacts were to occur. Impacts would be more likely to occur in areas that have not been previously inventoried for special status species.

Under Alternative C, the BLM would close the most travel routes within ACECs to protect special status species (see **Section 4.5.3**). In addition, motorized vehicles would be allowed on fewer trails within areas managed as limited to designated routes.

The types of impacts from lands and realty management would be the same as those described under Alternative B, except occupied, suitable, and potential special status species habitat would be ROW avoidance areas. This would help protect both known and undiscovered populations of special status species. Use of delineated utility corridors would be required, and solar and wind emphasis areas would be managed on 7,900 acres (47 percent fewer acres than under Alternative B) within the decision area. Alternative C would thus place the most restrictions on utility development of all alternatives.

Under Alternative C, disposal of occupied special status species habitat would be prohibited. This would ensure that occupied habitat remains under BLM management and would reduce the potential for impacts from land tenure adjustments.

Under Alternative C, BLM would manage 251,200 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing, causing the types of impacts described for mineral development under Effects Common to All Alternatives. Areas unacceptable for coal leasing on 58,200 acres (58 percent more acres than under Alternative A) would prevent impacts on special status species and their habitats from mineral development on these lands.

Under Alternative C, the BLM would manage 506,700 acres (48 percent fewer acres than under Alternative A) as open to fluid mineral leasing, causing the types of impacts described above for mineral development under Effects Common to All Alternatives. Areas closed to fluid mineral leasing on 554,700 acres (5.7 times percent more acres than under Alternative A), as well as stipulations on open lands, would prevent habitat and special status species impacts from mineral development on these lands. NSO stipulations would be applied on 858,000 acres of federal mineral estate (98 percent more acres than under Alternative A) and CSU stipulations would be applied on 664,400 acres of federal mineral estate (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), which would reduce the impact of fluid mineral development on special status species.

Impacts from ACEC management would be similar to those described under Alternative B. Under Alternative C, 23 ACECs would be managed on 168,000 acres (5.8 times more acres than under Alternative A).

In addition to those effects discussed under *General Special Status Species*, the following habitat-specific effects would occur with implementation of Alternative C.

Sagebrush Habitats and Species

Vegetation management in sagebrush habitats would be similar to those described under Alternative B. More cheatgrass treatments would be implemented under Alternative C, which would reduce infestations and restore native perennials over a greater area.

Special status species management actions that would affect sagebrush species would be similar to those described under Alternative B, but Alternative C also would apply an NSO around ferruginous hawk nests, red-tailed hawk nests, other raptor nest sites, and a 0.5-mile buffer around the NSO for reptiles and amphibians. These stipulations would provide the greatest protection for special status species that use sagebrush habitats.

Compared to the other alternatives, there would be additional protections for Gunnison and greater sage-grouse under Alternative C. Roan and Carr Creek and Glade Park would be ACECs managed for sage-grouse habitat. In addition, habitat management and improvements would be similar to those described for Alternative B. Stipulations and restrictions would be similar to Alternative B, except that both occupied Gunnison and greater sage-grouse habitat would be closed to fluid mineral leasing and non-energy leasable mineral exploration and development; the NSO for leks, nesting, and early brood-rearing habitat would include a 4-mile buffer to encompass most potential nesting habitat; all areas within a 0.6-mile radius of leks for below-ground facilities (e.g., utilities) and a 4-mile radius for aboveground facilities would be ROW exclusion areas; and sage-grouse occupied and suitable habitat would be ROW avoidance areas. Quantitative impacts on greater sage-grouse habitat under Alternative C are presented in **Table 4-30**, Impacts on Greater Sage-Grouse Habitat, Alternative C. Under Alternative C, all PPH and PGH would be closed to livestock grazing and fluid mineral leasing. More acres would be managed as ROW avoidance and exclusion and closed to mineral materials than under Alternative A.

As a result, management for sage-grouse and sage-grouse habitat under Alternative C would provide the greatest protection for this species, compared to all other alternatives.

Salt Desert Shrub Habitats and Species

Since many of the species that use salt desert shrub habitats also utilize sagebrush habitats, many of the impacts would be similar to those described

Table 4-30
Impacts on Greater Sage-Grouse Habitat, Alternative C

Resource	PPH (acres) (percent change from Alt A)	PGH (acres) (percent change from Alt A)
Livestock Grazing		
Open	0[1]	0[1]
Closed	5,400[1]	8,700[1]
Lands and Realty		
ROW avoidance	2,200 (+1,000 percent)	7,300 (+87 percent)
ROW exclusion	3,300[1]	1,500 (+1,400 percent)
Mineral Resources		
Fluid minerals – open	0[1]	0[1]
Fluid minerals – closed	5,600[1]	8,900[1]
Mineral materials - open	800 (-85 percent)	5,400 (-26 percent)
Mineral materials - closed	4,800 (+500 percent)	3,500 (+120 percent)
Travel Management[2]		
Closed to motorized and mechanized vehicles	4,900	3,500
Limited for motorized and mechanized vehicles	700	5,400

[1]Quantitative comparisons were not made when one of the values was zero.
[2]Acres would not be closed or limited to motorized and mechanized vehicles under Alternative A, thus there are no quantified comparisons.

previously for sagebrush habitats and species. Under Alternative C, the kit fox NSO and burrowing owl TL stipulations would be the same as described under Alternative B. The white-tailed prairie dog NSO would be expanded to areas within 46 meters (150 feet) of active prairie dog towns, providing additional protection for this species.

Vegetation management actions in salt desert shrub habitats would be similar to those described under Alternative B. More cheatgrass treatments would be implemented under Alternative C, which would reduce infestations and restore native perennials over a greater area.

Forest and Woodland Habitats and Species
In addition to the impacts described in **Section 4.3.5** under All Fish and Wildlife Habitats, management under Alternative C would focus on increasing mature pinyon-juniper acreage.

Riparian and Wetland Habitats and Species
There would be additional protective measures for riparian and wetland habitats and associated species than under Alternative B. For example, NSO stipulations would be applied around osprey *(Pandion haliaetus)* and Swainson's hawk nest sites, as well as within 0.5-mile around all identified canyon treefrog, northern leopard frog, and boreal toad breeding and denning sites. As a result, the

stipulations under Alternative C would provide the greatest protection for special status species that rely on riparian and wetland habitats, compared to all other alternatives.

Alternative C would manage 14 stream segments as suitable for inclusion in the NWSRS. Interim management protections for suitable stream segments would help protect riparian and aquatic habitats used by special status species, such as the federally endangered southwest willow flycatcher, Colorado pikeminnow, razorback sucker, bonytail, humpback chub, and other special status aquatic species; ESA candidate western yellow-billed cuckoo, and BLM sensitive Eastwood's monkeyflower.

River and Stream Habitats and Species

Special status species management for river and stream habitats and associated species would be similar to those described under Alternative B. Eight ACECs would be designated to protect special status fish (see **Table 2-2**).

WSR impacts would be similar to those described under *Riparian and Wetland Habitats and Species*. In addition, direct protection of special status fish and aquatic species would occur where fish are an ORV for a WSR-eligible segment.

Barren Habitats and Species

The types of impacts in barren habitats and on associated species would be the same as those described in Section 4.3.5 under *All Fish and Wildlife Habitats*. Special status species management for barren habitats and associated species would be similar to those described under Alternative B, except an NSO stipulation would be applied around peregrine and prairie falcon nests.

Alternative D

General Special Status Species

The types of impacts on special status species under Alternative D would be the same as those described under Alternative B except as indicated below. In general, Alternative D would emphasize habitat management for commodities and resource uses, as well as maintenance of vegetation conditions. While BLM would comply with all laws and regulations, there would be less focus on resource protection through wildlife emphasis areas and ACECs and improvement or restoration of habitats under Alternative D. There would also be fewer measures to reduce or limit surface-disturbing activities, such as fewer NSO, CSU, and TL stipulations, as well as ROW avoidance and exclusion areas. Stipulations are presented in **Table 2-1**.

As under Alternatives B and C, adaptive drought management actions would prevent surface-disturbing activities and associated impacts during periods of extreme to exceptional drought.

Fish and wildlife management would maintain habitat throughout the decision area, and stipulations to reduce surface-disturbing activities would prevent direct impacts on special status species. Under Alternative D, there would be no CSU for activities in high value and crucial wildlife habitat, no TL in big game production areas, and fewer measures to reduce habitat fragmentation. Managing 33,400 acres (82 percent fewer acres than under Alternative B) as a wildlife emphasis area would protect special status species and potential habitat that occur in these areas through restrictions and stipulations (see **Section 4.3.5**).

Fewer and less stringent special status species stipulations would be applied under Alternative D than under other action alternatives. Similar to Alternative B, an NSO would be applied within 200 meters (656 feet) of current and historically occupied habitat for threatened, endangered, proposed, and candidate plant species, and a Lease Notice would require inventories in areas of currently occupied or suspected habitat of special status species. In addition, an NSO would be applied within 200 meters of currently occupied habitat for threatened, endangered, proposed, and candidate plant species. Five existing ACECs would be maintained on 33,200 acres to protect special status species: Badger Wash, The Palisade, Pyramid Rock, Rough Canyon, and Unaweep Seep.

With its focus on commodities, Alternative D would allow the BLM to have fewer opportunities to use fire as a natural disturbance regime to meet resource objectives. This could lower biodiversity and vegetative health and vigor, increase cover of decadent (old and overgrown) plants, and prevent achieving land health standards in certain habitats. This would degrade habitat for special status species in some areas.

The types of impacts from visual resources management would be the same as those described under Alternative A. Under Alternative D, 333,900 acres (2.1 times more acres than under Alternative A) would be managed as VRM Class I and II.

The types of impacts from grazing would be the same as those described under Alternative B. The BLM would manage 977,200 acres (less than 1 percent fewer acres than under Alternative A) as open and 49,900 acres (3 percent more acres than under Alternative A) as closed to livestock grazing. However, range improvements would only be used to improve livestock forage, which would not benefit desired plant communities and special status species habitat. Further, limitations on grazing, such as requiring periodic rest or seasonal restrictions, would be applied on a case-by-case basis, which could allow for impacts on special status species or their habitats in certain locations.

Under Alternative D, BLM would not manage any lands with wilderness characteristics for wilderness characteristics, so impacts described under Alternative B would not occur.

The types of impacts from recreation would be the same as those described under Alternative B, but increased recreation would be encouraged under Alternative D, potentially impacting special status species. In these areas, BLM would adaptively manage to protect special status species if impacts were to occur. Impacts would be more likely to occur in areas that have not been previously inventoried for special status species. Any routes or motorcycle trials areas in the Castle Rock SRMA or elsewhere would require appropriate surveys and consultation with the Colorado State Historic Preservation Office, Native American Tribes, and USFWS before they could be designated to recreational use and in areas where significant data recovery could not be completed to mitigate adverse effects to cultural resources trails could be closed or redesigned.

The types of impacts from travel management would be the same as those described under Alternative B, but under Alternative D, motorized vehicles would be allowed on more areas managed as limited to designated routes, which would spread motorized impacts across a larger area.

Under Alternative D, fewer areas would be ROW avoidance or exclusion areas. In addition, Alternative D would put less emphasis on using utility corridors, and would manage eight corridors for facilities and utilities and 40,000 acres (1.7 times more acres than under Alternative B) as solar and wind emphasis areas. These actions could result in more habitat fragmentation and disturbance in previously undisturbed areas.

Under Alternative D, BLM would manage 265,600 acres (12 percent fewer acres than under Alternative A) as acceptable for coal leasing, causing the types of impacts described above for mineral development under Effects Common to All Alternatives. Areas unacceptable for coal leasing on 43,800 acres (19 percent more acres than under Alternative A) would prevent special status species impacts from mineral development on these lands.

Under Alternative D, BLM would manage 1,130,700 acres of federal mineral estate (1 percent fewer acres than under Alternative A) as open to fluid mineral leasing, causing the types of impacts described above for mineral development under Effects Common to All Alternatives. Federal mineral estate closed to fluid mineral leasing on 100,500 acres (4 percent more acres than under Alternative A), as well as stipulations on open lands, would prevent habitat and special status species impacts from mineral development on these lands. NSO stipulations would be applied on 497,800 acres of federal mineral estate (15 percent more acres than under Alternative A) and CSU stipulations would be applied on 471,500 acres of federal mineral estate (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), which would decrease the impact of fluid mineral development on special status species.

In addition to those effects discussed under *General Special Status Species*, the following habitat-specific effects would occur with implementation of Alternative D.

Sagebrush Habitats and Species

Sagebrush communities would be maintained through vegetation treatments, prioritizing winter sage-grouse (greater and Gunnison) habitat for treatment and restoration, reducing pinyon-juniper encroachments, increasing habitat connectivity, and managing for age class diversity. Fire would be allowed in low-elevation sagebrush with reseeding, which would help reduce the likelihood of cheatgrass infestation. Impacts would be similar to those described under Alternative B.

Fewer and less stringent management actions would be implemented to conserve Gunnison and greater sage-grouse under Alternative D, compared to the other action alternatives. Only the Roan and Carr Creeks wildlife emphasis area would be managed for sage-grouse habitat, and stipulations include a CSU for nesting and early brood-rearing habitat and TL within 0.6 mile of leks. However, actions to improve habitat and modify raptor perches would be the same as those described for Alternative B. Quantitative impacts on greater sage-grouse habitat under Alternative D are presented in **Table 4-31**, Impacts on Greater Sage-Grouse Habitat, Alternative D. Compared to Alternative A,

Table 4-31
Impacts on Greater Sage-Grouse Habitat, Alternative D

Resource	PPH (acres) (percent change from Alt A)	PGH (acres) (percent change from Alt A)
Livestock Grazing		
Open	5,400 (0 percent)	8,700 (0 percent)
Closed	0 (0 percent)	0 (0 percent)
Lands and Realty		
ROW avoidance	0[1]	0[1]
ROW exclusion	0 (0 percent)	0[1]
Mineral Resources		
Fluid minerals – open	5,600 (+1.8 percent)	8,900 (0 percent)
Fluid minerals – closed	0 (0 percent)	0 (0 percent)
Mineral materials – open	5,600 (+17 percent)	8,900 (+22 percent)
Mineral materials – closed	0[1]	0[1]
Travel Management[2]		
Limited for motorized and mechanized vehicles	5,600	8,900

[1]Quantitative comparisons were not made when one of the values was zero.
[2]Acres would not be closed or limited to motorized and mechanized vehicles under Alternative A, thus there are no quantified comparisons.

Alternative D would have approximately the same acreage open and closed to livestock grazing and fluid mineral leasing, fewer acres as ROW avoidance and exclusion areas, and more acres open to mineral materials.

Overall, degradation of sage-grouse habitat would be more likely to occur under Alternative D.

Salt Desert Shrub Habitats and Species

Since many of the species that use salt desert shrub habitats also utilize sagebrush habitats, many of the impacts would be similar to those described previously for sagebrush habitats and species. Less stringent stipulations would be applied under Alternative D compared with Alternatives B and C. A CSU stipulation would be required within 200 meters of active kit fox dens and within active white-tailed prairie dog towns. A TL would be applied within active prairie dog towns and within 0.25-mile of active burrowing owl burrows and nest sites. As a result, impacts on these species would be more likely to occur under Alternative D.

Salt desert shrub habitats would be maintained through fire suppression, grazing management, and erosion control in greasewood communities.

Forest and Woodland Habitats and Species

In addition to the impacts described in **Section 4.3.5** under *All Fish and Wildlife Habitats*, the BLM would not manage to maintain or increase old-growth pinyon-juniper woodlands, and wood product sales and forest harvest would be allowed within currently occupied lynx habitat in the Lynx Analysis Unit.

Riparian and Wetland Habitats and Species

The types of impacts from vegetation and special status species management would be similar to those described under Alternative B, but Alternative D would require less stringent mitigation measures, and an NSO stipulation would not be required in riparian areas. As a result, impacts on these species would be more likely to occur under Alternative D. A TL stipulation for occupied cutthroat trout waters would directly protect cutthroat trout.

Under Alternative D, no segments would be managed as eligible or suitable under the WSR Act. Impacts on river-related values, including riparian and wetland habitats, may occur because there would be no standard for protection of those values. The BLM may protect those values through other land use prescriptions and stipulations in this RMP.

River and Stream Habitats and Species

Special status species management would be similar to that described under Alternative B, but under Alternative D, the BLM would designate only one ACEC for special status fish (The Palisade). In addition, the BLM would prioritize and implement management actions to achieve desired future conditions of rivers and streams. A TL stipulation for occupied cutthroat trout

waters would directly protect cutthroat trout. Since Alternative D would require fewer and less stringent stipulations than the other action alternatives, impacts on river- and stream-dependent species would be more likely under Alternative D.

Under Alternative D, no segments would be managed as eligible or suitable under the WSR Act. Impacts on river-related values, including river and stream habitats, may occur because there would be no standard for protection of those values. The BLM may protect those values through other land use prescriptions and stipulations in this RMP.

Barren Habitats and Species

The types of impacts from special status species management would be similar to those described under Alternative B, but under Alternative D, a CSU stipulation (instead of an NSO stipulation under Alternative B) would be applied around special status bat species' roost sites and winter hibernacula. As a result, impacts on these species would be more likely to occur under Alternative D.

Cumulative

The CIAAs used to analyze potential impacts on special status fish, wildlife, and plants are included in the CIAAs for **Section 4.3.4** and **Section 4.3.5**.

Cumulative impacts on special status species are related to those described for vegetation and fish and wildlife. Past, present, and reasonably foreseeable future actions and conditions within the CIAA that have affected and will likely continue to affect special status species include mineral exploration and development, forestry, grazing, recreation, road construction, water diversion and withdrawals, weed invasion and spread, prescribed and wildland fires, land planning efforts, vegetation treatments, habitat improvement projects, insects and disease, and drought. Many of these activities change habitat conditions, which then cause or favor other habitat changes. For example, wildland fire removes habitat, and affected areas are then more susceptible to weed invasion, soil erosion, and sedimentation of waterways, all of which degrade habitats. In general, resource use activities have cumulatively caused habitat removal, fragmentation, noise, increased human presence, and weed spread, whereas land planning efforts and vegetation, habitat, and weed treatments have countered these effects by improving habitat connectivity, productivity, diversity, and health.

Climate change could cause an increase or decrease in temperatures and precipitation, which would affect soil conditions, vegetative health, and water flows and temperature. Such changes would alter habitat conditions, potentially creating conditions that could favor certain species or communities, weeds, or pests. Since special status species often inhabit very specific microhabitats, small changes could cause large effects.

Under the proposed RMP and alternatives, impacts on special status species would be minimized to the extent practical and feasible through compliance with the ESA and BLM Manual 6840, restrictions, stipulations, closures to mineral exploration and development, recreation, motorized travel, designation of ACECs to protect certain special status species, COAs, and by concentrating development in previously disturbed areas. Habitat conditions would be improved through treatments, weed prevention and control, acquisition of water rights, use of prescribed and wildland fire, forestry management, and grazing management. Since Alternative D would emphasize more resource use and development, impacts on special status species would be more likely to occur under this alternative. As a result, Alternative D could significantly contribute to cumulative impacts on special status species. In contrast, the incremental contribution of Alternatives A, B, and C to cumulative impacts on special status species is expected to be less than significant.

4.3.7 Wild Horses

This section discusses impacts on wild horses from proposed management actions of other resources and resource uses. Existing conditions concerning wild horses are described in **Section 3.2.9**, Wild Horses.

Impacts on wild horses generally result from activities that affect available forage and water or cause harassment or disruption to the wild and free roaming nature of a herd. Forage conditions could generally be affected by surface-disturbing activities and use of forage by wildlife. Surface disturbance or restrictions on surface disturbance in the LBCWHR could affect forage conditions. Likewise, management actions that disturb or restrict access or reduce disturbance to water resources could also affect wild horses or their habitat.

The wild and free-roaming character of wild horses is also integral to their preservation. Management actions that result in undisturbed natural areas with limited human presence or intervention preserve this character. In these areas, wild horses can be managed and viewed with limited impediments on their movement across the landscape. Management actions that alter the landscape and/or increase human disturbances and presence could reduce the wild and free-roaming nature of wild horses by disrupting their use of habitat and impeding normal wild horse behavior.

Methods of Analysis

Indicators of impacts on wild horses include the following:

- Changes in available forage and water;
- Changes in permitted AML;
- Changes in body condition; and
- Changes in wild horse behavior.

The analysis includes the following assumptions:

- The wild horse population would continue to increase through recruitment of foals. Recruitment rates will vary depending on fertility control program and natural mortality;
- Excess wild horses would be removed when monitoring data indicate there is no longer a thriving natural ecological balance in the LBCWHR; and
- The LBCWHR wild horse herd would be managed within the AML range through gathers and the selected application of additional population control practices.

Effects Common to All Alternatives

Management of wild horses would help ensure healthier viable herds by preventing overpopulation that could lead to overgrazing ranges, damage to water sources, and increased competition with wildlife.

Healthy uplands, watersheds, and soils would increase the potential for increased forage and water productivity, which would indirectly benefit wild horses. Management actions designed to reduce erosion and maintain or improve soils and vegetative cover and reclaim disturbed areas could indirectly benefit wild horses by increasing forage plants and maintaining or improving the plant communities.

Proper management of springs and riparian areas would provide for additional forage areas and ensuring reliable water sources. Control or eradication of noxious weeds would provide improved forage for wild horses by increasing the potential for the presence and vigor of forage plants.

Protecting special status plants and special status species habitat could directly affect wild horses by limiting access to site-specific areas or preventing forage improvement projects. Conversely, protecting areas that support special status species could prevent activities that inhibit wild horse activities and could provide cleaner and more dependable water sources for wild horses in the long term.

Wildlife species could compete with wild horses for forage, water, and cover when they occupy the same area. For example, big game species such as elk compete for similar forage as wild horses. In the long term, management actions to improve water quality, improve vegetation conditions, and increase forage production would limit competition.

Wildland fire would have varying effects on wild horses, depending on fire size and intensity, the timing of the fire, and fuel moisture content. Wildland fire would initially displace horses, and depending on the proximity of the horses to the fire, horses could be stressed, injured, or killed. Wildland fire would remove

vegetation and forage over the short term. Over the long term, wildland fire could improve forage production, especially when fire rehabilitation efforts are implemented. Restoring natural disturbance regimes such as fire, and using vegetative treatments to accomplish biodiversity objectives in resilient plant communities, would also benefit wild horses by maintaining a balance of seral stages.

Managing the Little Book Cliffs WSA (which overlays the LBCWHR) as VRM Class I would limit surface-disturbing activities that eliminate forage, harass wild horses, and disrupt the distribution and usage patterns of the herds.

Mineral extraction could temporarily or permanently remove forage areas for wild horses, depending on the location of the mineral extraction. The only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area. Activities associated with exploration and extraction could disrupt herd dynamics and open the potential for human activity to disturb herds. Loss of rangeland and forage could be mitigated by post-mining reclamation. Roads associated with mineral extraction would remove vegetative habitat until or if they were reclaimed and would increase opportunities for humans to disturb herds. Withdrawal or closure of areas for mineral development would reduce the potential for human-herd interaction and rangeland and forage loss. However, the LBCWHR would not be proposed for withdrawal from locatable mineral entry under any of the alternatives. Protection of resources through mitigation measures, standard operating procedures, and BMPs would preserve and restore range health.

Applying NSO stipulations would prohibit surface occupancy and surface-disturbing activities in the LBCWHR year-round instead of solely during crucial foaling and development time periods, reducing the risk of forage degradation and disturbance of wild horses. The NSO stipulation acreages would vary by alternative.

The application of CSU stipulations would mitigate surface-disturbing activities and limit disturbances to wild horses and their habitat. The CSU stipulation acreages would vary by alternative.

While horses would not be excluded from certain areas within the LBCWHR, short-term impacts of recreation activities on wild horses include degradation of habitat, loss of forage, and spatial disturbance. Long-term impacts of recreation on wild horses include loss of forage, reduced forage palatability because of dust on vegetation, disturbance and harassment caused by increased levels of human activities, altering traditional use areas, and the potential for recreational opportunities that help foster stewardship of the wild horse herd. Long-term impacts on wild horse distribution and usage patterns would reduce the horses' free-roaming nature. However, management of the Little Book Cliffs WSA

would prohibit many recreational activities that could impact wild horse behavior.

The short-term impacts of travel within the LBCWHR include degradation of habitat, loss of forage, and temporary displacement of horses. Long-term impacts of motorized use on wild horses include loss of forage, reduced forage palatability because of dust on vegetation, and disturbance and harassment caused by human and vehicle presence. These impacts are reduced when travel is closed or limited to designated trails. No areas would be managed as open for cross-country motorized use within the LBCWHR under any of the alternatives.

Any secondary road that is decommissioned or closed would benefit wild horses by limiting human access and allowing for revegetation. Actions to limit erosion and the spread of weeds would impact wild horses by improving the general health of wild horse habitat in the long term. However, if wild horses were the cause of erosion, changes would be made to AML or their behavior patterns. This could include treatment of other areas that could improve distribution of use. New roads would remove range forage and increase the possibility of human disturbance.

Short-term impacts from site-specific lands and realty actions such as small land transfers, construction of power lines and pipelines, and other construction activities within ROWs could include the temporary removal of forage and harassment and the displacement of wild horses. Long-term impacts from site-specific lands and realty actions include loss of forage, reduced forage palatability because of dust on vegetation, and disturbance and harassment from increased levels of human activities. Managing ROW avoidance and exclusion areas would reduce impacts by mitigating or excluding surface-disturbing activities. Specific areas managed as ROW avoidance or exclusion areas differ per alternative and are identified below.

Continuing to manage the Little Book Cliffs WSA, which overlaps 22,800 acres (65 percent) of the LBCWHR, would result in direct and indirect impacts. In general, the protections afforded to the Little Book Cliffs WSA such as restrictions on surface-disturbing and other disruptive activities would reduce harassment of wild horses and would help maintain and improve vegetation conditions, thereby maintaining or improving the forage base. On the other hand managing the area as a WSA would restrict some activities that would be beneficial for wild horse management such as vegetative treatments and construction of water facilities.

Interpretation and environmental education could serve as an important tool in fostering understanding and stewardship of the wild horse herd.

Implementing management for the following resources would have negligible or no impact on wild horses and are therefore not discussed in detail: air; cultural

resources; paleontology; livestock grazing; lands with wilderness characteristics; national trails; national, state, and BLM byways; and WSRs.

Quantitative impacts pertaining to wild horses in the 35,200-acre LBCWHR are displayed in **Table 4-32**, Acreage Impacts within the LBCWHR.

Table 4-32
Acreage Impacts within the Little Book Cliffs Wild Horse Range

Management Action	Alternative A	Alternative B	Alternative C	Alternative D
Motorized Use Limited to Designated Trails	29,100	9,400	9,300	10,100
Motorized Use Seasonally Limited	6,000	2,300	2,300	2,300
Closed to Motorized Use	0	23,400	23,600	22,800
ROW Avoidance Areas	30,400	9,800	100	13,300
ROW Exclusion Areas	2,600	24,000	33,600	22,800
Acceptable for Coal Leasing	16,600	8,200	8,200	9,000
Open to Fluid Mineral Leasing	12,400	12,400	0	12,400
Subject to NSO Stipulation	*4,600*	*12,400*	*0*	*5,300*
Subject to CSU Stipulation	*12,400*	*12,400*	*0*	*12,400*
Open for Mineral Material Sales	12,300	0	0	12,300
Open for Non-energy Mineral Leasing	12,300	0	0	12,300
SRMAs	4,600	0	0	0
ACECs	0	2,000	3,100	0

Source: BLM 2010a

Alternative A

Maintaining Coal Canyon as available for the placement of mine mouth facilities under Alternative A, which allows for a greater footprint of disturbance to accommodate facilities such as power plants, rather than the typical disturbance footprint of a mine, would limit wild horse habitat, reduce forage, and contribute to disturbance of the herd.

Under Alternative A, Stipulations TL-10, Wild Horse Winter Range, and TL-11, Wild Horse Foaling Area, would restrict mineral lease activities during certain crucial seasons for wild horse development, thereby preventing forage degradation or harassment of wild horses from other uses of public land.

Approximately 16,600 acres would be acceptable for coal development under Alternative A, temporarily or permanently removing forage areas for wild horses, depending on the location of the development. This is the greatest acreage acceptable for coal development under any alternative.

Approximately 12,400 acres would continue to be open to fluid mineral development under Alternative A, but 4,600 of those acres would be covered by an NSO stipulation and all 12,400 acres would be subject to a CSU stipulation, greatly reducing the effects identified under Effects Common to All Alternatives.

Approximately 12,300 acres would be open to mineral material sales under Alternatives A. The types of impacts would be the same as identified under Effects Common to All Alternatives.

Approximately 4,600 acres of the LBCWHR would continue to overlap the Grand Valley IRMA under Alternative A. While IRMAs introduce additional opportunity for impacts on wild horses from increased recreational use, they also provide for increased management and control of conflicts.

Cross-country foot and horse travel would be allowed throughout the LBCWHR and cross-country mechanized travel would be permitted outside the WSA. There would continue to be 29,100 acres managed as limited to existing roads and trails for motorized travel, 6,000 acres with seasonal closures, and zero acres closed to motorized use. Together, this alternative has the fewest restrictions on travel of any alternative. While the Little Book Cliffs WSA was not explicitly closed to motorized use in the 1987 RMP, the area is closed to motorized and mechanized use per BLM Manual 8550, Interim Management Policy and Guidelines for Lands under Wilderness Review (BLM 1995).

Prohibiting new ROWs or other surface-disturbing activities that would change the semi-primitive character in the LBCWHR would benefit wild horses by reducing potential effects on wild horses or their habitat from other uses of public land. Approximately 30,400 acres would be managed as ROW avoidance under Alternative A. Approximately 2,600 acres would be managed as ROW exclusion under Alternative A, less than under any other alternative. It should be noted, however, that within the Little Book Cliffs WSA, new ROWs could only be permitted for temporary uses that satisfy the nonimpairment criteria (BLM 1995), providing some protection for wild horses and their habitat.

Alternative B

Management of desired plant communities under Alternative B would equally benefit a variety of resources. Management of woodland communities towards a mixture of seral stages would provide for an optimal forage base for wild horses.

Maintaining an appropriate AML and allowing adjustments based on defined conditions would benefit wild horse management under Alternative B. A proper AML assures a viable, healthy wild horse population in balance with healthy rangelands. Alternative B would provide additional protection for wild horses over Alternative A by prohibiting mineral material sales and non-energy mineral leasing activities.

Prohibiting target shooting in the Coal Canyon and Main Canyon areas of the LBCWHR would provide more protection for wild horses than under Alternative A by reducing the risk of harassment or accidental death.

Closing Coal Canyon to the development of mine mouth facilities under this alternative would reduce the potential impact on habitat and water sources in the area. Further protection would be provided by applying an NSO stipulation to the LBCWHR under this alternative. An NSO stipulation would prohibit all surface-disturbing activities, not just mine mouth facilities, which would further reduce potential impacts on the herd.

Approximately 8,200 acres within the LBCWHR would be acceptable for coal development under Alternative B (51 percent fewer acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would occur over a smaller area.

Approximately 12,400 acres (same acreage as Alternative A) would be open to fluid mineral leasing under Alternative B, all of which would be subject to NSO and CSU stipulations. The types of impacts would be the same as those described under Alternative A.

No SRMAs within the LBCWHR would be identified under Alternative B. This would result in fewer focused recreation opportunities and fewer impacts from recreation in comparison to Alternative A, which has 4,600 acres managed as an IRMA that overlap the LBCWHR.

Closing the LBCWHR to motorized over-snow travel would reduce the risk of harassment to horses during winter months. Under Alternative B, 9,400 acres of the LBCWHR would be designated as limited to designated roads and trails for motorized and mechanized travel (57 percent fewer acres than under Alternative A), 2,300 acres along Coal Canyon Road would contain seasonal closures, and 23,400 acres would be closed to motorized and mechanized travel, resulting in greater restrictions on travel and consequently less of an impact than under Alternative A.

Approximately 9,800 acres (68 percent fewer acres than under Alternative A) would be managed as ROW avoidance under Alternative B. However, approximately 24,000 acres (9.3 times greater than under Alternative A) would be managed as ROW exclusion, resulting in greater restrictions on ROW development and fewer impacts on wild horses than under Alternative A.

Designating the Mt. Garfield ACEC (of which 2,000 acres overlaps the LBCWHR) would indirectly protect forage, water sources, and the free-roaming nature of the horses through ROW exclusions and restrictions on mineral development.

Alternative C

Managing for desired plant communities with an emphasis on maintaining or enhancing special status species habitat would have a greater impact on wild horses than under Alternative B by decreasing the availability of multiple types of vegetative feed. Managing for pinyon and juniper with an emphasis on old-growth retention would also prevent the necessary mixed seral stage plant communities that provide optimal forage for wild horses as identified under Alternative B.

Minimizing the use of mechanized and chemical treatments would reduce the tools available to maintain vegetation types suitable for wild horses.

Alternative C would provide additional protection of wild horses over Alternative A by prohibiting mineral material sales and non-energy mineral leasing activities.

Closing Coal Canyon to the development of mine mouth facilities in addition to applying an NSO stipulation to the LBCWHR would have the same impact on wild horses as described under Alternative B.

Approximately 8,200 acres (51 percent fewer acres than under Alternative A) would be acceptable for coal development under Alternative C. The types of impacts would be the same as under Alternative A, but would occur over a smaller area.

Closing the LBCWHR to fluid mineral leasing would eliminate impacts associated with fluid mineral development.

The type of impacts from prohibiting target shooting and motorized over-snow travel in the LBCWHR would be the same as identified under Alternative B.

Impacts from SRMAs would be identical to those described under Alternative B.

Under Alternative C, 9,300 acres of the LBCWHR would be designated as limited to designated roads and trails for motorized travel (68 percent fewer acres than under Alternative A), 2,300 acres along Coal Canyon Road would contain seasonal closures, and 23,600 acres would be closed to motorized and mechanized travel, resulting in more restrictions on motorized and mechanized travel and fewer disturbances to wild horses than under Alternative A.

There would be approximately 100 acres (99 percent fewer acres than under Alternative A) managed as ROW avoidance and 33,600 acres (12.9 times more

acres than under Alternative A) managed as ROW exclusion under Alternative C. The types of impacts would be the same as described under Alternative A, but the increase in acres of ROW exclusion would result in greater restrictions on ROW development and more protection for wild horses.

The types of impacts from designating the 5,700-acre Mt. Garfield ACEC (of which 3,100 acres overlaps the LBCWHR) would be similar to described under Alternative B, except that the larger amount of overlapping ACEC acreage would provide greater protection for wild horses.

Alternative D

The types of impacts from desired plant community management would be the same as described under Alternative C.

Alternative D would provide additional protection of wild horses over Alternative A by prohibiting mineral material sales and non-energy mineral leasing activities.

Closing Coal Canyon to the development of mine mouth facilities under this alternative would reduce the potential impact on habitat and water sources in the area.

Approximately 12,400 acres (the same as under Alternative A) would be open to fluid mineral development under Alternative D, all of which would be covered by a CSU stipulation and 5,300 acres (15 percent more acres than under Alternative A) of which would be covered by an NSO stipulation. The types of impacts would be the same as described under Alternative B, but because NSO stipulations would apply to fewer acres, there would be less stringent restrictions on fluid mineral leasing and surface-disturbing activities. The CSU stipulation would only require mitigating measures for fluid mineral leasing and could present the opportunity for activities harmful to the herd.

Approximately 9,000 acres (46 percent fewer acres than under Alternative A) would be acceptable for coal development under Alternative D, representing less of an impact from coal development than under Alternative A.

Impacts from SRMAs would be identical to those described under Alternative B.

Under Alternative D, 10,100 acres (65 percent fewer acres than under Alternative A) of the LBCWHR would be designated as limited to designated roads and trails, 2,300 acres along Coal Canyon Road would contain seasonal closures, and 22,800 acres would be closed to motorized and mechanized travel, resulting in more restrictions on motorized and mechanized travel and fewer disturbances to wild horses than under Alternative A.

Approximately 13,300 acres (56 percent fewer acres than under Alternative A) would be managed as ROW avoidance under Alternative D and approximately

22,800 acres (8.8 times more acres than under Alternative A) would be managed as ROW exclusion. The types of impacts would be the same as described under Alternative A, but the increase in acres of ROW exclusion would result in greater restrictions on ROW development and more protection for wild horses.

Cumulative

The CIAA used to analyze cumulative impacts on wild horses includes the entire planning area because impacts are expected to be limited to those actions originating within the planning area.

Cumulative impacts on wild horses are similar to those described under Effects Common to All Alternatives, above. Wild horses would directly benefit from actions to increase forage opportunities, to continue to retain no livestock grazing within the LBCWHR, to improve range conditions, to maintain or improve water sources, and to eliminate barriers to movement. Wild horse would indirectly benefit from restrictions on motorized travel or other potentials for disturbance from people, vehicles, and industrial activity.

Managing within the AML based on monitoring and range carrying capacity would benefit wild horses by preventing overpopulation, which could lead to overgrazing and range deterioration, which in turn could lead to impaired herd health.

4.3.8 Cultural Resources

This section discusses effects on cultural resources from proposed management actions of other resources and resource uses. Existing conditions concerning cultural resources are described in **Section 3.2.11**, Cultural Resources.

Cultural resources are past and present expressions of human culture and history in the physical environment. The term "cultural resource" can refer to archaeological and architectural sites, structures, or places with important public and scientific uses, and may include locations (e.g., sites, natural features, resource gathering areas or places) of traditional cultural or religious importance to specified social and/or cultural groups.

The primary goals of cultural resource management are to identify and evaluate these resources, to determine their appropriate uses or management, and to administer them accordingly, both on public lands and on other lands where BLM decisions could affect cultural resources. The objective of cultural resource management has several parts: preserving sites and landscapes, promoting public outreach and education, encouraging professional and academic research, and facilitating Native American traditional uses and consultation with interested groups.

Methods of Analysis

Effects on cultural resources would primarily result from unmitigated surface disturbance, such as cross-country travel, wildfires, wildfire suppression activities, erosion, unauthorized collection, vandalism, and trampling. Direct and indirect effects on cultural resources result from any surface-disturbing activity or alteration to the integrity of the resource, including setting. Federal actions defined as federal undertakings under Section 106 of the NHPA require the identification, evaluation, and consideration of adverse effects and the appropriate mitigation of those effects. Nearly all implementation actions would be subject to further cultural resource review before site-specific projects are authorized or implemented. If adverse effects are identified, mitigation measures, including avoidance, would have to be considered to minimize or eliminate the effects.

Effects from cross-country travel, wildfires, wildfire suppression activities, erosion, unauthorized collection, vandalism, and trampling are not usually considered under Section 106 of NHPA and could result in the unmitigated loss of cultural resource information. Most effects are difficult to quantify because the locations of most cultural resource sites in the planning area are unknown, assessment of most known locations are limited to brief surface evaluations during Class III inventory, monitoring of known locations is difficult, and planning-level alternatives typically do not identify specific areas for surface-disturbing activities.

Effects on cultural resources occur when there is damage or loss of these resources or their settings. The primary indicator for determining if an effect would occur is the effect on cultural resources eligible for listing on the NRHP or areas of importance to Native American or other traditional communities. Indicators of effects on cultural resources include the following:

- Extent of ground surface-disturbing activities and their potential for affecting known or unknown cultural resources, or areas of importance to Native American or other traditional communities;
- Increased access to, or activity in, areas where resources are present or anticipated. Vandalism or unauthorized collecting can destroy a cultural resource in a single incident. Public access to areas where cultural resources are present can increase the risk of vandalism or unauthorized collection of materials;
- The extent to which an action changes the potential for erosion or other natural processes that could affect cultural resources. Natural processes, such as erosion or weathering, will degrade the integrity of many types of cultural resources over time. Human visitation, recreation, vehicle use, livestock grazing, fire, trampling, and other activities can increase the rate of deterioration through natural processes.

- Measures that withdraw land or restrict surface development for the purpose of resource protection can provide direct and indirect protection of cultural resources from disturbance and from incompatible and unauthorized activities;
- The extent to which an action alters the setting (such as visual and audible factors) where relevant to certain cultural resources; and
- The extent to which an action alters the availability of cultural resources for appropriate uses, including access to spiritual sites or traditional resource gathering areas by Native Americans.

For this analysis, effects on cultural resources would be significant if cultural resources listed or eligible for listing on the NRHP or similar state register or allocated to a use category where long-term preservation is an objective (inadvertently or intentionally) were damaged, destroyed, or lost or removed from federal protections without appropriate mitigation. The analysis includes the following assumptions:

- Effects on cultural resources are assessed by applying the criteria of adverse effect, as defined in 36 CFR, Part 800.5a: "An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the action that may occur later in time, be farther removed in distance, or be cumulative."
- The criteria of adverse effect provide a general framework for identifying and determining the context and intensity of potential effects on other categories of cultural resources as well, if these are present. Assessment of effects involving Native American or other traditional community, cultural, or religious practices or resources also requires focused consultation with the affected group.
- BLM will comply with 36 CFR 800, Section 106 (including Native American consultation) and the Colorado Protocol when addressing federal undertakings; therefore, adverse effects on known cultural resources would be appropriately mitigated.
- The Archeological Resources Protection Act of 1979, as amended, provides permitting for the authorized removal of archaeological material through data recovery and excavation enforcement and legal remedies for all unauthorized removal of archaeological resources from federal land.
- Human occupation of North America for more than 10,000 years has left its mark on all landforms. The attributes by which the

significance of a site is evaluated may be manifest on the surface, slightly obscured by soil deposits, or deeply buried.

- There may be areas of importance to contemporary Native Americans that are not readily identifiable outside of those communities.
- Although there is limited information on cultural resources in the planning area, prehistoric and historic archaeological sensitivity overlays have been developed in conjunction with the Class I cultural resources inventory. These models are based on the results of research and compliance inventory projects and depict the relative potential for cultural resource sites within the planning area. However, as these data are geographically biased toward past project-oriented undertakings, this analysis does not attempt to quantify affected resources.
- Cultural resource protection and mitigation measures apply to all federal discretionary actions or federally funded actions (undertakings) and to leases granted by BLM, and would be applied at project design and implementation phases.
- Cultural resource inventories, initiated by either federal undertakings or Section 110 inventories, would result in the continued identification of cultural resources. Cultural Resources are also reevaluated and new information can result in a change to a site's eligibility or allocation. The cultural resource data acquired through these inventories and evaluations would increase overall knowledge and understanding of the distribution of cultural resources in the region.
- Effects on known cultural resource sites from authorized uses would be mitigated after appropriate Section 106 consultation requirements are met. Mitigation can include project cancellation, redesign, avoidance, or data recovery.
- The number of sites that could be affected by authorized actions depends on the type and quantity of surface-disturbing activities within the planning area and the cultural sensitivity of the area.

Effects Common to All Alternatives

Cultural resource compliance actions would continue under all alternatives. New protective measures based on cultural resource use categories would be expanded under Alternatives B, C, and D. Likewise, additional measures addressing protection of Native American resources and traditional uses would be expanded under the three action alternatives.

Potential effects from subsequent undertakings for all resources, resource uses, and special designations would be addressed at the project design and implementation phase. Required separate compliance with Section 106 would

result in the continued identification, evaluation, mitigation, and nominations to the NRHP. Effects on cultural resources eligible for listing in the NRHP would be avoided or mitigated. If previously undiscovered resources are identified during an undertaking, work would be suspended while the resource is evaluated and mitigated to avoid any further effects. Consultation would continue with Native American groups to identify any traditional cultural properties or resource uses and address effects. Through this process, effects would be minimized or eliminated, although residual effects and adverse effects as defined by 36 CFR, Part 800 would be possible. Many cultural resources are evaluated only by their surface manifestations and many resources evaluated as not eligible may actually be eligible, but these are lost through project implementation. Effects, especially on unidentified resources, resulting from ongoing unevaluated or unsupervised activities, natural processes, and unanticipated events such as wildfire, would continue.

Actions to protect watersheds and municipal source waters through surface use restrictions and erosion controls would provide incidental protections from effects due to surface disturbance and erosion. Some water sources and features may be important to Native Americans and actions that protect and maintain these water features and native plant and animal natural resources would help preserve these tribal values and traditional resources. Actions to modify or remove water control structures, develop wells, acquire water rights and sources, and modify water features include risks of disturbance of cultural resources and traditional uses and values through ground-disturbing activities, livestock trampling, changes in access, visibility, and setting of water features and changes to the water features themselves. As for all resources, effects on cultural resources would be evaluated for these undertakings, and protections and mitigations would be applied at project design and implementation phases.

Soil protection measures would seek to limit erosion resulting from ground-disturbing activities and actions on steep slopes. Many cultural resources are susceptible to erosion damage, including modifying spatial relationships of artifacts and destroying features and stratified deposits. The information loss is relevant to the site function, dates of occupation, subsistence, and past environments; all of these are important to understanding past culture. These measures to protect soils could preserve the integrity of cultural deposits and prevent damage from natural processes.

Vegetation management measures addressing land health, plant diversity, restoring natural processes, promotion of desired plant communities, maintaining forest health, reducing effects on rangeland during drought, and eliminating weeds would largely be compatible with cultural resource management goals and preservation. Many of the measures would reduce the potential for erosion of cultural sites, maintain and improve soil health, maintain or restore the historic setting, and protect plant resources that may be important to Native American communities. However, mechanical, biological,

and chemical treatments could affect cultural resources and could restrict access to resources for cultural purposes during treatment. Ground-disturbing mechanical vegetation treatments could modify the spatial relationships of artifacts and site features and break artifacts. Chemical treatments could alter the chemistry of soils and artifact residues and affect the reliability of dating surface features and affect artifact residue analysis. Use of fire as a treatment could affect flammable cultural resource artifacts and features, cause spalling and staining of rock (either as a surface for rock art or as part of a feature or structure), and distort the temporal and functional analysis of artifacts.

Measures to protect special status species and measures protecting other fish, wildlife, and plants include protective designations and stipulations and restrictions on surface and vehicle use that would provide protections for cultural resources from effects due to surface disturbance, erosion, effects on setting and access leading to vandalism, inadvertent damage, and unauthorized collection of cultural resources. Protective measures may inhibit Native American cultural uses in some areas.

The effects of wild horses or actions of managing the wild horses on cultural resources are similar to those for livestock grazing. Improper grazing and trampling reduces vegetative cover and disturbs the soil, which accelerates erosion and weathering. Cultural resources can be directly affected by the modification, displacement and loss of artifacts, features, middens, and loss of culturally important plants. Effects can also occur from land treatments or can be intensified when animals are concentrated near water sources where cultural resources may be present. Maintaining the LBCWHR as defined would avoid effects on other areas by concentrating effects to the defined area. Improving rangeland health and surface use restrictions on other activities could reduce the potential for effects on the physical integrity and setting of cultural resources.

The alternatives vary in current and proposed VRM class objectives. Cultural resources and cultural landscapes can contribute to the visual character and may be considered in determining VRM classifications. Managing areas as VRM Class I and II provide protection of cultural resources where visual setting is a contributor to the significance of the property or the traditional use. Effects would be directly and indirectly reduced where designations limit surface-disturbing activities in the more sensitive VRM class areas. Use of the visual resource contrast rating system during project planning could reduce the effect of visual intrusions on cultural resources, but projects may be directed to VRM Class IV or undesignated areas where cultural resources may be present. Visual intrusion on the setting of cultural resources must be considered in the Section 106 process and tribal consultation, regardless of VRM designation.

Wildland fire would have the potential to result in direct disturbance or loss of cultural resources through the destruction or modification of structures,

features, artifacts, cultural use areas, and culturally modified trees. Organic materials are especially vulnerable to heat damage. Fire management activities would involve ground-disturbing activities that could also directly affect cultural resources by altering the spatial relationships within archaeological sites. Also, fire retardant chemicals and heat could affect the accuracy of paleobotanical or radiocarbon data obtained from cultural resources. The removal of vegetation increases the visibility of cultural resources and exposes previously undiscovered resources. Sites exposed by fire or prepared for fire avoidance in prescribed burns are more susceptible to unauthorized collection, vandalism, and subsequent erosion. The risk of adverse effects on cultural resources is greatest from unplanned wildland fire since the locations of cultural resources are less likely to be known and avoided. Effects from prescribed fire would be similar to those of wildland fire, but prescribed fire is an undertaking subject to project-level analysis and Section 106 process. Ute Traditional leaders make a distinction between human intervention and ignition (both prescribed and arson) and natural ignition fires.

Forestry resource uses can lead to effects depending on the methods used, the amount of ground-disturbing activity permitted, and the potential for subsequent erosion. Increasing access for commercial harvesting of forest products can also lead to direct disturbance and erosion, alterations of the setting, vandalism, and unauthorized collection. Management measures vary between alternatives and include restrictions targeting culturally sensitive areas as well as other areas where incidental protection of cultural resources would occur. Measures that include thinning and other less ground destructive treatments and techniques would have less effect on cultural resources than intensive management. Measures that contribute to the restoration and preservation of forest health and structure may preserve Native American uses and their settings.

In areas open to grazing, livestock grazing is associated with ongoing effects on or near the ground surface. Improper grazing and trampling reduces vegetative cover and disturbs the soil, which accelerates erosion and weathering. The modification, displacement, and loss of artifacts, features, and middens results in loss of valuable cultural resource information regarding site function, date of use, subsistence, past environments, and other research questions. Trampling and grazing can also affect Native American use areas and culturally important plants. Effects on cultural resources occur more frequently where livestock concentrate such as permanent and intermittent water sources. The construction or maintenance of range improvements such as springs, reservoirs, fences, corrals, and livestock trails have the potential to affect cultural resources, especially if these areas have not been previously inventoried. File searches are conducted at the time of permit renewal with a recommendation for inventories and/or site evaluations in areas with a high potential for cultural resources where livestock congregate, and, if conflicts exist, mitigation measures are proposed. Range improvements are an undertaking subject to project-level

analysis and Section 106 process and protections and mitigations would be applied at project design and implementation phases. In all alternatives, cultural resources in areas closed to livestock grazing are directly protected.

Actions under all alternatives to protect springs and wetland riparian areas from livestock grazing would help protect water features and sources that may be culturally important to tribes. Actions that improve rangeland health could reduce the potential for effects from direct disturbance, erosion, and wildland fire.

Increased recreation use can affect cultural resources and sensitive Native American resources through direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and unauthorized collection or vandalism. The potential for effects on cultural resources increases when there is an increase in population, there is a change in recreation use that alters the visual or audible character of the setting, or when recreational use is concentrated in sensitive areas. The effect of repeated uses or visits over time could also increase the intensity of effects due to natural processes. Repeated visits to sites can create social trails, directing more people to sites that may not be recorded or sites that have not been allocated to Public Use. Increased access to more remote areas can lead to effects on undisturbed resources. Continuing and enhancing interpretation and public education can vest the public in resource protection and respect for Native Americans and cultural values.

Areas managed as SRMAs increase the intensity of permitted use of these areas and the risk for direct, indirect, and inadvertent damage to cultural and Native American resources from camping, visitor use, recreation, vandalism, firewood gathering, and other activities. An increase in human presence can also intrude on settings that may be important for cultural resources or Native American uses. NSOs to preserve recreational areas or scenic landscape values may also provide incidental protection for cultural resources. Areas managed as ERMAs are subject to less intensive, unstructured recreational uses with corresponding potential for effects on cultural resources and potentially less monitoring of cultural resources.

Existing travel management without limitation or designation can result in serious effects. Restricting vehicle use to existing or designated trails reduces the risk of disturbing cultural resources located off trails and helps protect the integrity and setting of sensitive Native American resources from effects. The closure of areas to multiple methods of travel provides the greatest protection for cultural resources as long as administrative access is maintained to permit Native American access for identified cultural uses. The Comprehensive Travel and Transportation Management alternatives vary in the location and extent of travel restrictions. Direct effects should be identified through inventory, and adverse effects addressed through avoidance by redesign or mitigation. Ongoing

indirect effects on cultural resources from use of designated trails are less likely to be detected or monitored and enforcing restrictions is difficult. Unauthorized travel would probably continue, and the potential risk of unauthorized collection or vandalism due to creation of unauthorized access would likely continue.

All alternatives include provisions to retain and acquire lands that contain significant cultural resources and culturally sensitive areas, to maintain access to resources, to reduce incompatible uses, and to minimize disturbance when delineating ROWs. The potential acquisition of new land would provide long-term federal consideration under the NHPA to any cultural resources included in the transaction and could enhance currently managed resources by consolidating holdings and potentially protecting the setting of cultural resources. Land tenure adjustments and new transportation facilities that allow for better access to public lands could facilitate cultural uses but could also lead to vandalism or unauthorized collection of cultural resources. Exchange or disposal of lands to nonfederal entities would permanently remove federal protections for any significant cultural resources present, which would be an adverse effect under the NHPA. Exchanges, disposal, and subsequent landscape changes could also result in effects on the setting of cultural resources.

The development and operation of transportation systems, pipelines, transmission lines, communication sites, renewable energy resources, and other land use authorizations can disturb large tracts of land containing many cultural resources and affect the setting of cultural resources over a great distance. Defining exclusion and avoidance areas for ROWs and other realty actions reduces the potential for effects on cultural resources resulting from discretionary actions at those locations. Siting ROWs along existing corridors does not reduce the potential for effects on cultural resources.

Potential effects associated with the exploration and development of coal resources, oil and gas, oil shale, geothermal resources, locatable minerals, mineral materials, and non-energy leasable minerals include physical disturbance and loss of setting. However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area. Archaeological deposits, historic structures, cultural landscapes, and Native American resources are affected by disturbance for facilities and roads; visual and aural intrusions; interference with cultural uses; and increased access that can lead to vandalism and unauthorized collection. The alternatives vary in amount of land and locations available for each kind exploration and development and the applicable requirements according to the objective of each alternative. The acreages in the planning area open to exploration and development vary widely by leasable, locatable, or salable mineral commodity. Depending on the alternative adopted, specific areas of the planning area could be subject to new disturbance and further development.

Discretionary mineral exploration and development activities are subject to further cultural resource review at each stage of development either through the Section 106 process, mine regulations, or permitting stipulations. Measures restricting activities that could affect cultural resources sites or requiring additional mitigations would maintain protection for these resources. Withdrawals for preserving natural resources would provide additional indirect protection for cultural resources and Native American resources in those locations from ground disturbance and alterations to setting alteration. Potential ongoing effects in the vicinity of existing mines and drilling locations would continue.

Surface use restrictions, completion of the NHPA Section 106 process, and permitting stipulations would mitigate or prevent many potential effects. However, potential effects on Native American resources and their settings would likely be difficult or impossible to adequately mitigate across the entire decision area, and any alterations to the landscape could affect the setting of cultural and Native American resources.

Nondiscretionary mining notices are not federal undertakings and are therefore not subject to NHPA regulations, but 43 CFR 3809 prohibits mining operators on claims of any size from knowingly disturbing or damaging them. Mining notices must be reviewed within 15 days, even though it may be difficult to determine the presence of resources in areas that have not been inventoried.

Areas with special designations, such as ACECs, are afforded special management measures designed to protect a variety of resource values, including geologic, botanic, historic, cultural, scenic, fish and wildlife resources, and rare or exemplary natural systems, or to protect human life and property from natural hazards. Protections afforded by the management measures for other resources would provide incidental protections for cultural resources. Management measures vary but include surface use restrictions, ground disturbance restrictions, prohibitions on motorized uses, VRM classifications, and other restrictions on incompatible activities. Designation may help preserve and enhance culturally important natural resources, but in some instances restrictions could impede Native American access and uses. Designations may attract more recreational use and the potential for inadvertent effects on cultural resources from recreation or intentional vandalism or unauthorized collection. Increased use of the internet by interested individuals to disseminate site location and encourage visitation to sites that are unrecorded or have not been allocated to public use can expose cultural resources to impacts.

Effects from managing four WSAs totaling 96,500 acres would be similar to those described for managing ACECs, but more restrictive management actions in WSAs would further reduce the potential for effects.

Measures for interpretation, environmental education, use of cultural resources in SRPS, and promotion of national, state, and BLM byways may enhance

appreciation and understanding of the fragile and finite nature of cultural resources; however, it can also lead to effects from access, degradation from use, vandalism, and unauthorized collection. Therefore, resources that are not suitable for public uses are not allocated to that use category and are not included in interpretation or education projects or SRPs.

Implementing management for the following resources would have negligible or no impact on cultural resources and are therefore not discussed in detail: air quality and paleontology.

Alternative A

BLM policy requires that management concerns for cultural resources be addressed through the allocation of recorded and projected resources to "use categories" as identified in BLM Manual 8110.42. Current management of cultural resources under Alternative A in the planning area does not include these proactive measures for consideration of scientific, educational, recreational, traditional, or experimental purposes and the development of appropriate management proscriptions. Alternative A does not include other proactive goals, objectives, and actions to accommodate and enhance Native American uses and values in their traditional homeland. Cultural resource compliance would continue as described in the methods and assumptions section, and effects would be as described under Effects Common to All Alternatives.

Alternative A would continue current measures, stipulations, and surface occupancy restrictions for the protection of soil, water, watersheds, vegetation, fish and wildlife, and special status species that would provide indirect protection of cultural resources, and potential Native American uses and values. These include restricting surface disturbance, reducing erosion, and reducing access and use. Including a 4,600-acre NSO stipulation for cultural resources, NSO stipulations designed to protect several different resources would be applied on 433,000 acres in this alternative, directly and indirectly protecting cultural resources by restricting surface disturbance. Cultural uses may be inhibited by vegetation treatments and access restrictions.

Prescribed fire is permitted for natural resource benefit. Wildland fire and fire suppression have the potential to result in direct disturbance or loss of cultural resources, especially in areas where resources have not been inventoried or cannot be considered in an emergency response.

Under Alternative A, indirect protections of the visual setting of cultural resources through VRM Class I and II designations would continue on 159,200 acres. Designations in these areas could also limit surface-disturbing activities protecting effects on cultural resources. However, 696,100 acres would remain undesignated under this alternative, and projects may be directed to culturally sensitive areas.

General effects due to livestock grazing are described under Effects Common to All Alternatives. Alternative A has the most land open for grazing (978,600 acres) and the least amount closed (48,600 acres).

General effects due to recreation are described under Effects Common to All Alternatives. Four special management areas on 358,300 acres (Bangs Canyon SRMA, North Fruita Desert SMA, Gateway IRMA, and Grand Valley IRMA) and one ERMA (703,100 acres) for recreation would be managed under Alternative A. Recreational uses are not as structured under this alternative, and the risk of effects on cultural resources is likely greater.

Current management designates 445,400 acres of the decision area as open to cross-country motorized use and 12,500 acres as open to intensive motorized use. Inventories were not conducted prior to allowing this use, and it is expected that effects on cultural resources have occurred and are ongoing through direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and access leading to unauthorized collection or vandalism.

Effects from land and realty actions are described under Effects Common to All Alternatives. Alternative A identifies 441,400 acres as ROW avoidance and 234,900 acres as exclusion areas for utility development. Seven corridors are managed as such, concentrating potential development and alterations to setting in those areas. Policy and standard stipulations address effects on cultural resources from lands and realty actions.

Five ACECs totaling 28,900 acres (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon, and Unaweep Seep) are afforded special management measures to protect a variety of resource values that would also protect cultural resources from incompatible uses. While all ACECs include cultural resources, the cultural resources of Rough Canyon are specific ACEC values in the designation. Protections include closures, limitations on motorized use, and surface and ROW restrictions.

Land adjacent to eligible WSR segments totaling 99.5 miles through BLM-administered public land would receive indirect protection from incompatible development and ground-disturbing activities under Alternative A. Increased use of these areas by the public, based on the designations, may lead to effects.

Alternative B

Under Alternative B, cultural resource management measures would allocate cultural resources to "use categories" as identified in BLM Manual 8110.42 and incorporate additional actions to accommodate Native American traditional uses.

Proactive management actions would be implemented based on allocations of cultural resources to scientific, educational, recreational, traditional, or

experimental use. Actions include NSO stipulations for the resource and a buffer surrounding the resource. Specific acreages for NSO stipulations driven by cultural resources are unavailable, but NSO stipulations for all resources would be applied 382,200 acres (16 percent fewer acres than under Alternative A) under this alternative. Additional actions include the nomination of resources to the NRHP; cultural resource management plans and NSO stipulations for East and West Indian Creek areas; cultural resource management plans guiding public and scientific uses; and subsurface inventory requirements for construction disturbance for the identification and documentation of buried resources. CSU stipulations would be applied on 656,200 acres (including 53,500 acres for cultural resources) of federal mineral estate for all resources (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate). Incorporating these actions would provide some additional protection of cultural resources and their settings from incompatible activities such as development, surface disturbance, vehicle use, vandalism, unauthorized collection, and visual intrusions. These allocations would also provide early guidance for identifying and resolving conflicts from land uses, for avoiding effects, and for developing appropriate mitigation options. Cultural resources discharged from management include those resources that no longer meet active management objectives of the other five use categories.

BLM would implement actions to identify and protect traditional cultural properties, collaborate with Native American tribes in the management and interpretation of resources important to them, and enhance opportunities to exercise Native American traditional use of cultural landscapes, cultural properties, and important plant resources. In addition to NSO buffers, the BLM would also nominate traditional sites to the NRHP, develop cultural resource management plans, and formalize protocols for gathering information for identifying sites that are important for cultural and religious purposes.

Managing cultural properties according to use categories does not replace BLM's compliance obligations under the NHPA. Cultural resource compliance would continue as described in the methods and assumptions section. Effects would be as described under Effects Common to All Alternatives.

Alternative B would expand current measures, stipulations, and surface occupancy restrictions for the protection of soil, water, watersheds, vegetation, fish and wildlife, and special status species. As described under Effects Common to All Alternatives, these measures would provide indirect protection of cultural resources and their settings and may enhance resources important for Native American uses. Expanded vegetation and fuel treatments to meet habitat and land health objectives may temporarily inhibit access for Native American cultural uses. Alternative B would also include a full range of wildfire management actions. Wildland fire and fire suppression have the potential to result in direct disturbance or loss of cultural resources, especially in areas

where cultural resources have not been inventoried or cannot be considered in an emergency response.

Under Alternative B, indirect protections of the visual setting of cultural resources through VRM Class I and II designations would be expanded to 518,600 acres (3.3 times more acres than Alternative A). Designations in these areas could also limit surface-disturbing activities, reducing effects on cultural resources. Cultural resources in VRM Class III and IV on 542,800 acres (40 percent less than Alternative A) would not benefit from these indirect protections, and projects may be directed to culturally sensitive areas.

General effects due to livestock grazing are described under Effects Common to All Alternatives. Alternative B reduces the amount of land open for grazing to 961,100 acres (2 percent fewer acres than under Alternative A) and increases the amount closed to 66,000 acres (36 percent more acres than under Alternative A).

General effects due to recreation are described under Effects Common to All Alternatives. Alternative B adds additional measures to structure recreational opportunities in SRMAs and ERMAs. Cultural resource inventories would be required prior to surface-disturbing implementation actions. BLM would manage three SRMAs totaling 78,300 acres (Bangs, Dolores River Canyon, and North Fruita Desert) (78 percent fewer than under Alternative A). With the exception of the North Fruita Desert, these include important cultural resource values. Additional surface use stipulations would be implemented that can indirectly protect cultural sites from large-scale disturbance, but effects from recreational use could still occur. There may be opportunities to further structure recreational opportunities to avoid effects or provide interpretive or educational information. Seven individual ERMAs totaling 175,500 acres (75 percent fewer acres than under Alternative A) would be recognized to provide for targeted recreation opportunities.

Alternative B would reduce to 5,400 acres the area open to cross-country motorized use (57 percent fewer acres than under Alternative A) and limit motorized travel to designated routes on 868,000 acres (3.9 times more acres than under Alternative A). Mechanized travel, which is not subject to planning area-wide route designations under Alternative A, would be limited to designated routes on 897,500. Foot and horse travel would be limited to designated routes on 24,600 acres and foot travel would be the only permitted mode of travel in Pyramid Rock. As compared to Alternative A, these actions would greatly reduce the potential for effects on cultural resources over a wide area from direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and access leading to unauthorized collection or vandalism. These effects would be primarily concentrated in the 5,400 acres open to intensive use and in the vicinity of designated trails for all uses.

Effects from land and realty actions are described under Effects Common to All Alternatives. Defining exclusion and avoidance areas for ROWs and other realty actions reduces the potential for effects on cultural resources resulting from discretionary actions at those locations. Alternative B identifies 740,900 acres (68 percent more acres than under Alternative A) as ROW avoidance and 204,200 acres (18 percent fewer acres than under Alternative A) as exclusion areas for utility development. Managing for only six corridors would concentrate potential development and alterations to setting in those areas. The cultural resources at Indian Creek ACEC would be in an ROW exclusion area.

Alternative B includes three units covering 24,400 acres that would be managed for wilderness characteristics (Maverick, Unaweep, and West Creek [adjacent]). Cultural resources are important supplemental values to an area's wilderness characteristics and can be protected by management measures such as NSO and CSU stipulations, ROW exclusion, travel restrictions, and mineral closures.

Alternative B would increase the number of ACECs to thirteen totaling 106,000 acres (same five as Alternative A as well as Atwell Gulch, Dolores River Riparian, Indian Creek, Juanita Arch, Mt. Garfield, Roan and Carr Creeks, Sinbad Valley, and South Shale Ridge) (2.7 times more acres than under Alternative A). Special management measures in the ACECs vary but may include surface use restrictions and closures, travel management measures, ROW exclusions, and other stipulations that would restrict incompatible uses. While all ACECs include cultural resources, the cultural resources of Atwell Gulch, Indian Creek, Rough Canyon, Sinbad Valley, and Pyramid Rock are called out as having ACEC values.

Managing 11.5 miles (88 percent fewer miles than Alternative A) of the Dolores River as suitable for inclusion in the NWSRS would provide indirect protection through CSU and ROW avoidance measures.

Surface use stipulations and ROW avoidance measures create a 200-meter buffer along the Old Spanish National Historic Trail and may provide protection of any archaeological resources associated with the trail and help preserve the trail setting. Tabeguache Trail would be proposed as a National Recreation Trail. Designation may lead to surface effects on cultural resources from recreational use and possible vandalism. Actions proposed to protect, interpret, and enhance the values of the trails and trail resources and to retain their setting are compatible and complementary with cultural resource protection.

Alternative B would expand interpretation and environmental education programs that could lead to protection and appreciation of cultural resource values in the decision area.

Alternative C

Cultural resource management measures would be the same as described under Alternative B. The BLM would allocate resources to "use categories" and use

these to define proactive management measures to meet desired outcomes. These allocations would provide early guidance for identifying and resolving conflicts from land uses, for avoiding effects, and for developing appropriate mitigation options. The BLM would also implement the measures to identify and protect traditional cultural properties, collaborate with the Ute tribes in the management and interpretation of resources important to them, and enhance opportunities to exercise Native American traditional use of cultural landscapes, cultural properties, and important plant resources. Incorporating these actions would provide additional protection of cultural resources and their settings from incompatible activities such as development, surface disturbance, vehicle use, vandalism, unauthorized collection, and visual intrusions.

The BLM would continue to meet its compliance obligations under the NHPA as described in the methods and assumptions section. Effects would be the same as described under Effects Common to All Alternatives.

Alternative C would further expand current measures, stipulations, and surface occupancy restrictions for the protection of soil, water, watersheds, vegetation, fish and wildlife, and special status species. Under Alternative C, NSO stipulations would be applied on 858,000 acres of federal mineral estate (98 percent more acres than under Alternative A). CSU stipulations for cultural resources would be applied on 68,400 acres (28 percent more acres than under Alternative B) for subsurface inventory requirements for construction disturbance, providing additional potential for the identification and documentation of buried resources. As described under Effects Common to All Alternatives, these measures would provide indirect protection of cultural resources and their settings and may enhance resources important for Native American uses. Expanded vegetation and fuel treatments methods may inhibit access for Native American cultural uses. Wildland fire management measures and potential effects would be the same as described under Alternative B.

Indirect protections of the visual setting of cultural resources through VRM Class I and II designations would be expanded to 654,000 acres (4.1 times more acres than under Alternative A). Designations in these areas could also limit surface-disturbing activities, reducing effects. Cultural resources in VRM Classes III and IV on 407,400 acres (55 percent fewer acres than under Alternative A) would not benefit from these indirect protections, and projects may be directed to culturally sensitive areas.

General effects due to livestock grazing are described under Effects Common to All Alternatives. Alternative C further reduces the amount of land open for grazing to 586,600 acres (4 percent fewer acres than under Alternative A) and increases the amount closed to 440,400 acres (84 percent more acres than under Alternative A).

General effects due to recreation are described under Effects Common to All Alternatives. Like Alternative B, Alternative C includes additional measures to

structure recreational opportunities in SRMAs and to implement surface use restrictions that provide incidental protection for cultural resources. Cultural resource inventories would be required for implementation. BLM would manage two SRMAs on 60,000 acres (Bangs and the North Fruita Desert SRMAs) (84 percent fewer acres than under Alternative A). With the exception of the North Fruita Desert SRMA, these include important cultural resource values. This may increase recreational use of these areas leading to more effects. Additional surface use stipulations would be implemented that can indirectly protect cultural sites (e.g., applying an NSO stipulation to Bangs and RMZ 1 in the North Fruita Desert SRMA), but effects from recreational use could still occur.

Alternative C is the most restrictive alternative in terms of travel designations. The decision area would be closed to all cross-country motorized use. Acres closed to motorized use would be increased to 379,500 acres (10.8 times more acres than under Alternative A), and mechanized travel would be closed on 367,000 acres. Foot and horse restrictions would be the same as described under Alternative B, except that foot travel would be prohibited in Pyramid Rock ACEC. Placing greater restrictions on travel would further reduce the potential for effects from direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and access leading to unauthorized collection or vandalism. Potential effects would be concentrated in the vicinity of designated trails. Pyramid Rock would be closed to all uses, except tribal and administrative uses, reducing the potential for effects.

Effects from land and realty actions are described under Effects Common to All Alternatives. Exclusion and avoidance areas for ROWs and other realty actions reduces the potential for effects resulting from discretionary actions at those locations. Alternative C identifies 627,000 acres (42 percent more acres than under Alternative A) as ROW avoidance areas and expands the exclusion areas for utility development to 365,800 acres (39 percent more acres than under Alternative A). Managing for six corridors would concentrate potential development and alterations to setting in those areas. The cultural resources at Indian Creek ACEC would be in a ROW exclusion area.

Alternative C includes 171,200 acres in 12 units that would be managed for wilderness characteristics (same as Alternative B as well as Bangs Canyon, East Demaree Canyon, East Salt Creek, Hunter Canyon, Kings Canyon, Lumsden Canyon, Spink Canyon, Spring Canyon, and South Shale Ridge) (7 times more acres than under Alternative B). Cultural resources are important supplemental values to an area's wilderness characteristics and can be protected by management measures such as NSO and CSU stipulations, ROW exclusion, travel restrictions, and mineral closures.

Alternative C would increase the number of ACECs to 23, totaling 168,000 acres (same 13 as Alternative B as well as Colorado River Riparian, Coon

Creek, Glade Park-Pinyon Mesa, Gunnison River Riparian, Hawxhurst Creek, John Brown Canyon, Nine-mile Hill Boulders, Plateau Creek, Prairie Canyon, and Reeder Mesa) (5.8 times more acres than under Alternative A). Special management measures in the ACECs and ACEC values attributed to the designations are the same as described under Alternative B.

Cultural resources along the 14 NWSRS-suitable segments would receive indirect protection from NSO or CSU and ROW exclusion or ROW avoidance measures. Actions that would adversely affect ORVs would not be permitted; the restriction of actions to protect ORVs would indirectly benefit cultural resources along the segments where cultural resources are not an ORV. Where cultural resources are an ORV, they would be directly protected.

Effects from national trails are similar to those described under Alternative B. Surface use stipulations and ROW avoidance measures addressing the buffers around the Old Spanish National Historic Trail may provide protection of any archaeological resources associated with the trail and may help preserve the trail setting. Protection of trail resources through a 0.5-mile NSO stipulation buffer is increased under Alternative C. The Tabeguache Trail would be proposed as a National Recreation Trail. Designation may lead to surface effects on cultural resources from recreational use and possible vandalism. Actions proposed to protect, interpret, and enhance the values of the trails and trail resources and to retain their setting are compatible and complementary with cultural resource protection.

Alternative C would further expand interpretation and environmental education programs that could lead to protection and appreciation of cultural resource values in the decision area.

Alternative D

Cultural resource management measures would be the same as described under Alternative B. BLM would allocate resources to "use categories" and use these to define proactive management measures to meet desired outcomes. BLM would also implement the measures to identify and protect traditional cultural properties, collaborate with Native American tribes in the management and interpretation of resources important to them, and enhance opportunities to exercise Native American traditional use of cultural landscapes, cultural properties, and important plant resources.

BLM would continue to meet its compliance obligations under the NHPA and the Colorado Protocol as described in the methods and assumptions section. Effects would be as described under Effects Common to All Alternatives.

Alternative D would emphasize commodity and resource uses. As such it would expand most current measures, stipulations, and surface occupancy restrictions for the protection of soil, water, watersheds, vegetation, fish and wildlife, and special status species, but not to the extent provided under Alternatives B and

C. NSO stipulations would be applied on 497,800 acres of federal mineral estate (15 percent more acres than under Alternative A) under Alternative D. CSU stipulations for cultural resources would be applied on 51,400 acres (4 percent fewer acres than under Alternative B) for subsurface inventory requirements for construction disturbance, thereby increasing the risk for more resources to be damaged or destroyed by inadvertent discovery in those areas. As described under Effects Common to All Alternatives, these measures would provide indirect protection of cultural resources and their settings and may enhance resources important for Native American uses. Compared to Alternatives B and C, mapped NSO stipulations specific to cultural resources are reduced by 1,180 acres in this alternative, resulting in greater potential for surface disturbances that could impact cultural resources. Use of vegetation and fuel treatments methods may inhibit access for Native American cultural uses. Wildfire management actions, from full suppression to using unplanned ignitions for natural resource benefits, would occur on fewer acres than Alternatives B and C. Current management under Alternative A does not specify where unplanned ignitions are managed for resource benefit. Wildland fire and fire suppression have the potential to result in direct disturbance or loss of cultural resources, especially in areas where cultural resources have not been inventoried or cannot be considered in an emergency response.

Indirect protections of the visual setting of cultural resources through VRM Class I and II designations on 333,900 acres would be 2.1 times more acres than current management under Alternative A, but would be far less than Alternatives B and C. Similarly, the 727,500 acres (19 percent fewer acres than under Alternative A) of VRM Class III and IV would be much higher than Alternatives B (34 percent more acres) and C (79 percent more acres). The effects of these designations would be similar to those described under Alternative C.

General effects due to livestock grazing are described under Effects Common to All Alternatives. The amount of land open for grazing would be 977,200 acres (less than 1 percent fewer acres than under Alternative A) and the amount of land closed to grazing would be 49,900 acres (3 percent more acres than under Alternative A), which are very similar to current grazing levels.

General effects due to recreation are described under Effects Common to All Alternatives. Like Alternatives B and C, Alternative D adds additional measures to structure recreational opportunities in SRMAs and ERMAs. Cultural resource inventories would be required for implementation. The BLM would manage six SRMAs totaling 79,000 acres (Bangs, Castle Rock, Gunnison River Bluffs, Grand Valley OHV, North Fruita Desert, Palisade Rims) (78 percent fewer acres than under Alternative A). With the exception of the North Fruita Desert SRMA, all of these are known to include important cultural resource values. Identification of the 4,400-acre Castle Rock SRMA would have significant impacts on cultural resources. Additional surface use stipulations would be implemented that can

indirectly protect cultural sites from large-scale disturbance, but effects from recreational use could still occur. There may be opportunities to further structure recreational opportunities to avoid effects or provide interpretive or educational information. Six individual ERMAs totaling 61,900 acres (91 percent fewer acres than under Alternative A) would be recognized to provide for targeted recreation opportunities. Closure to camping would be implemented at Pyramid Rock and other locations to protect cultural resources.

Limiting travel to foot travel in Pyramid Rock would mitigate the potential for effects in this sensitive area. (Access for Traditional Use by Native Americans may be accommodated through consultation.) Limiting equestrian travel to designated routes in Bangs SRMA would reduce the potential for effects in these areas. Alternative D would reduce to 10,200 acres (18 percent fewer acres than under Alternative A) the area open to cross-country motorized use. Compared to Alternative A, Alternative D would greatly reduce the potential for effects from direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and access leading to unauthorized collection or vandalism. Potential effects on cultural resources would primarily be concentrated in the 10,200 acres of open areas and in the vicinity of designated trails.

Effects from land and realty actions are described under Effects Common to All Alternatives. Exclusion and avoidance areas for ROWs and other realty actions reduces the potential for effects resulting from discretionary actions at those locations. Alternative D identifies 80,500 acres (82 percent fewer acres than under Alternative A) as ROW avoidance areas and 104,100 acres (56 percent fewer acres than under Alternative A) as exclusion areas for utility development. This is the least amount of any alternative. Managing for eight corridors would increase potential development and alterations to setting in additional areas.

Alternative D includes no lands with wilderness characteristics that would be managed for wilderness characteristics, so cultural resources would not be afforded additional incidental protections.

Under Alternative D, the BLM would continue managing five ACECs totaling 33,200 acres (same as Alternative A, though with Badger Wash, Pyramid Rock, and The Palisade expanded in acreage) (15 percent more acres than under Alternative A). These would be managed to protect a variety of resource values that would also protect cultural resources from incompatible uses. While all ACECs include cultural resources, the cultural resources of Rough Canyon and Pyramid Rock are called out as ACEC values in the designation. Protections include closures and limitations to motorized, equestrian, and mechanized travel and ROW restriction.

Surface use stipulations and ROW avoidance measures create a 50-meter buffer along the Old Spanish National Historic Trail and may provide protection of any

archaeological resources associated with the trail and help preserve the trail setting. Alternative D has the smallest protective buffer along the trail, with the exception of Alternative A, which does not provide a buffer. The Tabeguache Trail would be proposed as a National Recreation Trail. Actions that promote these trails may include opportunities for interpretation, but may also lead to surface effects from recreational use and possible vandalism. Actions proposed to protect, interpret, and enhance the values of the trails and trail resources and to retain their setting are compatible and complementary with cultural resource protection.

Compared to Alternative A, Alternative D would expand interpretation and environmental education programs that could lead to protection and appreciation of cultural resource values in the decision area.

Cumulative

The CIAA used to analyze cumulative effects on cultural resources extends outside the planning area, following fourth-order watershed boundaries that completely or partially overlap the planning area. Fourth-order watersheds were used as the basic unit of analysis because effects from most management actions proposed under the RMP and other existing activity plans are not expected to have cumulative influence beyond this scale.

The types of effects on cultural resources that have occurred in the past include destruction of cultural resources, loss of integrity due to physical or other disturbances, loss of setting, degradation from natural processes such as erosion and weathering, incremental disturbance from use or access, and effects from vandalism and unauthorized collection. Loss of access to Traditional Cultural Properties has not been specifically identified through consultation but is possible.

Current and future trends include population growth, urban encroachment, increases in mining, fluid mineral leasing, leasable minerals, renewable energy development, ongoing grazing, increase in recreational demand, road construction, water diversions, invasive species, erosion, wildland fire, forest disease and insects, drought, and climate change. These would continue to affect cultural resources and cultural landscapes through loss or disturbance of resources that are not or cannot be protected, changes in setting, pressure from incremental use, loss of access for Native Americans to resources, and theft or vandalism of cultural resources.

Cultural resources adjacent to areas of growth and development would be most susceptible to future effects. Development near public lands is also increasing as adjacent agricultural lands are being converted into subdivisions, increasing the risk of effects on cultural resources. The effects on cultural resources on adjacent private lands would be greater than on federal lands since they would not be subject to the same requirements or protections. The construction of buildings, roads, and associated structures increases ground disturbance, causing

effects on cultural resources and their settings. In general, the more people and development in an area, the greater the potential for disturbance and increased cumulative effects. Enforcement of measures designed to protect cultural resources and the natural resources and places used by Native Americans would become more difficult as population and use increase. Areas where intensive, cross-country motorized use is allowed would continue to expose cultural resources to effects. Designating routes can protect cultural resources located off the routes, but restrictions are difficult to enforce, especially as population and recreational use grows and other areas are closed. Increased use of GPS and off-road vehicles can facilitate vandalism and unauthorized collecting. Increased use of the internet to disseminate site location and encourage visitation to sites that are unrecorded or have not been allocated to public use will continue to expose cultural resources to impacts.

Actions related to recreation, grazing, vegetation treatment, wildland fire, mineral development, and energy development have had past effects and are expected to continue to affect cultural resources. Increased frequency of wildland fire due to drought, climate change, and forest health may lead to additional direct loss of cultural resources and effects due to suppression.

For actions that could affect cultural resources on federal land or actions that are funded, licensed, or permitted by the federal government, compliance is required with the NHPA and other laws, statutes, and regulations. Consideration of the effects of undertakings on protected cultural resources would be required, and most adverse effects would be resolved. For many types of cultural resources, information on the regional cultural resource base is not available or is scarce and needs to be developed to properly assess the significance of the resource base. Many cultural resources are evaluated only by their surface manifestations and many resources evaluated as not eligible may actually be eligible, but these are lost through project implementation. State agency actions using federal funds or needing a federal permit require cultural resource review. Effects would be avoided or mitigated in many of the regional actions. Some effects would be unavoidable. Measures are in place to identify threats to resources and to prioritize management actions, but some effects on known or unknown cultural resources resulting from activities such as natural processes, wildland fire, grazing, dispersed recreation, recreational use, and vandalism can go unnoticed and may not be mitigated. Mitigation could preclude other desirable management options and future uses. Development or actions on lands that are not protected by federal or other cultural resource statutes and regulatory protections could lead to loss of these resources and the regional heritage and knowledge that they contain.

Decisions from this RMP would have effects that, when combined with other past, present, and reasonably foreseeable actions, could produce cumulative effects on cultural resources and religious, traditional, or other sensitive Native American resources. Cumulative effects would result from the destruction and

loss of known and unrecorded resources and unanticipated discoveries. The continued documentation of new cultural resources from undertakings and permitted actions that would require inventory for compliance would result in additional information to expand and explain the area's cultural history. Proactive planning measures under Alternatives B, C, and D would improve current management of cultural resources in the decision area. The restrictions on open, cross-country use would drastically reduce the amount of land where cultural resources would be affected. Alternative C would be the most protective of the cultural resource base through measures targeting resource protection. In addition, all undertakings would be subject to the Section 106 process of the NHPA and other applicable laws and regulations. Adherence to appropriate predevelopment, development, and post-development protective measures would reduce most effects to an insignificant level. As such, implementation of the proposed RMP is not anticipated to contribute to cumulative effects in the CIAA.

4.3.9 Paleontology

This section discusses impacts on paleontological resources from proposed management actions of other resources and resource uses. Existing conditions concerning paleontological resources are described in **Section 3.2.12**, Paleontology.

Paleontological resources include any fossilized remains, traces, or imprints of organisms preserved in or on the earth's crust that are of scientific interest and that provide information about the history of life on earth. BLM policy is to manage paleontological resources for scientific, educational, and recreational values and to protect or mitigate these resources from adverse impacts. To accomplish this goal, paleontological resources must be professionally identified and evaluated, and paleontological data should be considered as early as possible in the decision-making process.

Requirements under all the alternatives to identify resources in areas of high potential prior to ground disturbance would allow evaluation, avoidance, recovery, or other mitigation to preserve the scientific, educational, and interpretive resource uses. Damage from cross-country motorized travel, wildfire suppression activities, erosion, unauthorized collection, and inadvertent vandalism could result in the unmitigated loss of scientific information. Cross-country motorized use is eliminated under the action alternatives, reducing the potential for surface impacts and access that may facilitate unauthorized removal.

Methods of Analysis

Impacts on paleontological resources occur from natural weathering and erosion and from surface-disturbing activities, excavation, and theft or vandalism.

Indicators of impacts on paleontological resources include the following:

- Physical destruction or damage of fossil-bearing geological formations that results in the loss of vertebrate fossils or other scientifically significant fossil resources.

Without removing some rock surrounding fossils, they would remain largely undetected; therefore, management actions that result in erosion do not necessarily result in damage to paleontological resources. Excessive erosion, especially from other surface disturbance on exposed localities, could damage fossils at the surface. While the location of every significant paleontological locality in the field office is not known, the analysis considers the different management actions and their potential to directly or indirectly affect paleontological resources. Education and public access can increase support for the appreciation and protection of paleontological resources but may also increase visitation and the potential for vandalism and unauthorized removal.

For this analysis, impacts on paleontological resources would be significant if there were substantial direct or indirect damage or destruction to or loss of vertebrate fossils or other scientifically significant fossil resources.

The analysis includes the following assumptions:

- Occurrences of paleontological resources are closely tied to the geologic units (e.g., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface.
- Geologic mapping can be used for assessing the potential for the occurrence of paleontological resources using the BLM's PFYC system.
- For the purpose of assessing impacts, only those objectives and actions potentially affecting vertebrate and scientifically important paleontological resources are considered.
- Scientifically important fossils would continue to be discovered throughout the planning area. Discoveries are most likely in geologic units classified as high potential PFYC Class 4 or 5, but known rich localities also have been found in the planning area in PYFC Class 3 units.
- Inventories conducted before surface disturbance or construction monitoring in high-probability areas may result in the identification and evaluation of previously undiscovered resources, which BLM would manage accordingly.

- Unmitigated surface-disturbing activities could dislodge or damage paleontological resources and features that were not visible before surface disturbance.
- A paleontological resource use permit is required to collect paleontological resources of scientific interest. Collections made on public land remain the property of the US and must be made available for research and education. Casual collecting of common invertebrate and plant fossils is allowed without permit throughout the planning area except where special designation may prohibit fossil collection.
- Mining claims targeting fossils are not permitted and commercial sale of petrified wood is prohibited.
- There is large market for fossil specimens. Scientifically important paleontological resources have been illegally removed from public lands without permits.

Effects Common to All Alternatives

Potential impacts on vertebrate and scientifically important paleontological resources were reviewed for all resource and resource use management measures.

Under all alternatives paleontological resources would be managed according to their PFYC classification, derived currently in the planning area from large-scale mapping of generalized geologic units. Inventories of proposed surface-disturbing activities would continue to be required in PFYC Class 4, 5, and sometimes Class 3 paleontological areas per current BLM policy. Proposed surface-disturbing actions in other areas would continue to be reviewed and inventories would be considered on a case-by case basis depending on knowledge of the proposed project area, the potential for paleontological resources to be present, the depth and extent of ground disturbance, and the presence of the known localities in the vicinity. Monitoring of construction and stipulations to stop work if resources are discovered would continue to be implemented in high potential areas. Paleontological resources are sometimes discovered through substantial excavations. These measures would help ensure the protection of paleontological resources from impacts due to authorized surface-disturbing activities and help ensure preservation of opportunities for scientific, educational, and recreational uses of these resources.

Paleontological resources near the ground surface can be exposed by natural erosion that can be exacerbated by surface-disturbing activities. Exposure can lead to discovery and appropriate resource uses, but fossils can be damaged or lost by the direct action of ground disturbance, subsequent erosion, and unauthorized collection. Measures to control erosion and loss of ground cover by reducing soil disturbance from construction, mineral exploration and development, grazing, forestry, steep slope restrictions, implementing

stormwater protection stipulations, managing vegetation, and post-burn fire rehabilitation have the potential for reducing erosion and potential impacts on paleontological resources near the ground surface.

While most areas with paleontological resources on the surface would not support significant amounts of vegetation, fire management activities related to unplanned ignitions can involve ground-disturbing activities at depths that can directly impact paleontological resources, if present. These actions include constructing fire lines and using heavy equipment. High severity fire can also damage surface fossils, including cracking, spalling, and oxidizing. Fire can result in impacts through erosion and the increased visibility of paleontological resources. Fire can also remove vegetation and expose previously undiscovered resources, allowing for their study and protection; however, locations exposed by fire can be susceptible to damage by subsequent erosion, vandalism, and unauthorized collecting.

Recreation can physically alter paleontological resources if present near the ground surface, lead to damage from erosion, and facilitate unauthorized collection and vandalism. Although recreational fossil collecting is allowed throughout the decision area except where special designation may prohibit fossil collection, recreational collectors may inadvertently collect scientifically important fossil specimens or exceed collecting limits. Vertebrate fossils, which include dinosaurs, mammals, sharks, and fish or any animal with a skeletal structure, or any scientifically important invertebrate or plant fossil cannot be collected on public lands without a special collecting permit. Douglas Pass along Highway 139 is heavily used by recreational fossil collectors, collecting the easily accessible fossils, and sometimes removing vegetation and topsoil to expose them. The Bangs Canyon area, which contains paleontological resources, would continue to be an SRMA under all alternatives. Developed recreational sites and structured recreational opportunities tend to concentrate any potential impacts in particular areas, but impacts due to dispersed recreation are more difficult to anticipate, monitor, and mitigate. In addition to the potential for damage of surface fossils from all forms of recreational travel, motorized vehicles can provide access to otherwise less accessible areas, potentially leading to new discoveries or leading to damage or unauthorized removal. Impacts from physical damage and unauthorized collection reduce opportunities for scientific, educational, and recreational uses of these resources.

Ground-disturbing lands and realty actions, exploration and development of oil and gas, oil shale, geothermal resources, and mineral resources in PFYC Class 4, 5 and sometimes Class 3 geologic formations would require paleontological inventories. The alternatives vary in amount of land and locations available for each kind development and in the applicable requirements according to the focus of the individual alternatives. Although large portions of the planning area would be open to future development, only a small portion of the planning area is expected to be subject to new disturbance or further development.

Paleontological resources may be discovered, preserved, or recovered as a result of survey, monitoring, or inadvertent discovery. These measures would help ensure the protection of paleontological resources from impacts due to authorized surface-disturbing activities and help ensure preservation of opportunities for scientific, educational, and recreational uses of these resources.

Areas with special designations, such as ACECs and WSAs, are afforded special management measures designed to protect a variety of resource values, including geologic, botanic, historic, cultural, paleontological, scenic, fish and wildlife resources, and rare or exemplary natural systems, or to protect human life and property from natural hazards. Management measures vary but include surface use restrictions, ground disturbance restrictions, prohibitions on motorized travel, VRM classifications, annual monitoring, and other restrictions on development and resource use. Paleontological resources within these areas would be preserved in situ, or collected only by approved scientific/educational permit. New discoveries from development and deep excavations would be less likely in these areas, but permits for scientific uses (collection, excavation, and curation) would be considered if compatible with the resource values that the designation is protecting. Pyramid Rock is an ACEC under all alternatives, and paleontological resources are called out as an ACEC value in the designation. All alternatives include four WSAs totaling 96,500 acres.

Measures for interpretation, environmental education, and promotion of national, state, and BLM byways may enhance appreciation and understanding of paleontological resources and the restrictions on collection. However, publicizing locations can also lead to impacts from vandalism, over-collecting, and unauthorized collection of scientifically important fossils.

Implementing management for the following resources would have negligible or no impact on paleontological resources and are therefore not discussed in detail: water resources, fish and wildlife, special status species, wild horses, and cultural resources.

Alternative A

Paleontological resources would continue to be managed according to their PFYC classification, and inventories of proposed surface-disturbing activities would continue to be required in PFYC Class 4, 5, and sometimes Class 3 paleontological areas and where paleontological resources are anticipated. These measures would help ensure the protection of paleontological resources from impacts due to authorized surface-disturbing activities and help ensure preservation of opportunities for scientific, educational, and recreational uses of these resources. Except as noted, anticipated impacts would be the same for all resources and resource uses as described under Effects Common to all Alternatives.

Under Alternative A, BLM would continue to manage a very large portion (445,400 acres) of the decision area as open to cross-country motorized use and 12,500 acres as open to intensive motorized use. In addition to the potential for damage of surface fossils from all forms of travel, this level of open cross-country motorized use can provide access to otherwise less accessible areas, potentially leading to new discoveries or, alternately, damage or unauthorized removal. Impacts from physical damage and unauthorized collection reduce opportunities for scientific, educational, and recreational uses of these resources.

Five ACECs, including Pyramid Rock and totaling 28,900 acres, are afforded special management measures to protect a variety of resource values that would also impact the management of any paleontological resources present. Management measures can include surface use restrictions, ground disturbance restrictions, prohibitions on cross-country travel, VRM classifications, annual monitoring, and other restrictions on development and resource use. The surface use restrictions could prevent new discoveries and/or excavations

Land adjacent to eligible WSR segments totaling 99.5 miles through BLM-administered land would be subject to surface use restrictions under Alternative A. While paleontological resources may be present elsewhere, paleontological resources are recognized as an ORV for the study segment of the Dolores River. Paleontological resources would be preserved; however, increased use of these areas by the public based on the designations may lead to impacts from unauthorized collection and vandalism. The surface use restrictions could prevent new discoveries and/or excavations.

The types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 300,700 acres as acceptable for coal leasing. Managing 36,700 acres as unacceptable for coal leasing, as well as applying stipulations on some acceptable lands, would reduce paleontological resource impacts from coal mining.

Five ACECs would be managed on 28,900 acres; within these areas paleontological resources would be protected as these would be closed to mineral material sales, and non-energy leasable mineral exploration and development. However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area.

Alternative B

Except as noted, anticipated impacts would be the same for all resources as described under Effects Common to All Alternatives. BLM proposes to proactively identify priority paleontological resource areas and conduct field inventories of highly sensitive localities. These actions would add to the scientific knowledge of the resources managed by BLM, guide further research,

determine if any protective measures are needed, and assist BLM in planning decisions.

Alternative B adds additional measures to structure recreational opportunities in SRMAs and ERMAs. BLM would manage three SRMAs on 78,300 acres (78 percent fewer acres than under Alternative A), all of which include important paleontological resource values. Additional surface use stipulations would be implemented that can indirectly protect paleontological resources from large-scale disturbance, but recreational use impacts could still occur. There may be opportunities to further structure recreational opportunities to avoid impacts or provide interpretive or educational information.

Alternative B would close the decision area to cross-country motorized use and reduce to 5,400 acres (57 percent fewer than under Alternative A) the area open to cross-country motorized use. These actions would greatly reduce the potential for impacts on paleontological resources over a wide area for damage of surface fossils from travel and would reduce vehicle access to otherwise remote areas. Increased access could potentially lead to new discoveries or damage or unauthorized removal. Impacts from physical damage and unauthorized collection reduce opportunities for scientific, educational, and recreational uses of these resources. Potential impacts on surface fossils, if present, would be concentrated in the 5,400-acre open area and in the vicinity of designated trails.

Alternative B includes three units covering 24,400 acres that would be managed for wilderness characteristics. Paleontological resources are supplemental values to an area's wilderness characteristics and would be subject to management measures such as NSO stipulations, ROW exclusion, travel restrictions, and mineral closures. Paleontological resources would be preserved, but surface use restrictions may preclude new discoveries. The surface use restrictions could prevent new discoveries and/or excavations, except under scientific permit as reviewed on a case by case basis.

Alternative B would increase the number of ACECs to thirteen totaling 106,000 acres (2.7 times more acres than under Alternative A). ACECs are afforded special management measures to protect a variety of resource values that would also impact the management of any paleontological resources present. The paleontological resources of Dolores River Riparian and Pyramid Rock are called out as ACEC values in the designations. Management measures can include surface use restrictions, ground disturbance restrictions, prohibitions on cross-country travel, VRM classifications, annual monitoring, and other restrictions on development and resource use to protect a variety of resource values that would also impact the management of any paleontological resources present.

Paleontological resources adjacent to the Dolores River would receive indirect protection through CSU and ROW avoidance measures under interim management guidelines for suitable WSRs.

Alternative B would expand interpretation and environmental education programs that could lead to protection and appreciation of paleontological resource values in the decision area. Measures to enhance, promote, interpret, and protect the paleontological resources of the Dinosaur Diamond National Scenic Byway may enhance appreciation and understanding of paleontological resources and the restrictions on collection. However, publicizing locations can also lead to impacts from vandalism, over-collecting, and unauthorized collection of scientifically important fossils.

The types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 253,400 acres (16 percent fewer acres than under Alternative A) within the coal resource potential development area as acceptable for coal leasing and development. There would be 56,000 acres (52 percent more acres than under Alternative A) managed as unacceptable for coal leasing and development. This, as well as stipulations on acceptable lands, would reduce paleontological resource impacts from coal mining and exploration by preventing or limiting development.

Under Alternative B, 20,700 acres would be petitioned for withdrawal from locatable mineral exploration or development. If withdrawn, these areas would provide additional protection to paleontological resources from surface-disturbing activities.

Alternative C

Except as noted, anticipated impacts would be the same for all resources as described under Effects Common to all Alternatives. As with Alternative B, BLM proposes to also proactively identify priority paleontological resource areas and conduct field inventories of highly sensitive localities. These actions would add to the scientific knowledge of the resources managed by BLM, guide further research, determine if any protective measures are needed, and assist BLM in planning decisions.

Like Alternative B, Alternative C includes additional measures to structure recreational opportunities in SRMAs. BLM would manage two SRMAs on 60,000 acres (84 percent fewer acres than under Alternative A), including Bangs, which includes important paleontological resource values. This may increase recreational use of these areas, leading to more impacts. Additional surface use stipulations would be implemented that can indirectly protect paleontological resources. There may be opportunities to further structure recreational opportunities to avoid impacts or provide interpretive or educational information.

Alternative C would close the decision area to cross-country motorized and mechanized use, and total acres closed to motorized use would be increased to 379,500 acres, which is more than the other alternatives (10.8 times more acres than under Alternative A). Pyramid Rock would be closed to all use. These actions would further reduce the potential for impacts on paleontological resources over a wide area for damage of surface fossils from travel and would reduce vehicle access to otherwise remote areas. Increased access could potentially lead to new discoveries or damage or unauthorized removal. Potential impacts on surface fossils, if present, would be concentrated in the vicinity of designated trails.

Alternative C includes 171,200 acres (7 times more acres than under Alternative B) in 12 units that would be managed for wilderness characteristics, including Bangs Canyon. Paleontological resources are supplemental values to an area's wilderness characteristics and would be subject to management measures such as NSO and CSU stipulations, ROW exclusion, travel restrictions, and mineral closures. Paleontological resources would be preserved, but surface use restrictions may preclude new discoveries and excavations, except under scientific permit as reviewed on a case by case basis.

Alternative C would designate 23 ACECs totaling 168,000 acres (5.8 times more acres than under Alternative A). ACECs are afforded special management measures to protect a variety of resource values that would also impact the management of any paleontological resources present. The paleontological resources of Dolores River Riparian, Nine-mile Hill Boulders, and Pyramid Rock are called out as ACEC values in the designation. Management measures can include surface use restrictions, ground disturbance restrictions, prohibitions on cross-country travel, VRM classifications, annual monitoring, and other restrictions on development and resource use to protect a variety of resource values that would also impact the management of any paleontological resources present.

Under Alternative C, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 251,200 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing and development. There would be 58,200 acres (58 percent more acres than under Alternative A) managed as unacceptable for coal leasing and development. This, as well as applying stipulations on lands acceptable for coal leasing and development, would reduce paleontological resource impacts from coal mining and exploration.

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B. However, under Alternative C, 45,100 acres (2.2 times more acres than under Alternative B) would be petitioned for withdrawal.

Effects on paleontological resources in suitable WSR segments are the same as those described under Alternative A.

Effects on paleontological resources from expanded interpretation and environmental education programs and measures to enhance, promote, interpret and protect the paleontological resources of the Dinosaur Diamond National Scenic Byway are the same as those described under Alternative B.

Alternative D

Except as noted, anticipated impacts would be the same for all resources as described under Effects Common to All Alternatives. As with Alternative B, the BLM proposes to also proactively identify priority paleontological resource areas and conduct field inventories of highly sensitive localities. These actions would add to the scientific knowledge of the resources managed by the BLM, guide further research, determine if any protective measures are needed, and assist the BLM in planning decisions.

Like Alternatives B and C, Alternative D adds additional measures to structure recreational opportunities in SRMAs and ERMAs. The BLM would manage six SRMAs on 79,000 acres (78 percent fewer acres than under Alternative A), including Bangs, which includes important paleontological resource values. Additional surface use stipulations would be implemented that can indirectly protect paleontological sites from large-scale disturbance, but recreational use impacts could still occur. There may be opportunities to further structure recreational opportunities to avoid impacts or provide interpretive or educational information.

Cross-country motorized use would be reduced to 10,200 acres (18 percent fewer acres than under Alternative A). This action would greatly reduce the potential for impacts on paleontological resources over a wide area for damage of surface fossils from travel and would reduce vehicle access to otherwise remote areas. Increased access could potentially lead to new discoveries or damage or unauthorized removal. Impacts from physical damage and unauthorized collection reduce opportunities for scientific, educational, and recreational uses of these resources. Potential impacts on surface fossils, if present, would be concentrated in the 10,200 acres of open areas and in the vicinity of designated trails.

Alternative D would keep the currently managed ACECs. Five ACECs totaling 32,200 acres (15 percent more acres than under Alternative A), including Pyramid Rock, are afforded special management measures to protect a variety of resource values that would also impact the management of any paleontological resources present. Management measures can include surface use restrictions, ground disturbance restrictions, prohibitions on cross-country travel, VRM classifications, annual monitoring, and other restrictions on development and resource use to protect a variety of resource values that would also impact the management of any paleontological resources present.

The types of impacts from coal leasing and development would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 265,600 acres (12 percent fewer acres than under Alternative A) as acceptable for coal leasing and development. There would be 43,800 acres (19 percent more acres than under Alternative A) managed as unacceptable for coal leasing and development. This, as well as applying stipulations on lands acceptable for coal lasing and development, would reduce paleontological resource impacts from coal mining and exploration.

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B. However, under Alternative D, 1,300 acres (94 percent fewer acres than under Alternative B) would be petitioned for withdrawal.

Effects on paleontological resources from expanded interpretation and environmental education programs and measures to enhance, promote, interpret, and protect the paleontological resources of the Dinosaur Diamond National Scenic Byway are the same as those described under Alternative B.

Cumulative

The CIAA used to analyze cumulative impacts on paleontological resources extends outside the planning area, following fourth-order watershed boundaries that completely or partially overlap the planning area. The fourth-order watersheds were used as the basic unit of analysis because impacts from most management actions proposed under the RMP and other existing activity plans are not expected to have cumulative influence beyond this scale. The types of effects on paleontological resources that have occurred in the past likely include destruction or damage of resources without the benefit of scientific study or interpretation due to construction, recreation, theft, vandalism, and the effects of natural processes without the benefit of recovery, scientific study, or interpretation.

Current and future trends include population growth, urbanization, mining, fluid mineral leasing, renewable energy development, increase in recreational demand, road construction, and erosion. For actions on public land and the mineral estate managed by BLM, impacts would be minimized through existing laws, regulations, and stipulations addressing surface-disturbing activities within PFYC Class 4 and 5 areas and other sensitive areas. Other ground-disturbing activities such as road construction, real estate development, and utility infrastructure in the CIAA may be reviewed by other federal, state, or local agencies for the presence and scientific value of paleontological resources and steps taken to recover or avoid significant finds. Actions on private land could result in the inadvertent destruction of paleontological resources or the removal of fossils without any scientific study. Population growth and increasing recreational demand can impact resources from unauthorized removal, vandalism, incremental damage of surface resources, and subsequent erosion.

Decisions from this RMP could contribute to cumulative impacts on paleontological resources when combined with other past, present, and reasonably foreseeable actions. The cumulative effects of surface-disturbing activities such as mineral development and lands and realty actions within PFYC Class 2, 3, 4, and 5 areas have the potential to damage or destroy some resources. Some fossils would be destroyed in the course of legitimate uses of public lands, as well as through natural weathering and erosion. Measures to identify resources in areas of high potential would allow evaluation by paleontologists in areas that had not been previously studied. Fossils that would have otherwise been destroyed would be avoided or recovered and made available for study in university and museum repositories. Beyond authorized ground disturbance, cumulative impacts could occur from intensive travel, dispersed recreation, wildfire suppression activities, erosion, unauthorized collection, and vandalism. These could result in the unmitigated loss of scientific information and could reduce the educational and interpretative potential of the resource. Measures under Alternatives B, C, and D would reduce the potential effect of effects of intensive recreational use. Adherence to appropriate predevelopment, development, and post-development protective measures would reduce most impacts to an insignificant level. As such implementation of the proposed RMP is not anticipated to contribute to cumulative effects in the CIAA.

4.3.10 Visual Resources

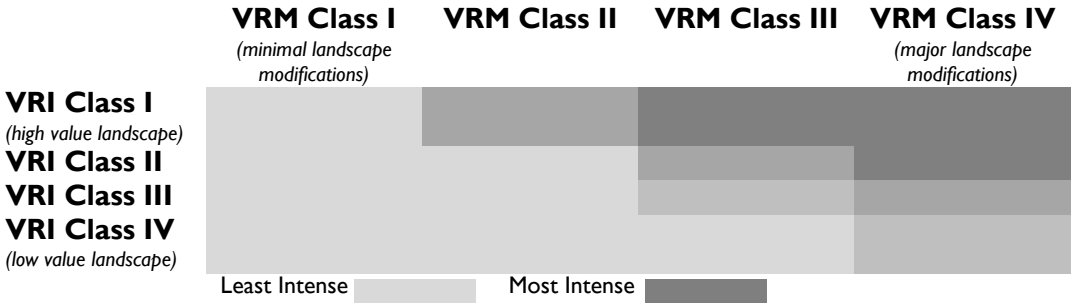
This section discusses impacts on visual resources from proposed management actions of other resources and resource uses. Existing conditions concerning visual resources are described in **Section 3.2.13**, Visual Resources.

Methods of Analysis

The visual resource inventory (VRI) classes form the basis for analysis in this section. VRI classes use the same numerical scale (i.e., I through IV) as VRM classes. They are the categories the BLM uses to classify the current visual character of the landscape and are a way to communicate the degree of visual value in the area. Generally VRI Class II indicates high visual value and VRI Class IV indicates low visual value. VRI Class I is reserved for areas where Congressional or administrative decisions were already made to preserve the natural setting outside of the inventory process (e.g., Wilderness areas). The visual resource inventory is on file at the GJFO.

Impacts on visual resources are assessed by comparing the VRI class of an area to the VRM class for the same area and assessing the potential for change in the three components of VRI classification (scenic quality, sensitivity level, and distance zones) discussed in **Section 3.2.13**, Visual Resources. The management of other resources and resource uses and how those actions might impact scenic resources are also examined.

The relative intensities of impacts anticipated as a result of applying certain VRM classifications to certain VRI classifications are displayed in the following diagram. In general, the intensity of impact increases as both the value of the landscape and allowable landscape modifications increase.



Applying VRM Class I objectives to any VRI classification would preserve the existing character of the landscape. In other words, the VRI classification would be expected to remain the same because only minimal landscape modifications would be permitted. On the other hand, while managing lands according to VRM Class IV objectives would allow for major landscape modifications, the perceived intensity of impact would be greater in VRI Class I areas than in VRI Class IV areas because of the higher value of the landscape. It should be noted that landscapes with higher scenic quality, generally identified as VRI Class II (VRI Class I areas are not inventoried for scenic quality), often have more visual variety than landscapes with lower scenic quality, generally identified as VRI Class III or IV, and may have more opportunities for blending modifications into the landscape.

When assessing scenic quality, seven factors are considered: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications. Where cultural modifications would be allowed, not only would the built environment change the landscape, but there could be a change in the landform or variety of vegetation forms, patterns, or texture from construction activities, removing topsoil and vegetation, changing soil composition, etc. Furthermore, where cultural modifications would be allowed to the extent that the basic components of the landscape (e.g., vegetation, soil, rock) changed drastically, the variety, contrast, and harmony of color could change as well. Changes to water could be incurred by the development of diversions, dams, or construction of facilities that block the feature from view. Cultural modifications in one area could also impact the adjacent scenery of another area. Finally, while the scarcity of the landscape itself would not change, modifications of scarce landscapes could be perceived as more intense than modification of more common landscapes, depending upon the sensitivity of the area.

Indicators of impacts on visual resources include the following:

- A proposed VRM class that would allow changes to the landscape that could alter its character enough that future visual resource inventories would result in a reclassification. For example, an area currently managed for VRM Class IV has VRI class II lands. The level of change allowed by VRM Class IV could alter the landscape to the point that future visual resource inventories could result in reclassifying the area to VRI Class III or IV.

The results of the VRI completed in 2009 are presented in **Table 3-18**, Visual Resource Inventory Class Distribution. The number of acres of each VRI Class in each VRM Class for all alternatives is shown in **Table 4-33**, Summary of Visual Resource Inventory Class by Visual Resource Management Class. Because no acres were rated as VRI Class I during the inventory, this table only displays data for VRI Classes II, III, and IV.

Table 4-33
Summary of Visual Resource Inventory Class by Visual Resource Management Class

VRM Class	Alternative acres (percent)			
	A	B	C	D
VRI Class II – 376,100 acres				
I	23,100 (6 %)	98,200 (26%)	99,800 (27%)	96,200 (26%)
II	87,600 (23 %)	215,000 (57%)	271,800 (72%)	162,000 (43%)
III	117,400 (31%)	62,000 (17%)	3,800 (1%)	92,700 (25%)
IV	-	-	-	25,600 (7%)
Undesignated	148,000 (39%)	-	-	-
VRI Class III – 382,300 acres				
I	4,000 (1%)	100 (<1%)	100 (<1%)	100 (<1%)
II	34,800 (9%)	63,500 (17%)	187,700 (49%)	25,900 (7%)
III	72,900 (19%)	318,100 (83%)	194,000 (51%)	339,400 (89%)
IV	-	100 (<1%)	100 (<1%)	17,000 (4%)
Undesignated	270,600 (71%)	-	-	-
VRI Class IV – 302,700 acres				
I	-	200 (<1%)	200 (<1%)	-
II	9,900 (3%)	36,000 (12%)	97,000 (32%)	7,000 (2%)
III	15,700 (5%)	78,400 (26%)	17,200 (6%)	97,900 (32%)
IV	-	188,200 (62%)	187,900 (62%)	197,400 (65%)
Undesignated	277,000 (92%)	-	-	-

Source: BLM 2010a

While topography and vegetation can allow for some landscape modifications, many built structures and roads can dominate the landscape, depending on their size, position, color, and contrast with surrounding conditions. As such, this

analysis focuses on management actions and allowable uses that have the most potential to increase or decrease VRI Class.

The analysis includes the following assumptions:

- The scenic vistas within the planning area would increase in sensitivity or public concern over the next 20 years.
- Visitors to BLM-administered public lands or residents living near BLM-administered public lands are sensitive receptors for impacts on visual quality.
- Activities that cause the most contrast and are the most noticeable to the viewer and the public would be considered to have the greatest effect on scenic quality and greatest magnitude of perceived impact on sensitive landscapes.
- The magnitude (or dominance) of a visual effect depends on a variety of factors, including the size of a project (i.e., area disturbed, physical size of structures), the location and design of roads and trails, and the overall visibility of disturbed areas.
- The more protection that is associated with the management of other resources and special designations, the greater the benefit to visual resources of the surrounding viewsheds.
- Visual resource design techniques and BMPs would be implemented to mitigate potentially harmful impacts.
- Visual contrast ratings would be required for all projects that fall within VRM Class I, II, III, and IV to determine conformance to the RMP VRM decisions, and for all projects introducing significant change in order to identify ways to reduce visual contrast. The visual contrast rating system would be used as a guide to analyze site-specific impacts of projects as well as facility design and placement. These facilities would be designed to minimize their visual impacts to conform to the area's VRM class objective. This would allow the BLM to reduce impacts on a site-specific basis to ensure compliance with the assigned VRM class.

Effects Common to All Alternatives

Implementing management actions for wildland fire management, soil resources, fish and wildlife, vegetation, and water resources have the potential to result in short-term effects on visual resources, including the following underlying components of scenic quality: vegetation, color, and cultural modifications. However, since the ground-disturbing activities associated with these resource programs are primarily involved in restoring healthier and more diverse native plant communities to the landscape, these programs would enhance the vegetation and color components of scenic quality over the long term. Cultural resource management actions may also result in short-term, isolated

disturbances associated with scientific excavation but would not have permanent effects.

Managing land as forestry and harvest zones would result in localized, long-term impacts by allowing for the removal of timber that would alter the visual setting. Impacts would be site-specific depending upon the VRI Class of the area for harvest but would primarily affect the vegetation, color, and cultural modification components of scenic quality.

Livestock and wild horse grazing may cause secondary effects on visual resources through trampling, compaction and grazing of vegetation, and channel incision. Watering areas are especially prone to disturbance, where concentrated vegetation and soil damage can occur. Structures associated with livestock grazing management (e.g., fences, stock ponds, guzzlers, cattle guards, feeding troughs) could create visual intrusions. It is unlikely that these activities or structures would degrade the scenic quality of an area so as to change the VRI Class. Modifications to grazing practices to improve land health needed as a result of overgrazing would also help restore the visual quality of the area.

Casual recreation use generally would not impact visual resources or the visual character of the area. However, limiting use or travel to designated routes can provide a measure of assurance against trail proliferation and promote the recovery of natural processes in the area, thereby potentially enhancing scenic quality. All forms of travel that produce established routes can impact visual resources. These impacts are generally confined to the route itself. In contrast, areas open to intensive use can affect visual resources by affecting the visual character of the entire area. Where cross-country travel occurs within scenic quality A or high sensitivity landscapes, the perceived impacts would be the most intense.

Managing areas as ROW exclusion would protect visual resources by prohibiting new cultural modifications requiring a ROW permit such as roads; pipelines; transmission lines; communication sites; wind, solar, and geothermal development; and other land use authorizations that could alter the visual quality of an area. These types of activities could also affect the vegetation and color components of scenic quality, particularly during construction periods. Right-of-way avoidance would provide limited protection by requiring mitigation measures to minimize alteration of the physical setting. In other areas, utilities such as new transmission lines, access roads, and related development have the potential to permanently affect visual resources. For each alternative, delineated utility corridors and wind and solar emphasis areas is compared to the VRI class of those areas to determine whether or not such development would impact the visual quality.

Under all alternatives, portions of the planning area would be available for mineral and energy development. While the coal potential in the GJFO is subsurface, there would be impacts on visual resources from associated facilities

including vents, storage areas, waste rock piles, treatment facilities, and conveyors. VRI Class II areas would be particularly sensitive to such development but would be protected by VRM Class I or, to a lesser degree, VRM Class II management. Acres of impacts are discussed under each alternative below. Coal development would not greatly impact visual resources as the coal potential in the GJFO is subsurface.

Much of the decision area with oil and gas development potential is already leased. So while development associated with oil and gas extraction can impact scenic quality, impacts from decisions made in this RMP affecting new leases would be minimal. Areas of high to very high development potential over the life of the plan are predominately VRI Class III and IV, so new development would have less of an impact on the scenic quality in those areas.

Stipulations for fluid mineral leasing and surface-disturbing activities (i.e., NSO, CSU, and TL) would mitigate impacts on visual quality from such action. Applying NSO stipulations would provide direct protection for visual resources by preventing surface occupancy and use that could alter viewsheds, vegetation, color, adjacent scenery, and cultural modifications associated with the scenic quality of an area. CSU stipulations would protect visual resources to a lesser extent because surface-disturbing activities would only have to be modified or moved to a different location. In high quality visual areas, these stipulations would provide some protection against the reclassification of areas to a lower VRI Class in the future. In general, alternatives with more acres protected by stipulations would provide more protection to high quality visual areas.

Visual character is related to the criteria used to determine the presence of wilderness characteristics including the absence of roads; structures such as developed recreation facilities, fences, pipelines, and power lines; and modifications such as vegetation treatment areas and mines (see **Section 3.2.14**, Lands with Wilderness Characteristics Outside Existing WSAs, for more information). The wilderness characteristics inventory identified twelve areas totaling 171,200 acres as having wilderness characteristics. Of those, 76,400 acres inventoried as VRI Class II; 79,700 acres inventoried as VRI Class III, and 15,200 acres inventoried as VRI Class IV.

Designating ACECs to protect scenic values would maintain the natural character of the landscape and the scenic values that led to their designation. Approximately 82,400 acres in seven areas (Colorado River Riparian, Dolores River Riparian, Juanita Arch, Mt. Garfield, the Palisade, Sinbad Valley, and South Shale Ridge) were determined to have relevant and important scenic values during the evaluation of nominated ACECs. The number and size of the ACECs varies across alternatives. All ACECs are either VRM Class I or VRM Class II under alternatives in which they are designated, except the Palisade ACEC, a portion of which would be managed as VRM Class III under Alternatives A and

D (see Alternatives A and D below). Managing ACECs with scenic values as VRM Class I or II would maintain the scenic quality of the ACECs.

Implementing management for the following resources would have negligible or no impact on visual resources and are therefore not discussed in detail: air; soil resources; water resources; vegetation; special status species; fish and wildlife; wild horses; cultural resources; paleontology; livestock grazing; coal; national trails; and national, state, and BLM byways.

Alternative A

Under Alternative A, 6 percent of VRI Class II lands would be managed as VRM Class I, resulting in preservation of the existing visual character of those areas. An additional 23 percent would be managed as VRM Class II, allowing for a low level of change. The remaining 265,400 acres (70 percent) would be managed as VRM Class III or is undesignated (see **Table 4-33**). Nearly all of the acres that are managed as VRM Class III or Undesignated are scenic quality B landscapes and have high visual sensitivity, so changes to these landscapes would be perceived as more intense than in lower value landscapes. Projects in areas without a VRM classification could impact visual resources on a case-by-case basis depending upon the project.

All stipulations for fluid mineral leasing and other surface-disturbing activities would provide direct or indirect protection for visual resources. However, Alternative A contains the fewest acres of stipulations. In addition, NSOs under Alternative A only apply to fluid mineral leasing, not all surface-disturbing activities. As such, fluid mineral development and other surface-disturbing activities have the most potential to impact visual resources under this alternative. The nature of the impacts is the same as that described under Effects Common to All Alternatives.

Under Alternative A, approximately 136,900 acres of VRI Class II lands are within the area of coal potential. Of those acres, none are managed as VRM Class I and approximately 2,500 acres (2 percent) are managed as VRM Class II. This alternative offers the least amount of protection to visual resources from coal development. Impacts are described under Effects Common to All Alternatives.

ROW exclusion and avoidance areas would indirectly benefit visual resources by preventing new developments that would create visual contrast. There are 234,900 acres managed as ROW exclusion and 441,400 acres managed as ROW avoidance under Alternative A. Of the remaining area, 89,300 acres (24 percent) of VRI Class II areas would be available for ROW location. Impacts from ROW management are discussed under Effects Common to All Alternatives.

Under Alternative A, 11,000 acres are open to intensive motorized use in VRI Class III and IV areas. Because of the low visual value of these areas, the intensity of impact from motorized travel is less than if the activity occurred in

areas of higher visual value (i.e., VRI Class II landscapes). On the other hand, approximately 126,800 acres of VRI Class II lands are open to non-intensive, cross-country motorized travel and could be impacted, as described under Impacts Common to All Alternatives.

Under Alternative A, WSAs are managed under a variety of VRM Classes ranging from VRM Class I (Sewemup Mesa and a portion of the Palisade) to undesignated (portions of Demaree Canyon and Little Book Cliffs). While managing for less than VRM Class I might normally allow for degradation of scenic quality and allow modifications in high sensitivity landscapes, interim management protection for WSAs requires management as VRM I and is such that development that would impair the areas' suitability for wilderness designation would not be allowed, thereby protecting the scenic quality of WSAs.

Under Alternative A, no lands with wilderness characteristics would be managed to protect their wilderness characteristics, thus none of those areas would receive management for wilderness characteristics that could benefit their visual character.

The BLM would designate five ACECs under Alternative A (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon and Unaweep Seep). Under Alternative A, only 23,600 acres in one area (The Palisade) would be designated as an ACEC to protect scenic values. A portion of The Palisade (1,400 acres) would be managed as VRM Class III and the remaining area would be managed as VRM Class I (4,100 acres) or II (18,000 acres). VRM Class III could allow for development that would diminish the scenic quality of the area. However, because the ACEC would be designated and managed to protect scenic values, among others, it is unlikely that development that would adversely impact the scenic quality of the area would be permitted. Scenic values of the 14 eligible WSR segments in this alternative would be protected because actions that would impair their ORVs would be prohibited. This is especially true for the eight segments that have a scenic ORV. Along stream segments eligible or suitable for inclusion in the NWSRS that have a scenic ORV (see **Table 2-4**, Summary of Wild and Scenic River Study Segments), the BLM would not permit any actions that would have an adverse effect on the visual quality of the segment, thereby protecting visual resources in these areas.

Alternative B

Under Alternative B, 26 percent of VRI Class II lands would be managed as VRM Class I (4.3 times more acres than under Alternative A), resulting in preservation of the existing visual character of those areas. An additional 57 percent would be managed as VRM Class II (2.5 times more acres than under Alternative A), allowing for a low level of change. All of the VRI Class II scenic quality A landscapes and 83 percent of scenic quality B landscapes would be managed as either VRM Class I or II. In addition, 84 percent of the VRI Class II

high sensitivity landscapes and 79 percent of VRI Class II medium sensitivity landscapes would be managed as either VRM Class I or II. Finally, 17 percent of VRI Class II landscapes would be managed as VRM Class III (47 percent fewer acres than under Alternative A), and the existing character of the landscape would be partially retained (see **Table 4-33**). All of the VRI Class II lands that would be managed as VRM Class III are of scenic quality B. Furthermore, 49,800 acres of VRI Class II high sensitivity landscapes would be managed as VRM Class III, which could result in more intense impacts than modifications to lower value landscapes.

There would be 204,200 acres (13 percent fewer acres than under Alternative A) of ROW exclusion and 740,900 acres (68 percent more acres than under Alternative A) of ROW avoidance. In the remaining area, 900 acres (less than 1 percent) of VRI Class II areas would be available for ROW location. All VRM Class I areas would be classified as ROW exclusion and all VRM Class II areas, except for delineated corridors, would be classified as ROW avoidance. Impacts would be similar to those described under Effects Common to All Alternatives.

There would be 12,200 acres identified as an emphasis area for solar development and 2,600 acres for wind power development. Solar and wind energy development would not likely degrade visual quality as all emphasis areas are VRI Class IV.

Under Alternative B, 5,400 acres (51 percent fewer acres than under Alternative A) would be open to cross-country motorized use in VRI Class III or IV areas; the magnitude of perceived impacts would be lower because of the low visual value in those areas. Additionally, 144,000 acres of VRI Class II lands would be closed to motorized use.

Under Alternative B, approximately 125,800 acres of VRI Class II lands are within the area of coal potential. Of those, 41,700 acres (33 percent) would be managed as VRM Class I; 56,200 acres (45 percent) would be managed as VRM Class II; and 27,900 acres (22 percent) would be managed as VRM Class III. Impacts on visual resources from coal development on the 97,900 acres of lands managed as VRM Class I and II would be minimal as most development associated with coal extraction would be precluded by the inability to conform with VRM Class I or II objectives. On the 27,900 acres managed as VRM Class III, construction of facilities needed for coal development would likely impact vegetation and color and would also add new cultural modifications. Impacts are described under Effects Common to All Alternatives.

Under Alternative B, WSAs would be managed as VRM Class I which would protect the scenic quality and sensitive landscapes of the areas.

Under Alternative B, 24,400 acres in three units would be managed to protect their wilderness characteristics. Approximately 15 percent of VRI Class II acres in all lands with wilderness characteristics units would be managed to protect

their wilderness characteristics, management that would benefit their visual quality and provide protection to the sensitive landscapes. Impacts are described under Effects Common to All Alternatives.

Under Alternative B, 80,600 acres (2.4 times more acres than under Alternative A) in six areas (Atwell Gulch, Dolores River Riparian, Mt. Garfield, The Palisade, Sinbad Valley, and South Shale Ridge) would be designated as ACECs to protect scenic values, all of which would be managed as VRM Class I (36 percent), II (16 percent), or III (48 percent). The remaining area found to have relevant and important scenic values but would not be designated as an ACEC under Alternative B (Colorado River Riparian) would still be managed as VRM Class II, which would help maintain the scenic quality of the area.

Portions of the Dolores River would be determined suitable for inclusion in the NWSRS. Scenic values are an identified ORV for the segment and the suitable portion would be managed as VRM Class II. Impacts would be the same as those described under Alternative A.

There would be one national scenic byway and two state scenic byways and all except for a portion of the Dinosaur Diamond National Scenic Byway would be managed as VRM Class II. As such, the scenic quality along the byways would be protected for the enjoyment of drivers.

Alternative C

Under Alternative C, 27 percent of VRI Class II lands would be managed as VRM Class I (4.3 times more acres than under Alternative A), resulting in preservation of the existing visual character of those areas. An additional 72 percent would be managed as VRM Class II (3.2 times more acres than under Alternative A), allowing for a low level of change. Finally 3,800 acres of VRI Class II lands would be managed as VRM Class III (97 percent fewer acres than under Alternative A), and the existing character of the landscape would be partially retained (see **Table 4-33**). Within the VRI Class II lands that would be managed as VRM Class III, all are of scenic quality B ranking and most (79 percent) have medium sensitivity. The remaining 21 percent are high sensitivity landscapes, and the intensity of perceived impact would be greatest in these areas. However, this only accounts for 800 acres within the decision area.

There would be 365,800 acres (56 percent more acres than under Alternative A) of ROW exclusion and 627,000 acres (42 percent more acres than under Alternative A) of ROW avoidance. In the remaining area, 300 acres of VRI Class II areas would be available for ROW location. As under Alternative B, all VRM Class I areas would be classified as ROW exclusion and all VRM Class II areas, except for delineated corridors, would be classified as ROW avoidance. Impacts would be similar to those described under Effects Common to All Alternatives.

There would be 5,300 acres (57 percent fewer acres than under Alternative B) identified as emphasis areas for solar energy development and 2,600 acres (same

as under Alternative B) for wind energy development, fewer than Alternatives B and D. The emphasis areas are in VRI Class IV areas; impacts would be the same as those described under Alternative B.

Under Alternative C, cross-country motorized use would be prohibited so there would be no impacts from cross-country motorized use.

Under Alternative C, approximately 125,800 acres of VRI Class II lands are within the area of coal potential. Of those acres, most would be managed as either VRM Class I (43,100 acres, 34 percent) or VRM Class II (79,900 acres, 63 percent). Impacts on visual resources from coal development on the 123,000 acres of lands managed as VRM Class I or II would be minimal as most development associated with coal extraction would be precluded by the inability to conform with VRM Class I or II objectives. On the 2,900 acres managed as VRM Class III, construction of facilities needed for coal development would likely impact vegetation and color and would also add new cultural modifications. Impacts are described under Effects Common to All Alternatives.

Impacts from WSA management would be the same as those described under Alternative B.

Under Alternative C, all 12 lands with wilderness characteristics units, totaling 171,200 acres, would be managed for wilderness characteristics (7 times more acres than under Alternative B), thus all of those acres would receive management that could benefit their visual resources (including management as VRM Class II). Impacts are described under Effects Common to All Alternatives.

Under Alternative C, all 86,900 acres in seven areas found to have relevant and important scenic values would be designated as ACECs to protect scenic values. All would be managed as VRM Class I (35 percent) or II (65 percent), which would help maintain the scenic quality of the areas.

There would be 14 WSR segments managed as suitable for inclusion in the NWSRS. Eight segments are managed to protect scenic values as an ORV. One segment would be VRM Class I and the remaining would be VRM Class II. The types of impacts would be similar to those described under Alternative A.

Alternative D

Under Alternative D, 26 percent (4.2 times more acres than under Alternative A) of VRI Class II lands would be managed as VRM Class I, resulting in preservation of the existing visual character of those areas. An additional 43 percent (89 percent more acres than under Alternative A) would be managed as VRM Class II, allowing for a low level of change; 25 percent (21 percent fewer acres than under Alternative A) would be managed as VRM Class III, potentially resulting in only partially retaining the character of those lands; and 7 percent would be managed as VRM Class IV, potentially resulting in a high level of change in those areas (see **Table 4-33**).

Within the VRI Class II lands that would be managed as VRM Class III, 7,700 acres (8 percent) are scenic quality A landscapes and an additional 85,000 acres (92 percent) are scenic quality B landscapes. Furthermore, 62,300 acres (67 percent) are of high sensitivity and the remaining acres (33 percent) are of medium sensitivity. Within the VRI Class II lands that would be managed as VRM Class IV, all are scenic quality B landscapes but have high sensitivity. Impacts from landscape modifications in these areas would be perceived as more intense than modifications in areas with lower visual value.

There would be 104,100 acres (56 percent fewer acres than under Alternative A) of ROW exclusion and 80,500 acres (82 percent fewer acres than under Alternative A) of ROW avoidance, the fewest of any alternative. In the remaining area, 220,800 acres (59 percent) of VRI Class II areas would be available for ROW location. As under Alternatives B and C, all VRM Class I areas would be classified as ROW exclusion. However, VRM Class II areas would not be classified as ROW avoidance, leading to the potential for impacts on visual resources in those areas.

There would be 36,300 acres (approximately 2 times more acres than under Alternative A) identified as emphasis areas for solar energy development and 3,700 acres (42 percent more acres than under Alternative A) for wind energy development, more than in any other alternative. All emphasis areas are in VRI Class IV; impacts would be the same as those described under Alternative B.

Under Alternative D, 9,800 acres (11 percent fewer acres than under Alternative A) would be open to cross-country motorized travel in VRI Class III or IV areas; the magnitude of perceived impacts would be less intense because of the lower visual value in those areas. Additionally, 106,900 acres of VRI Class II lands would be closed to motorized travel.

Under Alternative D, approximately 125,800 acres of VRI Class II lands are within the area of coal potential. Of those acres, 41,700 acres (33 percent) would be managed as VRM Class I and 44,200 acres (35 percent) would be managed as VRM Class II. VRM Class I or II management would protect about 68 percent of VRI Class II lands in the area of coal potential and impacts on visual resources would be minimal. However, the remaining 40,000 acres would be managed as either VRM Class III (25,000 acres, 20 percent) or VRM Class IV (15,000 acres, 12 percent), and these areas would be susceptible to impacts from coal development.

Impacts from WSA management would be the same as those described under Alternative B.

Under Alternative D, no lands with wilderness characteristics would be managed for wilderness characteristics, thus none of those areas would receive management for wilderness characteristics that could benefit their visual character. Impacts are described under Effects Common to All Alternatives.

The BLM would designate five ACECs under Alternative D (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon and Unaweep Seep). Under Alternative D, only 26,900 acres (15 percent more than under Alternative A) in one area (The Palisade) would be designated as an ACEC to protect scenic values. All of it would either be managed as VRM Class I (26,600 acres) or II (300 acres). There would not be any eligible or suitable WSR segments under Alternative D, thus none of those areas would receive management to maintain the eligibility or suitability that could benefit their visual character.

Visually Sensitive Areas

The GJFO administers several visually prominent resources and landscape features in the planning area. These include the Book Cliffs, Douglas Pass, Garvey Canyon, Hunter Canyon, Mt. Garfield, The Palisade, Sinbad Valley, and the Unaweep-Tabeguache Scenic and Historic Byway. Any impact to the scenic quality of these areas would have a disproportionate impact on the public's perception of the visual quality of BLM-administered public lands. Because the magnitude of impacts on VRI Class II areas are perceived as more intense because of the high value of the landscape, **Table 4-34**, Visual Resource Management Classes by Visual Resource Inventory Class II for Visually Sensitive Areas, compares the VRI Class II acres of visually sensitive areas with the proposed VRM classification across alternatives.

Though VRM classification for the features themselves is largely consistent across alternatives, considerable differences appear when looking at the VRM classification of the broader area surrounding these features. Many of the identified areas are surrounded by smaller acreages of VRM Class I or II under Alternative D than under Alternatives B or C, leading to the potential for development on surrounding landscapes that directly or indirectly contribute to the values of the visually sensitive areas.

For example, some lands comprising and surrounding the Book Cliffs and Douglas Pass are undesignated under Alternative A, introducing the potential for intrusions that would alter their VRI class. Alternatives B, C, and D would provide more defined protection to these destinations and their surrounding viewsheds by assigning VRM classes to the entire vicinity of each area.

Areas managed as VRM Class III or IV would allow more change that could impact the visual quality and sensitive landscapes of the areas. The Book Cliffs, Douglas Pass, and the Unaweep-Tabeguache Scenic and Historic Byway would be managed as VRM Class of III or IV in portions of VRI Class II areas across one or more alternatives (see **Table 4-34**). These areas could experience a level of change that would cause a reclassification of the VRI in the area.

On the other hand, the Book Cliffs, Mt. Garfield, the Palisade, Sinbad Valley, and the Unaweep-Tabeguache Scenic and Historic Byway would be managed as VRM Class I or II in portions of VRI Class II areas across one or more alternatives. In these areas, visual character would generally be preserved.

Table 4-34
Visual Resource Management Classes by Visual Resource Inventory Class II for Visually Sensitive Areas

VRM Class *(VRI Class II Acres)*	Alternative A	Alternative B	Alternative C	Alternative D
Book Cliffs (105,700)				
VRM Class I	--	43,700 (41%)	45,300 (43%)	43,700 (41%)
VRM Class II	4,200 (4%)	62,000 (59%)	60,400 (57%)	44,700 (42%)
VRM Class III	58,400 (55%)	--	--	12,800 (12%)
VRM Class IV	43,000 (41%)	--	--	4,500 (4%)
Douglas Pass (1,900)				
VRM Class II	--	1,900 (100%)	1,900 (100%)	1,900 (100%)
VRM Class III	1,800 (95%)	--	--	--
VRM Class IV	100 (5%)	--	--	--
Hunter Canyon (1,600)				
VRM Class II	1,000 (63%)	1,600 (100%)	1,600 (100%)	1,600 (100%)
VRM Class III	600 (37%)	--	--	--
Mt. Garfield (3,300)				
VRM Class I	900 (27%)	2,500 (76%)	2,500 (76%)	--
VRM Class II	700 (21%)	800 (24%)	800 (24%)	2,000 (61%)
VRM Class III	1,600 (49%)	--	--	1,300 (39%)
VRM Class IV	100 (3%)	--	--	--
The Palisade (4,800)				
VRM Class I	4,100 (85%)	4,800 (100%)	4,800 (100%)	4,800 (100%)
VRM Class II	700 (15%)	--	--	--
Sinbad Valley (3,700)				
VRM Class I	3,400 (92%)	3,400 (92%)	3,400 (92%)	3,400 (92%)
VRM Class II	--	300 (8%)	300 (8%)	300 (8%)
VRM Class III	300 (8%)	--	--	--
Unaweep-Tabeguache Scenic and Historic Byway (61,900)				
VRM Class I	14,600 (24%)	28,700 (46%)	28,700 (46%)	28,700 (46%)
VRM Class II	46,500 (75%)	33,200 (54%)	33,200 (54%)	11,600 (19%)
VRM Class III	300 (>1%)	--	--	21,600 (35%)
VRM Class IV	600 (1%)	--	--	--

Cumulative

The CIAA for visual resources is composed of those 4th-order watersheds that completely or partially overlap the planning area. Fourth-order watersheds were used as the basic unit of analysis because impacts from management actions proposed under the RMP and other existing activity plans are not expected to have cumulative influence beyond this scale.

Past and present actions within the CIAA that have affected visual resources include wildland fires, wildland fire management activities, timber harvesting, mining, cross-country travel, noxious weed invasion, urban and suburban sprawl, and road construction.

Actions likely to have the greatest future effect on visual resources in the CIAA are activities associated with energy and minerals development, continued urbanization, road construction, vegetation management, developed recreation, and utility development. Energy development, primarily dependent upon a variety of external factors, could have widespread and long-term effects on visual resources, and although sites are required to be reclaimed, some visual impacts remain (e.g., well caps). Urbanization has and is expected to continue to result in residential and/or commercial development expanding incrementally closer to BLM-administered public lands, which presents the GJFO with further challenges in meeting visual resources goals and objectives.

Continued urban growth and development of lands in the vicinity of BLM-administered public lands could also lead to an increased demand for energy resources, building materials, utilities, and minerals, all of which could spur development that would affect visual resources.

4.3.11 Wildland Fire Management

This section discusses impacts on wildland fire management from proposed management actions of other resources and resource uses. Existing conditions concerning wildland fire management are described in **Section 3.2.10**, Wildland Fire Management.

Methods of Analysis

Impacts on resources and resource uses resulting from implementation of the wildland fire management program are discussed in those particular resource sections in this chapter. Impacts on wildland fire management generally result from activities that affect fire intensity, frequency, and suppression efforts.

Indicators of impacts on wildland fire management include the following:

- Alteration of vegetative cover (standing and non-standing) that results in a substantial upward shift in the fire regime condition classes of the planning area (away from average reference conditions).
- A substantial increase in the risk of wildland fire ignitions in areas where it is not desired.
- Management actions that substantially inhibit a response to wildland fire or appropriate treatments to prevent wildland fire.

The analysis includes the following assumptions:

- Fire is an important functional, natural disturbance in many of the ecological systems found in the planning area.
- A direct relationship exists between the density of human use within the planning area and the frequency of human-caused fires.

- A direct relationship exists between fuel loading and potential fire intensity and severity.
- Human-caused wildfires will be suppressed.
- Demand for fuels treatments would likely increase over the life of this plan.
- Most fires in the planning area have natural causes (e.g., lightning strikes).

Effects Common to All Alternatives

Impacts on wildland fire management common to all alternatives include changes in fire frequency and intensity, and the ability to employ fire-suppression methods, all of which would affect management of fire within the GJFO planning area. Many different resource uses may introduce additional ignition sources into the GJFO planning area, which increase the probability of wildland fire occurrence and the need for fire-suppression activities. Fire intensity can be affected by activities that decrease fuel loading, such as vegetation treatments and harvesting of timber products, and activities that alter the composition and structure of vegetation communities. High-intensity fires generally result in a greater loss of vegetation cover, changes to soil chemistry, damage to root structures, and a greater ability for non-native species to become established. Restrictions associated with the management of WSAs, ACECs, lands with wilderness characteristics, cultural and paleontological resources, and special status species may limit fire suppression tactics and fuels treatment methods.

In lower elevation sagebrush, both planned and unplanned fire would generally be avoided, but limited application based on site specific conditions (e.g., areas not infested with cheatgrass) would be allowed. Mechanical fuel treatments in lower elevation sagebrush would require seeding. Vegetation treatments that target conifer encroachment in sagebrush would reduce fuels for future wildfires.

Managing habitat for a variety of wildlife species could include performing vegetation manipulation, prescribed fire, or managing unplanned wildfire for resource benefits. Under all alternatives, this would affect the wildland fire management program by reducing costs and potential for large, damaging unplanned fires.

Through consultation Native American Traditional Leaders have remarked that natural ignition fires are not necessarily a threat to cultural values, sites, or natural resources that may be of interest to them because a natural fire is part of the natural world. However, prescribed fire and arson-caused wildland fire is of concern. The BLM would continue to consult with Native American Traditional Leaders regarding prescribed fire on a case-by-case basis.

Forestry actions can impact wildland fire by reducing fuels loadings, thinning stands, and creating more fire-resilient stands that lower the risk of catastrophic wildfire. Forest management activities may slightly increase the risk of human-caused fires by introducing the presence of potential ignition sources.

While recreation use increases the risk of human-caused ignitions, intensive recreation management may reduce this risk by providing targeted activities and outcomes. However, with more overall recreation use comes the increased potential for human-caused ignition.

Livestock grazing may reduce fuels loading in certain areas, but quantifying the impact on wildland fire can be difficult because the effect of grazing is related to the fuel type where a fire burns. The impact is greatest where grass fuel types are the main carrier of the fire and only a small percentage of lands grazed in the decision area meet this criterion. Therefore, because AUMs vary only slightly across the four alternatives the effect on wildland fire is considered to be consistent across all alternatives.

Soils and water resources impacts are similar across all alternatives. Impacts on the fuels management program could include alterations on fuels treatment design and methods. Slopes, soil types, distance from riparian areas, and other factors associated with these resources all impact the options available for wildland fire and fuels management.

The development of energy and minerals resources increases the risk of wildfires by introducing new ignition sources. Facilities, infrastructure and transmission lines can increase fire and fuels program costs while decreasing fire management flexibility with regards to suppression options. Energy development also poses hazards to firefighters, including unknown toxins, facility protection, evacuation of industry personnel, and dangerous overhead power lines. Fire programs could incur additional costs to train firefighting personnel for emergency situations associated with energy development.

The road infrastructure supporting energy and minerals development would provide increased accessibility to remote areas for fire suppression and would provide fuel breaks in the event of wildland fire.

Issuance of ROWs, which are considered part of the WUI, can impact wildland fire management in several ways. Access and program costs are increased because of the increased potential for fire in the WUI. There may also be slightly higher risk of human-caused ignitions from construction, maintenance, and use of ROWs. As new WUI sites are developed, additional fuels treatments are necessary to address potential impacts from wildland fires.

Critical infrastructure ROW corridors would need maintenance throughout their life to keep vegetation at a level that would moderate fire behavior and allow for some protection from an unplanned wildland fire. Vegetation

maintenance would ensure that critical infrastructure would not fail at a time of need, such as during a wildland fire.

Comprehensive travel and transportation management impacts the wildland fire program by way of increased risk of human-caused ignitions, especially where motorized vehicles travel cross-country. All forms of travel encourage the spread of invasive weeds, particularly cheatgrass, which can shift fire regimes and increase fire behavior potential. When routes are closed and rehabilitated, they become unavailable for response to wildfires, limiting access opportunities.

To preserve wilderness characteristics in WSAs, there would be little to no fuels management in these areas. Likewise, fire management response to wildfire in WSAs would be limited so not to impair the suitability of such areas for wilderness designation.

Implementing management for the following resources would have negligible or no impact on wildland fire management and are therefore not discussed in detail: air quality; wild horses; paleontology; WSRs; national, trails; national, state and BLM byways; interpretation and environmental education; public health and safety; socioeconomics; or environmental justice.

Alternative A

Vegetation management and weed treatments would serve to decrease both standing and non-standing vegetation (fuel load) across the planning area, which would decrease the intensity of wildland fires and allow fires to be more easily controlled. These activities would also modify the composition and structure of vegetation communities by creating mosaic vegetation patterns and natural fuel breaks, and by promoting healthy, diverse vegetation communities that generally fuel low-intensity fires. Specifically, efforts to reduce incursion of non-native annual grasses (primarily cheatgrass), encroachment of shrubby vegetation, buildup of biomass in forested areas, and proliferation of noxious and invasive weeds would help to achieve this effect. Similarly, treatments for habitat improvement and forage would reduce fuels and reduce the likelihood for stand-replacing fire.

Designating 28,900 acres as ACEC could result in fewer human-caused ignitions due to restrictive management actions. Vegetation treatments would be those that benefit the identified relevant and important values of the particular ACEC. As a result, there is potential that little to no fuels treatments would be allowed in some ACECs and the risk of catastrophic wildfire would not be reduced.

Fewer special status species restrictions in this alternative mean there would be fewer modifications necessary for hazardous fuels treatments.

The wildland fire management program would continue to avoid implementing fuels treatments in areas with known cultural resources that would be adversely affected by fire and vegetative treatments. The presence of cultural sites may

necessitate a modification to the design of fuels treatments and sometimes cause the fuels treatment unit to be withdrawn from treatment. As a result, these areas would be at a higher risk for larger, more-intense wildland fires.

The extent of planned ignitions and mechanical treatments would be altered in design and potentially limited in the 159,200 acres of VRM Class I and II lands.

Managing 542,700 acres as unsuitable for forest harvest would increase fuel loading in those areas and subsequently the potential for more severe fires. Conversely, specific harvesting methods of forest and woodlands would reduce fuel accumulations in wooded areas and subsequently reduce wildland fire intensity and the demand for wildland fire management resources.

Continuing to manage 1,134,600 acres of the federal mineral estate as open to fluid mineral leasing would increase development activities and ignition sources, the impacts of which would be the same as those described under Effects Common to All Alternatives.

The impacts of managing 300,700 acres as acceptable for further coal leasing and development and 385,100 acres as suitable for public utilities would be the same as those described under Effects Common to All Alternatives, but would occur over a greater acreage than under other alternatives.

Regarding comprehensive travel and transportation management, Alternative A would have greatest potential for human-caused fire because it includes the least travel restrictions, thereby increasing the potential for the spread of invasives and new ignition sources.

No lands with wilderness characteristics would be managed for wilderness characteristics under Alternative A. The absence of such management would allow greater flexibility in hazardous fuels treatments, especially in those areas suited for mechanical treatments.

Alternative B

Under Alternative B, vegetation and weed treatments would decrease both standing and non-standing vegetation (fuel load) across the planning area, which would decrease the intensity of wildland fires and allow fires to be more easily controlled. The use of planned and unplanned fires to meet resource objectives would further decrease fire intensity and fuel loading. Mechanical treatments in all vegetation types, but especially in forest communities, could also help reduce the potential for crown fires and make them easier to manage and control. Planned and unplanned fires would be avoided in black brush and salt desert shrub communities, which would prevent the increase of invasive annuals that generally leads to a higher fire frequency.

The use of fire to maintain and increase desired plant community diversity would also help reduce fuel loads across the planning area. Management of salt

desert shrub communities requires suppression of all fires. Vegetation treatments in these communities targeting cheatgrass would reduce the risk of wildfire.

Within mountain shrub communities such as Gambel oak (*Quercus gambelii*), BLM would allow planned and unplanned ignitions and mechanical treatments to create canopy openings and reduce fuel loads.

Maintaining pinyon-juniper woodlands across seral stages would help to reduce the size and extent of late seral crown fires; fires in the earlier seral stages are easier to suppress and are typically smaller in size than late seral crown fires.

Management of conifer stands in this alternative would reduce fuel loads and increase canopy openings. This would reduce the potential for large wildfires and crown fires and the costs and resources associated with responding to them. However, actions involving mechanized equipment could slightly increase the potential for ignition sources and cost.

Adaptive drought management could limit prescribed burns and vegetation treatments during periods of extreme and exceptional drought. This would potentially reduce the acres mitigated against fire, but would also decrease the chance of invasive species outcompeting native vegetation post-treatment.

Managing 106,000 acres (3.7 times more acres than under Alternative A) as ACECs would result in impacts similar to those described under Alternative A, but occurring over a much larger area.

Managing 11 wildlife emphasis areas on 170,500 acres could increase the cost and limit flexibility for suppression and fuel treatment efforts. Hazardous fuels treatments could need wildlife mitigations, which could lead to increased costs, TLs, and alteration of project design.

Stipulations for special-status species management (including active nesting sites) could reduce suppression flexibility. The impacts would vary by stipulation, with buffer distances and exceptions presenting unique impacts regarding increased survey costs and design alterations for fuels treatments.

The impacts from cultural resources management actions would be the same as those described under Alternative A, but there would be additional restrictions in the form of NSO stipulations and management actions for the Allocation to Use category.

The types of impacts from forestry would be the same as those under Alternative A, but only 203,100 acres (63 percent fewer acres than under Alternative A) would be closed to wood product sales and or harvest.

The types of impacts from visual resources management actions would be the same as those described under Alternative A but VRM Class I and II lands would be managed on 518,600 acres (3.3 times more acres than under Alternative A).

The types of impacts from fluid minerals, coal, and lands and realty would be the same as those described under Alternative A, but would affect a smaller area.

The impacts from comprehensive travel and transportation management would be the same as those described under Effects Common to All Alternatives. There would be zero acres open to cross-country motorized and mechanized travel under Alternative B, resulting in fewer opportunities for unplanned ignition (intensive use would be allowed on 10,200 acres, in areas largely devoid of vegetation). Cross-country foot and horse travel would still present the potential for the spread of invasives and human-caused ignition.

Managing 24,400 acres for wilderness characteristics under Alternative B could result in reduced flexibility for hazardous fuels treatments.

Alternative C

The types of impacts from soils management actions would be the same as those described under Alternative B.

The types of impacts from vegetation management actions would be similar to those described under Alternative B, but increased fuel loading could be expected as a result of a reduction in mechanical treatments under Alternative C. For example, managing pinyon-juniper woodlands to increase old-growth would increase the size and extent of crown fires. Fires in older stands tend to burn intensely, are costly to suppress, and are typically larger in size. Other restrictions unique to Alterative C include less use of mechanical hazardous fuels treatments in mountain shrub communities and emphasizing vegetation management for the enhancement special status species habitat that could reduce acreage available for hazardous fuels treatment. These actions could increase fuel levels sufficient to produce a landscape with larger and more costly fires.

The types of impacts from managing ACECs would be similar to those described under Alternative A, but under Alternative C BLM would manage 23 ACECs on 168,000 acres (5.8 times more acres than under Alternative A).

The types of impacts from fish and wildlife management actions, with regards to wildlife emphasis areas, would be similar to those described under Alternative B but would occur over 170,500 acres (21 percent fewer acres than under Alternative B).

The types of impacts from special status species management actions would be same as those described under Alternative B but would occur over a larger area because of greater management emphasis on adjacent suitable habitat that

would restrict the areas available for hazardous fuel reduction projects and the use of unplanned ignitions to meet resource benefits.

The types of impacts from cultural resources management actions would be the same as those described under Alternative A, but there would be additional restrictions in the form of NSO stipulations and management actions for the Allocation to Use category.

The types of impacts from visual resources management actions would be the same as those described under Alternative A.

The types of impacts from fluid minerals, coal, and lands and realty actions would be the same as those described under Alternative A, but over a smaller area than under any other alternative.

The types of impacts from forestry management actions would be the same as those described under Alternative A, but approximately 435,300 acres would be closed to wood product sales and/or harvest under Alternative C (20 percent fewer acres than under Alternative A).

The types of impacts from comprehensive travel and transportation management actions would be the same as those described under Effects Common to All Alternatives, but would occur over a smaller area because Alternative C includes the most acres closed to different uses or where uses are limited to designated routes.

Under Alternative C, the BLM would manage 171,200 acres for wilderness characteristics (7 times more acres than under Alternative B). The types of impacts would be the same as those described under Alternative B, but would occur over a larger area.

Alternative D

Alternative D allows less flexibility in the management of unplanned ignitions because more suppression would be required as a result of allowing increased resource extraction under this alternative than under Alternatives B and C. This reduction in using natural ignitions for resource benefit would result in potentially increased fire suppression costs, especially large fire costs, and increase risks to the firefighter over the long term. Fuels treatments would prioritize manual and mechanical treatments.

The types of impacts from soils and special status species management actions would be the same as those described under Alternative B.

The types of general vegetation impacts would be the same as those described under Alternative B, except Alternative D would emphasize forage-producing vegetation treatments, reducing large fire potential. Alternative D does not emphasize cheatgrass control treatments, meaning cheatgrass would continue to

negatively alter fire regimes across a larger area than under Alternatives B. In addition, this alternative does permit much flexibility in performing hazardous fuels treatments in mountain shrub communities and pinyon/juniper, which would lead to the increased risk of large and/or unplanned fires.

Compared to Alternative B, there would be a greater reduction in fuel loading due to forage/habitat producing treatments in woodlands under Alternative D. This would lessen demands for wildland fire management resources in those areas unless the areas became infested with cheatgrass, in which case demands would rise.

The types of impacts from special status species management would be similar to those described under Effects Common to All Alternatives, but would occur over a smaller area than under Alternatives B and C because there would be fewer areas managed to promote special status species and therefore less potential for impacts on the wildland fire management program.

The types of impacts from cultural resources management actions would be the same as those described under Alternative A.

The types of impacts from visual resources management actions would be the same as those described under Alternative A but VRM Class I and II areas would be managed on 333,900 acres (2.1 times more acres than under Alternative A).

The impacts from fluid minerals actions would be the same as those described under Alternative A.

The types of impacts from coal and lands and realty actions would be the same as those described under Alternative A, but would occur over a smaller area.

The types of impacts from forestry management actions would be the same as those described under Alternative B, but only approximately 108,600 acres would be closed to wood product sales and/or harvest under Alternative D, the least of all alternatives (80 percent fewer acres than under Alternative A).

Managing 33,200 acres (15 percent more acres than under Alternative A) in five ACECs would result in impacts similar to those described under Effects Common to All Alternatives.

The types of impacts from comprehensive travel and transportation management actions would be the same as those described under Effects Common to All Alternatives, but additional closures to different uses and areas where uses are limited to designated routes would limit impacts.

No lands with wilderness characteristics would be managed for wilderness characteristics under Alternative D. The types of impacts would be the same as those described under Alternative A.

Cumulative

The CIAA for Wildland Fire Management is delineated by the fourth-order watersheds that completely or partially overlap the planning area. Rather than following administrative boundaries, wildland fires burn based on fuels, weather, and topography. Because of continuous fuels, historic high fire occurrence, and many jurisdictional lines occurring at mid-slope, GJFO fire management activities could affect fire management and resources outside of the planning area. For example, there is a high likelihood of fires burning from BLM-administered public lands to Forest Service lands on the Battlements, Grand Mesa slopes, and Uncompahgre Plateau. There is also the potential for wildland fires to impact adjacent BLM, private, and state lands, such as the Roan Cliffs fire in 2009, which burned onto public lands administered by the Moab Field Office.

Past and present management actions and natural events within the CIAA have altered the condition of vegetation and natural fire regimes across the landscape. These include fire suppression, vegetation treatments, grazing, timber harvesting, noxious and invasive weed spread, drought, and insect and disease outbreaks. In many cases, areas are now more prone to large, intense fires.

Urban development and recreational activities in the CIAA are expected to increase over the life of the RMP, creating additional potential ignition sources and the probability of wildland fire occurrence. Of these two factors, urbanization, and especially the expansion of residential areas, is expected to be the larger contributor to cumulative wildland fire impacts. The WUI is a high-priority suppression area, and suppression in the WUI can be more dangerous, time-consuming, and expensive than suppression in undeveloped areas. Additional WUI would increase the need for hazardous fuels projects to reduce the risk of wildland fires burning from BLM Lands into the WUI. Increased WUI can also increase costs associated with suppression and is more dangerous to firefighters and the public. Additional fire suppression resources could be needed, including federal, state, and local agency resources.

Increasing energy development on both BLM-administered public lands and adjacent private property increases the probability of human-caused ignitions and can require costly suppression efforts to protect life, property, and infrastructure. Fluid minerals development creates safety issues during wildland fires, including evacuations, unknown hazardous materials, and hazards regarding pipelines and other flammable materials. These issues add to the suppression costs and complexity in areas of fluid mineral developments.

Changing land use patterns and increased recreation and visitation would also result in the modification of vegetative communities; both trends present new vectors for the introduction of noxious weeds and nonnative vegetation species. These introduced species could eventually alter the fire regime of certain areas and potentially increase the frequency, size, and intensity of wildland fires.

4.3.12 Lands with Wilderness Characteristics Outside Existing WSAs

This section discusses impacts on lands with wilderness characteristics from proposed management actions of other resources and resource uses. Existing conditions concerning lands with wilderness characteristics are described in **Section 3.2.14**, Lands with Wilderness Characteristics Outside Existing WSAs.

The GFJO is required to perform a wilderness inventory, per Manual 6300-2 (BLM 2011), and identify those lands that contain wilderness characteristics. Wilderness characteristics considered in this analysis include naturalness, and outstanding opportunities for solitude or a primitive and unconfined type of recreation. In the planning area, 12 areas with a total of 171,200 acres were found to have wilderness characteristics based on the BLM Wilderness Characteristics Assessment (**Appendix F**).

Methods of Analysis

Indicators of impacts on lands with wilderness characteristics include the degradation of wilderness characteristics to a level at which the value of the wilderness characteristic would no longer be present within the specific area.

Analysis for this section discusses the impacts of planning decisions on managing lands with wilderness characteristics. Only potentially significant impacts are discussed in detail in the following sections.

This section also analyzes impacts on lands with wilderness characteristics that are not managed to protect those characteristics. Quantitative impacts pertaining to those areas are displayed in **Table 4-35**, Acreage Impacts on Lands with Wilderness Characteristics Not Managed for Wilderness Characteristics, and discussed in the following analysis.

Table 4-35
Acreage Impacts on Lands With Wilderness Characteristics Not Managed for Wilderness Characteristics

Management Action	Alternative A	Alternative B	Alternative D
ROW Avoidance Areas	69,700	99,900	0
ROW Exclusion Areas	64,800	27,500	1,600
VRM Class II	50,100	89,700	59,200
Subject to NSO Stipulation	121,700	119,100	79,300
Subject to CSU Stipulation	5,000	118,700	93,600
Acceptable for Coal Leasing	81,800	71,600	71,600
ACEC	0	31,200	100

Source: BLM 2010a

Effects Common to All Alternatives

Each alternative would impact the wilderness characteristics of lands with wilderness characteristics to some degree. Generally, actions that create surface disturbance degrade the natural characteristics of these areas and the setting for experiences of solitude and primitive recreational activities.

Fluid mineral leasing can impact lands with wilderness characteristics by potentially leading to disturbance of the natural landscape surface for drilling and related development, including roads and pipelines. Within the 171,200 acres of lands with wilderness characteristics in the planning area, approximately 1,800 acres have been classified as having high potential for oil and gas development (all within the South Shale Ridge unit) and 29,300 acres have been classified as having moderate potential (within portions of the Hunter Canyon and South Shale Ridge units). The remaining 139,900 acres of lands with wilderness characteristics have been classified as having low, very low, or no potential for oil and gas development and would not likely be developed over the life of the plan. Additionally, 35,200 acres have been identified as having potential for geothermal resources which includes all of the Bangs Canyon unit and a portion of the South Shale Ridge unit (14,700 acres).

While there is low to no potential for fluid mineral development in most of the lands with wilderness characteristics units, the majority of the areas, totaling 101,000 acres (59 percent), are already leased for oil and gas development. While stipulations for fluid mineral development may apply to these leases under Alternative A, stipulations under Alternatives B, C, and D would not retroactively apply to the existing leases, just as closing the areas to fluid mineral leasing would not apply to existing leases. In other words, existing leases would be subject to terms and conditions attached to the original lease. Conditions of Approval similar to the stipulations may be applied to the drill permit at a later stage to protect other resources or stipulations may be applied if a lease expires and the land is leased again. Should any of the leases be developed, there would likely be impacts on wilderness characteristics to the degree that at least portions of the area would no longer meet the criteria for having wilderness characteristics. Naturalness would be impacted primarily from increases in visual intrusions, human activity, and modifications to the landscape including indirect changes such as additional roads. Increased noise levels, visual impacts, presence of people, and associated traffic would impact opportunities for solitude and primitive recreation.

Coal development could impact lands with wilderness characteristics by leading to disturbance of the natural landscape surface for location of facilities and vents. East Demaree Canyon, East Salt Creek, Hunter Canyon, South Shale Ridge, Spink Canyon, and Spring Canyon are within the area of coal potential. Making these areas unsuitable for coal leasing would protect the naturalness of the areas.

Livestock grazing would be allowed under all alternatives. Impacts on lands with wilderness characteristics are possible from livestock grazing, particularly from fencing, which may lessen naturalness of appearance or limit unconfined recreation.

Management for wildland fire has the potential to impact lands with wilderness characteristics. In areas where suppression is a priority, there is the potential for fuels treatments that could result in vegetation modification and surface disturbance to prevent the spread of fires, potentially reducing the naturalness of appearance.

Management actions that protect resources would impact lands with wilderness characteristics by preserving or enhancing naturalness as well as opportunities for solitude and primitive recreation. For example, restrictions on soil and water resources management actions could preserve the naturalness of the landscape by preventing large-scale disturbances through the application of stipulations and other actions. Restrictions on surface use to protect cultural resources would limit visual impacts and habitat degradation, thereby protecting wilderness characteristics. Also, where lands with wilderness characteristics units overlap with wildlife emphasis areas, management actions to protect fish and wildlife would preserve wilderness characteristics by promoting a more natural landscape conducive to healthy vegetation, fish, and wildlife. Specific measures and impacts would vary by alternative and are discussed in the following sections.

Where such areas overlap or are adjacent to lands with wilderness characteristics, designation of special management areas such as ACECs and WSAs may also provide some protection of wilderness characteristics due to the protective measures proposed for special designation areas. These protective measures would include complementary management objectives where lands with wilderness characteristics units will be managed to protect their wilderness characteristics, and may offer some indirect protection of wilderness characteristics for units managed primarily for other resource considerations.

Implementing management for the following resources would have negligible or no impact on lands with wilderness characteristics and are therefore not discussed in detail: air; wild horses; paleontology; national trails; national, state, and BLM byways; and interpretation and environmental education.

Alternative A

The BLM would not manage any lands with wilderness characteristics to protect their wilderness characteristics under Alternative A. Management actions to protect other resources and special designation areas would offer some protection of wilderness characteristics, though surface-disturbing activities such as fluid mineral extraction and casual use (e.g., recreation) would have the potential to alter the natural setting as well as reduce opportunities for solitude or primitive recreation for all lands with wilderness characteristics units. Management under Alternative A has led to current conditions that include wilderness characteristics existing in 12 areas within the planning area. Wilderness characteristics would likely persist in many of these areas under

Alternative A, however, degradation of wilderness characteristics in at least some areas that currently possess wilderness characteristics would be likely under this alternative.

Of the 171,200 acres of lands with wilderness characteristics, 50,100 acres (29 percent) would be managed as VRM Class II which would protect wilderness characteristics because activities altering the existing landscape character would be prohibited. Another 41,900 acres (26 percent) would be managed as VRM Class III, which would allow some modifications to the landscape that could impair the naturalness of the area. The remaining 79,100 acres (46 percent) would be undesignated. Undesignated areas are not managed for VRM objectives so activities could be permitted that modify the landscape and thus impact the naturalness of the areas.

Managing lands with wilderness characteristics as unsuitable for public utilities (i.e., ROW exclusion) would protect wilderness characteristics by prohibiting disturbance from transmission lines, roads, and other utility developments. Under Alternative A, 64,800 acres (38 percent of lands with wilderness characteristics) would continue to be managed as unsuitable for public utilities. An additional 69,700 acres (41 percent) would continue to be managed as sensitive to public utility development (i.e., ROW avoidance) providing a certain amount of awareness for sensitive resources in the area, although ROW location may still occur. ROWs could impact wilderness characteristics on the 36,500 acres not managed as unsuitable for or sensitive to ROW location.

All or a portion of each of the 12 lands with wilderness characteristics units totaling 121,700 acres (71 percent of lands with wilderness characteristics) would continue to be protected by NSO stipulations for fluid mineral development. The majority of areas with NSO stipulations, however, have low to no potential for oil and gas so impacts from development would be unlikely, regardless.

Under Alternative A, a total of 81,800 acres (48 percent) of lands with wilderness characteristics in the area of coal potential would be available for coal leasing. While coal is largely mined subsurface in the GJFO, the location of facilities and vents could still impact the naturalness of these areas.

The BLM would designate five ACECs under Alternative A (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon and Unaweep Seep). The West Creek (adjacent) unit overlaps the Unaweep Seep ACEC. Impacts are described under Effects Common to All Alternatives. Similarly, there are several areas where lands with wilderness characteristics units and eligible WSR stream segments overlap: Ute Creek with the Unaweep unit; Blue Creek and Dolores River with the Maverick unit; and North Fork West Creek with the West Creek (adjacent) unit. In these instances, and where East Creek and the Bangs Canyon unit are adjacent to each other, WSR management would complement wilderness characteristics.

Alternative B

The BLM would manage the Maverick, Unaweep, and West Creek (adjacent) lands with wilderness characteristics units (24,400 acres or 14 percent) to protect their wilderness characteristics. Closing these units to fluid mineral leasing, mineral material disposal, and non-energy leasable development and exploration would protect wilderness characteristics by prohibiting development and infrastructure related to those actions, subject to valid existing rights (see Effects Common to All Alternatives). In addition, the BLM would apply NSO stipulations, prohibiting other surface-disturbing activities (not related to fluid mineral leasing) that could damage wilderness characteristics. While these actions would prevent alteration of wilderness characteristics, the potential for impacts on other lands with wilderness characteristics units would remain. For example, those units with high and moderate potential for oil and gas development would not be managed for wilderness characteristics and would be managed for multiple use (i.e., for other uses that may be incompatible with protection of wilderness characteristics). Of the 146,800 acres (86 percent) not managed for wilderness characteristics, NSO stipulations would be applied on 119,100 acres (81 percent) and CSU stipulations would be applied on 118,700 acres (81 percent) of lands with wilderness characteristics not managed for wilderness characteristics. The types of impacts are the same as those described under Effects Common to All Alternatives. For those areas where stipulations would not be applied, mineral exploration and development would have the potential to impact both the naturalness and opportunities for solitude and primitive recreation. Due to the scattered nature of the parcels available for development, and their relatively low potential for oil and gas, significant development and associated impacts would not likely occur.

The three areas managed for wilderness characteristics are outside of the area of coal potential, as are Bangs Canyon, Kings Canyon, Lumsden Canyon, and the remainder of the Maverick unit that is not managed for wilderness characteristics. Of the lands with wilderness characteristics in the area of coal potential, approximately 71,600 acres (49 percent) would be available for coal leasing. Impacts are similar to those described under Alternative A, although facilities would be subject to stipulations for surface-disturbing activities, if applicable, and so may receive indirect protection from coal development.

Management of forestry resources has the potential to impact wilderness characteristics should forest product harvest be available in lands with wilderness characteristics. Under Alternative B, activity-level plans would be developed to direct forest product removal. These plans would take into account other resource constraints such as wildlife habitat, soil erosion potential, and water quality, thus reducing impacts on lands with wilderness characteristics. Areas managed to protect their wilderness characteristics would be closed to wood product sales and/or harvest (including Christmas tree harvest), minimizing impacts on wilderness characteristics.

Wildland fire management is not likely to impact lands managed to protect their wilderness characteristics but may impact other lands with wilderness characteristics. For example, more aggressive fire suppression would likely occur in areas adjacent to private land and/or where other values are at risk.

In addition, lands managed to protect their wilderness characteristics would be managed as VRM Class II, which would protect wilderness characteristics because activities altering the existing landscape character would be prohibited. Of the areas not managed to protect their wilderness characteristics, approximately 89,700 acres (61 percent) would also be managed as VRM Class II. Compared with Alternative A, 2.3 times more acres of lands with wilderness characteristics would receive protection from VRM Class II management. The remaining area, 56,600 acres, would be managed as VRM Class III (35 percent more acres than under Alternative A). VRM Class III management would allow for noticeable changes to the landscape which could impact the naturalness and untrammeled nature of the areas.

All lands managed to protect their wilderness characteristics would be managed as ROW exclusion areas which would protect wilderness characteristics by prohibiting disturbance from transmission lines, roads, and other utility developments. On lands with wilderness characteristics not managed to protect their wilderness characteristics, 27,500 acres (19 percent) would be managed as ROW exclusion providing indirect protection to wilderness characteristics. Additionally, 99,900 acres (68 percent) of lands with wilderness characteristics would be managed as ROW avoidance areas. In total, 52,000 acres (30 percent) of lands with wilderness characteristics would be protected by ROW exclusion (20 percent fewer acres than under Alternative A).

Lands managed to protect their wilderness characteristics would be closed to motorized travel and mechanized travel (with an exception for mechanized travel on the Pickett Trail within the Maverick unit). In addition, no special recreation permits would be issued for competitive events. As such, visitor numbers and noise would likely remain at a low level, retaining naturalness, solitude, and opportunities for primitive and unconfined recreation. Other impacts from recreation would be negligible as any overlap of SRMAs and lands with wilderness characteristics would only occur in areas managed for non-motorized/non-mechanized recreation.

A number of measures designed to protect other resources would also aid in the preservation of wilderness qualities under Alternative B. For soil resources, management actions to promote meeting Standard 1 of Colorado's Standards for Public Land Health would allow adequate soil health to support more desirable plant communities, thus protecting naturalness in all lands with wilderness characteristics. For water resources, travel and mineral closures and NSO and CSU stipulations limit disturbances, which preserve wilderness qualities.

Vegetation treatments have the potential to result in a short term disturbance of lands and decrease in naturalness. Over the long term, treatments would likely improve naturalness as native plant species return. Similarly, weed treatments would likely lead to an increase in naturalness in the long term.

Finally, 146,400 acres of lands with wilderness characteristics are in areas of high or medium sensitivity for cultural resources, raising the potential for the application of stipulations or other protections than under Alternative A if cultural resources are identified.

Designation of special management areas may provide complementary protection of lands with wilderness characteristics' qualities where these areas are contiguous or adjacent due to the protective measures established for these areas. Portions of the West Creek (adjacent) unit would be contiguous with The Palisade WSA, which would provide additional protection for wilderness characteristics. Where lands managed to protect their wilderness characteristics overlap ACECs, ACEC management would be designed to protect wilderness characteristics (e.g., the Dolores River Riparian and Juanita Arch ACECs overlap the Maverick unit). In addition, where the South Shale Ridge lands with wilderness characteristics unit and ACEC overlap, the ACEC offers some protection of wilderness characteristics (e.g., ROW exclusion and VRM Class II). Finally, managing a portion of the Dolores River as suitable for inclusion in the NWSRS would provide additional indirect protection of the Maverick unit's wilderness characteristics on the 400 acres where those two areas overlap.

Alternative C

The BLM would manage all 171,200 acres of lands with wilderness characteristics to protect their wilderness characteristics (7 times more acres than under Alternative B). All impacts as discussed under Alternative B are relevant to Alternative C. However, because 7 times more acres are managed to protect their wilderness characteristics under Alternative C, the impacts on lands with wilderness characteristics would occur over a greater area and protection of wilderness characteristics would be increased.

Under Alternative C, stipulations designed to protect special status plant and animal species would protect wilderness characteristics by prohibiting potentially damaging leasing and surface-disturbing activities. For example, where the South Shale Ridge unit overlaps with a population of the federally threatened plant DeBeque phacelia, an NSO stipulation and protective management actions associated with the South Shale Ridge ACEC would limit disturbances that could degrade wilderness characteristics.

Surface resource protection for cultural resources, as described under Alternative B, would offer complementary protection for 146,400 acres of lands managed to protect their wilderness characteristics.

As discussed under Alternative B, closing lands managed to protect their wilderness characteristics to fluid mineral leasing, mineral material disposal and non-energy leasable development and exploration would protect wilderness characteristics by prohibiting development and infrastructure related to those actions, subject to valid existing rights (see Effects Common to All Alternatives). Impacts from coal development would be the same as those described under Alternative B.

As discussed under Alternative B, designation of special management areas may provide some additional protection of lands managed to protect their wilderness characteristics where these areas are contiguous or adjacent. As under Alternative B, the West Creek (adjacent) unit would be contiguous with The Palisade WSA and the Spink Canyon and Spring Canyon units would be contiguous with the East Demaree WSA, which would provide additional protection by prohibiting non-compatible uses along the border of the units. In addition, 36,300 acres of ACECs overlap with lands managed to protect their wilderness characteristics, including South Shale Ridge ACEC (overlaps with the South Shale Ridge unit) and portions of Dolores River Riparian ACEC (Maverick unit), providing additional protection through the use of complementary management actions in those ACECs. Similarly, there are several areas where lands managed to protect their wilderness characteristics and suitable WSR stream segments overlap: Ute Creek with the Unaweep unit; Blue Creek and Dolores River with the Maverick unit; and North Fork West Creek with the West Creek (adjacent) unit. In these instances, and where East Creek and the Bangs Canyon unit are adjacent to each other, WSR management would complement wilderness characteristics.

Alternative D

The BLM would not manage any lands with wilderness characteristics to protect their wilderness characteristics under Alternative D. As discussed under Alternative A, no special management would be enacted to preserve wilderness characteristics in inventoried lands with wilderness characteristics units. While some protection of these qualities may be provided by management actions for other resource programs, lack of management actions for lands with wilderness characteristics increases the potential for degradation of wilderness characteristics.

Of the 171,200 acres of lands with wilderness characteristics, approximately 59,200 acres (35 percent) would be managed as VRM Class II which would protect wilderness characteristics because activities altering the existing landscape character would be prohibited. Compared with under Alternative A, 18 percent more acres would be managed as VRM Class II under Alternative D. An additional 109,900 acres (64 percent) would be managed as VRM Class III which would allow some modifications to the landscape that could impair the naturalness of the area. The remaining one percent of lands with wilderness characteristics would be managed as VRM Class IV, which allows the most

modification to the landscape and has the most potential to impact the naturalness of the areas. Compared with Alternative A, 98 percent fewer acres would be managed as VRM Class III or IV.

Under Alternative D, only 1,600 acres in the Hunter Canyon and West Creek (adjacent) units would be managed as ROW exclusion areas, accounting for less than one percent of all lands with wilderness characteristics. Alternative D would provide the least amount of protection to lands with wilderness characteristics from ROW location, which could impact the naturalness and untrammeled nature of the areas. However, any ROWs would still have to meet VRM objectives, as previously described.

While no lands with wilderness characteristics would be managed to protect their wilderness characteristics, NSO stipulations to protect other resources would be applied on 79,300 acres (46 percent) of lands with wilderness characteristics, providing indirect protection to wilderness characteristics. Compared with Alternative A, 35 percent fewer acres would be protected by NSO stipulations. CSU stipulations would be applied on 93,600 acres (55 percent) of lands with wilderness characteristics. The type of impacts would be the same as those described under Effects Common to All Alternatives. For those areas where stipulations would not be applied, mineral exploration and development would have the potential to impact both the naturalness and opportunities for solitude and primitive recreation. Impacts from coal development would be the same as those described under Alternative B.

The BLM would designate 5 ACECs under Alternative D (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon and Unaweep Seep). The West Creek (adjacent) unit overlaps the Unaweep Seep ACEC. Impacts are the same as those described under Effects Common to All Alternatives.

Cumulative

The CIAA used to analyze cumulative impacts on lands with wilderness characteristics includes the planning area and all adjacent BLM-identified lands with wilderness characteristics that are adjacent or overlap the planning area boundary. Adjacent and overlapping BLM-identified lands with wilderness characteristics include the Beaver Creek and Granite Creek units in the Moab Field Office and the proposed Grand Hogback unit in the Colorado River Valley Field Office.

Many past, present, and reasonably foreseeable actions have impacted or have the potential to impact the wilderness characteristics of lands with wilderness characteristics. For example, continued residential development in the Grand Valley and nearby communities will likely increase visitor use on BLM-administered lands including lands with wilderness characteristics, potentially impacting wilderness characteristics by reducing opportunities for solitude. Development of energy and minerals resources could introduce sights, noises, and infrastructure in or adjacent lands with wilderness characteristics, which

could degrade their wilderness characteristics. In addition, vegetation management activities on public and private lands may alter landscape appearance and setting in the short and long term, protecting or degrading wilderness characteristics depending on the activity. Impacts on lands with wilderness characteristics would be mitigated where those lands are managed to protect their wilderness characteristics and/or where management actions governing other resources complement wilderness characteristics.

4.4 RESOURCE USE CONDITIONS

This section contains a description of the human uses of resources in the GJFO planning area and follows the order of topics addressed in **Chapter 3**:

- Forestry;
- Livestock grazing;
- Recreation and visitor services;
- Lands and realty; and
- Energy and minerals.

4.4.1 Forestry

This section discusses impacts on forestry from proposed management actions of other resources and resource uses. Existing conditions concerning forestry are described in **Section 3.3.1**, Forestry.

Methods of Analysis

The analysis uses the following indicator of impacts on forestry resources: Loss and/or alteration of the quality and quantity of forest and woodland products available for harvest to the extent that demand cannot be met.

This analysis focuses on management actions with physical disturbance potential that result in changing the quantity or quality of forest and woodland habitat and/or products available for harvest. Forestry generally pertains to forest and woodland species, although areas of vegetation not classified as forests or woodlands could also contain forest products that are suitable for harvest. When possible, mitigation measures were incorporated in the analysis to reduce the effects of impacts on vegetation, rangelands, and riparian/wetland areas.

The analysis includes the following assumptions:

- Forest and woodland products and traditional woodland products (Christmas trees, pinyon nuts, post/poles, and wildings) could originate from other areas and habitat that are not dominated by forest and woodland vegetation
- Improved forest health will likely increase quality and quantity of product available for harvest.

- Loss of harvestable acres through legislative or administrative designations (e.g., NCA, ACEC, etc.) will likely increase demand for forest products in other areas.

The quality and quantity of forest and woodland products available for harvest in the long term is directly tied to forest health and vegetation management. As discussed in **Chapter 3**, factors such as insect and disease outbreaks, age class structure diversity, and forest succession rate can impact forest health and products available for harvest. Forestry management under all alternatives would be undertaken with a goal of improving forest health. Impacts on vegetation management for forestry and woodlands are described in further detail in **Section 4.3.4**, Vegetation.

Effects Common to All Alternatives

Forest harvest is anticipated on a small portion of the decision area due to a lack of large-scale commercially harvestable timber. As discussed in **Chapter 3**, the majority of forestry products harvested from BLM-administered lands are from pinyon-juniper vegetation communities.

Actions that would affect forestry primarily include restrictions on surface-disturbing activities and other allowable uses such as limitations to protect sensitive resources and special designation areas. Applying NSO stipulations on steep slopes would impose limitations on treatment methods and harvest of forest and woodland products by reducing the area available for those practices. Over the life of the RMP, however, many of these restrictions would benefit the forestry program by stabilizing soils and improving stand quality. Similarly, areas used for drinking water have surface restrictions to reduce soil erosion and prevent water contamination that may conflict with forestry management objectives and limit forestry product development in these areas. Activity level plans would be developed with the needs of source water protection areas in mind; specific areas closed vary by alternative and are discussed below.

In general, vegetation management objectives would complement forestry management objectives, as both programs manage for healthy forests and woodlands. However, a CSU stipulation for old-growth woodlands may prohibit removal of forestry materials from some areas in all action alternatives (B, C, and D).

Measures designed to protect special status species and fish and wildlife may also impose restrictions on forest product harvest in areas where sensitive habitat is co-located with areas potentially available for forestry harvest. Under current management, mitigation and minimization measures to protect wildlife are determined on a site-specific basis. Under all action alternatives (B, C, and D), CSU stipulations would protect BLM sensitive species habitat, significant natural plant communities, and high-value or crucial wildlife habitat.

Impacts from cultural resources actions would occur in areas where NSO stipulations for allocated cultural resource sites are identified. Possible effects include restricting or relocating treatment boundaries and access roads away from cultural resources.

Wildland fire management has the potential to impact forestry by reducing lands available for harvest. However, with proper limitations and guidelines, fuels treatments would likely have long-term positive effects on forestry; useable forest byproducts such as biomass or fuelwood often result from treatment and restoration projects, such as hazardous fuels treatments, designed to improve forest health. Unplanned fire can burn forest products, affecting their availability and condition, however can improve stand health and open new areas for harvestable forest and woodland product. Specific impacts of wildfire treatment and management are discussed by alternative below.

Management of visual resources could have site-specific impacts, including mandated changes in treatment type, size, and location of allowable harvest to meet VRM class objectives. These impacts would be concentrated in VRM Class I and II areas where visual disturbance is more restricted. However, relatively little commercial forest harvest is forecasted for the next 15 to 20 years, and woodland harvest is unlikely to be significantly impacted by the management of visual resources.

Implementation of energy and minerals and ROW projects, such as pipelines, pads, and associated facilities, would have long term impacts on the forestry program by reducing the area available for harvest.

Management of the four WSAs would have direct, long-term impacts on forestry by prohibiting wood product sales and harvest, including Christmas tree harvest. As a result, closures may reduce the amount of forest product available for harvest and could affect forest health.

WSR management of Colorado River Segment 3 prohibits forestry practices. Impacts on forestry along this stretch of river are discussed in the Proposed RMP/Final EIS for the McInnis Canyons NCA [formerly Colorado Canyons NCA] and Black Ridge Canyons Wilderness (BLM 2004).

Under all alternatives, forestry and vegetation management treatments would generate woody biomass for production of various fuel types, in addition to traditional uses such as posts, poles, and firewood.

Implementing management actions for the following resources would have negligible or no impact on forestry and are therefore not discussed in detail: air; paleontology; livestock grazing; recreation and visitor services; comprehensive travel and transportation management; national trails; national, state, and BLM byways; and interpretation and environmental education.

Alternative A

Under Alternative A, the continued focus of the forestry program would be managing suitable pinyon-juniper woodlands and commercial forest land to maintain stand productivity and help meet fuelwood and saw-timber demands. Forestry zones would not be identified, and no management plans for forestry zones would be established. The delineation of areas for forest product development would be dictated by the lands determined to be suitable or unsuitable for harvest based on criteria established in the 1987 RMP, as described in **Chapter 3**. In total, approximately 542,700 acres are classified as unsuitable for harvest under this alternative.

Harvest of forest and woodland product would continue to be impacted by restrictions for cultural resources that limit or prohibit actions and treatments in areas where they would conflict with cultural resource protection. These restrictions reduce the availability of forest product if located in areas otherwise suitable for harvest.

Fuels treatments would continue to impact forestry where management actions reduce lands available for harvest. Under Alternative A, fuels treatments are proposed for fewer acres than under Alternatives B or C, preserving a greater quantity of forest products.

Biomass would be made available and collected in a manner consistent with existing direction, and implementation of Alternative A would have no impact on biomass utilization.

There is no management for wilderness characteristics within lands with wilderness characteristics under Alternative A; therefore, there would be no restrictions from this program on forestry practices. Management of some ACECs, including Unaweep Seep and the Palisade, would restrict forestry activities and limit the harvest of products from these areas. In the Palisade ACEC (23,600 acres), forestry cutting units would continue to be limited to 20 acres or less in the pinyon-juniper woodlands, and the Unaweep Seep ACEC (80 acres) is closed to commercial wood product sales, forest product harvest, and Christmas tree cutting.

Management of the 14 WSR study segments (not including Colorado River Segment 3) would allow for removal of forest products from eligible segments when forestry harvest does not conflict with the protection of ORVs, free-flowing nature, or tentative classification (i.e., wild, scenic, recreational) of the segments. Development of new roads and trails would be limited in the study corridor of segments tentatively classified as wild or scenic, which may result in additional costs or restrictions on harvest because of reduced access.

Alternative B

Under Alternative B, approximately 203,100 acres (63 percent fewer acres than under Alternative A) would be closed to wood product sales or harvest (not

including Christmas tree harvest). Activity level plans would be developed for each established forestry management zone as needed (see **Table 2-2**) taking into account site-specific conditions and resource concerns. The activity level plans would determine specific areas that are suitable or unsuitable for forest product harvest and would establish allowable harvest levels based on site-specific resource conditions and on vegetation management objectives to improve forest health. Therefore, the long-term impact would be an improvement in forest and woodland health.

Compared with current management, management actions for other resources under Alternative B place additional limitations on forestry product development. There would be approximately 203,100 acres closed to wood product sales and/or harvest (not including Christmas tree harvest), including WSAs, lands managed for wilderness characteristics, ACECs, the Palisade municipal watershed, VRM Class I areas, and known lynx habitat. These closures would lead to a decrease in the amount of forestry product available for harvest to the public. However, forest management activities and product harvest would be allowed for habitat improvement to meet resource objectives. Therefore, forest health could be improved in these areas.

The designation of 106,000 acres of ACECs (3.7 times more than under Alternative A) and management of 24,400 acres for wilderness characteristics would have direct, long-term impacts on forestry by reducing the area available for harvest. Under Alternative B, ACECs would be closed to forestry harvest. In addition, forestry activities and Christmas tree harvest would be prohibited in lands managed for wilderness characteristics to preserve the wilderness characteristics of landscape naturalness and solitude and primitive recreation opportunities. Christmas tree sales would be allowed in these areas unless they are identified as over harvested. For all special area closures, wood product sales and/or harvest would be allowed when implemented as habitat improvement projects to meet desired resource conditions. As a result, closures may reduce the amount of forest product available for harvest but should improve forest health.

As discussed under Effects Common to All Alternatives, drinking water protection may impose restrictions on forestry. Restrictions to protect municipal source water from erosion and pollution under this alternative include an NSO stipulation for Grand Junction and Palisade municipal watersheds and a CSU stipulation for Collbran and Mesa/Powderhorn Source Water Protection Areas and Jerry Creek Watersheds. Although these site-specific restrictions are not specific to forestry, forestry product harvest would be prohibited or limited in those areas, potentially decreasing the amount of forestry product available for harvest.

Under Alternative B, increased fuels treatments have the potential to impose additional limits on forest harvest by reducing the quantity of forest products

available for harvest. However, properly implemented fire plans and prescribed burning could improve forestry and woodland health as well as the quality and quantity of harvestable products.

Under Alternative B, tamarisk and Russian olive would be targeted for removal, and the woody biomass of these species would be made available for biomass use. Biomass can also be made available in conjunction with forestry and fuels projects depending on project resource objectives. Making biomass available represents a direct impact on the regional ability for biomass resources to be utilized.

Impacts would result from the 2,400 acres of NSO stipulations specific to cultural resources and on areas where the NSO stipulation for Use Allocations is applied.

Impacts from WSR management would be similar to those described under Alternative A, but would apply only to the portion of the Dolores River determined suitable for inclusion in the NWSRS.

Alternative C

Under Alternative C, approximately 435,300 acres (20 percent fewer acres than under Alternative A) would be closed to wood product sales or harvest (not including Christmas tree harvest). As under Alternative B, activity level plans would be developed for each established forestry management zone. Impacts from activity level plans would be the same as those described under Alternative B. Categorical closures under Alternative C include those described under Alternative B and SRMAs. The types of impacts from these closures would be similar to those described under Alternative B. As such, the quantity of wood product available for harvest would likely be further decreased.

Site-specific restrictions to protect municipal source water under this alternative include an NSO stipulation for Grand Junction and Palisade municipal watersheds, as well as for Collbran and Mesa/Powderhorn Source Water Protection Areas and Jerry Creek Watersheds. As under Alternative B, there is the potential for a decrease in the amount of forestry product available for harvest due to these restrictions.

Under Alternative C, increased fuels treatments have the potential to impose additional limits on forest harvest by reducing the quantity of forest products available for harvest. However, properly implemented fire plans and prescribed burning could improve forestry and woodland health as well as quality and quantity of harvestable products.

Under Alternative C, tamarisk and Russian olive would be targeted for removal, with the same types of impacts on biomass resource development as described under Alternative B.

Impacts from ACECs and lands with wilderness characteristics would be the same as those described under Alternative B, but would occur on 168,000 acres (5.8 times more than under Alternative A) and 171,200 acres (7 times more than under Alternative B), respectively.

Impacts would result from the 2,400 acres of NSO stipulations specific to cultural resources and on areas where the NSO stipulation for Use Allocations is applied.

Restrictions from WSRs would be the same as those described under Alternative A.

Alternative D

Under Alternative D, commodity uses would be emphasized and approximately 106,800 acres (81 percent fewer acres than under Alternative A) would be closed to wood product sales or harvest (not including Christmas tree harvest), the fewest acres of any alternative. As under Alternatives B and C, activity level plans would be developed for each established forestry management zone. As under Alternatives B and C, categorical closures have the potential to limit availability of forest products. Due to the closure of fewer acres under Alternative D, significant impacts on forestry product harvest would be less likely than under other Alternatives. Categorical closures under this alternative include the Palisade Municipal Watershed, Gunnison River Bluffs SRMA, and all ACECs. However, forest management activities and product harvest would be allowed for habitat improvement to meet resource objectives including forest health.

Restrictions to protect municipal source water under this alternative also include a CSU stipulation for Collbran and Mesa/Powderhorn Source Water Protection Areas and Jerry Creek Watersheds. Types of impacts would be similar to those described under Alternatives B and C.

Impacts would result specifically from the 2,400 acres of NSO stipulations specific to cultural resources and on areas where the NSO stipulation for Use Allocations is applied.

This alternative proposes to use manual and mechanical fuels treatments over the fewest acres of any alternative, thereby protecting the quantity of forest products. However, fewer treatments would also limit the potential for improving forest and woodland product quantity and quality.

Under Alternative D, tamarisk and Russian olive would be targeted for removal, with the same types of impacts on biomass resource development as described under Alternative B.

There is no management for lands managed for wilderness characteristics or WSRs under Alternative D, and, as such, there would be no restrictions from

these two programs on forestry management or harvest. Types of impacts from ACEC management would be similar to those described for Alternative A but would occur on 33,200 acres (15 percent more than under Alternative A).

Cumulative

The CIAA used to analyze cumulative impacts on forest management follows fourth-order watershed boundaries that completely or partially overlap with the planning area. The fourth-order watersheds are used as the basic unit of analysis because the scope of cumulative influence would be at the watershed scale and is not expected to extend beyond this scale.

Reasonably foreseeable past, present, and future actions that may impact forestry management include actions by the BLM within the planning area, actions by other land owners on private land, and natural causes. In addition to the current forestry practices discussed in **Chapter 3**, human actions that may impact forestry include mechanical treatments of vegetation on public and private rangelands, as well as conversion of land for agricultural or development purposes, particularly due to increasing residential development in the WUI. Forestry products would continue to be impacted by natural events, including insect epidemics, which are likely to diminish forest health and the quality and quantity of available harvest products. Expansion and increased diversity in previously open areas is likely to continue due to fire suppression, decreased acres available for harvest, and climate change, which may result in increased available harvest products. Forest management activities on public, private, and other federal land would continue to be implemented to reduce the size and intensity of existing and imminent disease and insect epidemics and to reduce the hazard of large-scale high-intensity wildfires. All action alternatives (B, C, and D) are thus likely to contribute to the cumulative improvement of forest health in the long term.

4.4.2 Livestock Grazing

This section discusses impacts on livestock grazing from proposed management actions of other resources and resource uses. Existing conditions concerning livestock grazing are described in **Section 3.3.2**, Livestock Grazing. Socioeconomic impacts resulting from livestock grazing allocations are described in **Section 4.6.3**, Socioeconomics and Environmental Justice.

Impacts on livestock grazing are generally the result of activities that affect forage levels, areas open to grazing, the type of livestock, the season of use, the ability to construct range improvements, and human disturbance or harassment of livestock within grazing allotments.

Methods of Analysis

Indicators of impacts on livestock grazing include the following:

- A reduction in forage levels, which leads to a decrease in permitted AUMs in areas that are open to livestock grazing due to various

resource issues or conflicts, or leads to cumulative management actions that affect operations to the degree considered vital to an individual operation;

- An increase in forage levels that leads to an increase in permitted AUMs across the decision area;
- RMP management actions that prohibit the ability to construct range improvements and conduct treatments (infrastructure and vegetation);
- Restrictions in season of use and type of livestock allowed on an allotment; and
- RMP management actions that result in areas being closed to livestock grazing.

The analysis includes the following assumptions:

- All existing leases and permits would be subject to terms and conditions by the authorizing officer.
- Livestock would be managed to achieve the Colorado Standards for Public Land Health (BLM 1997a; **Appendix E**, BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado) on all grazing allotments.
- Range improvements (e.g., fences, pipelines, water wells, troughs, and reservoirs) would result in a localized loss of vegetation cover throughout their useful life. However, range improvements generally lead to better livestock distribution and could benefit the overall forage base and rangeland health.
- Vegetation would be reestablished through reclamation practices along water pipelines within 5 to 10 years in sagebrush/grass communities and 15 to 20 years in cold desert communities; areas with fences, water wells, troughs, and reservoirs would remain disturbed during their useful life and would be revegetated upon abandonment.

  Range improvements would continue to be constructed and maintained in the decision area.
- Although livestock grazing is not considered a surface-disturbing activity, grazing could affect the surface in areas where livestock concentrate.
- Livestock grazing on public lands is tied to permittee-owned or -controlled base property on private land.

- Allotment Management Plans or grazing use agreements may be necessary to make changes in grazing management to address resource issues or concerns.
- Increases in forage availability could increase permitted AUMs for livestock operators.

Effects Common to All Alternatives

Requiring implementation of particular livestock grazing management actions to improve rangeland conditions could affect livestock grazing operators by increasing their time and costs associated with grazing on public lands. Long-term benefits to operators include a stabilized operation based on sustainable forage production. Grazing management actions could include range improvements, modified grazing periods, growing season rest, modified grazing systems, use of riparian pastures, construction of exclosures, implementation of forage utilization levels, conversions of livestock types, or other approaches. These actions would help enhance rangeland conditions and increase long-term forage production.

Properly managed soils generally provide healthy plant communities, which can benefit livestock grazing by increasing the forage base.

Managing for healthy watersheds provides for necessary water sources and improved forage conditions for livestock grazing in the long term. Protecting water quality and watershed health could require changes in livestock management, such as deferred or shortened grazing periods, additional range improvements, exclusion, establishing riparian pastures, and increased cattle herding.

In general, managing riparian habitat in compliance with Land Health Standard 2, Riparian Areas, could directly impact livestock grazing through increased herding, additional range improvements, season of use and livestock numbers adjustment, or site-specific exclosures. Allowing riparian habitat to maintain proper functioning condition would benefit grazing livestock by indirectly providing cleaner and more reliable water sources and more dependable forage availability.

Under all alternatives, there would be potential short-term, localized, grazing restrictions due to herbicide treatment of weeds. However, long-term ecological condition of the preferred forage for livestock would be improved. This is true for vegetation treatments and fire rehabilitation projects that require rest from grazing. In certain areas, drought restrictions could also cause short-term restrictions on grazing permittees relying on public land forage.

Protecting special status plants and special status species habitat could directly affect livestock grazing by limiting grazing areas, seasons of use, and concentration. Special status species habitats also would directly influence

location, type, and cost of range improvements. Conversely, intensively managing riparian areas that support special status species from grazing animals could provide cleaner and more dependable water sources for livestock in the long term.

Wildlife species (e.g., bighorn sheep) could compete with livestock for forage, water, and cover when they occupy the same area. Big game species such as elk compete for similar forage as cattle, sheep, and horses. During the fall, deer prefer the same browse species as sheep and cattle, creating an intensified competition for forage. Uneven distribution of big game would cause some grazing allotments to receive a disproportionate amount of wildlife use, thereby increasing competition for forage within those allotments. Achieving wildlife population objectives would help reduce these effects. Fish and wildlife habitat management would directly affect livestock grazing in the short term through restrictions on grazing management, such as increased rotation, timing or season of use changes, or temporary rest from grazing. In the long term, management actions that enhance fish and wildlife habitat would likely improve vegetation conditions and increase forage production.

Construction of range improvements could improve livestock distribution and allow livestock to use more of the rangeland, which would consequently enhance rangeland conditions. However, stipulations (i.e., NSO, CSU, or TL) could impact the construction of range improvements if the range improvement in question were not to meet the exemption criteria, which could negatively affect livestock operations. For example, NSO or CSU stipulations could make it difficult to build a stock pond and could result in a reduction of AUMs where capacity is limited by water distribution.

Under all alternatives, livestock grazing would be prohibited within the LBCWHR.

In general, information provided by cultural resource inventories can limit or eliminate livestock management (specifically the presence or location of range improvements) on a case-by-case basis. Grazing management would change if inventory or monitoring reveals adverse effects that threaten NRHP eligibility or use allocation. For example, fencing cultural sites and excluding grazing from these sites could be necessary.

Livestock and their handling facilities may be authorized under all VRM classes; however, the design and placement of new range improvements in VRM Class I and II areas would have to be constructed in such a way as to repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape (see BLM Handbook H-8410-1). This could increase costs for permittees. In general, VRM classes that restrict surface-disturbing activities because of their potential effect on visual resources would indirectly help maintain forage levels by reducing activities from public

land uses that could reduce forage, harass livestock, and increase the potential for noxious or invasive weeds.

Wildland fire would have varying effects on livestock grazing, depending on fire size, intensity, timing, and fuel moisture content. Initially, wildland fire would likely displace livestock, and, depending on the proximity to the fire, livestock could be stressed, injured, or killed. Wildland fire would remove vegetation and forage over the short term.

Over the long term, wildland fire could improve forage production, especially when post-fire management, such as seeding, is implemented. ESR practices would close areas to livestock grazing to protect seeded species and increase success. These practices protect the seeded species from being overgrazed in the short term in order to ensure the site is stabilized. In addition to site stabilization, successful establishment of seeded species often also provides the added benefit of establishing a stable forage base in the long term. Restoring natural disturbance regimes, such as fire, and using vegetative treatments to accomplish biodiversity objectives to improve plant community resilience would also benefit livestock grazing by maintaining a balance of seral stages.

In general, removing woodland species benefits livestock grazing by creating more grass and forb species for forage.

Impacts from livestock grazing management actions on the livestock grazing program would primarily be related to annual forage removal. Implementing BMPs and grazing management systems that achieve land health standards would improve forage conditions over the long term, indirectly improving livestock health and production.

If monitoring data indicate livestock grazing is negatively impacting other resources, appropriate adjustments would be made to AUMs, seasons of use, and utilization levels. Adjusting AUMs could impact the permittee negatively or positively, depending on the situation. Adjusting grazing management could impact livestock permittees by limiting flexibility for season of use and reducing the amount of available forage in the short term. Livestock removal during times of drought and critical growth periods could limit where permittees put their livestock. Overall, any reductions in AUMs, amount of time allowed, and utilization levels would negatively impact economics of the permittee's grazing operation.

In the long term, meeting utilization levels could lead to attainment of standards for rangeland health, which would create a sustained forage yield.

Short-term impacts of recreation on livestock grazing include degradation of rangelands, injury or death from collisions or shooting, and temporary displacement of livestock. Long-term impacts of recreation on livestock include loss of forage, reduced forage palatability because of dust on vegetation, and

disturbance and harassment caused by increased levels of human activities, including harassment from vehicles. Impacts from vehicles are reduced when travel is closed or limited to designated trails within areas open to livestock grazing. Closing areas to motorized or other forms of recreational travel can benefit permittees, especially when administrative access is permitted. Fencing major recreation sites (e.g., 18 Road Campground) would lead to a long-term loss for grazing. SRMAs managed for motorized use and access would increase these impacts, and SRMAs managed for a quiet recreational experience would decrease them. While SRMAs create additional opportunity for impacts on livestock grazing from increased recreational use, they also provide for increased management and conflict control and may protect open space and forage from development through such protections as stipulations.

Short-term impacts from site-specific lands and realty actions, such as small land transfers and construction of power lines, pipelines, or other structures within ROWs, include temporary forage removal, livestock displacement, and an increased potential for noxious weed introduction and proliferation. The time-frame for short-term displacement of cattle from a ROW can vary from a few weeks to months during construction, or it could last as long as a few years following reclamation to allow vegetation to become established and soils to stabilize. Cattle can also be injured or killed during the construction and use of ROWs (open trenches and vehicle collisions) if proper mitigation measures are not in place. Long-term impacts on livestock from site-specific lands and realty actions include changes and loss in forage, reduced forage palatability because of dust on vegetation, and livestock disturbance and harassment from increased levels of human activities.

Forage and range improvement projects would be permanently lost as a result of land disposals or exchanges. Most disposal tracts, though, are small, isolated "C" category allotments that do not have range improvements, meaning disposals would not likely result in the loss of desirable allotments. The BLM would be required to notify the permittee two years before any land disposal (43 CFR, 4110.4-2[b]), except in an emergency, and to compensate the permittees for the range improvement projects constructed under a range improvement permit or cooperative agreement, in accordance with 43 CFR, 4120.3-6(c).

During the exploration and testing phase of mineral development, direct impacts on livestock grazing would be minimal due to the small amount of acreage affected. Most likely, AUMs would not be affected in small areas of development. Surface-disturbing activities associated with mineral development directly affect large areas of grazing in the short term during construction of well pads, roads, pipelines, and other facilities. Impacts include changes in available forage, reduced forage palatability because of dust on vegetation, restriction of livestock movement, harassment, temporary displacement of livestock, and an increased potential for the introduction and proliferation of

noxious weeds, thereby causing a loss of livestock forage and associated AUMs. In the long term, a smaller amount of grazing acreage is permanently lost from mining operations following rehabilitation and minimal to no AUM loss. Improvement of roads associated with mineral development could facilitate livestock management operations by maintaining or improving access to remote locations within allotments. Properly implemented BMPs and reclamation mitigation measures would likely improve rangeland health and forage levels for livestock. Impacts from coal development would be largely confined to aboveground mine facilities because current mining occurs underground, and future applications are expected to be for underground mines.

The construction of new range improvements must meet stipulation exemption criteria before they can be allowed in areas where stipulations are applied. This could result in fewer new range improvements being constructed, limiting the ability to distribute livestock, increase permitted capacity, or locate livestock handling facilities where convenient to the permittee.

Most ACECs within the decision area would be designated to protect sensitive plant and wildlife habitat and significant cultural resources. Grazing availability depends on the designated ACEC management objectives.

Managing WSAs would have direct and indirect effects on livestock grazing. In general, restrictions on surface-disturbing and other disruptive activities would likely reduce harassment of grazing animals and maintain or improve vegetation conditions, thereby maintaining or improving the forage for livestock. Existing range improvements are considered valid existing rights and may be maintained in the same manner and degree to which they have been in the past. The construction of new range improvements may be limited, depending on their impact on wilderness values.

In general, transportation routes provide better access for permittees and allow for expedited checking and moving of livestock. The cattle also use transportation routes to move from pasture to pasture. Short-term impacts of road construction and temporary road closures include forage loss, temporary harassment, livestock displacement, and permittees being prevented from accessing their cattle in a timely fashion. Long-term direct and indirect impacts on cattle from newly developed transportation routes include forage loss, reduced forage palatability because of dust on vegetation, and disturbance and harassment caused by increased levels of human activities.

Total number of acres and AUMs within allotments opened to livestock grazing that are potentially affected by various described impacts are displayed in **Table 4-36**, Impacts within Open Grazing Allotments.

Table 4-36
Impacts within Open Grazing Allotments

Management Action	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Allotments open to grazing	978,600	961,100	586,600	977,200
Permitted AUMs	61,270	60,633	32,658	61,270
Open allotments with seasonal limitations	*0*	*176,800*		*Case by case*
IRMAs[1] and SRMAs	358,300	78,300	60,000	79,000
Open to intensive (cross-country) motorized use	12,500	5,400	0	10,200
Motorized use subject to seasonal limitations	105,000	66,500	32,400	52,000
Motorized use limited to designated routes	192,700	738,900	299,800	818,100
Closed to motorized use	13,500	139,000	226,700	69,100
Available for disposal	12,800	8,900	400	15,000
ROW avoidance areas	392,100	667,000	332,800	64,000
ROW exclusion areas	206,400	159,000	203,400	64,600
Acceptable for coal leasing	281,400	242,100	194,600	252,000
Open to fluid mineral leasing	894,400	797,700	259,500	887,800
Acres with NSO stipulation	*467,000*	*343,100*	*180,100*	*383,600*
Open to non-energy leasable mineral development	No similar action	453,700	120,000	856,300
Open for mineral material disposal	740,300	745,900	323,900	837,900

Source: BLM 2010a

Implementing management for the following resources would have negligible or no impacts on livestock grazing and are therefore not discussed in detail: air; paleontology; interpretation and environmental education; national trails; national, state, and BLM byways; Native American tribal uses; and public health and safety.

[1] IRMAs under Alternative A only.

Alternative A

This alternative includes the largest area open to livestock grazing; there would be no net change in the 978,600 acres available for livestock grazing or the assigned AUMs. Allowing for domestic sheep grazing in allotments on a case-by-case basis would also continue to allow permittees the flexibility of grazing varying livestock in areas adjacent to bighorn sheep populations. Not providing grass banks, especially when allotments are closed due to emergency situations, would result in a financial impact on those permittees affected by temporary closures.

Under Alternative A, stipulations would apply only to fluid minerals instead of all surface-disturbing activities, meaning they would not limit the construction of range improvements. In total, NSO stipulations would be applied on 467,000 acres of allotments.

Managing 358,300 acres as SRMAs and IRMAs (**Table 4-36**) would further encourage the use of BLM-administered public lands within those parts of the decision area for recreational purposes, reduce forage availability, and potentially increase livestock displacement, harassment, injury, or mortality. This acreage represents the greatest area identified for management under SRMA status, providing for the greatest impacts on livestock grazing.

Table 4-36 displays quantitative (acres of potential) impacts of motorized use, lands available for disposal, ROW exclusion and avoidance areas, and non-energy leasable mineral development on livestock grazing under Alternative A. Types of impacts for these public land uses would be the same as those identified under Effects Common to All Alternatives.

Acres of allotments open to grazing that would be acceptable for coal leasing and development, open to fluid mineral leasing, and open to mineral material sales under Alternative A represent the greatest potential impact on livestock grazing practices of any alternative. Types of impacts would be the same as those identified under Effects Common to All Alternatives.

ACECs would continue to be open to livestock grazing, with the exception of the permanent exclosures (186 acres) in the Badger Wash ACEC.

Under Alternative A, 59 miles of river segments that overlay open grazing allotments are eligible for inclusion in the NWSRS. This may require livestock permittees along these segments to change livestock management, including maintaining and constructing range improvements to protect ORVs, their free-flowing nature, and tentative classification.

Alternative B

This alternative would provide the third-largest area open to grazing, approximately 961,100 acres of allotments (2 percent fewer acres than under Alternative A), with 176,800 (18 percent) of those acres open with seasonal

limitations. (See **Appendix J** for changes in acres per allotment per alternative.) Total AUMS would be reduced to 60,633, a reduction of one percent from Alternative A. The types of impacts would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area than under Alternatives A and D.

By reducing AUMS under Alternative B, the permittee would be burdened with grazing more livestock on their base ranches or reducing the livestock they graze altogether, thereby indirectly affecting the permittee's income. Economic impacts from reducing AUMs are discussed further in the socioeconomic impact section.

Adjusting grazing allotment boundaries would increase or decrease the amount of acreage within an allotment. This could correspond to an increase or decrease in AUMs, thereby benefitting or impacting a permittee financially. The ability to make adjustments in allotment boundaries would result in more accurate representation of allotments and would allow for changes due to adjustments in management. In addition, an increase in acreage could allow for more flexibility in the grazing rotation. Resting an allotment for a minimum of two growing seasons following fire rehabilitation or vegetation treatments could allow for forage to be restored following a disturbing event.

Grass banks would be permitted under Alternative B, which would allow permittees to continue grazing their livestock on public lands when their own allotment is closed due to an emergency, thus limiting financial impacts.

Specifically limiting grazing in order to promote the delisting of impaired (303[d]-listed) water bodies would impact grazing management and practices on a case-by-case basis. Short-term effects could include loss of acres available for grazing, while long-term effects could include an increase in forage production as areas are rehabilitated. Securing adequate water rights for point sources on BLM-administered public lands would protect federal water for livestock grazing.

Managing woodland communities toward a mixture of seral stages would benefit livestock grazing by providing for an optimal forage base. Loss of allowable acres for harvest would likely promote the encroachment of pinyon-juniper and other forest/woodland species into sagebrush-grassland habitat. This could result in a long-term reduction of allowable forage for grazing livestock.

Implementing adaptive drought management would require additional management actions by permittees in the short term, including coordination with the BLM and base changes in livestock use on allotments affected by drought (depending on the drought severity classification). These actions would accelerate restoration of drought-stricken lands and would improve forage resources in the long term.

In general, grazing timing and intensity could be altered to protect special status plants and fish in areas. Locations of range improvement projects and maintenance activities could be restricted. In areas where grazing overlaps with sage-grouse habitat, permittees would have to install fences and make other range improvements that would not threaten the bird or its habitat or enable predation. If this would not be possible, range improvements would need to be moved or taken down. Either way, the sage-grouse decisions would result in additional management and costs by the permittee to continue to graze on public lands. As species are added to the special status species list, consultation with the USFWS could determine that livestock grazing is impacting a particular species. If so, changes to livestock grazing, including removal of livestock, could be considered.

The types of impacts from applying NSO stipulations on 343,100 acres open to grazing (27 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives. Range improvements may be allowed under exception criteria.

The types of impacts from managing 78,300 acres as SRMAs (78 percent fewer acres than under Alternative A) would be the same as those described under Alternative A, but recreation would be focused on fewer acres, thereby concentrating such impacts in those areas.

Under Alternative B, 5,400 acres of open grazing allotments (57 percent fewer acres than under Alternative A) would be managed as open to cross-country motorized use, 738,900 acres (3.8 times more than under Alternative A) would be managed as limited to designated roads and trails, 66,500 acres (37 percent fewer acres than under Alternative A) would be open with seasonal closures, and 139,000 acres (10.3 times more than under Alternative A) would be closed to motorized use. The types of impacts from these travel management actions would be the same as those described under Effects Common to All Alternatives, but greater travel restrictions under Alternative B than under Alternative A would reduce impacts on livestock grazing.

The types of impacts from managing 8,900 acres of open grazing allotments as available for disposal (30 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area.

The types of impacts from managing 667,000 acres of open grazing allotments as ROW avoidance areas (1.7 times more than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over a greater area.

The types of impacts from managing 159,000 acres of open grazing allotments as ROW exclusion acres (23 percent fewer acres than under Alternative A) would

be the same as those described under Effects Common to All Alternatives but would occur over a smaller area.

The types of impacts from managing 254,400 acres of open grazing allotments as acceptable for coal leasing and development (10 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area.

The types of impacts from managing 797,700 acres of open grazing allotments as open to fluid mineral leasing (11 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area.

The types of impacts from managing 453,700 acres of open grazing allotments as open to non-energy leasable mineral development would be the same as those described under Effects Common to All Alternatives.

The types of impacts from managing 745,900 acres of open grazing allotments as open to mineral material sales (less than 1 percent more acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area.

Of the 13 ACECs that would be designated under Alternative B, nine (95,200 acres) are entirely open to livestock grazing, two (4,400 acres) include closures in a portion of the ACEC, and two (4,800 acres) are closed to grazing. The types of impacts from managing the ACECs partially or entirely open to livestock grazing would be the same as those described under Effects Common to All Alternatives but would occur over a larger area.

Alternative C

This alternative would provide the smallest area open to grazing and the greatest decrease in grazing availability. Approximately 586,600 acres of allotments (40 percent fewer acres than under Alternative A) would be open to grazing. (See **Appendix J** for changes in acres per allotment per alternative.) Total AUMS would be reduced to 32,658 (a reduction of 47 percent from Alternative A). The types of impacts would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area than under any other alternative.

The types of impacts from adjusting allotment boundaries, resting allotments for a two-year growing season, and using adaptive drought and cultural resource management would be the same as those identified under Alternative B.

Types of impacts on livestock grazing from pursuing the use of grass banks, as well as promoting the delisting of impaired water bodies and securing adequate water rights, would also be the same as those described under Alternative B.

Closing the Grand Junction municipal watershed to livestock grazing would eliminate 21,900 acres of currently open grazing in the Whitewater Common allotment and 1,000 acres of open grazing in the North Fork Kannah allotment. Closing the Palisade Municipal Watershed to livestock grazing would eliminate 2,400 acres of open grazing in the Lower Rapid Cottonwood allotment, 200 acres of open grazing in the Chalk Mountain allotment, and 1,700 acres of open grazing in the Lloyd allotment. Closing these areas to livestock grazing would impact grazing operations the same as identified under Effects Common to All Alternatives.

Managing vegetation resources with an emphasis on maintaining or enhancing special status species habitat could result in increased grazing, such as changes in season of use, livestock distribution, or livestock exclusion.

Managing for pinyon and juniper with an emphasis on old-growth retention would not provide the necessary mixed seral stage plant communities that would provide optimal forage for livestock grazing.

The types of impacts from management actions, including stipulations, to protect special status plants and wildlife (including sage-grouse habitat) would be the same as those described under Alternative B. However, stipulations would cover a larger area under Alternative C. Domestic sheep grazing would be prohibited within allotments with historic, occupied, and potential bighorn sheep habitat (the largest area of any alternative), which would restrict or limit domestic sheep grazing in the decision area.

The types of impacts from applying NSO stipulations on 180,100 open to grazing (61 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives. Range improvements may be allowed under exception criteria.

Managing 60,000 acres (84 percent fewer acres than under Alternative A) of SRMAs would result in the same types of impacts as Alternative A but would occur over a smaller area.

Under Alternative C, zero acres of open grazing allotments (100 percent fewer acres than under Alternative A) would be managed as open to cross-country motorized use, 299,800 acres (1.6 times more acres than under Alternative A) would be managed as limited to designated roads and trails, 32,400 acres (69 percent fewer acres than under Alternative A) would be open with seasonal motorized and mechanized closures, and 226,700 acres (18 times more acres than under Alternative A) would be closed to motorized use, although administrative use may be allowed. Increasing the acreage closed to travel would reduce impacts on livestock grazing.

The types of impacts from managing 400 acres of open grazing allotments as available for disposal under Alternative C (97 percent fewer acres than under

Alternative A) would be the same as those described under Alternative A but would occur over a smaller area. The open grazing allotments available for disposal under Alternative C would be the least of any alternative, which would result in the least impact on livestock grazing.

The types of impacts from managing 332,800 acres of open grazing allotments as ROW avoidance areas (15 percent less than under Alternative A) would be the same as those described under Alternative A but would occur over a smaller area. Impacts would be less than under Alternative A.

The types of impacts from managing 203,400 acres of open grazing allotments as ROW exclusion areas (one percent less than under Alternative A) would be the same as those described under Alternative A but would occur over a slightly smaller area.

The types of impacts from managing 194,600 acres of open grazing allotments as acceptable for coal leasing and development (31 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over the smallest area of any alternative, representing the least impact on livestock grazing.

The types of impacts from managing 259,500 acres of open grazing allotments as open to fluid mineral leasing (71 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over the smallest area of any alternative, representing the least impact on livestock grazing.

The types of impacts from managing 120,000 acres of open grazing allotments as open to non-energy leasable mineral development would be the same as those described under Effects Common to All Alternatives but would occur over the smallest area of any alternative, representing the least impact on livestock grazing.

The types of impacts from managing 323,900 acres of open grazing allotments as open to mineral material sales (66 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over the smallest area of any alternative, representing the least impact on livestock grazing.

Within the 23 ACECs that would be designated under Alternative C, 75,800 acres would be open to livestock grazing and 74,300 acres, including all acres under 6,000 feet in elevation, would be closed to livestock grazing. The types of impacts from managing 75,800 acres as open to livestock grazing would be the same as those described under Alternative A but would occur over a smaller area.

Alternative D

This alternative would provide the second-largest area open to grazing. Approximately 977,200 acres of allotments (one percent fewer acres than under Alternative A) would be open to grazing, with seasonal limitations applied on a case-by-case basis. (See **Appendix J** for changes in acres per allotment per alternative.) Even though available grazing acreage would be reduced by one percent, the total allotted amount of AUMS would remain the same. Types of impacts would be the same as those described under Alternative A but would occur over a slightly smaller area.

Types of impacts from water resource management, adjusting allotment boundaries, adaptive drought management, resting allotments for a two-year period, and cultural resource management would be the same as those identified under Alternative B.

Managing vegetation resources with an emphasis on grazing and implementing vegetation treatments to increase forage production would result in improved grazing opportunities under Alternative D, as compared to other alternatives.

The types of impacts from management actions, including stipulations, to protect special status plants and wildlife would be the same as those described under Alternative B, but stipulations would cover a smaller area.

Determining rest periods on a case-by-case basis to meet standards for rangeland health provides the best opportunity for permittees to graze livestock with the least amount of impacts on their operation. Constructing range improvement projects on all categorized allotment provides the greatest flexibility (i.e., least amount of restrictions) to permittees.

As under Alternatives B and C, grass banks would be permitted under Alternative D, which would allow permittees to continue grazing their livestock on public lands when their own allotment is closed due to an emergency, thus limiting financial impacts.

The types of impacts from applying NSO stipulations on 383,600 acres open to grazing (8 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives. Range improvements may be allowed under exception criteria.

Managing 79,000 acres (88 percent fewer acres than under Alternative A) of SRMAs, in combination with increased visitation as a result of intensive marketing efforts, would result in impacts similar to those described under Alternative A; however, increased visitation would be focused in a smaller area, thereby intensifying impacts in those areas.

Under Alternative D, 10,200 acres of open grazing allotments (12 percent fewer acres than under Alternative A) would be managed as open to cross-country

motorized use, 818,100 acres (4.2 times more acres than under Alternative A) would be managed as limited to designated roads and trails, 52,000 acres (50 percent fewer acres than under Alternative A) would be open with seasonal closures, and 69,100 acres (5.5 times more acres than under Alternative A) would be closed to motorized use. Increasing closed areas over Alternative A would reduce impacts on livestock grazing, although there would be fewer closures under Alternative D than under Alternatives B and C.

The types of impacts from managing 15,000 acres of open grazing allotments as available for disposal under Alternative D (1.2 percent more acres than under Alternative A) would be the same as those described under Alternative A but would occur over a larger area. The open grazing allotments available for disposal under Alternative D would be the greatest of any alternative, which would result in the greatest impact on livestock grazing.

The types of impacts from managing 64,000 acres of open grazing allotments as ROW avoidance areas (84 percent fewer acres than under Alternative A) would be the same as those described under Alternative A but would occur over a smaller area. Impacts on grazing would be greater than under Alternative A.

Approximately 64,000 acres of open grazing allotments (69 percent fewer acres than under Alternative A) would be excluded from ROW development under Alternative D. The types of impacts would be the same as those described under Alternative A, but would be greater under Alterative D.

The types of impacts from managing 252,000 acres of open grazing allotments as acceptable for coal leasing and development (10 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives. Impacts on grazing would be less than under Alternative A.

The impacts from managing 887,800 acres of open grazing allotments as open to fluid mineral leasing (one percent fewer acres than under Alternative A) would be the same as those described under Alternative A.

The types of impacts from managing 856,300 acres of open grazing allotments as open to non-energy leasable mineral development would be the same as those described under Effects Common to All Alternatives, but the impacts would occur over the largest area of any alternative.

The types of impacts from managing 837,900 acres of open grazing allotments as open to mineral material sales (1.13 times more acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives. Impacts on grazing would be greater than under Alternative A.

Impacts on livestock grazing operations from ACEC management would be the same as those identified under Alternative A.

Cumulative

The CIAA used to analyze cumulative impacts on livestock grazing includes actions that occur on or next to all allotments located entirely or partially within the planning area. Past actions that have affected livestock grazing include human-caused surface disturbances (mineral development, recreation, prescribed burning, and historic grazing practices) and wildland fires that have contributed to current ecological conditions. Present actions affecting livestock grazing are mainly those that reduce available grazing acreage or the level of forage production in those areas. Key examples include wildland fires, land disposals, motorized vehicle use, oil and gas development, habitat restoration, and special designations that restrict grazing. Future actions affecting livestock grazing would be similar to present actions, including any restriction associated with future species listings under the ESA. The presence and potential expansion of bighorn sheep populations and management to protect bighorn sheep from disease could affect the ability of local livestock operators to convert from cattle use to domestic sheep use on specific allotments.

As stated in **Table 4-1**, grazing on private lands surrounding public lands is either stable or declining. In order to graze successfully on public lands, grazing operators require a stable base ranch on private lands from which to run their grazing programs. With population growth and the status of the economy, more and more ranches are closing, which could lead to a reduction in grazing on public lands if permits are not transferred to other operators and consolidated.

The cumulative impacts under each alternative would parallel the impacts of the alternatives in the general impact analysis, above. In general, management actions under every alternative would result in short-term forage reduction due to treatment activities, other surface-disturbing and disruptive activities, human disturbance, and the presence of grazing wildlife. Forage would increase over the long term as treated vegetation communities reach potential productivity.

Cumulative projects that increase human disturbance in grazing areas (e.g., mineral or renewable energy development) could also indirectly impact grazing by increasing weeds and invasive species. As stated above, weed invasion can reduce preferred livestock forage and increase the chance of weeds being dispersed by roaming cattle. Cumulative projects that increase human disturbance in grazing areas could also directly impact grazing by displacing, injuring, or killing animals.

Cumulative impacts from each resource or resource use would be greater on livestock grazing if the cumulative projects were to occur simultaneously. However, standard mitigation identified in Colorado's Standards for Public Land Health would be implemented across all alternatives and any other cumulative projects on BLM-administered public lands, thereby reducing or minimizing cumulative impacts on decision area lands.

4.4.3 Recreation and Visitor Services

This section discusses impacts on recreation and visitor services from proposed management actions of other resources and resource uses. Existing conditions concerning recreation and visitor services are described in **Section 3.3.4**, Recreation and Visitor Services. Existing conditions concerning comprehensive travel and transportation management are discussed in **Section 3.3.5**, Comprehensive Travel and Transportation Management; however, based on the level of recreational travel in certain parts of the planning area, some references to travel have been used in this section.

Recreational experiences and the potential attainment of a variety of outcomes-focused objectives are vulnerable to any management action that would alter the settings and opportunities in a particular area. Recreation settings are based on a variety of attributes, such as remoteness, the amount of human modification in the natural environment, evidence of other users, and restrictions and controls (see **Appendix K** for a description of recreation settings). Management actions that greatly alter such features within a particular portion of the planning area could affect the capacity of that landscape to support appropriate recreation opportunities and corresponding outcomes-focused objectives.

Methods of Analysis

Indicators of impacts on recreation and visitor services include the following:

- Changes to the essential recreation opportunities and recreation setting characteristics (RSCs) in SRMAs.
- Impediments to defined recreation activities and the associated qualities and conditions in ERMAs.
- Management actions result in long-term elimination or reduction of basic recreation and visitor services and resource stewardship needs.

In SRMAs, impacts could occur through changes to management focus (activities, experiences, and benefits) or RSCs (physical, social, operational). For example, changes in recreation settings would result in corresponding changes in the opportunities to achieve desired recreation experiences and associated benefits.

In ERMAs, impacts could occur through changes to the principle recreation activities and the associated qualities and conditions of the ERMA. Management of recreation in ERMAs is commensurate with the management of other resources and resource uses.

The analysis includes the following assumptions:

- Substantial increases in recreational activity could create risks to public health and safety.
- Traditional recreational uses within the planning area would continue, and an anticipated increase would occur in motorized recreation, wildlife viewing, hiking, mountain biking, camping, driving for pleasure, heritage appreciation, and new technology-based recreation activities.
- The potential for resource damage and conflicts between all types of users would increase with increasing use.
- Demand for SRPs would increase during the life of the plan.
- Shooting restrictions will only restrict target/projectile shooting. Shooting restrictions will not affect the lawful taking of game.
- Recreation planning guidance and the definitions for recreation management areas (e.g., SRMAs, ERMAs, IRMAs) have changed since the 1987 GJFO RMP. Alternative A nomenclature conforms to the old definitions and guidance, while the RMA allocations in the action alternatives conform to the current definitions and guidance.
- In the action alternatives, areas not managed as SRMAs or ERMAs allow recreation activities to occur, but recreation is not emphasized. These areas are managed to allow recreation uses that are not in conflict with the primary uses for these lands.
- In the action alternatives, individual SRMAs are managed to protect and enhance a targeted set of activities, experiences, benefits, and desired RSCs.
- In the action alternatives, individual ERMAs are managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Management of ERMAs is commensurate with the management of other resources and resource uses.

The analysis in this section is structured under three subheadings: SRMAs, ERMAs, and the decision area. First, management actions for each SRMA (or SMA or IRMA under Alternative A) are analyzed to determine whether they 1) sustain or enhance recreation objectives, 2) protect the desired recreation setting characteristics, and 3) constrain uses, including non-compatible recreation activities that are detrimental to meeting recreation or other critical resource objectives (e.g. cultural or threatened and endangered species).

Second, management actions for individual ERMAs are analyzed to determine whether they facilitate the visitors' ability to participate in outdoor recreation activities and protect the associated qualities and conditions.

Finally, the decision area discussion provides a broader analysis of impacts on recreation arising from implementing management for other resource programs that may occur over the entire decision area, including those areas managed as SRMAs or ERMAs.

Effects Common to All Alternatives

Outcomes-focused objectives in ERMAs are not purposefully protected by stipulations or rules prohibiting mineral materials sales, development of non-energy leasable minerals, or other uses incongruous with stated ERMA objectives. The ability to support and sustain the qualities and conditions of each ERMA could be challenged in areas where those protections do not exist. Consumptive uses could also pose visitor health and safety and resource protection risks, both of which could impact outcomes-focused objectives.

Impacts from management actions associated with paleontological surveys in Class 4 and 5 paleontological areas would not vary by alternative. Requiring these surveys in highly sensitive areas could limit actions such as facility construction, resulting in the diminished potential for new recreation amenities in certain areas.

Wildland fire could result in minor short-term impacts through temporary closures or evacuations that restrict recreation activities or the attainment of outcomes-focused objectives. Likewise, weed treatments involving herbicides in or near developed and dispersed recreation sites could result in short-term impacts from temporary re-entry closures (usually less than 24 hours).

Designating routes for certain uses would provide route-based recreational experiences and opportunities designed to minimize user conflict.

Implementing BMPs to minimize noise from compressor buildings and other motorized equipment, and to comply with COGCC standards for noise, would decrease noise intrusion that may degrade recreational experiences and opportunities. Likewise, the designation of areas where motorized equipment is limited or prohibited (e.g., Lands with Wilderness Characteristics, ACECs, and/or Wildlife Emphasis Areas) would have similar impacts on recreation. The magnitude of these impacts would be dependent upon the number of acres where noise-producing equipment is limited or prohibited. Impacts would be greatest in settings that are dependent upon a quiet soundscape, such as certain SRMAs that are managed to protect mechanized and/or non-motorized recreational experiences.

Implementing management for the following resources would have negligible or no impact on recreation and are therefore not discussed in detail: wild horses and WSAs.

Alternative A

Impacts would be expected where management plans for popular areas like the Grand Valley IRMA fail to provide adequate management direction for emerging recreation trends and increased visitation. These impacts would likely become significant in localized areas over the life of the plan.

Special Management Areas

Under Alternative A, recreation would continue to be managed to provide recreation opportunities in four special management areas.

Management of the Bangs Canyon SRMA (54,700 acres) would continue to be governed by its namesake 2006 implementation plan. This plan has generally helped facilitate beneficial recreation outcomes, though demand for mountain biking, trail running, and dog walking would continue to increase and may, over the life of the plan, outstrip the ability of current management actions to provide positive experiences. As the level of use continues to rise, some physical and social setting prescriptions could be degraded. Localized impacts would continue to occur in some areas of the SRMA. For example, the management of RMZ 6 for motorized recreation is in conflict with some of the heritage appreciation opportunities available in that area, leading to potential for user conflict and resource degradation.

The North Fruita Desert SMA (63,300 acres), managed under a 2004 implementation plan, would continue to contain a mountain bike emphasis area, an area for foot and horse users, and a motorized area that includes a 400-acre open area. This SMA was developed to serve both a local and regional customer base and mountain biking has become a very popular activity in spring and fall. This demand for mountain biking has exceeded the levels planned for in the 2004 implementation plan. At the same time, demand for foot and horse riding opportunities has not materialized, leading to a discrepancy between management objectives and actual use. This would continue to result in unfulfilled recreation experiences and inefficient use of BLM resources because the SMA is being managed for uses that are not occurring at a significant level.

Recreation experiences could also be diminished or eliminated in the portion of the North Fruita Desert SMA that overlaps those areas acceptable for further coal leasing and development within the coal development potential area. This could lead to the inability to carry out stated management objectives in the SMA, interfering with recreation outcomes.

The Gateway IRMA (120,700 acres) management plan does not identify the relationship between scenic settings and desired recreational experiences and outcomes, depriving the BLM of management tools necessary to achieve outcomes-focused objectives. While the area does not currently receive heavy use, visitation is expected to grow over the life of the plan. Without specific management actions and facility investments to support desired experiences and outcomes, growth in visitation would lead to user conflict, resource damage,

and users dispersing to other areas perhaps less capable of facilitating recreation.

The Grand Valley IRMA (119,600 acres) contains the Grand Valley OHV Open Area (11,400 acres) and a large group and motorized recreation event area. There is only minor recreation facility development to support those activities, leading to a continuation of unfulfilled recreational outcomes and a greater potential for resource damage.

Grand Junction ERMA

The remainder of the decision area is considered the Grand Junction ERMA (703,100 acres). Certain areas of the ERMA, such as Palisade Rims and Castle Rock, are expected to receive concentrated recreation use over the life of the plan. The ERMA is managed under old BLM policy and, as such, no special recreation management would be provided for these areas would likely deprive the recreationist of desired opportunities, experiences, and outcomes, and could result in user and resource conflicts. But without management direction regarding principal activities and associated qualities and conditions of the ERMA, the Grand Junction ERMA would be insufficient to facilitate desired recreational outcomes.

Decision Area

There would continue to be comprehensive travel designations for motorized use across the entire decision area but not for mechanized or non-motorized travel. Limiting motorized use to designated roads and trails on 225,500 acres and to existing roads and trails on 342,700 acres, would maintain opportunities for trail-based recreation. However, route proliferation in areas where travel is limited to existing roads and trails, or open to cross-country travel could degrade other users' experiences, especially those seeking a backcountry setting. Managing 12,500 acres as open for intensive motorized use would focus "play area" opportunities in appropriate areas and provide those users with designated areas to obtain those experiences. There would be few routes designated for specific uses, resulting in lower-quality user experiences and increased potential for user conflict. While managing 2,969 miles of routes as undesignated (i.e., open to all uses) would provide a wide range of recreational opportunities throughout the decision area, the potential for user conflict would continue to grow as these undesignated routes receive more use.

Limiting foot and equestrian travel to designated routes in Bangs Canyon SRMA (RMZs 1-4) would reduce user conflict and facilitate desired trail-based experiences. High-use areas where cross-country travel is allowed would continue to be at risk for user conflict where those concerns exist, such as North Fruita Desert SMA (RMZ 1).

The impacts from limiting mechanized travel to designated routes in all of Bangs Canyon SRMA and North Fruita Desert SMA would be similar to those described for foot and equestrian travel.

Continuing to prohibit target shooting along Little Park Road in the Bangs Canyon SRMA, portions of the North Fruita Desert SMA (the bicycle emphasis area and the open area only), designated open areas in the Grand Valley, and the Mt. Garfield area would reduce safety risks and the potential for user conflict in these popular areas.

Existing developed recreation sites would often meet the current level of recreational demand in the planning area. However, seasonal crowding in the North Fruita Desert campground may diminish user enjoyment of the area because use exceeds management capability. Similarly, the anticipated increase in recreation over the lifespan of the RMP could result in demand for additional or expanded developed recreation sites because of user conflicts and degraded recreation experiences.

The BLM would continue to manage 159,200 acres as VRM Class I and II, areas where outcomes-focused objectives would be protected by maintaining the scenic quality of those lands. Managing 206,100 acres as VRM Class III would not likely affect the type or amount of recreation use in these areas because the construction of facilities to support recreation would be permitted. The 696,100 acres without a designated VRM class allow the potential for development that could degrade outcomes-focused objectives due to diminished scenic quality.

Because no management actions are in place to protect lands with wilderness characteristics, there is no guarantee that primitive and unconfined recreational opportunities would be preserved over time. However, prohibiting mineral material disposal and prohibiting or limiting motorized travel to designated routes in ACECs and WSAs would protect primitive and unconfined recreation opportunities in special designation areas similar to the management prescriptions for lands with wilderness characteristics. Conversely, continuing to restrict motorized use in these areas would limit the types of experiences available to motorized enthusiasts.

The BLM would continue to manage 234,900 acres as unsuitable for public utilities (i.e., ROW exclusion areas), protecting recreation experiences by preserving opportunities for primitive and unconfined recreation. Continuing to manage 441,400 acres as sensitive to public utilities (i.e., ROW avoidance areas) would present the potential for development that could conflict with desired recreational opportunities.

Valuable recreation areas would continue to be prioritized for acquisition, which would enhance recreational opportunities on public land and reduce conflicts between recreationists and private landowners within the planning area.

The Little Book Cliffs and Demaree Canyon WSAs would be managed as unacceptable for coal leasing and development, protecting opportunities for primitive and unconfined recreation in those areas.

The BLM would continue to apply NSO stipulations on 545,100 acres, preserving the natural character of the landscape while maintaining existing recreation opportunities. Areas protected by an NSO stipulation for recreational resources include the following: the Palisade ONA, established recreation sites such as Island Acres State Park, Vega State Park, Highline State Park, Rough Canyon ACEC, Hunter/Garvey backcountry area, Granite Creek Canyons/Cliffs, Bangs Canyon, the Dolores River, and the Gunnison River.

Applying CSU stipulations to 74,100 acres, including the recreation resources at Bangs Benches, Granite Creek Benches, Hunter/Garvey Benches, and Lower Gunnison River, has the potential to inhibit outcomes-focused objectives by altering the physical RSCs. Well pads and roads created for mineral exploration and development could displace users to less developed areas or eliminate some recreational opportunities.

Several management actions would result in seasonal restrictions on recreation. For example, applying timing limitation stipulations on 233,000 acres and seasonal motorized travel limitations on 113,500 acres would benefit non-consumptive wildlife enjoyment opportunities, particularly within the LBCWHR, where wild horse winter range and foaling areas are protected seasonally, and within bighorn sheep seasonal habitat and elk calving areas. Seasonal motorized travel limitations, though, would temporarily reduce the area available for motorized recreation experiences. Over the long term, seasonal travel limitations would protect outcomes-focused objectives because they would prevent trail degradation in areas with fragile soils during seasonally wet periods.

Avoiding disturbance to raptors and other special status species birds during breeding seasons would seasonally reduce recreation opportunities in areas that are closed to public access. Protection of these species would, however, benefit wildlife viewing during other times of the year.

Temporary closure of recreation areas and routes could also occur as the result of natural and human-caused ignitions, fire suppression activities, and restoration actions. Recreation experiences could be enhanced over the long-term, as settings are restored to a more desirable condition complementary to recreational activities.

In the WSR suitability analysis, recreation is identified as an ORV for Colorado River Segment 3 and the Dolores River, meaning recreational boating opportunities and experiences may be enhanced as a result of protecting that ORV. Recreation activities may be restricted if found to adversely impact ORVs, the free-flowing nature, or the tentative classification of the affected segment. Only a limited number of trail crossings would be allowed in scenic segments, reducing future potential for expanded recreation opportunities. Recreation would not be restricted in recreational segments, so long as ORVs are protected.

Recreation opportunities would continue to be affected as a result of limiting surface disturbances to protect soils. This could result in short term road closures or limit new road developments. Also, where slopes exceed 40 percent, special design practices may be necessary to mitigate impacts on soil, water, and vegetation. Although unlikely that recreation facilities would be sited on slopes exceeding 40 percent, any facility proposals could be subject to higher costs as a result of mitigation.

Stream stabilization work along 63 miles of critically eroding streams and rivers could temporarily or permanently reduce recreational access to those areas. Similarly, riparian areas could be closed for rehabilitation, temporarily reducing recreation opportunities in those areas. If allowed to resume after stabilization and rehabilitation work, recreation opportunities in these areas could be improved.

Continuing to manage recreation areas, WSAs, wildlife areas, and special status species habitat as unsuitable for commercial timber harvest would protect recreation experiences by improving the opportunity and experience for both consumptive and non-consumptive recreational enjoyment of wildlife.

Range improvements could help to reduce conflicts with recreationists by preventing animals from wandering onto roads, trails, or developed recreation sites like campgrounds. While grazing does not often conflict with desired natural settings for recreation, trampling can degrade trail facilities when soils are wet and animals may pose a safety risk with certain activities.

The Old Spanish Trail within the Gunnison River Bluffs area would continue to attract users, but a lack of supporting management objectives and actions would limit effective management and potentially allow for increased conflict between recreation and competing uses along the trail. (The congressionally designated Old Spanish National Historic Trail in the planning area, a different route than what traverses the Gunnison River Bluffs, is believed to be under a paved road and users seeking to experience the history and culture of the route use a nearby historic trail in the Gunnison River Bluffs area.)

Cultural resource management plans for six sites would continue to preserve significant archaeological sites, but only one is appropriate for heritage appreciation opportunities. NSO stipulations would further protect four of these areas and the opportunity to appreciate them from a recreation standpoint.

Management actions would not close backcountry airstrips to recreational aircraft, thereby protecting the recreational experiences of aircraft users who utilize these backcountry airstrips.

This alternative would continue to be insufficient to meet recreationists' and visitors' need for improved interpretation and environmental education

resources because it does not provide specific objectives or actions for improving these services.

Alternative B

In general, this alternative attempts to identify the areas most likely to require or continue to require management actions to support recreation activities and the attainment of outcome-focused objectives. SRMAs would be managed to protect and enhance a targeted set of activities, experiences, benefits, and desired RSCs. Impacts by RMZ are discussed below. Management actions from other resource programs generally facilitate SRMA objectives. This alternative proposes seven ERMAs to support principal recreation activities and where recreation would be managed commensurate with other resources.

Bangs SRMA (17,300 acres)

Under Alternative B, most proposed management actions would complement the targeted social RSCs in each RMZ. By attracting mountain bikers primarily from the Grand Junction area, RMZ 1 (4,200 acres or 24 percent of the SRMA) would maintain a desired middle-country social setting characteristic (a move towards front-country could be expected if additional participants are drawn from regional or national locations). Increased visitation in RMZ 3 (3,600 acres or 20 percent of the SRMA) could lead to user conflict and displacement of one or more user groups along the popular Tabeguache Trail. Proposed partnerships with local tourism groups, local businesses, and the City of Grand Junction may help alleviate some social setting issues.

Management actions in RMZ 2 (9,500 acres or 56 percent of the SRMA), managed for motorized use and small to medium (4-6 people) social groups and fairly infrequent (fewer than 6) encounters on designated routes, would largely support the stated outcome-focused objectives. Issuing Class III SRPs (see **Appendix L**, Special Recreation Permits), with a potentially high number of vehicles, could introduce noise and congestion that inhibits other users' desired experiences and benefits.

An increase in bouldering and day hiking in RMZ 3 could introduce a larger number of participants to heritage appreciation if heritage resources allocated to public use are interpreted. At the same time, stronger operational setting management tools may be necessary in order to fully protect cultural resources if the RMZ begins to draw significant numbers of participants from beyond the Grand Junction area. Some recreational opportunities would be lost if monitoring in RMZ 3 shows unacceptable changes or loss of significant cultural resources.

Sufficient management restrictions are in place to preserve the desired physical RSCs: ROW avoidance areas, cultural resources allocated to use categories, VRM Class II areas, closure to mineral material disposal, and closure to fluid mineral leasing. These actions would restrict or prohibit the type of

development more likely to push the RMZ towards a rural physical setting characteristic.

Activities, outcomes, and the physical RSC of the SRMA would be protected by an NSO stipulation.

North Fruita Desert SRMA (44,100 acres)
Proposed management actions would help the BLM achieve desired physical RSCs by limiting surface-disturbing activities. Mountain bike use is expected to continue to grow in popularity in the SRMA over the lifespan of the plan. Mountain biking opportunities in RMZ 1 (25,000 acres or 57 percent of the SRMA) would be protected by limiting or prohibiting uses that may conflict with mountain bikers' desired physical RSCs. These actions include a VRM Class II classification, closure to mineral material disposal, and a ROW exclusion classification. Although RMZ 1 would be open to fluid mineral leasing, an NSO stipulation would be applied, protecting physical RSCs by preventing surface occupancy and surface-disturbing activities.

Outcome-focused objectives in RMZ 2 (19,100 acres or 43 percent of the SRMA), which includes Hunter Canyon and the NFD Open Area, would be largely attainable with the proposed management actions. Potential hindrances include management as VRM Class III, open to mineral material disposal, and as ROW Avoidance, all of which could conflict with the desired middle-counter physical setting.

In addition, overlap with the coal development potential area and RMZ 1 could create conflicts if coal development occurs within the RMZ. This use is incongruous with the desired future physical RSCs and could push those settings towards a rural character.

Proposed best management practices would help the BLM achieve desired operational RSCs. Closer coordination with area tourism promotional organizations would help the BLM manage issues associated with the increasing popularity of this SRMA and maintain desired operational RSCs where applicable.

Dolores River Canyon SRMA (16,900 acres)
Management actions would largely support the desired front-country and rural RSCs. For example, managing the SRMA as VRM Class II with an exception for recreation facilities would allow future development of trailheads and interpretive sites. Limiting SRPs to Class I and II would facilitate user experiences and benefits in this SRMA by discouraging large group events that could cause congestion on the roadways.

Closing the SRMA to fluid mineral leasing would protect the physical setting by prohibiting development and infrastructure that could conflict with visitors' desired activities and experiences. Limiting the SRMA boundary to a fairly

narrow river and highway corridor could limit recreation management options for adjacent BLM lands if this area becomes more popular over the life of the plan.

The Dolores River Riparian ACEC would be closed to recreational placer mining, except on valid existing claims, resulting in a loss of opportunity for users seeking to engage in that activity.

ERMAs

As described in **Section 3.3.4**, ERMAs would receive specific management consideration in order to address recreation use, demand or recreation and visitor service program investments. ERMAs would be managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Management of ERMA areas would be commensurate with the management of other resources and resource uses.

The Castle Rock ERMA (4,400 acres) would offer visitors singletrack, trail-based recreational opportunities. Trail design, construction, maintenance, and access points would reduce conflict among user groups and help protect natural and cultural resources. The BLM would also coordinate and consult with the SHPO, Tribes, and USFWS (as necessary) to ensure protection and stewardship of natural and cultural resources. However, facilitating recreation in this area through identifying an ERMA would likely lead to an increase in use and, with it, the potential for illegal off-trail use damaging to cultural resources, soils, and special status plant species.

The Dolores River Canyon ERMA (151,200 acres), designed to target motorized exploration and heritage tourism, overlaps all or portions of the following special designation areas: Sinbad Valley ACEC, Sewemup WSA, Blue Mesa wildlife emphasis area, Juanita Arch ACEC, Maverick lands with wilderness characteristics unit, Bull Hill wildlife emphasis area, Unaweep lands with wilderness characteristics unit, Unaweep Seep ACEC, West Creek (adjacent) lands with wilderness characteristics unit, and the Palisade WSA and ACEC. Motorized touring would be prohibited in the overlapping WSAs, limiting the area available for this activity, though heritage tourism involving travel by foot or horse would be allowed. Managing non-WSA portions of the ERMA as open to leasing would introduce the potential for development that conflicts with BLM's ability to support and sustain principal recreation activities and the associated qualities and conditions of the ERMA.

The Grand Valley ERMA Target Shooting zone (750 acres) is designed to serve pistol and rifle shooters from the Grand Junction area by providing the freedom to participate in a variety of close-to-home, day-use recreation target shooting activities. This ERMA is managed as a ROW avoidance area but is not covered by an NSO stipulation (except for the shooting zone), leaving open the potential for surface-disturbing activities associated with land use authorizations, permits, and leases. These activities would be incompatible with target shooting due to

health and safety risks and could cause conflict and the displacement of shooters to other locations in the planning area where recreational shooting is less desirable.

The Grand Valley ERMA Open Area zone (4,900 acres) is synonymous with the Grand Valley Open Area and is designed to serve motorized users from the Grand Junction area and surrounding region. Already a very popular destination for visitors seeking a cross-country OHV experience, the ERMA would be fenced or boundaries clearly marked, helping to discourage illegal cross-country use outside the ERMA. Targeting this area for large, competitive events would alleviate the need for similarly intensive recreation management and operational support in other parts of the decision area.

Compared to Alternative A, the location of the open area would provide improved recreational opportunities and better assist in achieving management goals through improved access and the use of clear and defensible boundaries (largely county roads) to help with compliance and enforcement.

The Gunnison River Bluffs ERMA (800 acres) would adequately support trail experiences for hikers, mountain bikers, and equestrians through complementary management actions, including a closure to mineral material disposal, non-energy leasables, and fluid mineral leasing. The ERMA would be closed to recreational target shooting, reducing opportunities for that activity, but improving public safety.

Impediments to recreation management objectives along the congressionally designated Old Spanish National Historic Trail would be negligible because public use primarily occurs on an adjacent historic trail (known as the Old Spanish Trail) within this ERMA and not the congressionally designated trail, which is a paved road located outside the ERMA. Management actions, as described above, would facilitate users' understanding of the history and culture of the Old Spanish National Historic Trail experience.

Similar to the Grand Valley ERMA, the 34&C Road ERMA (550 acres) would be split into two zones: shooting (220 acres) and Open Area (330 acres). The area encompassed by the proposed 34&C Road ERMA is currently open to both cross-country OHV travel and target shooting and increasing use has resulted in public safety risks. Separating the ERMA into two zones would address these risks and provide better opportunities for the recreating public. The Open Area zone would provide participants with an alternative to the Grand Valley Open Area and would not be targeted for large, competitive events, thereby preserving an area for more casual, family-oriented (i.e., non-competitive) cross-country OHV use. Providing a formal shooting area in a WUI setting would alleviate issues associated with non-designated shooting areas (e.g., public safety, trash, etc.) near residential areas.

Management actions associated with the Barrel Springs ERMA (10,300 acres) would adequately facilitate hunting and OHV travel except in cases where VRM Class III management may allow development that conflicts with those two activities.

The Palisade Rims ERMA (2,700 acres) would adequately support non-motorized day-use recreation activities through complementary management actions, including designation as VRM Class II, closure to non-energy leasable exploration and development, closure to mineral material disposal, and identification as ROW avoidance area.

Decision Area

Managing all types of recreation under a comprehensive designated routes system would greatly reduce user conflict while enhancing trail-based experiences. All route designations, including those for motorized, mechanized, and non-motorized use, were designed to support management objectives for SRMAs and ERMAs. Intensive cross-country use would be allowed on 5,400 acres (57 percent less than under Alternative A), in areas where such use is compatible with resource objectives. However, these areas could be closed if monitoring indicates the need for efforts to limit erosion and sedimentation/salt loading to the Colorado River. Closure of open areas would impact the GJFO's ability to accommodate this type of experience, and users in search of similar experiences could be tempted to drive off-trail in more sensitive areas.

Seasonal travel limitations for motorized and mechanized travel on 69,800 acres (41 percent fewer acres than under Alternative A) would have the same types of impacts as described under Alternative A, but would occur over a smaller area.

Implementing a comprehensive designated routes system would reduce the number of routes open to all uses, but route designations would be aimed at improving the quality of recreational opportunities in the decision area and reducing user conflict. For example, managing 1,111 miles of routes designated for full-size vehicles, UTVs, ATVs, and/or motorcycles would preserve route-based motorized opportunities while reducing duplicate routes that provide no unique recreational opportunity. Likewise, the elimination of undesignated routes would enhance recreational opportunities via reduced user conflict. However, closing and rehabilitating 954 miles of routes would result in a net loss of trail-based recreation opportunities in the decision area. Seasonal limitations for motorized use on 238 miles would reduce year-long, route-based motorized recreation opportunities, but would improve the quality of those opportunities by focusing use on times of year when routes are in better condition.

Continuing to limit foot and equestrian travel to designated routes in Bangs SRMA RMZs 1 and 3 (7,800 acres) and implementing a "limited to designated routes" policy in North Fruita Desert SRMA (RMZ 1; 25,800 acres) would have

the same type of impacts as described under Alternative A, but would occur over 24,600 acres (four times more than under Alternative A). Under Alternative B, Pyramid Rock ACEC (1,300 acres) would be closed to horse travel, reducing the area available for cross-country travel experiences. The types of impacts from allowing cross-country foot travel on 1,036,800 acres and horse travel on 1,035,500 acres would be the same as those described under Alternative A.

Under Alternative B, the BLM would implement comprehensive route designations for mechanized travel across the entire decision area. Mechanized travel would be limited to designated routes on 897,500 acres, the impacts of which would be the same as those described under Alternative A but would occur over a larger area. In addition, there would be 158,500 acres managed as closed to mechanized travel, limiting the area available for mechanized trail experiences. Intensive mechanized travel would be allowed on 5,400 acres of open areas (shared with motorized vehicles), though this experience is not currently popular with mechanized users.

While over-snow motorized travel is not subject to the comprehensive route designation process, desirable experiences could be lost through the closure of lynx habitat within the Lynx Analysis Unit; lands managed for wilderness characteristics; and the Atwell Gulch, Mount Garfield, Pyramid Rock, Roan and Carr Creeks, and Unaweep Seep ACECs. In addition, the LBCWHR would be closed to over-snow motorized travel and motorized vehicles would be faced with a seasonal closure of Coal Canyon. Both actions would further limit the areas available for those activities.

Closing areas to camping would restrict the area available for this activity, but may help focus use in more desirable areas, thereby improving the camping experience by reducing user and resource conflict.

All SRPs would be evaluated using Permit Evaluation Factors and Permit Classification System (see **Appendix L**), helping to ensure permitted activities would occur in areas that would facilitate desired outcomes.

Restricting recreation in areas where it adversely impacts riparian areas could result in the loss of popular water-based recreation opportunities. River-based recreation opportunities could be diminished through the use of fencing or bank protection features. Relocating trails and roads away from riparian areas would result in recreationists losing a specific opportunity and may interfere with desired outcomes in localized areas.

Management actions from water resources would impact recreation through the use of stipulations and efforts to delist impaired water bodies. Efforts to delist impaired water bodies (303[d] listed) could include limitations on recreational access to certain areas, resulting in temporary or long-term loss of

opportunities. Recreation access could benefit if water bodies are delisted, when restrictions could be lifted.

Short-term impacts could arise from a number of management actions. When using prescribed fire, mechanical treatments, and natural ignitions to create openings in dense stands of mountain shrub, recreation opportunities could be temporarily restricted in those areas. Drought management would temporarily reduce recreation opportunities through the closure of open areas during periods of extreme drought. During an exceptional drought, recreation opportunities would be lost if areas are closed to public entry. Timing limitations for raptors that seasonally prohibit human encroachment would result in the temporary loss of recreational opportunities in those areas. Seasonally limiting motorized and mechanized recreation in Hunter Canyon, wintering areas, and big game production areas would reduce the amount of land available for those recreation activities.

There would be 518,600 acres (3.3 times more than under Alternative A) managed as VRM Classes I and II. The types of impacts from these VRM classifications would be the same as those described under Alternative A, but would occur over 359,400 additional acres.

There would be 24,400 acres managed for wilderness characteristics, increasing opportunities for primitive and unconfined recreation by way of restricting other resource uses and motorized recreation. Competitive events and motorized travel (including over-snow motorized travel) would be prohibited, reducing the area available for these events and activities. Cross-country mechanized travel would also be prohibited, but this is a negligible impact because users typically prefer to engage in mechanized recreation activities on trails, not cross-country.

Closing the North Fruita Desert campground in the North Fruita Desert SRMA to livestock grazing would facilitate achievement of outcome-focused objectives by eliminating animals and their waste from camp sites. Similarly, other high intensity recreation areas and facilities could be closed to livestock grazing based on the results of monitoring. While grazing is generally compatible with dispersed recreation, closures for developed recreation sites would be instituted when necessary to reduce conflict.

Under Alternative B, a total of 204,200 acres would be managed as ROW exclusion areas (18 percent fewer acres than under Alternative A) and 740,900 acres would be managed as ROW avoidance areas (68 percent more acres than under Alternative A). The types of impacts from ROW actions would be the same as those described under Alternative A, but Alternative B would encourage new ROWs in existing corridors, such as major roads, power transmission lines, and oil and gas pipelines, and would site transmission facilities outside sensitive, high-value recreation areas, protecting the outcome-focused objectives in those areas. However, managing developed recreation sites and

open areas as ROW avoidance areas would introduce the potential for utility development possibly incompatible with recreational experiences sought in these areas.

The BLM would close 252,400 acres (8 percent fewer than under Alternative A) to mineral material disposal, protecting recreation experiences and opportunities by prohibiting facilities that could conflict with desired outcome-focused objectives. In addition, campgrounds, target shooting areas, and trailheads/picnic areas would be among the 20,700 acres petitioned for withdrawal from mineral entry. If withdrawn, recreation opportunities and experiences in these areas would be protected.

Under Alternative B, the BLM would apply NSO stipulations on 614,000 acres (42 percent more acres than under Alternative A). Because those stipulations would prohibit all surface-disturbing activities, they would preserve more of the natural character of the landscape. CSU stipulations would be applied on 656,200 acres (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), which has the potential to reduce the potential for achieving outcome-focused objectives by permitting development that conflicts with desired recreational experiences. Well pads and roads created for mineral exploration and development could displace users to less developed areas or eliminate some recreational opportunities.

Recreational boating opportunities and experiences may be enhanced as a result of protecting the recreational ORV along the portion of the Dolores River determined suitable for inclusion in the NWSRS. However, recreation activities may be restricted if they are found to adversely impact other identified ORVs, the free-flowing nature, or the tentative classification of the affected segment.

If the Secretary of Interior designates the Tabeguache Trail as a National Recreation Trail, the potential for increasing use could require additional management measures to ensure user conflict or crowding is kept to a minimum.

Allocation of cultural resources to Public Use would protect resources of interest to the recreating public once management plans for the allocation have been completed. Delays in plan preparation could impact the accessibility of sites to the public. Allocation to other Use Categories or the application of NSO and CSU stipulations specific to cultural resources could impact the development of recreation facilities and opportunities. Management actions that develop interpretive signage, informative maps, and cultural resource plans would facilitate outcome-focused objectives through education. The limitation on permanent improvements in the Indian Creek area complements recreation management actions for the area. Some new recreational opportunities would be associated with sites allocated to Public Use (historical trails and roads, rock art sites, and other historic sites at uranium mesas).

Management actions from interpretation and environmental education would help GJFO better accommodate a continued increase in visitation and recreation. In particular, interpretive signs and facilities would improve visitor experiences by educating users and providing additional information to help them better structure their visits to the GJFO in a manner consistent with their desired experiences.

Similar to Alternative A, management actions would not close backcountry airstrips to recreational aircraft, thereby protecting the recreational experiences of aircraft users who depend on these backcountry airstrips. One airstrip would be located within the Blue Mesa Wildlife Emphasis Area, which is seasonally closed to motorized use (including aircraft), but the winter closure would have negligible impact on aircraft use because this use typically occurs in spring, summer, and fall.

The BLM would continue to manage the four WSAs totaling 96,500 acres as closed to fluid mineral leasing, protecting primitive and unconfined recreation in those areas.

Alternative C

Under Alternative C, more stringent resource protection and fewer RMAs would promote quiet, dispersed recreational activities, benefiting those visitors who value a quiet soundscape and less structured recreational opportunities. Likewise, those seeking cross-country motorized recreation experiences and those visitors looking for a structured setting would find fewer opportunities. With little emphasis on promotion of the GJFO as a recreation destination, users could eventually gravitate to other parts of the region, causing RSCs to gravitate towards back-country, away from some RMZ objectives.

Even with slightly reduced visitation, not identifying any ERMAs would restrict BLM's ability to provide program investments that adequately address recreation use and user demand. This issue would be especially acute in the short-term under current or increased levels of visitation.

Bangs SRMA (17,300 acres)

Given the SRMA's proximity to Grand Junction and its popularity with local residents, encountering more than one small or medium social group (RMZs 1 and 2) or larger school groups (RMZ 3) would be likely. However, because of their close proximity to a majority of the planning area's population, if RMZs increase in popularity, strains would be placed on management of social and operational settings.

Proposed management actions would also be compatible with the desired operational RSCs. For example, providing simple visitor services and maintaining a low BLM presence away from trailheads would be adequate to support visitation by local residents.

Desired middle and backcountry physical RSCs would be preserved through management restrictions (e.g., VRM Class II, closure to mineral material disposal) that lessen the opportunity for development that would shift the SRMA towards front-country or rural RSCs. Additionally, the SRMA would be closed to oil, gas, and geothermal leasing, enhancing recreation by eliminating potential well pads, roads, and other leasing-related infrastructure that would conflict with desired recreational experiences.

While all RMZs would be managed as ROW avoidance (introducing the potential for some utility development potentially incompatible with recreational experiences sought in these areas), closing this SRMA to fluid mineral leasing and applying an NSO stipulation for surface-disturbing activities would help preserve desired physical RSCs.

North Fruita Desert SRMA (42,700 acres)

Proposed management actions would likely achieve mixed results in obtaining desired physical and social RSCs. On one hand, several management actions would protect and enhance users' experiences, including closing the SRMA to mineral material disposal and non-energy leasable exploration and development, managing the SRMA as unacceptable for coal leasing and development, and managing RMZ 1 as VRM Class II. On the other, a VRM Class III designation for RMZ 2 (18,900 acres or 44 percent of the SRMA) could be incongruous with the motorized activities occurring in that RMZ because development may pose safety risks and has the potential to alter the desired physical RSCs towards front-country.

Additional actions that would impact the proposed physical RSCs include managing RMZ 1 (23,800 acres or 56 percent of the SRMA) as a ROW exclusion area and applying an NSO stipulation, which would protect physical RSCs by preventing surface occupancy and surface-disturbing activities. However, RMZ 2 would be managed as a ROW avoidance area and subject to a CSU stipulation, which has the potential to inhibit achievement of outcome-focused objectives by permitting development that alters the physical RSCs in a manner incompatible with the desired future condition.

Solar emphasis area overlap with the SRMA could lead to conflict and displacement of recreational opportunities via a shift in social and physical setting RSCs as a result of solar power developments.

Closing RMZ 1 to recreational target shooting would reduce opportunities for that activity while improving public safety.

Removing the Hunter Canyon area from the SRMA would limit the ability to manage for targeted-outcomes for motorized recreation, rock-crawling in particular ERMAs.

There would be no ERMAs under Alternative C. Areas that currently receive moderate or high levels of visitation are projected to see increased visitation, including Palisade Rims, Gunnison River Bluffs, and Dolores River Canyon. Without identifying any of these areas as an ERMA, BLM's ability to address current and future recreation use and provide recreation and visitor services program investment would be inadequate to meet demand.

Decision Area

The types of impacts from implementing decision area-wide comprehensive route designations would be the same as those described under Alternative B. Under Alternative C, intensive cross-country motorized and mechanized use would be prohibited, eliminating a popular activity and forcing users to look beyond the decision area for an open area experience. Closure of all cross-country motorized opportunities could also prompt some users to go off-trail within the planning area, causing resource damage. Closing 379,500 acres to motorized use (10.8 times more than under Alternative A), including those areas currently open to intensive use, wildlife emphasis areas, critical habitat areas, lands managed for wilderness characteristics, some ACECs, and other areas, would have the same types of impacts on motorized and non-motorized users as described under Alternative A, but the closures would occur over a much larger area.

Through the proposed closure and rehabilitation of 1,593 miles of routes, Alternative C would implement the most restrictive route designation system for all types of use. Many closures would occur on duplicate or dead-end routes and would have little impact on the quality of route-based recreation in the decision area. Motorized recreation (allowed on up to 709 miles of routes, depending on the type of vehicle) would also be limited through management restrictions associated with lands managed for wilderness characteristics, wildlife emphasis areas, ACECs, and other resources and special designations proposed under Alternative C. These limitations would reduce route-based motorized recreation opportunities as compared to other alternatives. Similar limitations and impacts would exist for mechanized travel and, to a much lesser extent, foot and horse travel. Seasonal motorized limitations would occur on 151 miles of routes, but that wouldn't correspond to greater year-round opportunities because of the higher number of routes closed under Alternative C.

Seasonal travel limitations for motorized and mechanized travel on 51,400 acres (2.1 times fewer acres than under Alternative A) would have the same types of impacts as described under Alternative A, but would occur over a smaller area. Many of the areas managed as a seasonal closure under Alternative A would be closed under Alternative C.

Cross-country mechanized travel would not be allowed, although this type of experience is not currently popular with mechanized users. The types of impacts from limiting mechanized use to designated routes on 694,400 acres

would be the same as those described under Alternative A, but would occur over a larger area. The types of impacts from prohibiting mechanized travel on 367,000 acres (2.3 times more acres than under Alternative B; there is no similar action under Alternative A) would be the same as those described under Alternative B.

Foot and horse travel would be prohibited in the Pyramid Rock ACEC (1,300 acres), slightly reducing the area available for hiking and horseback riding experiences. Otherwise, foot and horse travel would be managed similarly to Alternative A, and the types of impacts would be the same.

All SRPs would be evaluated using Permit Evaluation Factors and Permit Classification System (see **Appendix L**), helping to ensure permitted activities would occur in areas that would facilitate desired outcomes.

The types of impacts from WSR actions would be the same as those described under Alternative A.

The types of impacts from managing 654,000 acres (4.1 times more than under Alternative A) as VRM Class I and II would be the same as those described under Alternative A, but they would occur over a greater area.

The types of impacts on recreation from lands managed to protect their wilderness characteristics would be the same as identified under Alternative B, except the impacts would be spread over 171,200 acres (7 times more than under Alternative B), ensuring the protection of a greater area for primitive and unconfined recreation over the life of the plan while further reducing the area available for motorized recreation.

Under Alternative C, a total of 365,800 acres would be managed as ROW exclusion areas (39 percent more acres than under Alternative A) and 627,000 acres would be managed as ROW avoidance areas (42 percent more acres than under Alternative A). The types of impacts from ROW management actions would be the same as those described under Alternative A, but they would occur over a larger area.

The types of impacts from cultural resources, livestock grazing, and interpretation and environmental education actions and from closing the Dolores River Riparian ACEC to recreational placer mining would be the same as those described under Alternative B. The impact of petitioning to withdraw campgrounds, target shooting areas, and trailheads/picnic areas from mineral entry would be the same as those described under Alternative B.

The types of impacts from closing 452,000 acres (57 percent more than under Alternative A) to mineral material disposal, including SRMAs, would be the same as those described under Alternative B, but would occur over a larger area.

The types of impacts from water resources actions would be the same as those described under Alternative B, except that additional areas would be covered by an NSO or CSU stipulation or closed to leasing.

Impacts on recreational aircraft use of backcountry airstrips would be the same as described under Alternative B.

A total of 554,700 acres (5.7 times more than under Alternative A) would be closed to fluid mineral leasing, including Bangs SRMA and RMZ 1 in the North Fruita Desert SRMA. This would enhance recreation in these areas by prohibiting well pads, roads, and other leasing-related infrastructure that would conflict with desired recreational experiences.

Alternative D

The BLM would place a greater emphasis on promoting recreation, likely resulting in an even larger increase in use than if current management objectives were carried forward (i.e., Alternative A). As a result, SRMAs in particular would become increasingly popular destinations. For example, the North Fruita Desert SRMA, which is already receiving heavy use in spring and fall, could see use levels that strain the GJFO's ability to preserve desired back- and middle-country social RSCs. This scenario would likely be replicated in other very popular areas of the field office.

Bangs SRMA (17,300 acres)

RMZ 2 (9,500 acres or 56 percent of the SRMA) could see increased use levels that strain the GJFO's ability to preserve desired back-country social RSCs. In addition, if RMZ 3 (3,500 acres or 20 percent of the SRMA) increases in popularity with users from beyond the immediate region, the social RSC could quickly exceed middle-country. This level of use would also place demands on operational RSCs by introducing a need for more than simple visitor services and a low BLM presence beyond trailheads. Management for RMZ 1 (4,200 acres or 24 percent of the SRMA) would be best equipped to accommodate a substantial increase in use because its social RSCs plan for participants to encounter a season average of up to 15 encounters per day with occasional large groups of cyclists.

The Little Park Road corridor would continue to be closed to target shooting, consistent with desired RSCs for that area, but also resulting in continued displacement of shooting activities to other areas within the planning area.

By applying an NSO stipulation in the entire SRMA, physical RSCs would be adequately preserved in the same manner as described under Alternative B.

North Fruita Desert SRMA (44,100 acres)

Physical RSCs in RMZ 1 (25,000 acres or 57 percent of the SRMA) would be protected through management as VRM Class II and the application of an NSO stipulation, restricting many types of development. However, the desired

physical RSCs in RMZ 2 (19,100 acres or 43 percent of the SRMA) could be impacted by management as VRM Class III and open to mineral material disposal, which introduces the possibility for development incompatible with a middle-country setting. In addition, RMZ 2 would be subject to a CSU stipulation, the impacts of which are the same as those described under Alternative B.

The impacts from managing part of the SRMA as acceptable for further coal leasing and development are the same as those described under Alternative B.

By prohibiting recreational target shooting in the open area and identifying no shooting areas in the remainder of the SRMA, opportunities for shooting would be maintained and risks to public safety would be minimized.

Castle Rock SRMA (4,400 acres)

The Castle Rock SRMA is designed to provide intermediate to expert level motorcycle riding and mountain biking. Expanses of exposed rock provide a durable surface for this activity, but the area is also rich in sensitive cultural resources and special status plant species. Any routes or motorcycle trials areas would require appropriate surveys and consultation with the Colorado State Historic Preservation Office, Native American Tribes, and USFWS before they could be designated to recreational use and in areas where significant data recovery could not be completed to mitigate adverse effects to cultural resources trails could be closed or redesigned. Developing unique motorcycling and mountain biking opportunities in this area would be consistent with the SRMA's objectives and proposed implementation decisions. However, riders traveling off-route or creating social routes could damage cultural resources and special status plant species. The potential for such damage could strain the SRMA's operational RSCs by requiring inordinate amounts of recreation program and staff resources towards protecting and mitigating effects to cultural and natural resources.

Gunnison River Bluffs SRMA (800 acres)

Proposed management actions would help the BLM achieve desired RSCs. For example, limiting mechanized travel to designated routes would provide adequate opportunities for bicyclists and would reduce resource conflicts and user conflicts with day hikers. Closing the SRMA to mineral material disposal, non-energy leasables, and fluid mineral leasing, and applying an NSO stipulation for surface-disturbing activities would preserve the natural landscape and enhance the recreational experiences for which the SRMA is managed.

The entire SRMA would be open to recreational target shooting, improving opportunities for that activity but compromising public safety.

Palisade Rims SRMA (2,700 acres)

Proposed management actions would largely support the desired physical RSCs. For example, closure to non-energy leasable exploration and development,

closure to mineral material disposal, an NSO stipulation, and classification as ROW avoidance area (with the exception of the existing power corridor) would limit development that could conflict with user experiences. Even a large increase in visitation resulting in a congested trail system would be accommodated by the proposed operational RSCs, which include directional signage at trail intersections.

The SRMA would be open to recreational target shooting, improving opportunities for that activity but compromising public safety.

Grand Valley SRMA (9,700 acres)
This area, already popular with local and regional visitors, would benefit from being managed as an SRMA, where recreation is recognized as the predominant land use planning focus and specific recreation opportunities and RSCs are managed and protected on a long-term basis. By developing portals, trailheads, and restrooms, the SRMA would be well-suited to accommodate large competitive events and intensive, cross-country motorized use proposed for the area. Trailhead signage would help minimize user conflict by educating users, but a dramatic increase in use could result in greater potential for conflict and safety issues.

The portion of the SRMA that overlaps the open area in Alternative A would continue to be closed to recreational target shooting, reducing opportunities for that activity but improving public safety.

ERMAs
As described in **Section 3.3.4**, ERMAs would receive specific management consideration in order to address recreation use, demand or recreation and visitor service program investments. ERMAs would be managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Management of ERMA areas would be commensurate with the management of other resources and resource uses.

An increase in population around Gateway would cause use to continue to grow in the Dolores River Canyon ERMA (16,800 acres), creating a demand for improved facilities and services. Proposed partnerships to develop new trail-based opportunities, identify interpretive pullouts and highway crossings, and reroute unsustainable trails would help support and sustain mountain biking, hiking, motorized touring, and other principal activities. These actions would also benefit the associated qualities and conditions of the ERMA, especially where the ERMA overlaps with the Palisade WSA and ACEC, Sewemup WSA, and Unaweep Seep ACEC.

Supporting management actions would largely support and sustain the ERMA, except that there is no NSO stipulation in non-WSA portions of the ERMA, presenting the opportunity for surface-disturbing activities that could conflict with visitors' ability to participate in outdoor recreation activities.

The Dolores River corridor area would not be closed to recreational target shooting, posing a risk to user safety.

Managing the Timber Ridge ERMA (11,900 acres) for a variety of non-motorized activities may conflict with allowing mineral material disposal in the ERMA, not applying stipulations for fluid minerals or surface-disturbing activities, and managing the area as suitable for consideration of public utilities. All of these management actions have the potential to introduce types of development incompatible with a primitive recreation experience that is dependent upon the qualities and conditions of the ERMA.

The 34 and C Road ERMA (550 acres) would be split into two zones: a target shooting zone (220 acres or 40 percent of the ERMA) and an Open Area zone (330 acres or 60 percent of the ERMA). Management and administration BMPs would support recreational target shooting and cross-country use by providing facilities and signage needed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Providing a structured recreation setting would also help address urban interface issues including conflicts between users and homeowners and shooting safety concerns with adjacent private property. Moving the current open area to a location with better opportunities and easier access would help concentrate use. The ERMA, providing more focused management, would also aid BLM's ability to address trash dumping and the area's night-time party scene.

The Grand Valley Target Shooting ERMA (800 acres) would provide visitors close-to-home, day-use recreational target shooting. By constructing appropriate facilities for the attainment of the recreation objective (e.g., backstops, shade shelters, and shooting benches), this ERMA would sustain the principal recreational activity and provide a setting conducive to target shooting.

Both the Barrel Springs (10,300 acres) and South Shale Ridge (21,600 acres) ERMAs would offer visitors the freedom to participate in a variety of recreation activities in a relatively unchanged, natural-appearing landscape. Both ERMAs would be managed as VRM Class III, which introduces the potential for moderate change to the characteristic landscape. However, much of these areas are covered by NSO stipulations for steep slopes, limiting the potential for surface-disturbing activities that would decrease BLM's ability to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMAs.

Decision Area

The types of impacts from motorized route designations would be the same as those described under Alternative A. Managing 10,200 acres as open to cross-country motorized use (18 percent fewer acres than under Alternative A) would slightly reduce the area available for cross-country experiences. The types of impacts from prohibiting motorized use on 111,300 acres (3.2 times more than under Alternative A) would be the same as those described under

Alternative A. The types of impacts from implementing seasonal travel limitations for motorized travel on 54,700 acres (2 times fewer acres than under Alternative A) would be the same as those described under Alternative A.

The types of impacts from route designations, including closures and rehabilitations and limitations on route-based motorized recreation, would be the same as described under Alternatives B and C, but would occur over a smaller number of miles of routes. For example, motorized use, depending on the type of vehicle, would be allowed on 1,968 miles of routes, providing the most opportunities for route-based motorized recreation in a comprehensive designated routes system. Users preferring mechanized travel would experience similar impacts. Foot travel would be allowed on all routes designated for public use, resulting in greater freedom for this mode of travel. Horse travel would be prohibited on only seven miles of routes (the same as Alternative B), resulting in negligible restrictions on users seeking this type of opportunity. Seasonal limitations for motorized use on 223 miles of routes would result in impacts similar to those described under Alternative B.

The types of impacts from mechanized travel designations would be the same as those described under Alternative A, but there would be 10,200 acres open to cross-country travel (89 percent more acres than under Alternative B; there is no similar action under Alternative A), seasonal limitations would be applied on 54,700 acres (2 times fewer acres than under Alternative A), and closures would be applied on 98,000 acres (38 percent fewer acres than under Alternative B; there is no similar action under Alternative A).

The types of impacts from foot and horse travel designations would be the same as those described under Alternative A, except that the Pyramid Rock ACEC (1,300 acres) would be closed to horse travel (zero acres would continue to be closed to horse travel under Alternative A) and 17,700 acres in Bangs (RMZs 1 and 3), Castle Rock, and Palisade Rims SRMAs would be limited to designated routes for foot and horse travel (2.9 times more than under Alternative A).

All SRPs would be evaluated using Permit Evaluation Factors and Permit Classification System (see **Appendix L**), helping to ensure permitted activities would occur in areas that would facilitate desired outcomes.

The types of impacts from lands with wilderness characteristics actions would be the same as those described under Alternative A.

The types of impacts from cultural resources; paleontological resources; livestock grazing; locatable minerals; interpretation and environmental education; and national, scenic, and historic trails actions would be the same as those identified under Alternative B.

Under Alternative D, a total of 104,100 acres would be managed as ROW exclusion areas (56 percent fewer acres than under Alternative A), and 80,500 acres would be managed as ROW avoidance areas (82 percent fewer acres than under Alternative A). While the types of impacts from ROW management actions would be the same as those described under Alternative A, the area available to activities potentially in conflict with desired recreational experiences would be larger. For example, Bangs SRMA (except for a 100-meter corridor along Little Park Road and Monument Road) and Palisade Rims SRMA would be managed as ROW avoidance areas under Alternative D.

The BLM would manage 333,900 acres (2.1 times more acres than under Alternative A) as VRM Class I and II would have the same impacts as described under Alternative A, but over a larger area. The types of impacts from managing 727,500 acres (19 percent fewer acres than under Alternative A) as VRM Class III and IV would be the same as under Alternative A, but would occur over a larger area than in the other alternatives.

Closing 100,500 acres of federal mineral estate (4 percent more acres than under Alternative A) to fluid mineral leasing would have the same types of impacts as described under Alternative A, but those impacts would occur over 4,000 additional acres.

The types of impacts from closing 155,300 acres to mineral material disposal (40 percent fewer acres than under Alternative A), including Bangs, Gunnison River Bluffs, North Fruita Desert (RMZ 1), and Palisade Rims SRMAs would be the same as those described under Alternative A, but would occur over a larger area.

Recommending designation of the Land's End, John Brown Canyon, and Niche to Blue Mesa (Uranium Trail) byways would have the potential for attracting additional users to those resources. Recreational use of the byways is not expected to hamper the desired experiences of those users, and corridor management plans would identify facilities and management actions necessary to preserve experiences and promote desired outcomes.

Similar to Alternative A, management actions would not close backcountry airstrips to recreational aircraft, thereby protecting the recreational experiences of aircraft users who depend on these backcountry airstrips.

There would be no impacts on recreation from WSR actions under this alternative because no stream segments would be determined suitable for inclusion in the NWSRS.

Cumulative

The CIAA used to analyze cumulative impacts on recreation resources includes the planning area, all big game herd units that intersect the planning area, and the CIAA for greater sage-grouse. Any activities that affect game populations

would in turn impact the potential for realizing recreation benefits (e.g., wildlife viewing and hunting) because of the loss or gain of the number of animals. The CIAA also extends along major roads, trails, and rivers where management inside the planning area could impact use outside the planning area boundary.

At the broadest level, the physical, social, and operational recreation character of BLM public lands is quickly changing from natural to more developed, from less crowded to more contacts with others, and from less restrictive to more rules and regulations. These changes will impact the activity opportunities that can be offered and the recreation experience and benefit opportunities that can be produced by land managers and partners.

Past and present actions that have had, and continue to have cumulative impacts, on recreation include surrounding BLM and Forest Service management plans, increased visitation (especially from residents within the planning area and those from the surrounding region), urbanization of the Grand Valley, advances in outdoor recreation equipment, management in existing SRMAs and ERMAs, and energy development.

Forest plans for adjacent Forest Service lands and RMPs for adjacent BLM-administered public lands have closed areas and routes to motorized recreation, causing users to move to BLM-administered public lands in the planning area.

Increasing urban and suburban populations proximate to the planning area have greatly increased the level of recreational use on BLM-administered public lands. There is a strong correlation between population growth, visitation, and recreation in large part because many new residents have moved to the area specifically because of easy access to recreation opportunities on BLM-administered public lands. The expanding suburban development footprint has also placed many new neighborhoods directly adjacent to BLM property boundaries, resulting in increased trespass onto private property and resource impacts from private property owners accessing public lands from adjoining private land (e.g., social trailing, etc.).

The combination of the region's growing population, the GJFO planning area's longer season of use in comparison to many Colorado destinations, and the bounty of desirable recreation settings have combined to greatly increase use in the planning area.

Advances in technology are at least partly responsible for increased recreation across the planning area. Motorized vehicles are more capable of accessing previously remote areas of the GJFO, improvements in mountain biking have made that activity increasingly popular, and enhancements in equipment and clothing have made day hiking and camping more accessible to more people.

Increased oil, gas, and locatable and salable mineral exploration and development have altered physical RSCs through the construction of well pads,

roads, and related infrastructure. As a result, many areas have trended away from a more natural setting and users seeking a back-country or primitive experience have been displaced.

Past and present management of ERMAs and SMAs focused primarily on providing activity opportunities. For example, management of the North Fruita Desert SMA focused on mountain biking and motorized activities. This area has not been managed for a long-term commitment to specific settings, or outcome opportunities. As a result, settings changed and opportunities have been lost. In another example, the Grand Junction ERMA has been managed for a variety of activities in a variety of settings. There has been an incremental change to the settings as increased motorized participation caused more landscapes to be segmented by user-created routes, and more areas to be dominated by motorized use.

Reasonably foreseeable trends that would result in cumulative impacts on recreation include continued growth patterns in demand for all recreation experiences, increased demand for close-to-home recreation opportunities for local residents, continued and increased visitation from a growing regional population, and increased popularity of adjacent public lands and private resorts.

4.4.4 Lands and Realty

This section discusses impacts on lands and realty from proposed management actions of other resources and resource uses. Existing conditions concerning lands and realty are described in **Section 3.3.6**, Lands and Realty.

Impacts on lands and realty would result from actions that increase the demand for or restrict the number or location of ROWs and other land use authorizations or that would impact land tenure objectives.

Methods of Analysis

Indicators of impacts on lands and realty include the following:

- Ability to accommodate the demand for ROW authorizations based on the number and total size of ROW corridors.
- Ability to accommodate preferred routes for ROW corridors based on the acres and location of ROW exclusion and avoidance areas.
- Ability to accommodate preferred locations for communication sites based on available locations.
- Ability to accommodate preferred routes or locations for all ROWs, including, but not limited to, renewable energy development, transportation systems, pipelines, and transmission lines, based on available locations.
- A substantial reduction in areas open for ROW applications for solar and wind projects.

- Ability to accommodate land tenure adjustments necessary to meet resource and community needs based on the acres and location of lands identified for disposal, retention, or acquisition.

The mandate to manage land for multiple uses requires the BLM to consider the potential impacts of management actions on lands and realty, including ROWs and land tenure. Because lands and realty is a resource use rather than an environmental component, impacts on lands and realty are a direct result of actions from other resource programs and resource uses. The discussion of the effects on lands and realty under each alternative is limited to the effects on permitted or authorized uses and land tenure, including restrictions, costs, and issuance or denial of proposals. Management actions of other resources were assessed to determine restrictions or limitations to land use authorizations (including ROWs) and land tenure.

The analysis includes the following assumptions:

- Existing ROWs and communication sites would be managed to protect valid existing rights.
- Existing ROWs may be modified upon their renewal, assignment, or amendment if the requested actions meet the objectives of the RMP.
- ROW holders may continue their authorized use as long as they are in compliance with the terms and conditions of their grant.
- The BLM would continue to process land tenure adjustments.
- The demand for communication sites and ROWs would increase over the life of this RMP.
- Maintenance and upgrading of existing utilities and other ROWs would occur before the construction of new facilities in the decision area.
- One hundred percent of the identified renewable energy emphasis areas would be developed over time.
- Demand for small distribution facilities to extend and upgrade services, such as power and telephone, is expected to remain at current growth rates as rural development continues.
- Demand for land tenure adjustments to accommodate community expansions is expected to remain at current levels but could fluctuate depending on the degree of economic growth and development occurring within and adjacent to the planning area.
- Retention areas would include all decision area lands (the BLM-administered public lands within the planning area) that are not

managed as disposal or cooperative management tracts, unless on a case by case analysis the lands meet the disposal criteria outlined.

- The BLM would continue to manage approximately 20,100 acres as withdrawn from locatable mineral entry.
- Withdrawals would be reviewed, as needed, and recommended for renewal, continuation, or termination. All existing withdrawals initiated by other agencies, such as the US Bureau of Reclamation and the Federal Energy Regulatory Commission, would be continued unless the initiating agency requests that the withdrawal be terminated.
- Although exceptions, modifications, and waivers may be obtained to address some of the stipulations outlined in **Appendix B**, it is assumed that the stipulations specified for each alternative would be applied to all proposed surface-disturbing activities on decision area public lands.
- Renewable energy resources include solar and wind. (Biomass resources are part of the forestry program and are discussed in **Section 4.4.1**, Forestry.) (Geothermal resources are part of the fluid minerals program and are discussed in **Section 4.4.5**, Energy and Minerals.)

Effects Common to All Alternatives

Isolated tracts of BLM-administered public lands that become known in the future and that are not required to meet other resource objectives would be identified for disposal under all alternatives, thus leading to increased public land management efficiency. These lands would be managed as ROW avoidance and only ROW applications that would not unduly depreciate the tracts' appraised value would be approved on disposal tracts. Public access would be reserved in patents where it would benefit the public, which would ensure access for resource use as well as lands and realty development activities. Land exchanges would be considered in retention areas on a case-by-case basis in order to meet resource objectives if the exchange is in the public interest and would improve management efficiency or would result in the acquisition of private property with high resource values. Applications would be considered in retention areas to meet community or organization needs under the Recreation and Public Purposes Act in accordance with resource objectives. These actions could result in land tenure adjustments to meet community needs. Lands or interests in acquired lands would be managed in a manner consistent with other public lands in the surrounding area.

Under the Recreation and Public Purposes Act, as amended (43 USC 869 et seq.), all lands within Recreation and Public Purposes leases and patents are subject to lease under the provisions of this part, subject to such conditions as the Secretary deems appropriate.

Resources and resource uses affecting lands and realty (e.g., water, vegetation, and soils) prescribe ROW exclusion and avoidance areas and stipulations (as outlined in **Appendix B**). ROW exclusion areas would reduce route options in the region. ROW applications could be submitted in ROW avoidance areas; however, a project proposed in these areas would be subject to additional requirements such as resource surveys and reports, construction and reclamation engineering, long-term monitoring, special design features, and re-routing. As a result of special surveys and reports, alternative routes may need to be identified and selected to protect sensitive resources.

Managing BLM-administered lands as ROW avoidance areas and applying stipulations could result in increased application processing time and costs due to the need to relocate facilities or due to greater design and siting requirements. The increased processing time, costs, and requirements may affect new ROWs or renewed ROWs at existing sites.

Areas with TL stipulations would be closed to ROW construction and maintenance, surface-disturbing activities, and intensive human activity during identified time frames. All TL stipulations would be applied within ROW avoidance areas.

Under all alternatives, WSAs are managed as ROW exclusion areas. If any WSAs are released from wilderness study by Congress, the area would still be managed as a ROW exclusion area, and no facilities could be located in the area without amending the RMP. Impacts associated with development activities in the planning area are discussed under the appropriate resource section (e.g., impacts on soils and vegetation are discussed in **Section 4.3.2**, Soil Resources, and **Section 4.3.4**, Vegetation, respectively).

Solar and wind ROW applications may only occur on any lands that are not managed as ROW exclusion areas. The acreages of lands with ROW exclusions vary across alternatives. Alternatives with greater ROW exclusion acreages are considered to have long-term direct impacts on the ability for solar and wind resources to be developed. The acreages under each alternative that are not within exclusion areas are provided in **Table 4-37**, Acreage Impacts on Renewable Energy. This table shows the acreages that are proposed as renewable energy emphasis areas and that are also open for the development of other ROWs.

As discussed above, ROW applications may be filed for ROW avoidance areas; however, projects proposed in such areas would be subject to restrictions that would add time and cost. Alternatives with greater ROW avoidance areas are considered to have short-term direct impacts (e.g., special surveys, reports, and construction and reclamation BMPs) and long-term direct impacts (e.g., potential maintenance actions) on the economic feasibility of the development of solar and wind resources. The acreages under each alternative that are within

Table 4-37
Acreage Impacts on Renewable Energy

	Alternative A	Alternative B	Alternative C	Alternative D
Solar emphasis areas	0	12,200	5,300	36,300
Solar emphasis areas with ROW avoidance	N/A	10,500	4,500	2,100
Solar emphasis areas without ROW avoidance	N/A	1,700	800	34,200
Solar Energy Zones	0	9,200	0	9,200
Solar Energy Zones with ROW Avoidance	N/A	7,700	N/A	0
Solar Energy Zones without ROW Avoidance	N/A	1,500	N/A	9,200
Wind emphasis areas	0	2,600	2,600	3,700
Wind emphasis areas with ROW avoidance	N/A	1,800	1,800	0
Wind emphasis areas without ROW avoidance	N/A	800	800	3,700

Source: BLM 2010a

ROW avoidance areas are provided in **Table 4-37**, Acreage Impacts on Renewable Energy.

Identifying solar and wind emphasis areas and SEZs would have long-term, direct impacts on the utilization of solar and wind resources because applicants would be directed to the most suitable locations for development. These areas have been screened for sensitive resources, and no major resource concerns have been identified. The degree of impact would be in direct proportion to the acreages identified.

Emphasis areas and portions of emphasis areas that are closer to existing transmission lines and access routes would be more likely to be developed than emphasis areas and portions of emphasis areas that are farther from such features. This is because proximity to transmission and access reduce costs and the likelihood for environmental constraints associated with construction and interconnection.

Implementing management for the following resources or resource uses would have negligible or no impact on lands and realty and are therefore not discussed in detail: livestock grazing, wildland fire management, interpretation and environmental education, Native American tribal uses, public health and safety, socioeconomics, and environmental justice.

Alternative A

Managing 234,900 acres as unsuitable for utilities (i.e., ROW exclusion areas) would prohibit the placement of ROWs in these areas, thereby reducing options for ROW placement in the decision area.

Areas managed as sensitive for utility development (i.e., ROW avoidance areas) would cover 441,400 acres. These areas could impose design and siting requirements and associated costs on new ROWs or assigned, amended, or renewed ROWs at existing sites. Such requirements could restrict placement, limit future access, delay availability of energy supply (by restricting pipelines, transmission lines, and wind and solar projects), create dead zones, or delay communications service availability. Such requirements could also require ROWs to be installed in areas with more restrictions on accessibility or construction. In addition, in ROW avoidance areas, the potential for denying requests for new or amended and renewed ROWs at existing sites would increase.

Applications for communications facilities would be considered for sites that meet resource program objectives. Co-location of communication site facilities and use of existing sites would be encouraged.

A total of five corridors encompassing 88,600 acres would be delineated for large-scale linear facilities such as public utilities; utility companies would be encouraged to use these corridors. Co-location of facilities within the corridors would reduce impacts on resources in other planning area locations, clarify the preferred locations for facilities, streamline construction and maintenance of the facilities, and simplify planning for new facilities. However, delineation of corridors would limit options for ROW/facility design and selection of more-preferable locations. The remainder of BLM-administered public lands outside of ROW exclusion and ROW avoidance areas would be available for ROW development (including transmission lines, pipelines, and communication sites), which would accommodate desired placement of facilities, accommodate access and efficient energy supply, and minimize additional costs.

Under Alternative A, there would continue to be no identified solar or wind emphasis areas. ROW applications for solar and wind facilities would be processed on a case-by-case basis. Without emphasis areas that have been screened for potential conflicts, the processing of solar and wind applications would be slowed.

Under Alternative A, 126 tracts totaling 16,100 acres would remain classified as for available for disposal. Land disposals proximate to cities or towns would accommodate community expansion needs by enabling lands suitable for agricultural use, commercial development, or industrial development to be used for the highest use or most appropriate use. Disposal efforts would also reduce isolated tracts, thus increasing public lands management efficiency. The BLM would also continue working with the Federal Aviation Administration and the Grand Junction Regional Airport Authority on the potential airport expansion involving up to 2,100 acres of public land. Disposal areas would remain managed as ROW avoidance areas; only ROW applications that would not unduly depreciate a tract's appraised value would be approved on disposal tracts.

Limitations on the use of disposal areas for land use authorizations could increase demand for authorizations and associated impacts in retention areas.

Identifying five cooperative management agreement tracts totaling 240 acres would provide opportunities for qualified agencies or entities to manage or acquire these isolated tracts through exchange, administrative transfer, or other appropriate means.

Under Alternative A, 7,800 acres would be identified within the Grand Mesa Slopes SMA (**Figure 2-30, Appendix A**) as available for land exchanges limited to the Grand Mesa Slopes SMA to improve resource management of this area.

Acquisition of lands that meet the criteria outlined in **Chapter 2** (e.g., areas with potential to be managed as SMAs, that are historically significant, that contain sensitive habitat, or that have valuable recreation areas) would protect sensitive resources and accommodate resource management.

Alternative B

ROW exclusion and avoidance areas would have the same types of impacts as those described under Alternative A, except that there would be 204,200 acres managed as ROW exclusion areas (18 percent fewer acres than under Alternative A) and 740,900 acres managed as ROW avoidance areas (68 percent more acres than under Alternative A).

Under Alternative B, the BLM would work with applicants to prioritize co-locating communication site facilities and use existing sites, as feasible. Co-location of facilities would have the same effects as those described under Alternative A. If the communication site cannot be co-located in one of the delineated areas, a new site could be considered.

A total of 6 corridors including 96,400 acres would be delineated for public utilities and other facilities, which is 1 more corridor and an additional 7,800 acres (9 percent more) than under Alternative A. Placement of new facilities or upgrades to existing facilities would be encouraged in these corridors or in other areas with previous disturbance and existing facilities. Placement of facilities within the corridors and areas of existing disturbance would have the same effects as co-locating facilities, as described under Alternative A. Delineation of corridors and placement of facilities in previous disturbance areas could limit options for ROW/facility design. The remainder of BLM-administered public lands outside of ROW exclusion or ROW avoidance areas would be available for ROW development, which would have the same effects as those described under Alternative A.

Site facilities and commercial filming authorized under 2920 permits would be restricted in ROW avoidance and exclusion areas. In addition, applications for filming permits for mechanized or motorized uses would be restricted to

existing roads, trails, or disturbance. Limiting activities to disturbed or developed areas would also limit impacts.

Trespass actions would be monitored and managed through ROW authorization or trespass procedure for removal and site restoration, which would result in improved management of lands and resources.

Under Alternative B, there would be 12,200 acres of solar emphasis areas, 2,600 acres of wind emphasis areas, and 9,200 acres of SEZs that are entirely within the solar emphasis areas boundary. These areas have been screened for potential resource conflicts and, as a result, would likely make the processing of solar and wind applications more efficient.

Under Alternative B, special mitigation would be required during development of any project within the 2 Road solar emphasis area and SEZ, such that project activities would be compatible with the Prairie Canyon Wildlife Emphasis Area. This management action would be a long-term, direct impact on solar resource development because it would add development time and cost.

Alternative B identifies 12,500 acres for land disposal (22 percent fewer acres than Alternative A). This classification would enable disposal of lands suitable for public purposes, which would accommodate community expansion or economic development. Disposal efforts would also reduce isolated tracts, thus increasing public lands management efficiency. Under this alternative, the disposal area includes the 2,100 acres of public lands for the Grand Junction Regional Airport expansion. Additional lands may be identified for disposal in urbanizing areas on a case-by-case basis to meet community expansion needs and where the public interest would be well served. Parcels containing or integral to significant habitat for species of concern would not be disposed of unless the habitat can be maintained or USFWS concurs. Disposal tracts would be managed as ROW avoidance areas and be subject to a CSU stipulation. Only ROW applications that would not unduly depreciate the tracts appraised value would be approved on disposal tracts, and site-specific relocations would apply under the CSU. Many of the disposal tracts would be small and remote, and managing these tracts as ROW avoidance areas would not have a measurable impact on other retention lands.

Delineating 22 cooperative management agreement tracts on 5,600 acres would have impacts similar to those described under Alternative A, but impacts would affect 17 more tracts and 5,400 more acres, 22 times more than Alternative A. Tracts that do not have an agreement in place within 10 years would be identified for disposal to relieve BLM management of these isolated or difficult to manage tracts.

Areas considered for acquisition would be similar to those described under Alternative A, except that Alternative B would include additional acquisition

criteria not listed under Alternative A, which could result in additional areas being acquired.

A petition to withdraw 20,700 acres from locatable mineral entry would be made for all or a portion of 6 ACECs, 3 types of recreation sites, and the Logan Wash Mine Site, which would promote resource protection but also limit the location of mineral activities and associated facilities and potentially increase resource impacts in other areas.

Alternative C

Types of impacts of ROW exclusion and avoidance areas would be the same as those described under Alternative A, except that Alternative C would identify 365,800 acres as ROW exclusion (39 percent more acres than under Alternative A), and 627,000 acres as ROW avoidance areas (42 percent more acres than under Alternative A). Effects of the BLM working with applicants to prioritize co-locating communication site facilities and using existing sites, as feasible, would be the same as those described under Alternative A.

A total of 6 corridors including 92,100 acres would be delineated for large-scale linear ROWs, such as public utilities and other facilities, which is 1 more corridor on 3,500 acres (4 percent) more than under Alternative A. Impacts of delineating corridors for large-scale linear ROWs and other facilities would be similar to those described under Alternative B. However, placement of new major facilities or upgrades to these types of facilities would be required in these corridors or in other areas with previous disturbance and existing facilities as determined practical. This would result in greater concentration of facilities and less impacts on other areas.

Impacts of site facilities and commercial filming authorized under 2920 permits, as well as monitoring and managing trespass actions, would be the same as those described under Alternative B.

Under Alternative C, there would be 5,300 acres of solar emphasis areas (57 percent fewer acres than under Alternative B; there is no similar action under Alternative A) and 2,600 acres of wind emphasis areas (the same as Alternative B; there is no similar action under Alternative A). As under Alternative B, special mitigation would be required during development of the 2 Road solar emphasis area such that projects there would be compatible with the Prairie Canyon Wildlife Emphasis Area. This management action would be a long-term, direct impact on solar resource development because it would add development time and cost.

Alternative C identifies 2,600 acres for land disposals, which is 13,500 acres (84 percent) fewer than Alternative A. Identifying lands for disposal would have impacts similar to those described under Alternative B. However, under Alternative C, lands with occupied or potential special status species habitat and

other resources values of interest, such as big game critical and severe winter range, would be retained.

Delineating 12 cooperative management agreement tracts totaling 3,000 acres would have impacts similar to those described under Alternative A, but impacts would affect 7 more tracts totaling 2,800 acres, over 12 times more than Alternative A. Tracts that do not have an agreement in place within ten years would be identified for disposal to relieve BLM management of these isolated or difficult to manage tracts.

Areas considered for acquisition would be similar to those described under Alternative B, except that Alternative C includes five additional criteria focused on habitat and wildlife range, riparian areas, and recreation areas that are not listed under Alternative B, which could result in additional areas being acquired.

A petition to withdraw 45,100 acres from locatable mineral entry (2.2 times more than under Alternative B) would be made for 10 ACECs, 3 types of recreation sites (the same as Alternative B), and municipal watersheds, resulting in the same type of impacts as those described under Alternative B, but occurring over a larger area.

Alternative D

ROW exclusion and avoidance areas would have similar impacts as those described under Alternative A, except that there would be 104,100 acres managed as ROW exclusion areas (56 percent fewer than Alternative A), and 80,500 acres managed as ROW avoidance areas (82 percent less than under Alternative A).

Effects of the BLM working with applicants to prioritize co-locating communication site facilities and using existing sites, as feasible, would be the same as those described under Alternative A. However, if the communication site cannot be co-located in one of the delineated areas, a new site may be considered, which may lead to additional disturbance and impacts in other areas.

A total of 7 corridors including 119,100 acres would be delineated for large-scale linear ROWs, such as public utilities and other facilities, which is 3 more corridors on 30,500 acres (35 percent) more than under Alternative A. Delineating corridors would have similar impacts as those described under Alternative B, except that placement of new facilities or upgrades to existing facilities would be determined on a case-by-case basis and would not be required to co-locate in the delineated corridors. If facilities were co-located within the corridors, it would reduce impacts on resources in other locations within the planning area, streamline construction and maintenance of the facilities, and simplify planning for new facilities. However, interactions between certain types of ROWs (e.g., natural gas pipelines and transmission lines due to corrosion problems or two large transmission lines due to decreased reliability rating) may make placement within corridors difficult. Alternative D would

provide the greatest number of options for ROW/facility design and selection of applicants' preferred locations.

Impacts of site facilities and commercial filming authorized under 2920 permits, as well as monitoring and managing trespass actions, would be the same as those described under Alternative B.

Under Alternative D, there would be 36,300 acres of solar emphasis areas (3 times more acres than under Alternative B and 9,200 acres of SEZs that are entirely within the solar emphasis areas boundary; there is no similar action under Alternative A) and 2,600 acres of wind emphasis areas (the same as Alternative B; there is no similar action under Alternative A). The boundary of the Grand Valley OHV Open Area could be modified to accommodate solar development upon receipt of application for development and subsequent approval. This would make more land in the decision area available for solar development and is a long-term, direct effect on the utilization of solar resources.

Alternative D identifies 18,000 acres for land disposals, 1,900 acres (12 percent) more acres than under Alternative A. Lands identified for disposal would have impacts similar to those described under Alternative B. Criteria for disposal would be the same as under Alternative B but would also include lands proximate to cities or towns, lands without legal public access, and lands identified for future industrial growth north of the Grand Junction Regional Airport expansion area.

Delineating 13 cooperative management agreement tracts totaling 2,700 acres would have impacts similar to those described under Alternative A, but impacts would affect 8 more tracts totaling 2,460 acres, almost 10 times more than Alternative A. Tracts that do not have an agreement in place within ten years would be identified for disposal to relieve BLM management of these isolated or difficult to manage tracts.

Areas considered for acquisition would include only lands within or adjacent to WSAs and ACECs.

A petition to withdraw 1,300 acres from locatable mineral entry (94 percent fewer acres than under Alternative B) would be made for the Pyramid Rock ACEC and 3 types of developed recreation sites (the same as Alternative B), resulting in the same type of impacts as described under Alternative B, but occurring over a smaller area.

Cumulative

The CIAA used to analyze cumulative impacts on the uses administered by the lands and realty program is composed of fourth-order watersheds that completely or partially overlap the planning area. Fourth-order watersheds were used as the basic unit of analysis because impacts from most management

actions proposed under the RMP and other existing activity plans are not expected to have cumulative influence beyond this scale. Past, present, and reasonably foreseeable projects, plans, or actions that make up the cumulative impact scenario for lands and realty include the following:

1. Amended Land and Resource Management Plan for Grand Mesa, Uncompahgre, and Gunnison National Forests (1991). This plan sets management, protection, and use goals and guidelines for the Grand Mesa, Uncompahgre, and Gunnison National Forests.
2. Bangs Canyon Land Acquisitions. Completed in 2011.
3. Colorado Canyons National Conservation Area and Black Ridge Canyons Wilderness (2004). This plan sets management, protection, and use goals and guidelines for the McInnis Canyons National Conservation Area.
4. Colorado National Monument General Management Plan Final Environmental Impact Statement (2005). This plan sets management, protection, and use goals and guidelines for the Colorado National Monument.
5. Dominguez-Escalante National Conservation Area Land Acquisitions. Decisions expected in 2012 and 2013.
6. Energy Gateway South 500kV interstate transmission project with one alternative in northwest corner of Mesa County. Decision expected 2014.
7. Final Environmental Impact Statement for White River National Forest (2002). This plan sets management, protection, and use goals and guidelines for the White River National Forest.
8. Interim Management Policy for Dominguez-Escalante National Conservation Area and Dominguez Canyon Wilderness (2010). This plan sets management, protection, and use goals and guidelines for the Dominguez-Escalante National Conservation Area. A new RMP is being prepared and is expected to be implemented in 2012.
9. Moab Field Office RMP (2008). This plan sets management, protection, and use goals and guidelines for the BLM Moab Field Office.
10. Proposed Colorado Mesa University Recreation and Public Purposes Act Land transfer. Completed in 2012.
11. Proposed Grand Junction Regional Airport Land Transfer. Decision expected 2012.
12. Proposed Mountain Island Land Exchange. Decision expected 2012.

13. TransWest Express 600kV interstate transmission project with one alternative in northwest corner of Mesa County. Decision expected 2014.
14. Uncompahgre Basin (1989) and San Juan/San Miguel (1985) RMPs. These plans set management, protection, and use goals and guidelines for the BLM Uncompahgre Field Office.
15. Zephyr 500kV interstate transmission project with multiple alternatives through the Grand Junction FO. Decision time frame unknown.

Increasing demand for disposal lands for community development and increasing interest in utility, mineral, and renewable energy development in the CIAA places a greater demand on lands and realty actions. These demands create the need for land tenure adjustments and additional ROWs for pipelines, transmission lines, and other facilities supporting development. Two land tenure actions are pending decisions. Restrictions on ROWs outlined in the RMP alternatives, combined with restrictions from other management plans in the area, would have a minor cumulative effect by reducing routing options and possibly increasing project construction or implementation costs.

Roadway development activities, the Designation of Energy Corridors on Federal Lands in the 11 Western States PEIS, and ongoing climate changes and anticipated associated changes in the regulation of greenhouse gases would contribute direct and indirect long-term impacts on the utilization of solar and wind resources in the CIAA. The drought that has been experienced across the Western US for the seven or eight years leading up to this RMP revision, if it continues, could indirectly impact the ability for certain water-consuming solar technologies to be implemented in the CIAA.

4.4.5 Energy and Minerals

This section discusses impacts on leasable, locatable, and mineral materials from proposed management actions for other resources and resource uses. Existing conditions concerning energy and minerals are described in **Section 3.3.3**, Energy and Minerals.

Methods of Analysis

This section presents potential impacts on leasable, locatable, and salable mineral (mineral material) resources from management actions for other resource and resource use programs. Leasable minerals include coal, potash, oil and gas, geothermal resources, oil shale, and uranium. Locatable minerals include uranium, vanadium, gold, alabaster, copper, silver, tungsten, gem minerals (e.g., amethyst and fluorite), high-calcium limestone, and zeolite. Salable minerals, also referred to as mineral materials, include sand and gravel, common variety limestone aggregate, building stone, moss rock, cinders (clinker), clay, decorative rock, and petrified wood.

Indicators for impacts on mineral resources are the following:

- The amount of land made unavailable for mineral resource activities;
- The restrictions that may be placed on mineral claiming, leasing, or development; and
- The potential for the presence of mineral resources on these lands.

When an area is withdrawn or closed to mining development, mineral resources can no longer be accessed and extracted. This represents an impact on the potential discovery, development, and use of those resources by decreasing the availability of mineral resources. Where information is available, consideration is given to the development potential for mineral resources within the lands withdrawn or closed. For example, an indicator of a significant impact on mineral resources is if there were a substantial reduction in either of the following:

- Federal leasing and development of oil and gas, coal, salable minerals, or potash in areas with development potential; or
- Areas available for development of locatable minerals.

In areas that are open to mineral development, factors that affect mineral extraction and prospecting include permitting, regulatory policy, public perception and concerns, travel management, transportation, proximity to sensitive areas, low commodity prices, taxes, and housing and other necessities for workers.

The amount of area that would fall under restrictions outlined in **Chapter 2** and the impact of those restrictions on mineral development are presented in **Table 4-38**, Quantitative Impacts on Mineral Resources, and are discussed below in the analysis of each alternative.

The analysis for energy and minerals includes the following assumptions:

- Existing leases and claims would not be affected by the closures or withdrawals proposed under this RMP.
- The Mineral Leasing Act of 1920, as amended, and the Mineral Leasing Act for Acquired Lands of 1947, as amended, would govern the BLM's management of oil and gas leasing on about 570 million acres of BLM, National Forest, and other federal lands, as well as private lands where the federal government has retained mineral rights. The BLM works to ensure that development of mineral resources is in the best interests of the nation.
- Oil and gas operations on existing leases would be subject to COAs by the authorizing officer.

Table 4-38
Quantitative Impacts on Mineral Resources

	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Leasable Minerals (Fluid) [1]				
Closed to fluid mineral leasing and geophysical exploration	96,500	202,400	623,600	100,500
Closed to leasing—BLM surface/federal minerals	96,500	182,700	554,700	100,000
Closed to leasing—Private or state surface/federal minerals	0	19,700	68,900	500
Open to fluid mineral leasing and geophysical exploration	1,134,600	1,028,800	607,600	1,130,700
BLM surface/federal minerals	964,800	878,700	506,700	961,400
Private or state surface/federal minerals	169,800	150,100	100,900	169,300
Open to fluid mineral leasing and geophysical exploration subject to standard lease terms (*not subject* to additional lease stipulations (i.e., NSO, CSU and TL)	524,500	78,800	49,100	186,000
BLM surface/federal minerals	354,700	29,200	21,100	104,900
Private or state surface/federal minerals	169,800	49,600	28,000	81,100
Open to leasing with NSO or surface-disturbing activities stipulation[2]	433,000	429,100	302,900	400,900
BLM surface/federal minerals	433,000	382,200	266,300	349,700
Private or state surface/federal minerals	0	46,900	36,600	51,200
Open to leasing with CSU stipulation[2]	74,100	563,500	326,800	445,800
BLM surface/federal minerals	74,100	527,500	303,500	433,000
Private or state surface/federal minerals	0	36,000	23,300	12,800
Open to leasing with TL stipulation[2]	233,000	401,600	241,600	438,700
BLM surface/federal minerals	233,000	349,400	197,600	405,900
Private or state surface/federal minerals	no data	52,200	44,000	32,800
Salable Minerals				
Closed to salable minerals	274,300	252,400	452,000	155,300
Open to salable minerals	787,100	809,000	609,400	906,100

Table 4-38
Quantitative Impacts on Mineral Resources

	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Open to salable minerals with NSO or surface-disturbing activities stipulation	n/a	307,000	365,600	307,500
Locatable Minerals				
Mining claims within areas withdrawn	1,300	1,300	1,300	1,300
Mining claims within areas petitioned for withdrawal	0	2,400	6,000	0

[1]Total acreage for stipulations is greater than the total acreage within the GJFO boundary because stipulations (NSO, CSU, and TL) may overlap.
[2]Total acreage for individual stipulations are not additive; where overlapping occurs, acres are accounted for only once in the total.
Source: BLM 2010a

- Valid existing leases would be managed under the stipulations in effect when the leases were issued; new stipulations proposed under this RMP would apply on new leases.
- Leasing and drilling could occur only where the management actions described in **Chapter 2** would reasonably allow.
- If an area is leased, it could be developed; however, not all leases would be developed within the life of this RMP.
- As the demand for energy increases, so will the demand for energy resources.
- Stipulations apply to fluid mineral leasing on lands overlying federal mineral estate, which includes federal mineral estate underlying BLM lands, privately owned lands, and state-owned lands. There are 1,231,200 acres of federal mineral estate within the decision area.
- Development potential is broken into six categories based on the GJFO's RFD (BLM 2012a). Areas with potential are characterized as very high, high, moderate, or low; areas with no potential are characterized as very low or no potential.

Effects Common to All Alternatives

Stipulations, while not directly withdrawing or closing areas, impact the availability of fluid mineral resources by restricting the location of surface facilities and methods of development. Under the action alternatives (Alternative B, C and D), the definition of a stipulation has been expanded to include all surface-disturbing activities (and occupancy) associated with land use authorizations, permits, and leases issued on BLM lands. Therefore, under the action alternatives, NSO, CSU, and TL stipulations would restrict the locations

of all surface-disturbing activities associated with land use authorizations, permits, and leases issued on BLM lands. They also would restrict the manner in which the activities may be implemented and when they may occur in areas where they are applied. Most methods of mineral extraction require surface disturbance, such as the construction of roads, well pads, and pipelines. As a result, any stipulation would likely affect the availability of mineral resources. Stipulations would not apply to locatable mineral development.

In areas where NSO stipulations are applied, drilling would need to be done by directional or horizontal methods in order to reach subsurface targets. However, these drilling methods are more expensive, and the target area where they could reach is limited. This means that some minerals may be inaccessible in areas where an NSO stipulation covers a large area or where no leasing is allowed on surrounding lands. Salable minerals are extracted by surface mining, which would be precluded in areas with NSO stipulations. In general, these restrictions could make the extraction of the mineral resources impossible.

In ROW exclusion areas off lease, the placement of ROWs would also be prohibited for new leases. ROWs that serve leases issued under the 1987 RMP and that do not have NSO stipulations may be allowed. During development of oil and gas leases issued under the 1987 RMP most of the lands within those leases that are proposed as ROW exclusion would be managed as ROW avoidance.

CSU stipulations allow some use and occupancy in areas where they are applied. While less restrictive than an NSO, a CSU stipulation allows the BLM to require special operational constraints, to shift the surface-disturbing activity more than 200 meters (656 feet), or to require additional protective measures to protect the specified resource or value, such as special construction techniques for preventing erosion in sensitive soils. While not prohibiting surface-disturbing activities, a CSU stipulation does influence the location and level of operations within the subject area.

Areas where TL stipulations are applied are closed to fluid mineral exploration and development, surface-disturbing activities, and intensive human activity during identified time frames, usually based on seasons or species' breeding times. While some operations would be allowed at all times (e.g., vehicle travel and maintenance), construction, drilling, completions, and other intensive operations would not be allowed during the restricted time frame. Most activities, however, can be initiated and completed outside of the restricted dates specified in the TL stipulation.

Existing mineral leases are not subject to the terms or stipulations of these RMP alternatives. New leases of federal mineral estate with development restrictions, such as overlapping or numerous lease stipulations, may be difficult or uneconomical to develop, depending on the alternative (see **Appendix A**, Figures, and **Appendix B**, Stipulations).

Potential lessees should take into account the possibility that such a lease may not allow for maximum extraction and transport of the mineral resources. Potential lessees considering development of leases should consider whether the restrictions can be dealt with through technical or special engineering means. These would both protect the resource or value of concern for a given stipulation and would economically and efficiently produce the mineral resource. Portions of restricted leases may be more costly to develop and produce and in some cases may not be feasible to develop. Where NSO stipulations would be applied, generally production would come from the edges of NSO blocks or from existing leases that do not have NSO stipulations. The use of directional or horizontal drilling to reach minerals under blocks of NSO could result in increased well densities in the areas where surface occupancy is allowed. Large quantities of oil and gas may not be recoverable from federal mineral estate, depending on the restrictions that apply to the alternative.

Solid Leasable Minerals – Coal

Under all alternatives, areas available for coal resources were refined using the four specific land use screening steps that are unique to developing land use planning decisions for federal coal lands (43 CFR 3420):

1. Identification of coal with potential for development;
2. Determination of whether the lands are unsuitable for coal development;
3. Consideration of multiple use conflicts; and
4. Consultation with surface owners.

Different maximum depths of the coal resources were used between Alternative A (current management) and Alternatives B, C, and D to adjust for new technology that allows deeper coal to be mined. When screening against the criteria listed in 43 CFR 3420, those areas with coal resource potential that also pass the screening criteria are defined as potentially acceptable for coal leasing and development. Those that do not pass the screening criteria are defined as unacceptable for coal leasing and development. Refer to **Appendix N**, Coal Screen Criteria, for a complete description of the coal screening process carried out for the GJFO decision area. Due to the depths of coal resources within the decision area, it is anticipated that all coal would be mined by underground mining techniques.

The areas with high potential for coal development are near the McClane Canyon mine, the proposed Book Cliffs Lease by Application area, and along the Colorado River near the former Roadside Mine. Under all alternatives, the areas within the Demaree Canyon and Little Book Cliffs WSAs would be unacceptable for coal leasing and development; however, industry has not shown interest in these areas, so no impact on coal mining is anticipated.

Solid Leasable Minerals – Leasables, Potash

The potash potential area is centered on the Sinbad Valley in the southwest corner of the planning area. Under all alternatives, the Sewemup WSA would be closed to non-energy mineral leasing, making the eastern edge of the potash potential area unavailable. In 2008, the industry sought prospecting permits for potash, but BLM decisions on these permits have been deferred until completion of this RMP. This is because the current RMP is silent on decisions for non-energy mineral leasing. Management actions that would make areas unavailable to potash leasing would affect potash exploration and possible mining in the near future.

Fluid Leasable Minerals – Oil, Gas, and Geothermal Resources

The total federal mineral estate is 1,231,200 acres. Of this area, 826,300 acres (67 percent) have oil and gas development potential, 665,700 acres of which are leased. Approximately 397,500 acres (32 percent) of the total federal mineral estate have geothermal potential, and there are no geothermal leases within the GJFO decision area. The management actions being considered in this RMP would affect only future leases.

Under all alternatives, WSAs would be closed to oil, gas, and geothermal leasing. The Little Book Cliffs WSA is within the geothermal potential area that lies in the southeastern portion of the planning area. This portion of the potential area would be closed to geothermal leasing under all alternatives.

Wildland fire could affect fluid mineral operations by threatening and burning infrastructure, causing evacuations and interrupting production by shutting in wells and pipelines.

Fluid Leasable Minerals – Oil Shale

The oil shale potential is in the northern portion of the planning area, but there has not been much recent industry interest in developing these resources. Under all alternatives, leasing for underground mining of oil shale would be open on a case-by-case basis on the 560 acres identified in the *Approved Resource Management Plan Amendments/ROD for Oil Shale and Tar Sands Resources to Address Land Use Allocations in Colorado, Utah, and Wyoming and Final Programmatic Environmental Impact* (BLM 2008c). The BLM is reviewing its decisions in the aforementioned plan in a programmatic planning process; any additional decisions would be adopted by this RMP, as applicable. Because there is no current interest in the oil shale deposits in the GJFO decision area, and there is no difference among the alternatives specifically concerning oil shale leasing or extraction, oil shale resources are not discussed in further detail. In the future, any leasing would be evaluated through the BLM NEPA process.

Locatable Minerals

Mineral exploration and development of locatable minerals is allowed under the General Mining Law of 1872 on all BLM-administered public lands unless it is withdrawn from mineral entry. Stipulations do not apply to locatable mineral

development. To restrict locatable mineral development, the BLM must apply to the Secretary of the Interior for withdrawal actions, with subsequent valid existing rights reviews for existing claims.

Under all alternatives, approximately 1,047,100 acres (85 percent) of mineral estate underlying BLM-administered lands would be open to the location of mining claims; approximately 20,100 acres would remain withdrawn from the location of mining claims. Most of the decision area with high potential for locatable minerals has already been claimed, so the management actions being considered in this RMP would affect only future mining claims. As a result, RMP management actions would have limited effects on locatable minerals.

To date, there has been no large-scale exploration or mining for gold in the decision area. Since about 2007, there has been a dramatic increase in filed mining claims and small-scale prospecting and mining along the Dolores River. This is expected to continue if the price of gold continues to rise or remains similar to prices experienced between 2007 and 2012. There is low potential for large-scale mining, but small-scale prospecting and mining are expected to continue.

During past uranium price spikes, exploration and mining were very high in the planning area. Based on interest when uranium prices are high, there is potential for several uranium mines in the uranium high potential area in the southwest portion of the planning area. The Pup Tent (one acre) is the only uranium mine currently withdrawn, making this area unavailable to uranium exploration and mining. Under Alternatives B, C, and D, additional uranium mining sites could be withdrawn for bat roosting (including maternity roosts) and hibernacula. However, if these sites had mining or valid and existing rights, they would not be impacted unless mining claims were dropped or were to become inactive.

Under Alternatives B and C, the proposed Sinbad Valley ACEC would be adjacent to the uranium high potential area and could impact extraction by making resource extraction more controversial.

Salable Minerals

Most of the past and current demand for salable minerals in the decision area has been for sand and gravel. The potential for development is judged to be moderate on BLM lands, as the best-quality deposits and those closest to the demand (for example, Grand Junction) lie on private land. Accelerated urban development in areas such as Whitewater and Grand Junction could lead to demands on sand and gravel deposits immediately outside the Grand Junction city limits. Moderate potential for dimension stone occurs in the southern half of the planning area. The area with moderate potential for clay occurs in a wide swath, from the area around Grand Junction and Whitewater northwest to the Utah border.

General

Public access on lands managed for wilderness characteristics would become more restricted, which would affect leasable and salable mineral development. Instead of having vehicle access into these areas, most access would be restricted to foot or horseback (valid existing rights may be excepted), reducing the amount of mineral exploration and development that could occur.

In conjunction with adjacent private lands, permission from landowners to cross private land to access public land is sometimes denied and could result in mineral resources not being discovered and developed on lands still available to mineral development. Mineral resources in other ownerships may not be developed if the adjacent public lands are withdrawn from mineral entry because the deposit may not be economically feasible to develop if it were to cross ownership and only a portion were available for development.

Alternative A

Solid Leasable Minerals – Coal

Under Alternative A, a maximum depth of 1,500 feet was used to calculate a coal potential area of 337,400 acres (Screen 1). Twenty criteria, based mostly on resource values, were then applied (Screen 2) to determine whether those lands identified as having development potential (Screen 1) were suitable for development. As a result, 11 percent of the decision area with coal potential would remain unacceptable for further coal leasing and development under Alternative A. No additional areas were found unacceptable for further coal leasing and development after multiple land use decisions were evaluated (Screen 3); private surface owners (Screen 4) were not consulted for this land use planning process. Refer to **Appendix N**, Coal Screen Criteria, for a complete description of the coal screening process for the GJFO decision area.

The impact from making lands unacceptable for further coal leasing and development would be the same as those described under Effects Common to All Alternatives. The areas with current and potential near-future coal mining activities would continue to be acceptable to coal mining under this alternative, so there would be no impact on current and potential near-future coal mining.

Solid Leasable Minerals – Non-Energy Leasables, Potash

Under Alternative A, the Sewemup WSA would remain closed to potash mining. This would impact the availability of leasing potash on the eastern edges of the Sinbad Valley potash potential area. None of the remaining potash potential area would be subject to NSO or CSU stipulations under this alternative, but the area would continue to be subject to TLs. This constraint would allow surface-disturbing activities only from May 1 to December 1. As a result, the timing of development would continue to be impacted, but the area where mining would be allowed would not.

Fluid Leasable Minerals – Oil, Gas, and Geothermal

Under Alternative A, 1,134,600 acres (92 percent) of mineral estate would remain open to oil, gas (including unconventional categories such as shale gas), and geothermal leasing and development. Approximately 96,500 acres (8 percent) would remain closed.

Of the 397,500 acres with geothermal potential in the GJFO decision area, 372,193 acres (94 percent) would remain open to leasing. An NSO stipulation would continue to be applied to the Bangs Canyon area. Otherwise, the primary restrictions on geothermal development would continue to be TL stipulations that allow surface-disturbing activities from May 1 to December 1. As a result, the timing of development would continue to be impacted, but the area where development would be allowed would not.

Leasing decisions for oil and gas are presented in **Table 4-39**, Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative A.

Table 4-39
Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative A

Leasable Minerals (Fluid)	With Development Potential	Without Development Potential
Federal Mineral Estate Development Potential	*826,300*	*404,900*
Closed to leasing	52,000	44,500
Open to leasing	774,200	360,300
Open with no stipulations	344,300	180,100
Open with NSO stipulations[1]	281,500	151,500
Open with CSU stipulations[1]	59,300	14,800
Open with TL stipulations[1]	179,100	53,900

Source: BLM 2010a
[1]Total acreage for stipulations is greater than the total acreage within the GJFO boundary because stipulations may overlap.

Of the 1,134,600 acres of federal mineral estate that is currently open to leasing, 774,200 acres (68 percent) has development potential and would remain open under Alternative A. Approximately 344,300 acres (44 percent of lands with development potential) would remain open with no stipulations, providing the most flexibility for oil, gas, and geothermal leasing and development. The remaining 429,900 acres (56 percent of lands with development potential) would have some type of stipulation applied to the leases unless an exception or modification was granted (see **Appendix B**). The types of impacts from applying stipulations in areas with development potential would be the same as those described under Effects Common to All Alternatives.

Locatable Minerals

Under Alternative A, 20,100 acres (1 percent) of mineral estate underlying BLM-administered lands would remain withdrawn from the location of mining claims, and no additional areas would be recommended for withdrawal. Because no new areas would be petitioned for withdrawal, there would be no decrease in the area currently available to the claiming of locatable minerals. Within the area currently withdrawn from the location of mining claims, 1,300 acres remain of active mining claims that could be affected.

The area with high gold potential is in placer deposits along the Dolores River, where gold has been mined in the past. The small-scale prospecting and mining using motorized equipment currently requires a permit, not a mining claim. Under Alternative A, the areas with high gold potential along the Dolores River would continue to not be withdrawn from future claim staking, and permits for motorized small-scale prospecting and mining would still need to be approved. Therefore, current mining would not be impacted.

Salable Minerals

Approximately 274,300 acres (22 percent) of mineral estate underlying BLM-administered lands would remain closed to the disposition of salable minerals, precluding future mining in these areas.

Alternative B

Solid Leasable Minerals – Coal

The coal potential development area under Alternative B would be smaller than under Alternative A because of additional screening criteria requirements under 43 CFR 3420. Under Alternative B, 18 percent of the coal potential area would be managed as unacceptable for coal leasing and development due to screening criteria. This is based on resource values (**Appendix N**, Coal Screen Criteria), which are 7 percent more than under Alternative A. The increase in area unacceptable for coal leasing would not impact current and potential near-future coal mining activities. This is because the areas with current and potential near-future coal mining would be acceptable to coal mining under this alternative.

Under Alternative B, 253,400 acres would be acceptable to coal leasing, 7,900 acres (3 percent) of which would have no stipulations. Areas devoid of stipulations provide the most flexibility for placement of facilities and coal development.

Under Alternative B, 156,900 acres, or 62 percent, of the area acceptable for future coal leasing would be covered by NSO stipulations associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, and ACECs. Other restrictions associated with paleontological resources and national trails also would be covered by these NSO stipulations. An NSO stipulation would restrict the locations and sizes of surface disturbance allowed for potential future exploration and mining and

methane venting and capture. Efforts to maintain natural flows of surface waters could reduce the amount of water available for mining and could restrict the quantity or quality of any mine discharge water. Where mitigation would be required, these mitigations would increase costs and could also limit development options.

The NSO stipulation for steep slopes greater than or equal to 40 percent accounts for the greatest percentage of stipulated acreage. This NSO stipulation, however, has an exception for coal exploration and surface-disturbing activities necessary for developing federally leased coal (e.g., mine portals, roads and pads associated with vent holes, methane capture). This would reduce the area where coal development would be stipulated and would minimize the impact on coal development.

In areas with moderate constraints, such as CSU and TL stipulations, coal could still be developed. However, activities would need to be modified to minimize impacts on the resource or value being protected by the stipulation; alternately, the activity could be shifted more than 200 meters (656 feet) to protect the specified resource or value.

Solid Leasable Minerals – Non-Energy Leasables, Potash

In the decision area, 493,900 acres (47 percent) would be closed to the leasing of non-energy minerals. The current RMP is silent on decisions for non-energy leasables, so a comparison to the baseline is not reasonable. Within the 2,800-acre potash development potential area, 1,900 acres would be closed (500 acres of which are in the Sewemup WSA). An additional 20 acres would be open to leasing with an NSO stipulation, resulting in 880 acres available for exploration or development of potential potash resources in the decision area.

Fluid Leasable Minerals – Oil, Gas, and Geothermal

Under Alternative B, 1,028,800 acres (84 percent) of federal mineral estate would be open to oil, gas, and geothermal leasing and development, a 9 percent decrease from Alternative A. Approximately 202,400 acres (16 percent) of the federal mineral estate would be closed under Alternative B (2.1 times more than under Alternative A).

Of the 397,500 acres with geothermal potential in the GJFO decision area, 337,700 acres (85 percent) would remain open to leasing. Approximately 59,800 acres (15 percent) of the area with geothermal resource potential would be closed to geothermal leasing under this alternative, including the Bangs Canyon area and the Palisade municipal watershed area. Much of the geothermal potential area east of Palisade would be subject to NSO stipulations. The types of impacts would be the same as those described under Effects Common to All Alternatives.

Leasing decisions for oil and gas are presented in **Table 4-40**, Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative B.

Table 4-40
Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative B

Leasable Minerals (Fluid)	With Development Potential	Without Development Potential
Federal Mineral Estate Development Potential	*826,300*	*404,900*
Closed to Leasing	69,300	133,200
Open to Leasing	757,000	271,800
Open with No Stipulations	42,800	36,000
Open with NSO Stipulations[1]	335,400	93,800
Open with CSU Stipulations[1]	435,300	128,100
Open with TL Stipulations[1]	278,700	122,900

Source: BLM 2010a
[1] NSO, CSU, and TL stipulations may overlap. As such, the total acreage of stipulations may be greater than the total area open to fluid mineral leasing.

Of the 1,028,800 acres of federal mineral estate that would be open to leasing, 757,000 acres (74 percent) would be open in areas with development potential. Approximately 42,800 acres (6 percent of lands with development potential) would be open with no stipulations. The remaining 714,200 acres (94 percent of lands with development potential) would have some type of stipulation applied to the leases unless an exception or modification was granted (see **Appendix B**, Stipulations). The types of impacts from applying stipulations in areas with development potential would be the same as those described under Effects Common to All Alternatives.

This alternative would increase restrictions on development when compared to Alternative A. Of the 757,000 acres of federal mineral estate that would be open to leasing and that have development potential, 335,400 acres (44 percent) would be subject to an NSO stipulation (19 percent more acres than under Alternative A), 435,300 acres (57 percent) would be subject to a CSU stipulation (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), and 278,700 acres (37 percent) would be subject to a TL stipulation (56 percent more acres than under Alternative A; see **Table 4-38**, Quantitative Impacts on Mineral Resources. These restrictions would result from management actions associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, areas where coal and gas storage are incompatible with oil, gas, and geothermal leasing and development, ACECs, and other restrictions associated with paleontological resources and national trails. Stipulations would restrict the locations and sizes of surface disturbance allowed for oil, gas, and geothermal development in specific areas. As a result, the cost of extraction could increase, and the resource could be inaccessible in places due to technical reasons, such

as if the resource were too far to reach with directional or horizontal drilling, thereby making some of the federal mineral estate effectively inaccessible.

Locatable Minerals

Under Alternative B, 20,700 acres would be recommended for withdrawal from the location of mining claims (preventing the location of future mining claims). Combined with the additional 20,100 acres previously withdrawn (Alternative A), the availability of locatable minerals would be limited on 40,800 acres, or 4 percent of the mineral estate underlying BLM-administered lands (2.1 times more acres than under Alternative A). Lands recommended for withdrawal under this alternative could affect 2,400 acres of active mining claims. The types of impacts would be the same as those described under Effects Common to All Alternatives.

Under Alternative B, the center of the area with moderate copper and silver potential would be petitioned for withdrawal as part of the designation of the Sinbad Valley ACEC, reducing the potential for the development of a future copper/silver mine in the decision area.

The proposed Sinbad Valley ACEC would be outside of the uranium high potential area; nevertheless, this ACEC designation could impact extraction activities in the high potential area by making them more controversial.

Salable Minerals

Of the 1,061,400 acres in the decision area, 252,400 acres would be closed to the disposition of salable materials (mineral material), 8 percent fewer acres than under Alternative A. An additional 307,000 acres open to mineral material development would be subject to NSO stipulations under this alternative. Disposition of mineral materials requires surface mining, so NSO stipulations would effectively close these areas to mining mineral materials unless an exception were granted.

Certain CSU and TL stipulations would restrict the locations, sizes, and timing of surface disturbance allowed for potential future mining. These stipulations are associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, and ACECs, as well as other restrictions associated with paleontological resources,

Alternative C

Solid Leasable Minerals – Coal

Under Alternative C, 19 percent of the area with coal potential would be managed as unacceptable for coal leasing due to screening criteria based on resource values (**Appendix N**). This is 8 percent more than under Alternative A. The types of impacts would be the same as those described under Effects Common to All Alternatives.

Under Alternative C, 251,200 acres would be acceptable to coal leasing, 12,100 acres of which (less than one percent) would have no stipulations. Impacts would be similar to those described under Alternative B.

NSO stipulations associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, and ACECs, as well as other restrictions associated with paleontological resources, would cover 225,500 acres, or 90 percent, of the area acceptable for coal leasing, thereby restricting the locations and sizes of areas of surface disturbance associated with coal development activities. Alternative C would be the most restrictive alternative with more NSO stipulations applied than any other alternative. Furthermore, no NSO exceptions for surface-disturbing activities necessary for federally leased coal would be granted under this alternative. As a result, impacts on coal mining could occur.

In areas with moderate constraints, such as CSU and TL stipulations, impacts on coal development activities would be similar to those described under Alternative B.

Solid Leasable Minerals – Non-Energy Leasables, Potash

In the decision area, 762,900 acres (72 percent) would be closed to the leasing of non-energy minerals. The current RMP is silent on decisions for non-energy leasables; therefore a comparison to the baseline is not reasonable. Within the 2,800-acre potash development potential area, 1,900 acres would be closed (500 acres of which are in the Sewemup WSA). An additional 20 acres would be open to leasing with an NSO stipulation, resulting in 880 acres available for exploration or development of potential potash resources in the decision area.

Fluid Leasable Minerals – Oil, Gas, and Geothermal

Under Alternative C, 607,600 acres (49 percent) of federal mineral estate would be open to oil, gas, and geothermal leasing and development, a 46 percent decrease from Alternative A. Approximately 623,600 acres (51 percent) of the federal mineral would be closed to leasing (6.5 times more than under Alternative A).

Of the 397,500 acres with geothermal potential in the GJFO decision area, 187,400 acres (47 percent) would remain open to leasing. Approximately 210,100 acres (53 percent) of the area with potential for geothermal resources would be closed to geothermal leasing, the highest of any alternative. The area open to geothermal leasing, located generally to the east of Whitewater, would be subject to CSU stipulations, the impact of which would be the same as that described under Effects Common to All Alternatives.

Leasing decisions for oil and gas are presented in **Table 4-41**, Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative C.

Table 4-41
Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative C

Leasable Minerals (Fluid)	With Development Potential	Without Development Potential
Federal Mineral Estate Development Potential	*826,300*	*404,900*
Closed to Leasing	404,400	219,300
Open to Leasing	421,800	185,700
Open with No Stipulations	20,500	28,600
Open with NSO Stipulations[1]	243,000	59,800
Open with CSU Stipulations[1]	228,000	98,800
Open with TL Stipulations[1]	158,800	82,800

Source: BLM 2010a
[1] NSO, CSU, and TL stipulations may overlap. As such, the total acreage of stipulations may be greater than the total area open to fluid mineral leasing.

Of the 607,600 acres of federal mineral estate that would be open to leasing, 421,800 acres (69 percent) would be open in areas with development potential. Approximately 20,500 acres (5 percent of lands with development potential) would be open with no stipulations, providing the least flexibility for oil, gas, and geothermal leasing and development. The remaining 401,300 acres (95 percent of lands with development potential) would have some type of stipulation applied to the leases unless an exception or modification were granted (per **Appendix B**, Stipulations). The types of impacts from applying stipulations in areas with development potential would be the same as those described under Effects Common to All Alternatives.

This alternative would increase restrictions on development in comparison with Alternative A. Of the 421,800 acres of federal mineral estate that would be open to leasing that have development potential, 243,000 acres (58 percent) would be subject to an NSO stipulation (14 percent less acres than under Alternative A), 228,000 acres (54 percent) would be subject to a CSU stipulation (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), and 158,800 acres (11 percent) would be subject to a TL stipulation (24 percent less acres than under Alternative A) (**Table 4-38**, Quantitative Impacts on Mineral Resources). Restrictions would result from management actions associated with soils, water resources, special status species habitat, old-growth forest, important fish and wildlife areas, wild horses, cultural resources, visual resources, lands with wilderness characteristics, recreation, areas where other mineral resources or operations are incompatible with oil, gas, or geothermal leasing and development, ACECs, national historic trails, and backcountry byways, as well as other restrictions associated with paleontological resources and WSR eligible segments.

Stipulations would restrict the locations and sizes of surface disturbance allowed for oil, gas, and geothermal development in specific areas. As a result, the cost of extraction could increase, and the resource could be inaccessible in places due to technical reasons, such as the resource is too far to reach with directional or horizontal drilling, thereby making some of the federal mineral estate effectively inaccessible.

Locatable Minerals

Under Alternative C, 45,100 acres would be recommended for withdrawal from mineral entry (preventing the location of future mining claims). Combined with the additional 20,100 acres previously withdrawn (under Alternative A), the availability of locatable minerals would be limited on 65,200 acres, or 6 percent of the mineral estate underlying BLM-administered lands (3.2 times more acres than under Alternative A). Lands recommended for withdrawal under this alternative could affect 6,000 acres of active mining claims. The types of impacts would be the same as those described under Effects Common to All Alternatives.

The area with high gold potential along the Dolores River would be withdrawn from claiming under Alternative C. Permitted recreational placer activity would only be allowed to continue on valid and existing mining claims.

Like under Alternative B, under Alternative C, the center of the area with moderate copper and silver potential would be withdrawn as part of the proposed Sinbad Valley ACEC. This withdrawal would decrease the potential for the future development of a copper/silver mine in the decision area.

The proposed Sinbad Valley ACEC would border the uranium high potential area, but its designation would not impact the potential for future uranium mining because it would not overlap the high potential area.

Salable Minerals

Under alternative C, 452,000 acres would be closed to the disposition of salable materials (mineral materials) (57 percent more acres than under Alternative A). An additional 365,600 acres open to mineral material development are subject to NSO stipulations under this alternative. Disposition of mineral materials requires surface mining methods. Therefore, NSO stipulations would effectively close these areas to mining mineral materials unless an exception was granted.

CSU and TL stipulations associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, and ACECs, as well as other restrictions associated with paleontological resources, would cover much of the open area and would restrict the locations, sizes, and timing of surface disturbance allowed for potential future mining activities. The types of impacts would be the same as those described under Effects Common to All Alternatives, but Alternative C would be the most

restrictive because more stipulations would be applied than under any other alternative.

Alternative D

Solid Leasable Minerals – Coal

Under Alternative D, 16 percent of the area with coal potential would be managed as unacceptable for coal leasing due to screening criteria based on resource values (**Appendix N**), which is 3 percent more than under Alternative A. The types of impacts would be the same as those described under Effects Common to All Alternatives.

Under Alternative D, 265,600 acres would be acceptable to coal leasing. Of that total, 44,900 acres (17 percent) would have no stipulations. Impacts would be similar to those described under Alternative B.

The types of impacts from applying stipulations within the area acceptable for coal leasing would be similar to those described under Alternative B (including the exception for coal exploration and development activities in areas with an NSO stipulation for steep slopes). Alternative D would apply fewer NSO stipulations (125,400 acres or 47 percent of the area acceptable for coal leasing) than Alternatives B or C and would thus be less restrictive.

Solid Leasable Minerals – Non-Energy Leasables, Potash

In the decision area, 136,000 acres (13 percent) would be closed to the leasing of non-energy minerals. The current RMP is silent on decisions for non-energy leasables; therefore a comparison to the baseline is not reasonable. Within the 2,800-acre potash development potential area, 500 acres of the Sewemup WSA would be closed, and an additional 250 acres would be open to leasing with an NSO stipulation, leaving 2,050 acres available for exploration or development of potential potash resources in the decision area.

Fluid Leasable Minerals – Oil, Gas, and Geothermal

Under Alternative D, 1,130,700 acres (92 percent) of federal mineral estate would be open to oil, gas, and geothermal leasing and development, a less than one percent decrease from Alternative A. Approximately 100,500 acres (9 percent) of federal mineral estate would be closed under Alternative D (4 percent increase from Alternative A).

Of the 397,500 acres with geothermal potential in the GJFO decision area, 369,100 acres (93 percent) would remain open to leasing. Approximately 28,400 acres (7 percent) of the area with potential for geothermal resources would be closed to geothermal leasing. The area open to geothermal leasing, located generally to the east of Whitewater, would be subject to CSU stipulations, the impact of which would be the same as that described under Effects Common to All Alternatives.

Leasing decisions for oil and gas are presented in **Table 4-42**, Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative D.

Table 4-42
Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative D

Leasable Minerals (Fluid)	With Development Potential	Without Development Potential
Federal mineral estate development potential	*826,300*	*404,900*
Closed to leasing	52,900	47,600
Open to leasing	773,400	357,300
Open with no stipulations	126,500	59,500
Open with NSO stipulations[1]	274,100	126,800
Open with CSU stipulations[1]	316,600	129,200
Open with TL stipulations[1]	265,000	153,700

Source: BLM 2010a
[1] NSO, CSU, and TL stipulations may overlap. As such, the total acreage of stipulations may be greater than the total area open to fluid mineral leasing.

Of the 1,130,700 acres of federal mineral estate that would be open to leasing, 773,400 acres (68 percent) would be open in areas with development potential. Approximately 126,500 acres (16 percent of lands with development potential) would be open with no stipulations. The remaining 646,900 acres (84 percent of lands with development potential) would have some type of stipulation applied to the leases unless an exception or modification were granted (see **Appendix B**, Stipulations). The types of impacts from applying stipulations in areas with development potential would be the same as those described under Effects Common to All Alternatives.

This alternative would increase restrictions on development compared to Alternative A. Of the 773,400 acres of mineral estate that would be open to leasing with potential, 274,100 acres (35 percent) would be subject to an NSO stipulation (3 percent less acres than under Alternative A), 316,600 acres (41 percent) would be subject to a CSU stipulation (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), and 265,000 acres (34 percent) would be subject to a TL stipulation (48 percent more acres than under Alternative A; **Table 4-38**, Quantitative Impacts on Mineral Resources). These restrictions result from management actions associated with soils, water resources, special status species habitat, woodlands and old-growth forest, fish and wildlife areas, wild horses, cultural resources, visual resources, and recreation. They also result from management actions for areas where other mineral resources or operations are incompatible with oil, gas, or geothermal leasing and development, ACECs, national historic trails, and backcountry byways, as well as other restrictions associated with paleontological resources.

Stipulations would restrict the locations and sizes of surface disturbance allowed for oil, gas, and geothermal development in specific areas. As a result, the cost of extraction could increase, and the resource could be inaccessible in places due to technical reasons, such as if the resource were too far to reach with directional or horizontal drilling, thereby making some of the federal mineral estate effectively inaccessible.

Locatable Minerals

Under Alternative D, 1,300 acres would be recommended for withdrawal from the location of mining claims, thereby preventing the location of future mining claims. Combined with the additional 20,100 acres previously withdrawn, the availability of locatable minerals would be limited on 21,400 acres, or 2 percent of the mineral estate underlying BLM-administered lands (slightly more acres than under Alternative A). No mining claims would be affected by lands recommended for withdrawal under this alternative. The types of impacts would be the same as those described under Effects Common to All Alternatives.

The area with high gold potential along the Dolores River would not be withdrawn from future claiming under Alternative D. Permits for recreational mining could be approved, meaning users engaging in this activity would not be displaced.

Salable Minerals

Under Alternative D, 155,300 acres would be closed to the disposition of salable minerals (mineral materials) (40 percent fewer acres than under Alternative A). An additional 307,500 acres open to mineral material development would be subject to NSO stipulations under this alternative. Disposition of mineral materials requires surface mining, so NSO stipulations would effectively close these areas to mining mineral materials unless an exception were granted.

Much of the area would be covered by CSU and TL stipulations associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, and ACECs, as well as other restrictions associated with paleontological resources. These stipulations would restrict the locations, sizes, and timing of surface disturbance allowed for potential future mining. The types of impacts would be the same as those described under Effects Common to All Alternatives, but Alternative D, with its fewer stipulations, would be more flexible than Alternatives B and C.

Cumulative

The CIAA for locatable minerals, mineral materials, and non-energy leasable minerals is the GJFO planning area, regardless of land ownership. Impacts on mineral resources that are individually minor may cumulatively reduce exploration and production of commodities from BLM-administered public lands. The BLM has no control over many of the factors that affect mineral extraction and prospecting. These factors include regulatory policy, public

perception and concerns, transportation, well spacing, low commodity prices, taxes, and housing and other necessities for workers. Issues under BLM control are discussed earlier in this section, and most preclude the leasing or development of mineral resources or the additional costs to projects.

Coal exploration and development would continue under all alternatives on existing leases. However, new coal leases and development would be impacted from an increase in the amount of lands allocated as unacceptable for coal leasing and development. An increase in stipulations across all alternatives, specifically NSO stipulations, would reduce exploration and methane capture opportunities.

Potash exploration and mining would be limited under Alternatives B, C, and D. Most of the 2,800-acre potash development potential area, centered on the Sinbad Valley in the southwest corner of the planning area, would be closed to leasing of non-energy minerals or would be covered with an NSO stipulation. However, since the current RMP is silent on non-energy leasing decisions, all action alternatives would provide more opportunities for potash exploration and mining than would Alternative A.

Interest in domestic oil and gas exploration and development mirrors the swings in the mineral commodity prices. As the price increases, the development of existing leases increases, as well as the demand for new leases, even in areas with less development potential. Stipulations on oil and gas leasing would have a cumulative effect on the ability to develop these resources. As interest in renewable energy development grows, the demand for geothermal leases is expected to increase.

Locatable mineral development is an ongoing enterprise in the planning area and would continue under all alternatives. As prices for gold remain high, exploration for gold is expected to increase. Mining for copper and silver would be impacted under Alternatives B and C because the center of the moderate copper and silver potential area would be withdrawn as part of designating the Sinbad Valley ACEC.

Salable mineral extraction and use is expected to increase, along with increasing mining activity, commercial development, recreation, and private property development, especially along the Interstate 70 and state highway corridors. As the amount of BLM-administered public land available for disposition of salable materials is reduced from Alternative A (by 53 percent under Alternative B, 55 percent under Alternative C, and 37 percent under Alternative D), demand for salable minerals would increase in other areas.

Mineral exploration and development would continue to occur under all alternatives. However, acreages open to exploration and development would vary by alternative. Overall, Alternative C would be the most restrictive to mineral development and could result in the greatest number of cumulative

impacts. Alternative A would be the least restrictive to mineral development and could result in the fewest cumulative impacts.

4.5 SPECIAL DESIGNATIONS

This section is a description of the special designation areas in the GJFO planning area and follows the order of topics addressed in **Chapter 3**:

- Wilderness Study Areas;
- Areas of Critical Environmental Concern;
- Wild and Scenic Rivers;
- National Trails; and
- National, State, and BLM byways.

4.5.1 Wilderness Study Areas

This section discusses impacts on WSAs from proposed management actions of other resources and resource uses. Existing conditions concerning WSAs are described in **Section 3.4.1**, Wilderness Study Areas. The size and number of WSAs would be the same under all alternatives and is described in **Table 2-1**.

Methods of Analysis

Indicators of impacts on WSAs include the following:

- Potential changes in wilderness characteristics (naturally appearing, opportunities for solitude or primitive and unconfined recreation, and unique or supplemental values) within the WSAs.
  - Naturally Appearing—Status of native biological communities; abundance and distribution of nonindigenous species; AUMs of livestock use inside the WSA;
  - Opportunities for Solitude or Primitive and Unconfined Recreation—Amount of visitor use; area of WSA affected by travel routes; type and number of agency provided and user-created recreation facilities; type and extent of management restrictions;
  - Unique and Supplemental Values—Severity of disturbances to cultural resources; status of indigenous species that are listed or that are candidates for listing as threatened or endangered.

Impacts on the wilderness characteristics of untrammeled, natural, and undeveloped appearance, opportunities for solitude or primitive and unconfined recreation, and unique or supplemental values are considered in this analysis.

The analysis includes the following assumptions:

- WSAs in the planning area would continue to be managed according to Interim Management Policy for Lands under Wilderness Review (H-8550-1; BLM 1995a) until Congress either designates or releases all or portions of the WSAs from further consideration.
- Management of WSAs is subject to valid existing rights and grandfathered uses under all alternatives, as consistent with the Interim Management Policy for Lands Under Wilderness Review.
- Actions that would "impair the suitability of WSAs for preservation as wilderness" would not be permitted unless they were to meet one of the following exception criteria described in H-8550-1, Interim Management Policy for Lands under Wilderness Review (BLM 1995a):
  - Emergencies, such as suppression activities associated with wildfire or search and rescue operations;
  - Reclamation activities designed to minimize impacts on wilderness values created by Interim Management Policy violations and emergencies;
  - Uses and facilities that are considered grandfathered or valid existing rights under the Interim Management Policy;
  - Uses and facilities that clearly protect or enhance the land's wilderness values or that are the minimum necessary for public health and safety in the use and enjoyment of the wilderness values; and,
  - Reclamation of pre-FLPMA impacts.
- All activities approved in a WSA would be closely managed to ensure that it would not impair the area's wilderness characteristics and therefore its suitability for designation as wilderness. Preservation of wilderness characteristics within a WSA is paramount and should be the primary consideration when evaluating any proposed action or use.
- Impacts on wilderness and WSAs from implementing management actions for other resources, resource uses, and special designations would be considered negligible. Allowable uses in WSAs are permitted if they meet the "nonimpairment" standard.
- Implementation-level activities within wilderness and WSAs would be evaluated on a case-by-case basis to determine how the activity would impact the wilderness characteristics; actions may enhance wilderness characteristics or may be detrimental to wilderness characteristics.

- WSAs, if released by Congress, would still contain wilderness characteristics, and BLM management could impact those characteristics.

Effects Common to All Alternatives

Effects of Wilderness Study Areas Management

Because the BLM would not permit any actions that impair a WSA's wilderness characteristics, such impacts would only occur from activities associated with valid existing rights or grandfathered uses. There may be indirect impacts from management of other resources that would enhance wilderness characteristics; however, such impacts are generally negligible because protections are not as strict as those afforded to WSAs, in accordance with the BLM's Interim Management Policy for Lands under Wilderness Review (BLM 1995a).

The oil, gas, and coal leases in Demaree Canyon and Little Book Cliffs WSAs (described in **Section 3.4.1**) are considered valid existing rights and have existing structures (including access roads, drill pads, wells, and pipeline gathering systems). The mineral rights and structures exist even though they can compromise wilderness characteristics, especially during minerals extraction. The Interim Management Policy for Lands under Wilderness Review (BLM 1995a) states that mining and mineral leasing uses can continue in the manner and to the degree in which these uses were being conducted at the time FLPMA was passed, as long as they do not cause unnecessary or undue degradation of the lands. While this clause allows for a natural progression of development, new impacts cannot be of a significantly different type than the impacts involved with the pre-FLPMA activity. Depending on the location of mineral extraction sites throughout the WSAs, impacts could be localized if production areas were concentrated, or impacts could be more widespread if sites of active production were dispersed throughout the WSA. Regarding coal extraction, the severity of impact on wilderness characteristics would depend on whether mines were surface or subsurface. In subsurface mining, values impacted could include undeveloped values and opportunities for solitude (when mining is active), whereas wilderness characteristics and unconfined recreation would be affected with surface mining.

Mining claims are next to the Sewemup Mesa WSA boundary. If developed, associated activities could impact visitors' perceptions if the activities were visible from within the WSA. The nearness of the land with compromised wilderness characteristics and recreation values would in turn affect the perception of similar values within the Sewemup Mesa WSA, particularly opportunities for solitude and scenic and ecological values.

A recent proposal was submitted to the BLM for potash exploration next to the Sewemup Mesa WSA boundary. If potash were discovered, activities associated with its development could be incompatible with the protection of wilderness

character in the WSA. These characteristics would be perceived as degraded, particularly opportunities for solitude and scenic and ecological values.

Existing range improvements constitute a valid existing right and would continue to be maintained. Structures may diminish the undeveloped characteristics of WSAs. Grazing itself would continue in the same manner and at the same degree of physical and visual impacts that existed at the time of the passage of FLPMA; cattle grazing may impact the untrammelled characteristic of the WSAs.

Changes in grazing may be allowed in number, kind, or season of use if, following the preparation of an environmental assessment (if not adequately addressed in an existing NEPA document), the effects were found to be negligible (BLM 1995a). Livestock grazing is considered a valid existing right in all WSAs, except Sewemup Mesa and Little Book Cliffs, which is in the LBCWHR. Structures used for grazing, such as fences, stock trails, springs, and stock ponds, exist in these areas, with human-made stock ponds being widespread throughout the grazing allotments.

Wild horse grazing within the LBCWHR could impact various wilderness characteristics. This is because grazing and other activities of horses could degrade the landscape, thereby potentially impacting the naturalness and untrammeled nature of the Little Book Cliffs WSA. Ultimately, the BLM would strive to minimize the impacts on relevant wilderness characteristics through proper management of the wild horse population.

The Palisade WSA has seen an increase in recreational rock climbing in a small area due to the use of one permit for guided climbing trips into the area. While some climbers have expressed interest in adding permanent climbing bolts in the WSA (which could impact wilderness characteristics), the area is used mostly by the permittee, and public interest for climbing in the area remains low.

Stipulations, closures, and exclusion areas implemented to protect soil resources may indirectly improve the naturalness of WSAs. The protection of soil resources outside of WSAs or lands with wilderness characteristics (described in **Section 4.3.12**) would in turn lead to heightened wilderness characteristics for any existing WSA. Stipulations, closures, and exclusion areas could have the same effect on water resources via the lack of interference with hydrologic processes.

In WSAs, all fire and seeding treatments would have to conform to Interim Management Policy; therefore, impacts on WSAs would likely be negligible.

Managing all WSAs as VRM Class I contributes to the protection of the wilderness characteristics of untrammeled and natural appearance. All WSAs would be managed as ROW exclusion areas, which would help preserve the wilderness characteristics of the WSAs. The BLM would consider the

acquisition of lands within or next to WSAs in order to enhance wilderness characteristics.

WSAs are closed to fluid mineral leasing and have an NSO stipulation. These restrictions would help protect all wilderness characteristics. The Demaree and Little Book Cliffs WSAs are closed to coal leasing, which further protects wilderness characteristics. Sewemup Mesa and the Palisade WSAs are not within the coal potential area, so impacts from coal are null in these WSAs.

Effects of Management Should Congress Release WSAs from Wilderness Consideration
This section discusses the effects of managing released WSA lands on wilderness characteristics. Effects of managing released WSA lands on other resources and resource uses are discussed in general within those other resource and resource use sections of this chapter.

Closing released WSA lands to public motorized use, not including administrative use (e.g., motorized use associated with grandfathered uses and valid existing rights, such as livestock grazing permittees), would protect the wilderness characteristics. This would be accomplished by restricting activities that could impact natural and untrammeled appearance and opportunities for solitude and primitive/unconfined recreation.

There is the potential for degradation of wilderness characteristics of released WSA lands from motorized and mechanized travel on designated routes. Such travel could impact natural and untrammeled appearance and opportunities for solitude and primitive and unconfined recreation.

Closing released WSA lands to wood product sales and harvest (including Christmas tree harvest) would minimize impacts on wilderness characteristics. Opening released WSA lands to wood product sales and harvest could diminish opportunities for solitude and degrade scenic and ecological values.

Prohibiting issuance of SRPs for competitive events would result in visitor numbers and noise likely remaining at low levels, and the retention of naturalness, solitude, and opportunities for primitive and unconfined recreation. Issuing SRPs for competitive events on released WSA lands would have the opposite effect because high concentrations of recreation users (large groups or frequent group encounters) would decrease outstanding opportunities for solitude.

Managing released WSA lands as ROW exclusion areas would help preserve all wilderness characteristics of those lands. Managing released WSA lands as ROW avoidance areas would have the same effect on those lands where ROWs are not developed.

Closing released WSA lands to mineral material disposal, non-energy leasable mineral exploration and development, coal leasing, and fluid mineral leasing and

geophysical exploration would help protect all wilderness characteristics. Opening released WSA lands to any of these uses would diminish opportunities for solitude and could degrade scenic and ecological values. All WSAs in the planning area are located in areas of low to no development potential for oil and gas and moderate to no development potential for coalbed natural gas. Parts of the Little Book Cliffs and Demaree Canyon WSAs, however, may be available for coal development, as they are located within the coal potential area. Such development would diminish opportunities for solitude and could degrade scenic and ecological values.

Applying NSO stipulations and prohibiting surface-disturbing activities and new developments on released WSA lands would protect naturalness.

Managing released WSA lands as VRM Class I would contribute to the protection of the wilderness characteristics of untrammeled and natural appearance. Managing released WSA lands as VRM Class II or III would allow some modifications to the landscape that could impair the naturalness of the area.

If released by Congress from consideration as a WSA, stipulations, closures, and exclusion areas implemented to protect soil resources may indirectly improve the naturalness of the released lands. If a WSA were released from its WSA status and changed to Wilderness designation or as a land with wilderness characteristics unit managed to protect wilderness characteristics, then management would follow the appropriate management prescriptions. In either case, the protection of soil resources outside of WSAs, Wilderness Areas, or lands with wilderness characteristics (described in **Section 4.3.12**) would in turn lead to heightened wilderness characteristics for any existing WSA or related designation. Stipulations, closures, and exclusion areas could have the same effect on water resources via the lack of interference with hydrologic processes.

Implementing management for the following resources would have negligible or no impact on WSAs and are therefore not discussed in detail: forestry; recreation; national trails; national, state, and BLM byways; and interpretation and environmental education.

Alternative A

Effects of Wilderness Study Areas Management

Alternative A would allow resource uses in WSAs that maintain each area's suitability for preservation as wilderness and protects the viability of current wilderness characteristics.

Regarding travel management, there is the potential for degradation of wilderness characteristics in WSAs from motorized and mechanized travel on

existing ways. Such travel could impact natural and untrammeled appearance and opportunities for solitude and primitive/unconfined recreation.

Effects of Management Should Congress Release WSAs from Wilderness Consideration
The purpose of **Table 4-43**, Impacts on Released Wilderness Study Area Lands by Alternative, is to summarize by alternative the various management actions that would result in each WSA should it be released.

Table 4-43
Impacts on Released Wilderness Study Area Lands by Alternative[1]

Management Action	Alternative A				Alternative B				Alternative C				Alternative D			
	S	D	P	L	S	D	P	L	S	D	P	L	S	D	P	L
Close to public motorized use	S		P[2]		S		P	L[3]	S	D	P	L[3]				
Close to public mechanized use					S				S	D	P	L[3]				
Seasonally close to public motorized use		D[2]		L[2]												
Limit public motorized use to designated routes			P[2]	L[2]		D		L[4]				L[4]	S	D	P	L
Limit public mechanized use to designated routes			P[2]			D	P	L[3]					S	D	P	L[3]
Limit public motorized use to existing routes		D[2]	P[2]													
Open to all modes of travel				L[2]												
Consider SRPs for competitive events	S	D	P	L		D		L[3]					S	D	P	L[3]
Prohibit SRPs for competitive events					S		P		S	D	P	L[3]				
Open to wood product sales and harvest						D	P							D		L[3]
Unsuitable for forest harvest (Alt. A)/ closed to wood product sales and harvest (Alts. B-D)	S	D	P	L	S			L[3]	S	D	P	L[3]	S		P	
Sensitive to public utility development (Alt. A)/ ROW avoidance (Alts. B-D)	S[2]	D[2]	P[2]	L[2]		D	P	L					S	D	P	L
Unsuitable for public utilities (Alt. A)/ROW exclusion (Alts. B-D)	S[2]	D[2]	P[2]	L[2]	S				S	D	P	L				

Table 4-43
Impacts on Released Wilderness Study Area Lands by Alternative[1]

Management Action	Alternative A				Alternative B				Alternative C				Alternative D			
	S	D	P	L	S	D	P	L	S	D	P	L	S	D	P	L
Open to mineral material sales		D[2]		L[2]		D	P						S	D		L[3]
Close to mineral material sales	S	D[2]	P	L[2]	S			L[3]	S	D	P	L[3]			P	
Open to non-energy leasable minerals						D	P						S	D	P	L[3]
Close to non-energy leasable minerals					S			L[3]	S	D	P	L[3]				
VRM Class I	S		P[2]													
VRM Class II			P[2]	L[2]	S	D	P	L[3]	S	D	P	L[3]			P	
VRM Class III		D[2]	P[2]	L[2]									S	D		L[3]
VRM undesignated		D[2]		L[2]												
Open to fluid mineral leasing						D		L[3]					S	D	P	L[3]
Close to fluid mineral leasing	S	D	P	L	S		P		S	D	P	L				
Subject to no surface occupancy and no surface-disturbing activities stipulation					S	D	P	L	S	D	P	L			P	

[1]S=Sewemup Mesa WSA (17,800 acres); D=Demaree Canyon WSA (22,700 acres); P=The Palisade WSA (26,700 acres); L=Little Book Cliffs WSA (29,300 acres)
[2]This action would apply to only a portion of the noted WSA lands if released.
[3]This action would apply to only that portion of the Little Book Cliffs WSA lands, if released, that are outside the LBCWHR (6,500 acres).
[4]This action would apply to only that portion of the Little Book Cliffs WSA lands, if released, that are within the LBCWHR (22,800 acres).

If Congress were to release the Little Book Cliffs WSA from wilderness consideration, then managing lands under the 1987 RMP would include the prescriptions summarized in **Table 4-43**. Opening released Little Book Cliffs WSA lands to all modes of travel would degrade wilderness characteristics. Such travel would impact natural and untrammeled appearance and opportunities for solitude and primitive and unconfined recreation.

Under Alternative A, if Congress were to release any of the four WSAs from wilderness consideration, wilderness characteristics would not be preserved for the long term, and any wilderness characteristics would only be protected indirectly from other resource management.

Alternative B

Effects of Wilderness Study Areas Management

Lands managed for wilderness characteristics, where they are next to WSAs, could create additional protection for WSAs because the management for the areas is similar. A wider expanse of contiguous land containing WSAs and lands managed for wilderness characteristics could therefore heighten protection within WSAs and could further ensure the integrity of wilderness characteristics. Under Alternative B, The Palisade would be contiguous with the West Creek (adjacent) lands with wilderness characteristics unit.

Wilderness study areas would be closed to motorized use, except for administrative use, including routes associated with grandfathered uses and valid existing rights. Closing WSAs to motorized use would protect the wilderness characteristics in these areas by restricting activities that could impact natural and untrammeled appearance and opportunities for solitude and primitive and unconfined recreation.

If Congress were to release any WSAs, except for the Little Book Cliffs WSA, from wilderness consideration, the lands may still receive some protection by being managed according to management prescriptions for lands with wilderness characteristics (see **Section 4.3.12**). If Congress were to release the Little Book Cliffs WSA from wilderness consideration, it would be managed as part of and in accordance with the LBCWHR (see **Section 4.3.7**, Wild Horses).

Effects of Management Should Congress Release WSAs from Wilderness Consideration

Impacts are summarized in **Table 4-43**.

Under Alternative B, if Congress were to release the Sewemup Mesa WSA from wilderness consideration, wilderness characteristics would be preserved for the long term.

If Congress were to release the Little Book Cliffs WSA from wilderness consideration, then that portion overlapping the LBCWHR (22,800 acres) would be managed as part of and in accordance with the Alternative B LBCWHR management prescriptions (see **Table 4-43** and **Section 4.3.7**, Wild Horses). In that portion, the wilderness characteristics of unique and supplemental values would be preserved for the long term. However, the natural and untrammeled appearance and opportunities for solitude and primitive/unconfined recreation could be degraded on that portion overlapping the LBCWHR because motorized travel would be limited to designated routes.

The remainder of the Little Book Cliffs WSA not overlapping the LBCWHR (6,500 acres), if released, would be managed per the prescriptions summarized in **Table 4-43**. On these 6,500 acres, wilderness characteristics would be preserved for the long term.

If Congress were to release Demaree Canyon WSA from wilderness consideration, wilderness characteristics would not be preserved for the long term. Any wilderness characteristics would be protected only indirectly from other resource management.

If Congress were to release The Palisade WSA from wilderness consideration, wilderness characteristics could be indirectly preserved for the long term by prescriptions associated with The Palisade ACEC.

Alternative C

Effects of Wilderness Study Areas Management
The types of impacts from management of lands with wilderness characteristics would be the same as those described under Alternative B.

Effects of Management Should Congress Release WSAs from Wilderness Consideration
Impacts are summarized in **Table 4-43**.

In Congress were to release Alternative C, if Sewemup Mesa, Demaree Canyon, or The Palisade WSAs from wilderness consideration, wilderness characteristics would be preserved for the long term.

If Congress were to release the Little Book Cliffs WSA from wilderness consideration, then that portion overlapping the LBCWHR (22,800 acres) would be managed as part of and in accordance with the Alternative C LBCWHR management prescriptions (see **Table 4-43** and **Section 4.3.7**, Wild Horses). As under Alternative B, in that portion, the wilderness characteristics of unique and supplemental values would be preserved for the long term. However, the natural and untrammeled appearance and opportunities for solitude and primitive and unconfined recreation could be degraded on that portion overlapping the LBCWHR because motorized travel would be limited to designated routes.

The remainder of the Little Book Cliffs WSA not overlapping the LBCWHR (6,500 acres), if released, would be managed in accordance with the prescriptions summarized in **Table 4-43**. On these 6,500 acres, wilderness characteristics would be preserved for the long term.

Alternative D

Effects of Wilderness Study Areas Management
Under Alternative D, there are no lands managed for wilderness characteristics contiguous with any existing WSAs. Impacts would be similar to those described under Alternative A.

Under Alternative D, WSAs would be closed to motorized and mechanized use, and the same management prescriptions and impacts from comprehensive travel and transportation management would apply as described under Alternative B.

Effects of Management Should Congress Release WSAs from Wilderness Consideration
Impacts are summarized in **Table 4-43**.

Under Alternative D, if Congress were to release the Sewemup Mesa or Demaree Canyon WSAs from wilderness consideration, wilderness characteristics would not be preserved for the long term. Any wilderness characteristics would be protected only indirectly from other resource management.

If Congress were to release the Little Book Cliffs WSA from wilderness consideration, then that portion overlapping the LBCWHR (22,800 acres) would be managed as part of and in accordance with the Alternative D LBCWHR management prescriptions (see **Table 4-43** and **Section 4.3.7**, Wild Horses). The remainder of the Little Book Cliffs WSA not overlapping the LBCWHR (6,500 acres), if released, would be managed in accordance with the prescriptions summarized in **Table 4-43**. On all released Little Book Cliffs WSA lands, the wilderness characteristics of unique and supplemental values would likely be preserved for the long term. However, the natural and untrammeled appearance and opportunities for solitude and primitive and unconfined recreation could be degraded because motorized travel would be limited to designated routes.

If Congress were to release The Palisade WSA from wilderness consideration, wilderness characteristics could be indirectly preserved for the long term by prescriptions associated with The Palisade ACEC.

Cumulative
Montrose County has a Colorado RS 2477 claim to improve an old route that runs along the western boundary of Sewemup Mesa WSA. This improved access route, coupled with an overall increase in use in the Gateway area, could lead to an increase in visitation to this area, which could impact wilderness characteristics.

4.5.2 Areas of Critical Environmental Concern

This section discusses impacts on ACECs from proposed management actions of other resources and resource uses. Existing conditions concerning ACECs are described in **Section 3.4.2**, Areas of Critical Environmental Concern.

Interdisciplinary team meetings were held to discuss citizen ACEC nominations and the effectiveness of current ACEC management areas. The discussions of those meetings are described in **Appendix D**, Summary of Areas of Critical Environmental Concern Report on the Application of Relevance and Importance Criteria, and were used in this analysis.

Methods of Analysis

Impacts identified for ACECs are specific to the area and are based on the effect management actions would have on the relevant and important values of an ACEC, which are identified in **Appendix D**.

Impacts on ACECs include the following:

- Impacts would occur if management actions that fail to "prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards" (BLM Manual 1613, Areas of Critical Environmental Concern) (BLM 1988).

The analysis includes the assumption that although management actions for most resources and resource uses have field-office-wide application, ACEC management prescriptions apply only to those lands within each specific ACEC, as outlined.

Effects Common to All Alternatives

The acreage designated as ACECs under each alternative would be directly correlated with the extent of resources afforded protection throughout the decision area. As such, the more acreage that is designated as an ACEC, the more resources that would be protected.

In general, management actions that protect resources, such as improvements in water quality and quantity, surface disturbance restrictions, management for desired plant communities and habitats, travel restrictions and closures, and recreation restrictions, would help maintain and improve the important and relevant values within ACECs. Impacts would vary depending on the ACEC and the values that would be affected.

In all ACECs, BLM would implement restrictions on surface-disturbing activities, such as requiring NSO stipulations, closure to fluid mineral leasing, and travel and recreation restrictions. These would help protect and prevent damage to the important and relevant values each ACEC was designated to protect. ACECs that overlap with WSAs would receive additional protection from restrictions within WSAs, such as closure to fluid mineral, geothermal, and oil shale leasing, until Congress either designates the WSAs as wilderness or releases them from wilderness consideration. Under all alternatives, exclosures associated with the hydrologic study area within the Badger Wash ACEC would directly protect the important and relevant values from surface disturbance, as large areas are permanently fenced.

Weed treatments within ACECs (such as tamarisk removal along waterways) would cause short-term degradation of certain resources due to increased likelihood of soil erosion and sedimentation and removal of stream shading

vegetation. Over the long term, these treatments would improve the relevant and important biological values within ACECs.

Fish and wildlife, special status species, and cultural resources protections would apply within ACECs and would complement protections within these areas and prevent degradation of ACEC values.

Depending on their extent, location, and severity, wildfires could cause short- and long-term damage to ACEC values through habitat removal, changes to the visual landscape, sedimentation of waterways, increased likelihood of weed invasion and conversion to cheatgrass. ESR techniques would be applied to minimize impacts.

Grazing would be allowed in most ACECs, depending upon the location and alternative. If mismanaged, overgrazing could damage the resources an ACEC was designated to protect through trampling and weed spread, thus degrading habitats and scenic values. Adaptive management would be used to adjust grazing to reduce impacts.

Travel, particularly motorized travel, and utility development within ACECs could cause impacts on ACEC values. Impacts could include flattening or removal of vegetation, desired plant communities, and special status plant species, habitat degradation and fragmentation, weed spread, degradation of scenic resources, damage to cultural or geologic resources, and increased noise. Impacts would be reduced where travel routes are closed or seasonally closed to motorized use, limited to designated routes, or where lands are managed as ROW avoidance or exclusion areas.

Designation of special management areas or management of lands for wilderness characteristics that overlap or lie adjacent to ACECs may also provide some protection of ACEC values due to complementary management objectives.

Quantitative impacts associated with ACECs are shown in **Table 4-44**, Acreage Impacts on Areas of Critical Environmental Concern.

Implementing management for the following resources would have negligible or no impact on ACECs and are therefore not discussed in detail: air quality; wild horses; paleontology; visual resources; national trails; national, state, and BLM byways; Native American tribal uses; public health and safety; socioeconomics; or environmental justice.

Alternative A

Under Alternative A, GJFO would continue to manage five ACECs on 28,900 acres. Impacts would be similar to those described for Effects Common to All Alternatives.

Table 4-44
Acreage Impacts on Areas of Critical Environmental Concern

Resource or Resource Use	Alt A	Alt B	Alt C	Alt D
ACECs	28,900	106,000	168,000	33,200
Livestock Grazing				
Open for Livestock Grazing	26,700	95,200	75,800	30,200
Closed to Livestock Grazing	0	5,900	74,300	1,300
Comprehensive Travel and Transportation Management				
Closed to Motorized Use	6,100	54,400	118,700	30,200
Motorized Use Limited to Existing Routes	100	0	0	0
Motorized Use Limited to Designated Routes	22,600	452,100	49,100	3,000
Open to Intensive Motorized Travel	0	0	0	0
Closed to Mechanized Travel		50,700	116,400	27,900
Limited to Designated Routes for Mechanized Travel		55,800	51,400	5,300
Open to Cross-country Mechanized Travel	0	0	0	0
Closed to Horse Travel	1,300	1,300	1,300	1,300
Designated to Limited Routes for Horse Travel		10,600	2,300	2,300
Open to Cross-country Horse Travel		94,600	164,200	29,600
Closed to Foot Travel	0	0	1,300	0
Designated to Limited Routes for Foot Travel		10,600	2,300	2,300
Open to Cross-country Foot Travel		95,900	164,200	30,900
Lands and Realty				
ROW exclusion areas	16,600	79,000	100,400	32,400
ROW avoidance areas	9,600	26,500	67,400	400
Fluid Mineral Leasing				
Closed to Fluid Mineral Leasing	1,400	52,700	166,000	26,700
NSO	27,400	106,000	168,000	33,200
CSU	1,500	78,000	67,400	5,400
TL	4,900	46,900	71,500	20,000

Source: BLM 2010a

Some restrictions would continue to be applied within ACECs, although management would rely on outdated guidance and may not fully reflect current conditions and issues.

While areas with high cultural or wildlife value would be unsuitable for forestry under this alternative, some impacts from forestry within ACECs would continue to occur since forestry management would not be stringent enough to prevent these impacts.

Under Alternative A, 26,700 acres (93 percent) of ACECs would continue to be open, and no acres would be closed to grazing. Impacts from grazing would be similar to those described for Effects Common to All Alternatives.

The potential for recreation-related impacts would continue where the Rough Canyon ACEC overlaps with the Bangs Canyon SRMA. The overlapping RMZ

would continue to be focused to support the ACEC, which would minimize impacts. If impacts occurred, BLM would change management within the SRMA to help protect the values for which the ACEC was designated.

Under Alternative A, motorized use would continue to be closed on 6,100 acres (22 percent) and limited to designated or existing routes on 22,600 acres (78 percent). As under all alternatives, no areas would be open to intensive use. The types of impacts on ACEC values, as described for Effects Common to All Alternatives, would be reduced or minimized.

ROW exclusion areas would be identified within 16,600 acres (57 percent) of ACECs. In addition, ROW avoidance areas would be identified within 9,600 acres (33 percent) of ACECs. In these areas, impacts on ACEC values described for Effects Common to All Alternatives would be avoided or minimized. Utility development in areas not identified for avoidance or exclusion would continue to cause impacts as described for Effects Common to All Alternatives.

NSO, CSU, and TL stipulations within ACECs are presented in **Table 4-44**. Under Alternative A, 27,400 acres (95 percent) of ACECs would continue to be open to fluid mineral leasing with an NSO stipulation applied. The Unaweep Seep ACEC (80 acres) (less than 1 percent) would be closed to fluid mineral leasing. These restrictions would protect ACEC values from surface disturbance in these areas.

While only a small portion of the areas found to have relevant and important scenic values would be designated as an ACEC, 49 percent of all areas found to have relevant and important scenic values, regardless of ACEC designation, would still be managed as VRM Class I or II, which would help maintain the scenic quality and sensitive landscapes of the areas. However the remaining 51 percent of lands found to have relevant and important scenic values would be managed as VRM Class III (34 percent) or would not have an assigned VRM classification (17 percent), which could result in an impact to the visual quality of the areas or allow landscape modifications in sensitive landscapes that would attract the attention of the casual observer.

Lack of interpretation or environmental education under Alternative A would continue to result in user actions that could degrade ACEC values.

Alternative B

Under Alternative B, 13 ACECs on 106,000 acres (3.7 times more acres than under Alternative A) would be designated. Impacts would be similar to those described for Effects Common to All Alternatives.

Under Alternative B, 95,200 acres (90 percent) of ACECs would be open, and 5,900 acres (6 percent) would be closed to grazing. Impacts from grazing would be similar to those described for Effects Common to All Alternatives.

Impacts from recreation-related impacts would be similar to those described for Alternative A. In addition, the Dolores River Riparian ACEC and Juanita Arch ACEC overlap with the Dolores River Canyon SRMA. The overlapping areas would be focused to support the ACECs, which would minimize impacts. If impacts occurred, BLM would change management within the SRMA to protect the values for which the ACECs were designated.

Under Alternative B, motorized use would be closed on 54,400 acres (51 percent) and limited to designated routes or seasonally closed to motorized vehicles on 52,100 acres (49 percent). Seasonal closures would also apply to mechanized travel, affording another level of protection during sensitive times of year. As under all alternatives, no areas would be open to intensive use. Pyramid Rock ACEC (1,300 acres) would be closed to equestrian use, further reducing travel-related impacts in that area. No areas would be closed to foot travel. The types of impacts on ACEC values from comprehensive travel and transportation management, as described for Effects Common to All Alternatives, would be reduced or minimized.

ROW exclusion areas would be identified within 79,000 acres (75 percent) of ACECs, and ROW avoidance areas would be identified within 26,500 acres (25 percent). In these areas, impacts on ACEC values from utility development, as described for Effects Common to All Alternatives, would be avoided or minimized. Utility development in areas not identified for avoidance or exclusion would cause impacts as described for Effects Common to All Alternatives.

BLM would consider acquisition of lands within or adjacent to ACECs, which could provide for more contiguous BLM-administered public land, prevent encroachment of private development, and enhance the relevant and important values for which the ACEC was designated.

NSO, CSU, and TL stipulations within ACECs are presented in **Table 4-44**. In addition, 52,700 acres (50 percent) of ACECs (including Badger Wash, Dolores River Riparian, Juanita Arch, The Palisade, Rough Canyon, and Sinbad Valley) would be closed to fluid mineral leasing under Alternative B to protect the areas' important and relevant values by prohibiting surface disturbing activities in these areas.

While only a small portion of the areas found to have relevant and important scenic values would be designated as an ACEC, 52 percent of all areas found to have relevant and important scenic values, regardless of ACEC designation, would still be managed as VRM Class I or II, which would help maintain the scenic quality and sensitive landscapes of the areas. However the remaining 48 percent of lands found to have relevant and important scenic values would be managed as VRM Class III, which could result in an impact to the visual quality of the areas or allow landscape modifications in sensitive landscapes that would attract the attention of the casual observer.

Enhanced awareness and appreciation of ACEC values resulting from interpretation and environmental education under Alternative B could result in user actions that would protect ACEC values.

Alternative C

Under Alternative C, 23 ACECs on 168,000 acres (5.8 times more acres than under Alternative A) would be designated. Impacts from recreation, land acquisition, and environmental education would be similar to those described for Alternative B.

Under Alternative C, 75,800 acres (45 percent) of ACECs would be open to grazing and 74,300 acres (44 percent) would be closed to grazing. Impacts from grazing would be similar to those described for Effects Common to All Alternatives.

The Rough Canyon ACEC would overlap with the Bangs SRMA, and the overlapping RMZ would be focused to support the ACEC, which would minimize impacts. If impacts occurred, BLM would change management within the SRMAs to protect the values for which the ACECs were designated.

Under Alternative C, motorized use would be closed on 118,900 acres (71 percent) and limited to designated routes or seasonally closed on 49,100 acres (30 percent). Seasonal closures would also apply to mechanized travel, affording another level of protection during sensitive times of year. As under all alternatives, no areas would be open to intensive use. Pyramid Rock ACEC (1,300 acres) would be closed to all modes of travel, further reducing travel-related impacts in that area. The types of impacts on ACEC values from comprehensive travel and transportation management, as described for Effects Common to All Alternatives, would be reduced or minimized.

ROW exclusion areas would be identified within 100,400 acres (60 percent) of ACECs, and ROW avoidance areas would be identified within 67,400 acres (40 percent). In these areas, impacts on ACEC values from utility development, as described for Effects Common to All Alternatives, would be avoided or minimized.

NSO, CSU, and TL stipulations within ACECs are presented in **Table 4-44**. In addition, 166,000 acres (99 percent) of ACECs would be closed to fluid mineral leasing under Alternative C. These management actions would protect ACEC values from surface disturbance in these areas.

Enhanced awareness and appreciation of ACEC values resulting from interpretation and environmental education under Alternative C could result in user actions that would protect ACEC values.

Alternative D

Under Alternative D, five ACECs would continue to be designated, though the total acreage of these ACECs would increase to 33,200 acres (15 percent more acres than under Alternative A). Impacts from recreation, land acquisition, and environmental education would be similar to those described for Alternative B.

Under Alternative D, 30,200 acres (91 percent) of ACECs would be open, and 1,300 acres (4 percent) would be closed to grazing. Impacts from grazing would be similar to those described for Effects Common to All Alternatives.

For this alternative, the Rough Canyon ACEC would overlap with the Bangs SRMA. Impacts would be similar to those described for Alternative A.

Under Alternative D, motorized use would be closed on 30,200 acres (91 percent) and limited to designated routes on 3,000 acres (9 percent). As under all other alternatives, no acres would be open to cross-country motorized use. Pyramid Rock ACEC (1,300 acres) would be open only to foot travel, further reducing travel-related impacts in that area. No ACECs would be closed to cross-country foot travel. The types of impacts on ACEC values from comprehensive travel and transportation management, as described for Effects Common to All Alternatives, would be reduced or minimized.

ROW exclusion areas would be identified within 32,400 acres (98 percent) of ACECs, and ROW avoidance areas would be identified within 400 acres (1 percent). In these areas, impacts on ACEC values from utility development, as described for Effects Common to All Alternatives would be avoided or minimized. Utility development in areas not identified for avoidance or exclusion would cause impacts as described for Effects Common to All Alternatives.

NSO, CSU, and TL stipulations within ACECs are presented in **Table 4-44**. In addition, 26,700 acres (80 percent) of ACECs would be closed to fluid mineral leasing under Alternative D. These management actions would protect ACEC values from surface disturbance in these areas.

While only a small portion of the areas found to have relevant and important scenic values would be designated as an ACEC, 46 percent of all areas found to have relevant and important scenic values, regardless of ACEC designation, would still be managed as VRM Class I or II, which would help maintain the scenic quality and sensitive landscapes of the areas. However the remaining 54 percent of lands found to have relevant and important scenic values would be managed as VRM Class III (24 percent) or IV (30 percent), which could result in an impact to the visual quality of the areas or allow landscape modifications in sensitive landscapes that would attract the attention of the casual observer. Alternative D provides the least amount of protection for lands found to have relevant and important scenic values.

Enhanced awareness and appreciation of ACEC values resulting from interpretation and environmental education under Alternative D could result in user actions that would protect ACEC values.

Cumulative

Cumulative impacts on ACECs under the proposed plan and alternatives could result from non-BLM actions and decision on lands adjacent to ACECs. While protections exist within ACECs, population growth, development, and recreation throughout the planning area may, over time, encroach upon these areas, causing potential degradation of the important and relevant resources, such as through increased noise, air pollution, and light pollution. Other impacts include displacement of species, habitat fragmentation, and changes to the visual landscape that could indirectly affect resources within ACECs. Impacts would be greater in areas where recreation areas, such as SRMAs or ERMAs, or development were adjacent to an ACEC. BLM would adaptively manage to protect ACEC values and minimize impacts where applicable and feasible.

4.5.3 Wild and Scenic Rivers

This section discusses the impacts on WSRs from proposed management actions of other resources and resource uses. Existing conditions concerning WSRs are described in **Section 3.4.3**, Wild and Scenic Rivers.

Methods of Analysis

Indicators of impacts on WSRs include the following:

- Any potential change to the ORVs, tentative classification (i.e., wild, scenic, recreational), or free-flowing nature of the river segment or corridor area from its current state, as described in **Section 3.4.3** and **Appendix C**.

Documentation of the process used to determine suitability can be found in **Appendix C**. The analysis looks at both the 0.25-mile study corridor and the river mileage on BLM-administered public land to more accurately portray impacts.

The analysis includes the following assumptions:

All eligible stream segments under consideration for WSR designation will be managed under interim protective measures required by the WSR Act and BLM Manual 8351, Wild and Scenic Rivers – Policy and Program Direction for Identification, Evaluation, and Management (BLM 1993c) until the Record of Decision for this RMP is adopted. At that time, any stream segment not found suitable for inclusion in the NWSRS would lose its interim protection. This procedure and the interim protective measures would ensure that the values for which these river segments were found eligible are not comprised until the final RMP is adopted.

If WSR protection is not provided (i.e., if segments are found not suitable or Congress releases them from WSR consideration), provisions may still remain to protect these river corridors under a combination of existing plans and policies and actions proposed under the action alternatives of this RMP. These provisions protect streamside and riparian habitats, riparian and aquatic wildlife, water quality, and cultural and visual resources. The major difference between designation and non-designation is the legislative, and thus lasting, protection afforded designated streams. In addition, the WSR Act requires that BLM develop a comprehensive management plan for the designated stream segment Decisions in this RMP, however, affect suitability only. Once a segment is determined suitable, it can be formally recommended to Congress or the Secretary of the Interior for inclusion in the NWSRS.

Implementing certain actions and alternatives analyzed in this RMP could negatively impact WSR values. These values include the free-flowing nature, ORVs, and tentative classification of the segments. The impacts could occur because under certain alternatives, stream segments are determined to be not suitable for inclusion in the NWSRS. Under a not suitable determination, all interim protections associated with the WSR Act are eliminated. Recognizing that, the analysis of impacts on eligible stream segments includes an evaluation of where the management actions may be inconsistent with the tentative classification given to each eligible segment, as well as impacts on its ORVs or free-flowing nature.

Effects Common to All Alternatives

All segments, regardless of eligibility, suitability, or nonsuitability determination, may receive indirect protection to the WSR characteristics (i.e., ORVs, free-flowing nature, and tentative classification) from stipulations for the protection of other resources. An NSO stipulation generally provides protection by prohibiting surface occupancy and surface-disturbing activities that might degrade or contribute to the degradation of the ORVs, and by preventing projects that might impact the tentative classification (i.e., wild, scenic, recreational) or free-flowing nature of the segment. A CSU stipulation would provide a slightly lesser degree of protection to the WSR characteristics, as surface-disturbing activities are allowed, but rather must be modified or moved so as not to impact the resource. Finally, TL stipulations provide a similar level of protection as NSO, but only during certain times of the year. These are especially important in protecting aquatic and terrestrial wildlife species and their habitat during critical times. The acres affected by each type of stipulation are detailed under each alternative below.

Weed treatments in the short-term may impact ORVs or tentative classification as evidence of human activity may be seen. However in the long-term, weed treatment and eradication would benefit ORVs as riparian health improves.

In WSR study segments where scenic values have been identified as an ORV, VRM Class I and II management would provide the most protection to the scenic ORV. VRM Class I and II management may also provide indirect protection for other ORVs or tentative classification by preventing certain types of development that would impact the ORVs or tentative classification. Conversely, VRM Class III or IV management could lead to impacts on scenic ORVs by allowing development that would directly impair scenic quality. VRM Class III or IV management may also indirectly impact other ORVs or tentative classification by allowing certain types of development. Under all alternatives, Colorado River Segment 3 would be managed as VRM Class I to the south of the river and VRM Class II to the north of the river. This would provide protection to the tentative classification and the ORVs by precluding large-scale development that would be incompatible with VRM Class I or II management. Impacts from VRM on Colorado River Segment 3 are not discussed further under the separate alternatives impact analysis. The acres managed under each VRM class for the remaining 13 segments are detailed under each alternative below.

While livestock grazing presently appears to be commensurate with management of the ORVs, it could have minor and localized effects on some ORVs. Livestock grazing in riparian areas may impact water quality, potentially affecting fish, wildlife, vegetation, and recreation ORVs. Because livestock grazing is subject to Colorado Standards for Public Land Health, adjustments to grazing management would be implemented in cases where land health standards are not being met due to grazing activities. These adjustments could include changes in stocking rate, the timing of grazing, and additional terms and conditions.

Increased recreation has the potential to impact ORVs associated with each segment. However, impacts could be mitigated by building infrastructure to keep people away from special resources or through education efforts. Motorized and mechanized vehicle use could impact ORVs and tentative classification of WSR study segments. Closing areas to motorized or mechanized travel would protect areas from impacts associated with such use. Designating routes for certain motorized and mechanized uses would help protect ORVs to a lesser degree.

WSR study segments may also be impacted by being within ROW avoidance or exclusion areas. ROW exclusion would provide the most protection to ORVs and tentative classification by prohibiting all new ROWs in the area. This is especially true of North Fork of West Creek, tentatively classified as wild, so as not to allow intrusions that would change the classification. While this is also helpful to segments classified as scenic, such classification allows for more change than segments classified as wild. The southern portion of Colorado River Segment 3 excludes ROWs in accordance with wilderness protection. This would provide direct impacts on scenic, geological, and wildlife ORVs.

Recreational ORVs could also benefit as the user experience would not be diminished by the development of new ROWs south of the river. North of the river, the BLM would require undergrounding of new utility lines or would require them to be located within the railroad ROW or along existing roads. This would prevent the sprawl of new utility lines within the segment study corridor. Because much of the corridor includes canyons or steep slopes, the development of new utilities within the segment study corridor is unlikely, with, perhaps, the exception of along the railroad. Impacts from ROW development on Colorado River Segment 3 are not discussed further under the separate alternatives impact analysis. The acres managed as ROW avoidance and exclusion areas are detailed under each alternative below.

Within the McInnis Canyons NCA, the BLM would continue to acquire private in-holdings from willing sellers, including along Colorado River Segment 3. The consolidation of land management would enhance the BLM's ability to manage the segment for the protection of the ORVs and tentative classification. Acquisition of land from willing sellers of private land would provide the same benefits to other segments.

Development resulting from fluid mineral leasing has the potential to impact ORVs and tentative classification of segments. As discussed above, some impacts may be mitigated through stipulations. In order to further reduce impacts, ORVs and tentative classification may benefit from being closed to fluid mineral leasing. All segments except the following are in areas of low to no potential for oil and gas and impacts are therefore not expected: a portion of Roan Creek, a portion of Carr Creek, and Colorado River Segment 1. The following segments do not have potential for geothermal resources and impacts are therefore not expected: Roan and Carr Creeks, Dolores River, a portion of Blue Creek, Ute Creek, North Fork West Creek, and a portion of West Creek. Segments closed to fluid mineral leasing are detailed under each alternative below.

A portion of West Creek, Rough Canyon Creek, and North Fork West Creek are withdrawn from locatable mineral entry. Rough Canyon Creek and portions of segments occurring within WSAs (Dolores River, West Creek, North Fork West Creek, and Ute Creek) are and would remain closed to mineral material sales. Prohibiting such development would protect the ORVs and tentative classification of the segments. While not all segments are closed to such uses, the segments may receive protection from such uses via stipulations, as detailed under each alternative below.

Except for valid existing rights, Segment 3 of the Colorado River is "withdrawn from i) all forms of entry, appropriation, or disposal under the public land laws; ii) location, entry, and patent under the mining laws; and iii) the operation of the mineral leasing, mineral materials, and geothermal leasing laws" (Public Law 106-353, Section 6(l)(5)(c), Colorado Canyons National Conservation Area and Black Ridge Canyons Wilderness Act of 2000). As such, the general prohibition

of new energy development in the area would contribute to the protection of the ORVs along the segment and would help preserve its tentative classification. Impacts from energy development on Colorado River Segment 3 are not discussed further under the separate alternatives impact analysis.

The Dolores River itself is not within The Palisade or the Sewemup Mesa WSAs. However, portions of the study corridor extend into The Palisade WSA (130 acres) the Sewemup Mesa WSA (870 acres). WSA management includes VRM Class I, ROW exclusion, closure to motorized and mechanized vehicle use, NSO stipulation for surface-disturbing activities, and closure to fluid mineral leasing, all of which would provide protection for the ORVs and free-flowing nature of the segment. In addition, portions of West Creek, North Fork West Creek, and Ute Creek are also within the Palisade WSA and would receive protection from WSA management.

Where WSR study segments overlap ACECs, ACEC management would complement WSR objectives. Details of ACEC management prescriptions can be found in **Chapter 2**. Impacts of management prescriptions such as VRM class, stipulations, ROW avoidance/exclusion decisions, and leasing decisions are folded into the applicable discussion. Only a total acreage of overlap is provided under each alternative below.

WSR study segments could benefit from interpretation and environmental education efforts that teach users about the importance of protecting the ORVs and encouraging them to recreate in the area in ways that do not threaten the resources.

Implementing management for the following resources would have negligible or no impact on WSRs and are therefore not discussed in detail: air quality; wild horses; wildland fire management; forestry; national trails; and national, state, and BLM byways.

Alternative A

Under Alternative A, the GJFO would continue to manage the 14 segments identified in **Chapter 2** (**Table 2-2**) as eligible for inclusion in the NWSRS. The BLM would protect the free-flowing nature, ORVs, and tentative classifications (i.e., wild, scenic, recreational) of the segments until a suitability determination is made for the segments.

Continuation of current management would result in a long-term impact on the characteristics associated with eligible WSR segments because they would continue to be protected by interim protective management. The BLM would not approve any action that would adversely affect the free-flowing nature of any of the 14 WSR segments, their ORVs, or tentative classifications. Impacts may be experienced where other special management designations overlap a stream segment, thereby providing an additional layer of protection, and where other RMP management actions help protect or enhance the ORVs. Acreages

associated with selected management prescriptions are shown in **Table 4-45**, Select Quantitative Wild and Scenic River Impacts, Alternative A.

Alternative A provides NSO protection to portions of all segments totaling about 19,000 acres. The alternative also provides CSU protection to portions of all segments except for North Fork West Creek for a total of about 22,900 acres. Finally, portions of five segments are protected by TL stipulations for a total of about 3,900 acres (see **Table 4-45**). Impacts are the same as those described under Effects Common to All Alternatives.

Alternative A would provide VRM Class I or II protection for approximately 12,400 acres (49 percent) of eligible segments, excluding Colorado River Segment 3. Of the segments with a scenic ORV, the majority of Blue Creek (2,400 acres), Colorado River Segment 1, and a portion of the Dolores River (400 acres) are managed as VRM Class III or are undesignated (see **Table 4-45**). While development in these areas would pose a threat to the scenic ORV of the segments, under eligibility, the BLM would not permit any project that would diminish the scenic ORV of the segments.

Portions of three segments are within Bangs Canyon SRMA: East Creek (1,800 acres), Rough Canyon Creek (1,200 acres), and Gunnison River Segment 2 (600 acres). The Bangs Canyon SRMA is primarily used by local communities and management of the zones overlapping the three WSR segments is commensurate with protection of the ORVs.

Under Alternative A, portions of the Dolores River (11,000 acres) and Gunnison River Segment 2 (400 acres) are closed to motorized use. All or portions of 11 segments (Colorado River Segments 1 and 2, Dolores River, North Fork Mesa Creek, Blue Creek, Roan Creek, Carr Creek, North Fork West Creek, Ute Creek, East Creek, and West Creek) totaling approximately 11,200 acres are open to cross-country motorized travel. The remaining area is either limited to designated or limited to existing roads and trails.

Portions of all segments except for North Fork Mesa Creek would be protected as either ROW exclusion areas or ROW avoidance areas (9,200 acres and 6,800 acres, respectively) under Alternative A, which accounts for about 63 percent of eligible segments, excluding Colorado River Segment 3 (see **Table 4-45**). Impacts are the same as those described under Effects Common to All Alternatives.

Colorado River Segment 1 and portions of Roan and Carr Creeks are within the area of coal resource potential and are acceptable for coal leasing and development. Coal development has the potential to impact ORVs through surface disturbance leading to soil erosion, impaired water quality, and habitat fragmentation or loss. However, under Alternative A, the BLM would not permit coal development if it were found to impact the ORVs, free-flowing nature, or tentative classification of the segments.

Table 4-45
Select Quantitative Wild and Scenic River Impacts, Alternative A

Segment	Stipulation (acres)			VRM Class (acres)				ROW		Closed to Fluid Mineral Leasing (acres)	Petitioned for Withdrawal from Locatable Mineral Entry (acres)
	NSO	CSU	TL	I	II	III	Undesignated	Exclusion	Avoidance		
Blue Creek	1,500	2,900	0	0	600	0	2,400	0	100	0	0
Carr Creek	1,400	1,700	0	0	0	0	1,700	0	1,300	0	0
Colorado River Segment 1	1,100	2,200	300	0	0	2,100	100	0	2,200	0	0
Colorado River Segment 2	80	100	0	0	0	100	0	0	100	0	0
Dolores River	5,900	5,900	0	1,100	4,400	200	200	3,300	0	1,000	0
East Creek	2,000	1,900	40	0	1,500	400	0	500	1,400	0	0
Gunnison River Segment 2	800	1,000	0	0	500	400	100	500	400	0	0
North Fork Mesa Creek	300	700	0	0	0	0	700	0	0	0	0
North Fork West Creek	1,100	200	600	0	1,100	0	0	900	0	900	100
Roan Creek	400	2,000	1,600	0	0	0	2,000	0	1,200	0	0
Rough Canyon Creek	1,300	1,200	0	0	1,200	0	0	900	100	0	900
Ute Creek	1,400	1,400	500	0	200	0	0	1,400	0	0	0
West Creek	1,700	1,700	800	0	1,800	0	0	1,700	0	600	600
Total	**18,980**	**22,900**	**3,840**	**1,100**	**11,300**	**3,200**	**7,200**	**9,200**	**6,800**	**2,500**	**1,600**

Source: BLM 2010a

All of the segments with moderate to high potential for oil and gas (a portion of Roan Creek, a portion of Carr Creek, and Colorado River Segment 1) are open to fluid mineral leasing. However they may be subject to stipulations that would mitigate impacts from such activities (see **Table 4-45**). Of the segments with potential for geothermal resources (a portion of Blue Creek, Colorado River Segments 1 and 2, East Creek, Gunnison River Segment 2, North Fork West Creek, Rough Canyon Creek, and a portion of West Creek), only a portion of North Fork West Creek (900 acres) and a portion of West Creek (600 acres) are closed to geothermal leasing. The segments open to leasing may be subject to stipulations that would mitigate impacts from geothermal development activities (see **Table 4-45**).

A portion of four segments totaling about 2,500 acres overlap ACECs and receive protection from ACEC management as discussed under Impacts Common to All Alternatives. A portion of Rough Canyon Creek (900 acres) is within Rough Canyon ACEC; portions of North Fork West Creek (900 acres), Ute Creek (100 acres), and West Creek (600 acres) are within the Palisade ACEC; and a portion of West Creek (100 acres) is within the Unaweep Seep ACEC.

Alternative B

Under Alternative B, BLM would determine that a portion of the Dolores River is suitable for inclusion in the NWSRS, and also determine that the remaining portions of the river are not suitable. For a detailed description of the suitable and not suitable reaches on the Dolores River, see **Appendix C**. Under Alternative B, BLM would determine that all other eligible stream segments are not suitable for inclusion in the NWSRS.

While only certain portions of the Dolores River would be managed as suitable, Alternative B would provide some protection to study segments via stipulations imposed on fluid mineral leasing and other surface-disturbing activities. In total, 6 percent more acres would be protected by NSO, 41 percent fewer acres would be protected by CSU, and 4.3 times more acres would be protected by TL stipulations (see **Table 4-46**, Select Quantitative Wild and Scenic River Impacts, Alternative B). Impacts are the same as those described under Effects Common to All Alternatives.

Alternative B would provide more protection to the study segments than under Alternative A through VRM management. The Dolores River would be managed primarily as VRM Class II, with a portion managed as VRM Class I. Portions of three nonsuitable segments (West Creek, North Fork West Creek, and Ute Creek) would also receive protection from VRM Class I management for a total of about 2,450 acres (2.2 times more acres than under Alternative A). All or portions of 12 segments would be managed as VRM Class II, totaling about 18,900 acres (67 percent more acres than under Alternative A). Segments

Table 4-46
Select Quantitative Wild and Scenic River Impacts, Alternative B

Segment	Stipulation (acres)			VRM Class (acres)				ROW		Closed to Fluid Mineral Leasing (acres)	Petitioned for Withdrawal from Locatable Mineral Entry (acres)
	NSO	CSU	TL	I	II	III	IV	Exclusion	Avoidance		
Suitable											
Dolores River	3,600	2,000	3,100	900	2,800	0	0	2,800	700	3,200	400
Nonsuitable											
Blue Creek	1,700	1,800	2,700	0	2,900	0	0	900	2,000	0	0
Carr Creek	1,500	600	100	0	1,700	0	0	0	1,700	0	0
Colorado River Segment 1	2,200	1,200	1,600	0	2,000	0	200	0	2,100	0	0
Colorado River Segment 2	100	100	0	0	100	0	0	0	100	0	0
Dolores River	2,300	1,800	2,000	100	2,100	0	0	2,300	0	2,400	800
East Creek	400	1,500	1,900	0	1,900	0	0	0	1,900	100	0
Gunnison River Segment 2	1,000	600	500	0	600	400	0	0	700	200	0
North Fork Mesa Creek	300	400	300	0	700	0	0	0	0	0	0
North Fork West Creek	1,100	200	400	900	200	0	0	1,100	0	1,100	700
Roan Creek	1,700	1,400	600	0	1,900	0	0	0	2,000	0	0
Rough Canyon Creek	1,200	800	1,200	0	1,200	0	0	900	400	1,200	900
Ute Creek	1,400	500	800	50	1,300	0	0		1,400	1,400	0
West Creek	1,700	600	1,400	500	1,200	0	0	1,700	0	1,700	900
Total	**20,200**	**13,500**	**16,600**	**2,450**	**18,900**	**2,100**	**200**	**11,100**	**12,300**	**11,300**	**3,700**

Source: BLM 2010a

managed as VRM Class III or IV total about 2,300 acres (78 percent fewer acres than under Alternative A; see **Table 4-46**). A small portion of Colorado River Segment 1 (200 acres, 7 percent) would be managed as VRM Class IV. The small portion managed as VRM Class IV would allow for visual intrusion that would impact the scenic ORV of the area.

A small portion of the Dolores River (400 acres) is within the Maverick unit that would be managed for wilderness characteristics. Lands with wilderness characteristics management, including NSO, closed to motorized travel, ROW exclusion, closed to fluid mineral and non-energy leasing, closed to mineral material sales, and VRM Class II, would help protect ORVs and the free-flowing nature of the segment. Portions of nonsuitable segments are also within units managed for wilderness characteristics and would receive similar protection. A portion of Blue Creek (900 acres) is within the Maverick unit and a portion of Ute Creek (1,100 acres) is within the Unaweep unit.

As there are more SRMAs and individual ERMAs proposed under Alternative B than under Alternative A, more WSR study segments would have the potential to be impacted by concentrated recreation management. Management of the SRMAs and ERMAs would focus on certain outcomes to benefit the users and management of the zones overlapping the three WSR study segments is commensurate with protection of the ORVs. All or portions of the Dolores River, Blue Creek, West Creek, North Fork West Creek, and Ute Creek, totaling approximately 6,800 acres are within the Dolores River Canyon SRMA. All or portions of Gunnison River Segment 2 and Rough Canyon Creek, totaling approximately 1,400 acres, are within Bangs SRMA.

All or portions of nine WSR study segments (Dolores River, Blue Creek, Gunnison River Segment 2, Roan Creek, Carr Creek, Rough Canyon Creek, West Creek, North Fork West Creek, and Ute Creek) totaling about 11,200 acres would be closed to motorized vehicle use (2 percent fewer acres than under Alternative A). None of the areas are open to cross-country motorized or mechanized use. Impacts are the same as those described under Effects Common to All Alternatives.

Alternative B would provide more protection to WSR study segments via ROW avoidance and exclusion than under Alternative A. In total, 21 percent more acres would be protected as ROW avoidance areas and 81 percent more acres would be protected as ROW exclusion areas (see **Table 4-46**) than under Alternative A. Impacts are the same as those described under Effects Common to All Alternatives.

Only Colorado River Segment 1 and a small portion of Roan Creek are within the area of coal resource potential; however, Colorado River Segment 1 is in an area unacceptable for further coal leasing. Coal development has the potential to impact the fish ORV in Roan Creek through surface disturbance leading to soil erosion, impaired water quality and habitat fragmentation or loss. However,

the trout in Roan Creek are currently considered protected under the Endangered Species Act and any new coal development would require consultation with USFWS, including measures designed to minimize impacts.

All of the segments with development potential for oil and gas (Roan Creek, Carr Creek, Colorado River Segment 1, and portions of Colorado River Segment 2) are open to fluid mineral leasing. However they may be subject to stipulations that would mitigate impacts from such activities (see **Table 4-46**). Of the segments with potential for geothermal resources (a portion of Blue Creek, Colorado River Segments 1 and 2, East Creek, Gunnison River Segment 2, North Fork West Creek, Rough Canyon Creek, and a portion of West Creek), only the following are open to geothermal leasing: Blue Creek, Colorado River Segments 1 and 2, a portion of East Creek, and a portion of Gunnison River Segment 2. These segments may be subject to stipulations that would mitigate impacts from geothermal development activities (see **Table 4-46**). Note that while the study corridor for East Creek is 2,900 acres, 1,100 acres are within the Dominguez-Escalante NCA, which is closed to fluid mineral leasing. Therefore, the entirety of the East Creek study area would be closed to fluid mineral leasing.

All or portions of eight segments totaling about 8,100 acres overlap ACECs and receive protection from ACEC management as discussed under Impacts Common to All Alternatives. A portion of the Dolores River (3,200 acres) is within the Dolores River Riparian ACEC, which is managed to protect resources including scenic and paleontological values. A small portion (1,300 acres) is also within the Palisade ACEC which is managed to protect resources including scenic values. Portions of nonsuitable segments are also within ACECs and would receive incidental protection. A portion of Blue Creek (200 acres) is within the Dolores River Riparian ACEC; portions of Ute Creek (100 acres), North Fork West Creek (1,000 acres), and West Creek (800 acres) are within the Palisade ACEC; portions of Roan and Carr Creeks (1,700 acres and 1,300 acres, respectively) are within the Roan and Carr Creeks ACEC; a portion of Rough Canyon Creek (900 acres) is within the Rough Canyon ACEC; and a portion of West Creek (100 acres) is within the Unaweep Seep ACEC.

Alternative C

Under Alternative C, all segments would be determined suitable for inclusion in the NWSRS. The BLM would continue managing the segments to protect the free-flowing nature, associated ORVs, and tentative classification. Implementation of Alternative C would result in impacts similar to or the same as those described under Alternative A as the BLM would not approve any action that would adversely affect the free-flowing nature of any of the 14 WSR segments, their ORVs, or tentative classifications. Impacts may be experienced where other special management designations overlap a stream segment and provide an additional layer of protection, and where other RMP management actions help protect or enhance the ORVs.

Alternative C would provide the most protection to WSR study segments via stipulations. Compared to Alternative A, 9 percent more acres would be protected by NSO, 35 percent fewer acres would be protected by CSU, and 4.3 times more acres would be protected by TL stipulations (see **Table 4-47**, Select Quantitative Wild and Scenic River Impacts, Alternative C). Impacts are the same as those described under Effects Common to All Alternatives.

Alternative C would provide the most protection to WSR study segments from VRM as all segments would be managed as either VRM Class I or II. Portions of the Dolores River, North Fork West Creek, Ute Creek, and West Creek would be managed as VRM Class I, totaling approximately 2,450 acres (2.2 times more acres than under Alternative A). The remaining segments would be managed as VRM Class II, totaling approximately 21,300 acres (88 percent more acres than under Alternative A; see **Table 4-47**). Impacts are the same as those described under Effects Common to All Alternatives.

A small portion of the Dolores River (1,100 acres) and Blue Creek (900 acres) are within the Maverick lands with wilderness characteristics unit that would be managed for wilderness characteristics; portions of West Creek (100 acres) and North Fork West Creek (100 acres) are within West Creek unit; portions of West Creek (300 acres) and Ute Creek (1,200 acres) are within Unaweep unit; portions of Dolores River (500 acres) are within the Lumsden Canyon unit; and portions of Gunnison River Segment 2 (400 acres) and East Creek (400 acres) are within the Bangs Canyon unit. The types of impacts would be similar to those described under Alternative B.

Under Alternative C, fewer WSR study segments overlap SRMAs compared to the other action alternatives. Impacts would be similar to those described under Alternative B. All or portions of Gunnison River Segment 2 and Rough Canyon Creek, totaling approximately 1,400 acres, are within Bangs SRMA.

All or portions of 12 suitable segments (Colorado River Segments 1 and 2, Dolores River, Blue Creek, Gunnison River Segment 2, Roan Creek, Carr Creek, Rough Canyon Creek, East Creek, West Creek, North Fork West Creek, and Ute Creek) totaling about 14,400 acres would be closed to motorized vehicle use (26 percent more acres than under Alternative A). None of the areas are open to cross-country motorized or mechanized use.

Alternative C would provide the most protection to WSR study segments via ROW avoidance and exclusion. All or portions of nine segments would be managed as ROW exclusion (Dolores River, North Fork Mesa Creek, Blue Creek, Gunnison River Segment 2, Rough Canyon Creek, East Creek, West Creek, North Fork West Creek, and Ute Creek) totaling approximately 8,100 acres. While more segments would be protected as ROW exclusion areas than under Alternative A, 12 percent fewer acres would be protected, compared with Alternative A. An additional 14,900 acres along all segments would be

Table 4-47
Select Quantitative Wild and Scenic River Impacts, Alternative C

Segment	Stipulation (acres)			VRM Class (acres)				ROW		Closed to Fluid Mineral Leasing (acres)	Petitioned for Withdrawal from Locatable Mineral Entry (acres)
	NSO	CSU	TL	I	II	III	IV	Exclusion	Avoidance		
Blue Creek	1,700	2,000	2,700	0	2,900	0	0	900	2,000	900	200
Carr Creek	1,700	1,400	100	0	1,700	0	0	300	1,400	1,300	0
Colorado River Segment 1	2,200	2,200	1,600	0	2,200	0	0	0	2,200	0	0
Colorado River Segment 2	100	100	0	0	100	0	0	0	100	70	0
Dolores River	5,900	3,300	5,100	1,000	4,900	0	0	2,600	3,300	5,600	4,400
East Creek	700	1,500	1,900	0	1,900	0	0	400	1,500	400	200
Gunnison River Segment 2	1,000	500	500	0	1,000	0	0	400	500	600	0
North Fork Mesa Creek	300	700	300	0	700	0	0	0	700	0	0
North Fork West Creek	1,100	100	400	900	200	0	0	900	100	1,000	700
Roan Creek	2,000	1,400	600	0	2,000	0	0	0	1,400	1,900	0
Rough Canyon Creek	1,200	400	1,200	0	1,200	0	0	900	400	1,200	900
Ute Creek	1,300	200	800	50	1,300	0	0	1,100	200	1,300	1,200
West Creek	1,600	1,100	1,400	500	1,200	0	0	600	1,100	1,300	1,200
Total	**20,800**	**14,900**	**16,600**	**2,450**	**21,300**	**0**	**0**	**8,100**	**14,900**	**15,570**	**8,800**

Source: BLM 2010a

managed as ROW avoidance (2.2 times more acres than under Alternative A; see **Table 4-47**). Impacts are the same as those described under Effects Common to All Alternatives.

Colorado River Segment 1 and a small portion of Roan Creek are within the area of coal resource potential. Under Alternative C, both segments are located in areas that are unacceptable for further coal leasing, which would ensure that there would be no impacts from coal leasing on the ORVs, free-flowing nature, or tentative classification of the segments.

Of the segments with moderate to high potential for oil and gas (Roan Creek, Carr Creek, Colorado River Segment 1, and Colorado River Segment 2), portions of all segments, including all of Colorado River Segment 1, are open to fluid mineral leasing, totaling approximately 2,700 acres. However they may be subject to stipulations that would mitigate impacts from such activities (see **Table 4-47**). Of the segments with potential for geothermal resources (a portion of Blue Creek, Colorado River Segments 1 and 2, East Creek, Gunnison River Segment 2, North Fork West Creek, Rough Canyon Creek, and a portion of West Creek), only the following are open to geothermal leasing: Colorado River Segments 1 and portions of Colorado River Segment 2 and Gunnison River Segment 2. These segments may be subject to stipulations that would mitigate impacts from geothermal development activities (**Table 4-47**). Note that while the study corridor for East Creek is 2,900 acres, 1,100 acres are within the Dominguez-Escalante NCA, which is closed to fluid mineral leasing. Therefore, the entirety of the East Creek study area would be closed to fluid mineral leasing.

All or portions of 11 segments totaling about 12,600 acres overlap ACECs and receive protection from ACEC management as discussed under Impacts Common to All Alternatives. A portion of Colorado River Segment 1 (900 acres) is within the Colorado River Riparian ACEC. Portions of the Dolores River (3,200 acres) and Blue Creek (200 acres) are within the Dolores River Riparian ACEC. Portions of the Dolores River (1,300 acres), West Creek (800 acres), North Fork West Creek (1,000 acres), and Ute Creek (100 acres) are within the Palisade ACEC. A portion of Gunnison River Segment 2 (400 acres) is within the Gunnison River Bluffs ACEC; portions of Roan and Carr Creeks (1,900 acres and 1,700 acres, respectively) are within the Roan and Carr Creeks ACEC; a portion of Rough Canyon Creek (900 acres) is within the Rough Canyon ACEC; a portion of East Creek (100 acres) is within Nine-mile Hill Boulders ACEC, and a portion of West Creek (100 acres) is within the Unaweep Seep ACEC.

Alternative D

Under Alternative D, all 14 eligible segments would be determined not suitable, a potential long-term impact on the WSR characteristics of these segments as the ORVs, free-flowing nature, and tentative classification identified during

eligibility would not be protected by either eligibility or suitability management. While the BLM would not be obligated to protect the ORVs, free-flowing nature, or tentative classification of the segments, they may still receive protection from other resource management actions.

Alternative D would provide less protection for the WSR study segments via NSO and CSU stipulations as Alternative A, although TL stipulation protections would increase. Compared to Alternative A, 7 percent fewer acres would be protected by NSO, 59 percent fewer acres would be protected by CSU, and 4.3 times more acres would be protected by TL stipulations (see **Table 4-48**, Select Quantitative Wild and Scenic River Impacts, Alternative D). Impacts are described under Effects Common to All Alternatives.

Alternative D would provide the least amount of protection to the WSR study segments from VRM and has the most VRM Class IV areas of any action alternative. Portions of West Creek, North Fork West Creek, and Ute Creek totaling approximately 1,450 acres would be managed as VRM Class I (32 percent more acres than under Alternative A). All or portions of nine segments (Blue Creek, Colorado River Segments 1 and 2, Dolores River, East Creek, Gunnison River Segment 2, Rough Canyon Creek, Ute Creek and West Creek) would be managed as VRM Class II, totaling about 6,200 acres (45 percent fewer acres than under Alternative A). Segments managed as VRM Class III or IV total about 16,200.

acres (55 percent more acres than under Alternative A; see **Table 4-48**). Of the segments with scenic ORVs, a portion of Blue Creek (2,600 acres), a portion of Colorado River Segment 1 (500 acres), a portion of the Dolores River (4,900 acres), a portion of North Fork West Creek (200 acres), a portion of Ute Creek (200 acres), and a portion of West Creek (1,100 acres) would be managed as VRM Class III or IV, potentially allowing impairment of the scenic quality.

Under Alternative D, fewer WSR study segments would overlap SRMAs compared to Alternative B. The type of impacts would be similar to those described under Alternative B, but would occur over a smaller area. All or portions of Gunnison River Segment 2 and Rough Canyon Creek, totaling approximately 1,700 acres, are within Bangs SRMA. A portion of Gunnison River Segment 2 (340 acres) is within the Gunnison River Bluffs SRMA.

All or portions of five segments (Dolores River, Gunnison River Segment 2, Rough Canyon Creek, West Creek, and North Fork West Creek) totaling about 4,000 acres would be closed to motorized vehicle use (65 percent fewer acres than under Alternative A). None of the areas are open to cross-country motorized or mechanized use.

Table 4-48
Select Quantitative Wild and Scenic River Impacts, Alternative D

Segment	Stipulation (acres)			VRM Class (acres)				ROW		Closed to Fluid Mineral Leasing (acres)	Petitioned for Withdrawal from Locatable Mineral Entry (acres)
	NSO	CSU	TL	I	II	III	IV	Exclusion	Avoidance		
Blue Creek	1,200	400	2,700	0	300	2,600	0	0	0	0	0
Carr Creek	1,300	600	100	0	0	1,700	0	0	0	0	0
Colorado River Segment 1	2,200	1,100	1,600	0	1,800	300	200	0	0	0	0
Colorado River Segment 2	100	100	0	0	100	0	0	0	0	0	0
Dolores River	5,900	2,100	5,100	0	1,000	4,800	100	1,000	0	1,000	0
East Creek	400	1,400	1,900	0	40	1,900	0	0	500	100	0
Gunnison River Segment 2	1,000	500	500	0	600	300	100	0	200	0	0
North Fork Mesa Creek	300	0	300	0	0	700	0	0	0	0	700
North Fork West Creek	1,100	100	400	900	0	200	0	900	0	900	0
Roan Creek	500	1,400	600	0	0	2,000	0	0	0	0	0
Rough Canyon Creek	1,200	800	1,200	0	1,200	0	0	900	400	0	900
Ute Creek	900	400	800	50	1,100	200	0	50	0	50	0
West Creek	1,600	400	1,400	500	40	1,100	0	500	0	600	900
Total	**17,700**	**9,300**	**16,600**	**1,450**	**6,180**	**15,800**	**400**	**3,350**	**1,100**	**2,650**	**2,500**

Source: BLM 2010a

Alternative D would provide the least protection to WSR study segments via ROW avoidance and exclusion. Portions of five segments would be managed as ROW exclusion (Dolores River, Rough Canyon Cree, West Creek, North Fork West Creek, and Ute Creek) totaling approximately 3,400 acres (64 percent fewer acres than under Alternative A). Portions of three segments would be managed as ROW avoidance (Gunnison River Segment 2, Rough Canyon Creek, and East Creek) totaling approximately 1,100 acres (84 percent fewer acres than under Alternative A; see **Table 4-48**). Impacts are the same as those described under Effects Common to All Alternatives.

Colorado River Segment 1 and a small portion of Roan Creek are within the coal resource potential area and are acceptable for further coal leasing and development. Impacts from coal development on Roan Creek would be the same as those described under Alternative B. Colorado pikeminnow and razorback sucker found in Colorado River Segment 1 are protected under the Endangered Species Act and any new coal development would have to receive concurrence from USFWS. The scenic ORV would be mostly protected by VRM Class II management, and the bald eagle (the basis for the wildlife ORV along the segment) is protected by the Bald and Golden Eagle Protection Act.

All of the segments with potential for oil and gas (Roan Creek, Carr Creek, and Colorado River Segments 1 and 2) are open to fluid mineral leasing. However they may be subject to stipulations that would mitigate impacts from such activities (see **Table 4-48**). Of the segments with potential for geothermal resources (a portion of Blue Creek, Colorado River Segments 1 and 2, East Creek, Gunnison River Segment 2, North Fork West Creek, Rough Canyon Creek, and a portion of West Creek), only a portion of East Creek (100 acres), a portion of North Fork West Creek (900 acres), and a portion of West Creek (600 acres) following are closed to geothermal leasing, leaving the remaining areas available. These segments may be subject to stipulations that would mitigate impacts from geothermal development activities (see **Table 4-48**).

All or portions of five segments totaling about 3,000 acres overlap ACECs and receive protection from ACEC management as described under Impacts Common to All Alternatives. Portions of the Dolores River (100 acres), West Creek (800 acres), North Fork West Creek (1,000 acres), and Ute Creek (60 acres) are within the Palisade ACEC. A portion of Rough Canyon Creek (900 acres) is within the Rough Canyon ACEC, and a portion of West Creek (100 acres) is within the Unaweep Seep ACEC.

Cumulative

The CIAA for WSRs includes all land, regardless of ownership, within the GJFO and surrounding BLM field offices. Under Alternatives A and C, where all stream segments would be found eligible or suitable, management of the Colorado and Dolores River would be consistent with neighboring field office, which also found that portions of those rivers are suitable for inclusion in the NWSRS.

Alternative B, in which some portions of the Dolores River are found suitable, would be consistent with suitability determinations in the Uncompahgre and Moab Field Offices. The Uncompahgre and Moab Field Offices determined that sections of the Dolores River that are primarily under federal ownership are suitable for inclusion in the NWSRS. For the segments under Alternatives B and D, where the BLM would not be required to prevent impacts on the free-flowing nature, tentative classification, or ORVs, there could be impacts when approving permits or resource use applications. There are no reasonably foreseeable future projects at this time that would impact the segments. However, if major projects are proposed and there is no systematic analysis of impacts on river-related values pursuant to the WSR Act, there could be significant cumulative impacts on river-related values.

Other federal agencies considering permit applications (not under BLM authority) that could affect the free-flowing nature, ORVs, or tentative classification of any of the eligible or suitable segments would need to seek formal comments from the BLM and the BLM would discourage projects with such impacts. Other agencies would not be required to act on the BLM's comments, so the effect to eligible and suitable segments would depend on the decisions outside of BLM authority. For stream segments determined not suitable under Alternatives B and D, the BLM would not make recommendations based solely on the need to protect WSR values when BLM is asked for comments on projects authorized by other agencies. Rather, if asked to comment, BLM would focus on impacts on documented multiple-use values, rather than focusing on compliance with the WSR Act standards for protection of ORVs, free flowing nature, and classification.

4.5.4 National Trails

This section discusses impacts on national trails from proposed management actions of other resources and resource uses. Existing conditions concerning national trails are described in **Section 3.4.4**, National Trails.

As described in the 1968 National Trails System Act, Section 3(3), "National historic trails… follow as closely as possible and practicable the original trails or routes of travel of national historic significance. Designation of such trails or routes shall be continuous, but the established or developed trail, and the acquisition thereof, need not be continuous onsite. National historic trails shall have as their purpose the identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment."

Direct impacts on national trails typically result from actions that disturb the soil or alter characteristics of the surrounding environment that contribute to trail significance and introduce visual elements out of character with the property or that alter its setting, or result in neglect of the resource to the extent that it is deteriorated or destroyed. For example, surface-disturbing activities that impact trail ruts for historic trail are considered a direct impact because the trail

segments are nonrenewable. Conversely, actions that result in data collection and preservation of national historic and recreational trails would also be considered impacts.

Indirect impacts on national trails result from project-induced increases or decreases in activity in the planning area. The construction of a recreational facility may increase visitor use, which could result in indirect impacts on previously undisturbed trail segments, particularly along national historic trails. Recreation, in particular, is a complex issue, as actions taken to preserve historic values can positively and negatively affect heritage tourism and trail enthusiasts.

Methods of Analysis

Indicators of impacts on national trails include the following:

- Alterations to the level of public recreation, and the features giving the Old Spanish National Historic Trail its national historic significance; and
- Alterations to the level of public recreation or changes to the scenic, natural, and cultural resources of the Tabeguache National Recreation Trail.

For all agency undertakings that could impact national trails, the BLM complies with Section 106 of the NHPA prior to conducting the undertaking. Section 106 compliance typically includes inventory, evaluation, and consultation with the Colorado State Historic Preservation Office.

The analysis includes the following assumptions:

- Protection of national trails and related sites occur in accordance with federal laws and BLM regulations and agreements.
- The BLM looks favorably at opportunities to cooperate with private landowners to minimize or eliminate disturbance to national trails.
- Recognizing that national trails often comprise numerous routes rather than a single trace, all protective zones begin at the outer edges of trails rather than at a centerline, which is difficult to define.
- Certain projects, due to their size or topography of the land, may require consideration of visual intrusions into the setting beyond the foreground or middleground zones to comply with Section 106 of the NHPA.

Effects Common to All Alternatives

The portion of the Old Spanish National Historic Trail that occurs on BLM-administered public lands within the GJFO is minimal. Approximately 40 miles of the Trail are within the GJFO planning area, and approximately 7 miles of the

Trail are under BLM jurisdiction. The congressionally designated route within the planning area follows US Highway 50; therefore, the BLM manages a separate route for the historic trail experience. Once the Old Spanish trail-wide comprehensive plan is completed by the BLM and National Park Service, the portion of the Trail on BLM-administered public lands would be managed in consideration of the trail-wide comprehensive plan and to minimize impacts on the Trail In the interim, BLM management actions would have minimal impact on the Trail under any alternative.

Comprehensive travel and transportation management restrictions in place for the Old Spanish and Tabeguache Trails would continue to impact trail usage. For example, under all alternatives sections of the Old Spanish Trail are open to motorized, mechanized, and non-motorized travel. Travel restrictions for the Tabeguache Trail vary by alternative and are therefore described by alternative below. For both trails, travel restrictions would impact the types of experiences available along these trails. Opening the trails to more types of uses would likely increase use levels, but may discourage some users who desire a quiet soundscape and less crowded experience.

Management for other resources along the lands adjacent to national trails may impact features of trails and the visitor experience. In general, surface-disturbing activities would not preserve or promote the scenic, natural, and cultural resources found along the Old Spanish or Tabeguache Trails.

Stipulations on surface-disturbing activities (e.g., NSO and CSU) and ROW location restrictions (i.e., ROW avoidance and exclusion areas) could benefit trails by restricting or minimizing surface disturbance, thus preserving the scenic, natural, and cultural resources. Impacts from fluid minerals would be minimal for both trails under all alternatives due to NSO and CSU stipulations for the Old Spanish Trail (see **Chapter 2**) and low oil and gas potential in the area adjacent to both the Old Spanish and Tabeguache Trails. Neither the Old Spanish Trail nor the Tabeguache Trail is within the coal potential area; therefore, no impacts from coal development are anticipated under any alternatives. Locatable mineral development has the potential to impact national trails under all alternatives as development of this resource would not be compatible with preservation of trail values. The area surrounding the Old Spanish and Tabeguache Trails is not withdrawn or proposed for withdrawal under any alternatives.

Measures in place to protect other resources may indirectly provide some enhancement or preservation of the qualities of national trails or limitations on development of trails. For example, applying NSO stipulations to protect cultural resources have the potential to enhance cultural resources as well as preserve scenic qualities in the area around the Old Spanish or Tabeguache Trails. Similarly, protective measures for paleontology would have the potential to limit surface disturbance and thus preserve scenic and historic values.

Restrictions on surface-disturbing activities to protect other resources may limit improvements to national trails that may be needed to preserve them. For the Tabeguache Trail, these restrictions could limit recreation-related development needed to enhance the recreational experience along the trail.

Protection for special status species may also impact management of the Old Spanish Trail. Populations of a federally threatened species, the Colorado hookless cactus, may occur near the Old Spanish Trail. Site-specific analysis would be required to determine locations of populations. Should populations be identified in this area, management activities allowed on the Old Spanish Trail would be consistent with the preservation of this species.

Implementing management for the following resources would have negligible or no impact on national trails and are therefore not discussed in detail: air, climate, geology, water resources, vegetation, fish and wildlife, wild horses, wildland fire management, lands with wilderness characteristics, forestry, livestock grazing, wilderness study areas, coal, and national, state, and BLM byways.

Alternative A

Under Alternative A, the BLM would continue to work with the National Park Service and local non-federal partners to manage the Old Spanish Trail. The Tabeguache Trail would not be petitioned for listing as a national recreational trail.

No special restrictions would be put in place for surface occupancy or fluid mineral leasing surrounding the Old Spanish Trail, which could result in impacts on visual resources or setting for the trail.

Visual resource management has the potential to impact the natural scenic qualities of trails. Under Alternative A, portions of the Old Spanish Trail would be managed as VRM Class III and portions would have no VRM designation. VRM Class III areas allow for moderate changes to the landscape that may be noticeable. In areas without a VRM classification, projects would be required to meet VRM objectives on a case-by-case basis. In both cases, development may be permitted that could impact the scenic qualities of the trail.

Alternative B

Under Alternative B, management of the Old Spanish Trail would continue as described under Alternative A. In addition, an NSO stipulation prohibiting surface occupancy and surface-disturbing activities within a 200-meter buffer around the Old Spanish Trail would be in place, providing more protection from surface-disturbing activities than under Alternative A. BLM would petition the Tabeguache Trail for listing as a national recreation trail, but no NSO stipulations would be in place for this trail, leaving the trail vulnerable to surface-disturbing activities that could degrade its recreational value.

Under Alternative B, a 50-meter buffer around the Old Spanish Trail would be managed as VRM Class IV, providing very limited protection from visual disturbances, but resulting in minimal impacts because the trail corridor was categorized as VRI Class IV during the 2009 visual resource inventory (Otak 2009). Impacts would be similar to those described under Alternative A. The Tabeguache Trail would be managed as VRM Class II, providing an adequate level of protection necessary to protect users' experiences. However, since VRM Class II objectives also limit the type and visibility of development that can occur, this designation may preclude some development necessary to support recreational use along the trail.

Under Alternative B, 50 meters on either side of the Old Spanish Trail would be managed as a ROW avoidance area limiting the impacts from new transmission and roadway development.

Protecting against soil erosion and improving soils to maintain vegetative cover is proposed under Alternative B. These measures have the potential to impose restrictions on recreational development and management activities associated with trails.

Under Alternative B, the BLM would petition to have the Tabeguache Trail listed as a National Recreation Trail as described in the National Trails System Act of 1968 as amended (PL 90-543). Should the petition succeed, recreational use of the trail is likely to increase, thus providing the potential for greater opportunities for interpretation and education regarding the natural, cultural, and historical resources associated with the trail, while also increasing pressure on trail resources including cultural and historic resources adjacent to the trail. The Tabeguache Trail has portions open to motorized use and portions closed to motorized use. No NSO or CSU stipulations would be applied along the Tabeguache Trail. The BLM would seek to acquire easements or ROWs on non-federal land to support the trail crossing or trail facilities as needed. Without land acquisitions or easements, access to portions of the trail that currently pass through private property could be restricted or closed. The portion of the Tabeguache Trail located within Bangs SRMA would be managed according to the management actions of the SRMA. A portion of the Tabeguache Trail passes through the Rough Canyon ACEC. If activities associated with trail management were found to impact the relevant and important values for which the ACEC was designated, activities would be modified, which could limit certain uses of the trail.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of national trails within the decision area.

Alternative C

Under Alternative C, management of the Old Spanish Trail would continue as described under Alternative A. In addition, an NSO stipulation prohibiting

surface occupancy and surface-disturbing activities within a 0.5-mile buffer of the Old Spanish Trail would be in place. A CSU stipulation would be applied within 5 miles of either side of the Old Spanish Trail. Combined, these stipulations would provide the most protection from surface-disturbing activities of any alternative. Impacts from oil and gas would be minimal for both the Old Spanish and Tabeguache Trails due to restrictions in place and low potential adjacent to the trails.

Under Alternative C, a 50-meter buffer around the Old Spanish Trail would be managed as VRM Class III, providing more protection from disturbance than the other alternatives, but still allowing for some visual disturbance along the trail. As under Alternative B, VRM management for the Old Spanish Trail would result in minimal impacts because the trail corridor was categorized as VRI Class IV during the 2009 visual resource inventory (Otak 2009). Impacts from VRM along the Tabeguache Trail would be the same as those described under Alternative B.

Under Alternative C, 50 meters on either side of the Old Spanish Trail would be managed as a ROW avoidance area limiting the impacts from new transmission and roadway development.

Protecting against soil erosion and improving soils to maintain vegetative cover is proposed under Alternative C, the impacts of which are the same as those described under Alternative B.

Management actions to protect Rough Canyon Creek, which would be found suitable for inclusion in the NWSRS, may impact the Tabeguache Trail since it overlaps the WSR study corridor. If activities associated with trail management were found to impact ORVs or tentative classification of the segment, activities would be modified. Impacts from the WSR segment are likely negligible due to the location of the trail on the canyon rim away from the river. All other impacts on Tabeguache Trail would be similar to those described for Alternative B.

Implementation of an interpretation and environmental education program under Alternative C would enhance awareness and appreciation of national trails within the decision area.

Alternative D

Under Alternative D, the Old Spanish Trail would continue to be managed as described under Alternative A. In addition, an NSO stipulation prohibiting surface occupancy and surface-disturbing activities within a 50-meter buffer around the Old Spanish Trail would be in place. Impacts from fluid minerals would be minimal for both the Old Spanish and Tabeguache Trails due to restrictions in place and low potential adjacent to the trails.

Impacts from VRM on the Old Spanish and Tabeguache Trails would be the same as those described under Alternative B.

Under Alternative D, 50 meters on either side of the Old Spanish Trail would be managed as a ROW avoidance area limiting the impacts from new transmission and roadway development.

Protecting against soil erosion and improving soils to maintain vegetative cover is proposed under Alternative D, the impacts of which are the same as those described under Alternative B.

Implementation of an interpretation and environmental education program under Alternative D would enhance awareness and appreciation of national trails within the decision area.

Cumulative

The CIAA used to analyze cumulative impacts on national trails includes the entire planning area, as well as adjacent BLM field offices in which the Old Spanish National Historic Trail or Tabeguache Trail occurs. The Old Spanish Trail is the only national trail adjacent to or within the planning area boundary. It also occurs within the Uncompahgre Field Office to the south and the Moab Field Office to the west. Management of the Old Spanish Trail in those field offices is similar to the management prescribed in this plan. Under the agency preferred alternative in the Uncompahgre RMP revision, being revised at this time, the BLM would petition for the designation of the Tabeguache Trail as a National Recreation Trail, which would enhance the values and manageability of the trail.

Past, present, and reasonably foreseeable actions with the potential to have cumulative impacts on national trails include continued oil and gas development, ROW location, and, most importantly, increasing recreation and visitor use in the region putting additional pressure on trails. As discussed, management of the Old Spanish Trail is conducted in coordination with the National Park Service and local non-federal partners. Management plan development for this trail, as well as management direction provided for the Tabeguache Trail from adjacent BLM field offices or federal land managers has the potential to decrease the potential for degradation and assist in the preservation of natural, cultural and historic trail resources.

4.5.5 National, State, and BLM Byways

This section discusses the impacts on national, state, and BLM byways from proposed management actions of other resources and resource uses. Existing conditions concerning national, state, and BLM byways are described in **Section 3.4.5**, National, State, and BLM Byways.

Byways, including scenic and historic byways, are an important resource that support recreation needs on BLM-administered public lands and tourism needs of local communities.

Byways are used frequently and are susceptible to direct and indirect impacts. Direct impacts on byways include any action that substantially limits or prevents the use of the byways. Indirect impacts include actions that alter the scenic or historic values associated with the byway.

Methods of Analysis

Indicators of impacts on national, state, and BLM byways include the following:

- Management actions that fail to prevent irreparable damage to important archaeological, historic, cultural, natural, recreational, or scenic qualities of a byway.

The analysis includes the following assumption:

- Management prescribed for national, state, and BLM byways would provide opportunities for motor touring while enhancing the understanding of the multiple uses of public lands.

Effects Common to All Alternatives

For all alternatives the BLM would support the management of designated national highways within the planning area consistent with other resources. Designated byways include the Grand Mesa Scenic and Historic Byway, Dinosaur Diamond National Scenic Highway, Unaweep-Tabeguache Scenic and Historic Byway, and any additional byways designated by the US Secretary of Transportation during the life of the plan. The BLM would work with local, state, and federal partners to manage these byways.

Management of BLM resources along the lands adjacent to scenic byways may affect the visitors experience depending on the permitted activities. Generally, surface-disturbing activities would not enhance the visitor experience as they would detract from the byways' historic, natural, or scenic qualities. However, management actions such as applying NSO stipulations, closing areas to fluid mineral leasing, identifying ROW avoidance and exclusion areas, and special designations such as WSAs, ACECs, and WSRs could all benefit byways by restricting or minimizing surface disturbance thus preserving the historic, natural and scenic qualities of lands adjacent to byways. Impacts from these management actions, including those adjacent to byways, are discussed by alternative. Visual impacts from mineral development or exploration, such as dust clouds, could occur in most of these areas and would impact visitor experiences; however, the impact would be short term. In addition, for all alternatives, there is little overlap of lands adjacent to byways and areas with high or moderate fluid mineral potential, therefore fluid minerals development is

not likely to result in significant changes to scenic and historic qualities for byways.

VRM Classes I and II benefit byways by limiting surface disturbance that could detract from scenic values. While byways themselves do not mandate a specific VRM classification, VRM classifications from management of adjacent or overlapping resources may result in protection of scenic values on lands surrounding byways (see **Section 4.3.10**, Visual Resources).

Restoring unhealthy vegetation communities and reducing infestations of noxious weeds could indirectly affect byways by enhancing the natural diversity of the native landscape in areas adjacent to the byways. Short-term disturbance may occur due to the use of machinery for vegetation manipulation, but these effects would be temporary. Weed treatments, such as the removal of tamarisk or Russian olive, would provide localized benefit, particularly along the Unaweep-Tabeguache Scenic and Historic Byway where it parallels the Dolores River. Similarly, promoting, and protecting paleontological resources associated with the Dinosaur Diamond National Scenic Byway would enhance this byway.

Stipulations to protect against soil erosion and maintain vegetative cover are proposed under all alternatives and would impact byways by enhancing or preserving the scenic qualities of adjacent lands.

The byways that would be managed and/or designated under each alternative are displayed in **Table 4-49**, Miles of Designated Byways.

Table 4-49
Miles of Designated Byways

	Alt A	Alt B	Alt C	Alt D
National Byway				
Dinosaur-Diamond	22	22	22	22
State Byways				
Grand Mesa	4	4	4	4
Unaweep-Tabeguache	28	28	28	28
Total	**32**	**32**	**32**	**32**
BLM Byways				
Land's End	n/a	n/a	n/a	2
John Brown's Canyon	n/a	n/a	n/a	6
Niche to Blue Mesa	n/a	n/a	n/a	14
Winter Flats Road	n/a	n/a	n/a	26
Total	**n/a**	**n/a**	**n/a**	**48**

Source: BLM 2010a

Implementing management for the following resources would have negligible or no impact on byways and are therefore not discussed in detail: air quality; special status species; fish and wildlife; wild horses; wildland fire management;

lands with wilderness characteristics; forestry; livestock grazing; WSAs; and national trails.

Alternative A

Under Alternative A, efforts to protect scenic ORVs along eligible WSR segments would benefit scenic values of the byways by prohibiting or limiting most surface-disturbing activities. The WSR study corridor of the Dolores River, North Fork West Creek, West Creek, and Ute Creek all overlap the Unaweep-Tabeguache Byway.

No restrictions on fluid mineral extraction specific to byways would be in place under this alternative; therefore, impacts on the adjacent landscapes from fluid mineral development could occur, but are unlikely due to the limited mineral potential adjacent to byways.

NSO stipulations for cultural resources would limit impacts on visual resources and therefore protect adjacent byways.

Lack of interpretation and environmental education resources along byways could result in user actions that degrade historic or natural qualities of lands adjacent to byways should sensitive resources not be protected for other resource programs.

By not establishing any BLM byways, resources along those roads would not receive the level of public recognition and traffic would not increase at levels commensurate with an official byway.

Alternative B

As under Alternative A, no BLM byways would be established under this alternative. As a result, fewer visitors to byways would be anticipated under this alternative and impacts would be the same as those described under Alternative A.

A CSU stipulation would apply to fluid mineral leasing and other surface-disturbing activities within 0.5-mile of scenic byways. Fluid mineral potential for the buffer surrounding byways under Alternative B is, however, limited. Within the area covered by the CSU stipulation, 10,500 acres are in areas with potential; 19,200 acres of no potential are found within the buffer. Development of fluid minerals could impact scenic or historic values of byways through the introduction of new facilities and increased traffic.

Surface use restrictions proposed for cultural resource protection would limit impacts on visual resources and therefore protect scenic qualities associated with any adjacent byways.

Alternative C

As under Alternative A, no BLM byways would be established under this alternative. As a result, fewer visitors to byways would be anticipated under this alternative and impacts would be the same as those described under Alternative A.

Impacts from WSR management actions would be the same as those described under Alternative A.

Similar to Alternative B, a CSU stipulation within 0.5-mile of scenic byways would be applied. This stipulation would cover 15,400 acres surrounding 25 miles of scenic byways, all of which falls within low potential areas for fluid mineral development. Due to the lack of fluid mineral potential adjacent to the byways, development of fluid minerals is not likely to impact scenic or historic values of byways.

Surface use restrictions proposed for cultural resource protection would limit impacts on visual resources and therefore protect adjacent byways.

Alternative D

Four BLM byways would be established under this alternative: Land's End, John Brown's Canyon, Niche to Blue Mesa, and Winter Flats Road (see **Table 4-49**). There would likely be an increase in driving for pleasure on newly designated routes and impacts would be similar to those described under Alternative B.

A portion of the Unaweep-Tabeguache and Niche Road byways would run through the Dolores River Canyon SRMA, and driving for pleasure combined with SRMA visitation could lead to an increase in use. As discussed for Alternative B, enhanced awareness and appreciation can result in increased protective actions but may also strain resources. In addition, noticeable increases in traffic may be perceived as a negative impact by local residents who value remote settings or depend on the byways for transportation.

A CSU stipulation would be applied within 0.25-mile of scenic byways and would cover 15,900 acres encompassing 52 miles of roads. Similar to Alternatives B and C, fluid mineral potential for the buffer surrounding byways is limited. The CSU would apply to 3,300 acres of moderate potential along 10 miles of road and 12,600 acres of low potential along 42 miles of road. Due to the lack of high fluid mineral potential adjacent to the byways, development of fluid minerals is not likely to impact scenic or historic values of byways.

Surface use restrictions proposed for cultural resource protection would limit impacts on visual resources and therefore protect adjacent byways.

Cumulative

The CIAA used to analyze cumulative impacts on byways includes the planning area and the Grand Mesa Scenic Byway, the only byway on lands adjacent to the planning area boundary.

Proposed management actions likely to have the greatest effect on byways in the GJFO planning area are activities associated with energy and minerals development, land use, and visitor use. Energy development has potential to impact byways by altering visual landscapes through the addition of pipelines or transmission lines and increased truck traffic on roadways. Certain land uses that surround BLM-administered public lands, such as continued growth and development, also have the potential to affect byways by leading to increased visitor use of byways and increased demand for resources such as housing, energy and utilities, the development of which has the potential to impact naturalness of lands surrounding byways by converting lands from their natural setting.

4.6 SOCIAL AND ECONOMIC CONDITIONS

This section is a description of the support conditions in the GJFO planning area and follows the order of topics addressed in **Chapter 3**:

- Native American tribal uses;
- Public health and safety; and
- Socioeconomics and environmental justice.

4.6.1 Native American Tribal Uses

This section addresses potential effects from management actions on Native American tribal interests, specifically Indian Trust Assets, treaty-based rights, and reservation lands. Indian Trust Assets are legal interests in property, physical assets, or intangible property rights held in trust by the US for Indian tribes or individual Indians. There are no known Indian Trust Assets or treaty-based rights or responsibilities of the BLM in the planning area; therefore, no further analysis is required.

If Indian Trust Assets or treaty-based rights are revealed during the RMP process or implementation, the BLM will conduct consultation and fulfill its obligations under applicable treaties, the tribal trust relationship, various federal laws, DOI and BLM regulations, and guidance and executive orders. The BLM, as a federal agency, will continue to maintain government-to-government relationships with federally recognized Indian tribes and will consult with tribes during resource management actions affecting tribal lands and resources.

Overall socioeconomic effects from management actions are discussed in **Section 4.6.3**, Socioeconomics and Environmental Justice. Cultural and traditional tribal uses of the planning area include gathering and harvesting plants, medicines, material, hunting, fishing, and ceremonial and religious use.

Effects on traditional cultural properties, sacred sites, culturally important natural resources, traditional practices, and tribal access are discussed in **Section 4.3.8**, Cultural Resources.

4.6.2 Public Health and Safety

This section discusses impacts on public health and safety from proposed management actions of other resources and resource uses. Existing conditions concerning public health and safety are described in **Section 3.6.2**, Public Health and Safety.

Methods of Analysis

The analysis includes the following assumptions:

- Public health and safety issues would receive priority consideration in the management of public lands.
- Demand for safe visits would increase with increasing numbers of public land users.
- Activities and resources available in and around the planning area would continue to be important to the health and safety of current and future residents.
- Most abandoned mine sites in the planning area are identified and characterized.
- All new hazardous materials and waste sites are identified and characterized.
- Resource development activities identify any possible generation of hazardous waste.
- No substantial new hazardous materials uses and (or) waste generating occurs within the planning area.
- The BLM's Hazard Management and Resource Restoration Program responds to all hazardous material releases on public surface. Emergency cleanup actions are implemented on sites posing a substantial threat to the public and (or) the environment.

The pace and timing of mineral development activities is dependent on a variety of factors outside the management decisions of BLM. These include national and international energy demand and prices, production factors within the planning area, and business strategies of operators. Because the pace of development in the planning area is unknown, a relatively constant rate of development is assumed for this analysis. Therefore, actual impacts could vary if the rate of development or production changes over the study period.

Effects Common to All Alternatives

ROW exclusion areas preclude the development of projects such as energy facilities and transmission lines. Since the construction, operation and

maintenance of such development projects come with associated safety risks for both workers and the public, alternatives that have greater acreages of ROW exclusion areas are considered to have lower long-term, indirect health and safety impacts.

Lands that are open for consideration for mineral material sales have the potential for future health and safety risks related to mining activities. The number of acres open to mineral material sales is considered to be proportional to the potential for long-term, indirect health and safety risks.

Lands that are open for fluid mineral leasing have the potential for future health and safety risks related to oil, gas and geothermal exploration, development, operation, and decommissioning. The number of acres open for leasing is considered to be proportional to the potential for long-term, direct health and safety impacts. Use, storage, and transportation of fluids such as produced water, hydraulic fracturing fluids, and condensate have the possibility of spills that could migrate to surface or groundwater causing human health impacts. The possibility that hydraulic fracturing fluids may migrate to shallow groundwater sources is still speculative based on ongoing studies by the EPA (EPA 2011a). Hydraulic fracturing occurs in the gas producing formations at depths greater than 5,000 feet in the GJFO. Water, sand, and chemical additives are pumped into the formation at extremely high pressure, to create fractures that allow gas to flow into the well. Theoretically, improperly completed wells or perforations into zones of geological weakness (i.e., faults or fractures) could create conduits that allow hydrofracturing fluids, produced water, and methane to migrate to groundwater resources. If a groundwater source is contaminated, there are few cost-effective ways to reclaim that water source; thus, the long-term impacts of groundwater contamination are considerable. In addition to BLM Onshore Orders 43 CFR 3160) and COGCCs requirements for well completions (COGCC 2010b), GJFO protects surface and shallow groundwater through stipulations and site-specific conditions of approval for drilling, completions, and fluids management.

Lands that are acceptable for further coal leasing and development have the potential for future health and safety risks related to coal mining. The acres acceptable for further leasing and development are considered to be proportional to the potential for long-term, direct health and safety impacts.

Hazardous fuels treatments, including prescribed fire and mechanical treatment, would improve public safety by reducing fire hazard. Many of these fuels treatments occur in locations to reduce the chance of a wildfire burning from BLM lands onto adjacent private lands. These fuels treatments reduce the fire behavior when a wildfire burns into them, increasing the potential of success of fire suppression operations. Treatments to reduce hazardous fuels also help protect other public land users that could become trapped, injured, or even killed during a wildfire event. The highest priority of the Wildland Fire

Management program, which includes the fuels program, is to protect firefighter and public safety.

Surface waters can be indirectly impacted over the long term from development activities in the same watershed and from livestock grazing, which can introduce both chemical and biological (e.g., fecal coliform, nitrogen) contamination into waters. Contaminated surface waters pose health risks to recreational users who may come into contact with those waters. Development activities in the vicinity of drinking water aquifers (groundwater) pose a risk of contamination of those aquifers and health impacts on consumers of the groundwater. All alternatives include a planning objective to protect municipal watersheds and source water protection areas, however, actions vary between alternatives.

Under all alternatives, livestock grazing has the potential for human interaction and injury. The potential for long-term, indirect impacts are considered to be in direct proportion to the acreages that are open for livestock grazing under each alternative, and therefore, the level of risk varies by alternative along with these acreages.

Managing No Shooting Areas improves public health and safety by limiting the risk of the public being injured by gunfire. The potential for long-term, direct impacts are considered to be inversely proportional to the acreages that are closed for shooting under each alternative, and therefore, the level of risk varies by alternative along with these acreages.

Implementing management for the following resources would have negligible or no impact on public health and safety and are therefore not discussed in detail: air quality; soils resources; vegetation; special status species; fish and wildlife; wild horses; cultural resources; paleontology; visual resources; lands with wilderness characteristics; forestry; WSAs; ACECs; national trails; and national, state, and BLM byways.

Alternative A

There are no public health and safety impacts uniquely associated with Alternative A. As a result, impacts under this alternative would be similar to those described under Effects Common to all Alternatives and all current conditions and trends would be expected to continue.

Alternative B

Alternative B promotes the delisting of impaired water bodies (303d listed) by monitoring actions, including, but not limited to, grazing, comprehensive travel and transportation management, and other surface-disturbing actions and implementing appropriate management change. This management action could improve water quality in currently impaired water bodies and result in lower health risks for users of those waters.

The use of chemical treatments in wildland fire management and vegetation treatments for weeds would result in increased use, storage, transportation of these chemicals, and a related increase in potential for human health risks through exposure.

Prohibiting recreational target shooting in Coal Canyon would address the numerous complaints from the public over safety issues, enhance public safety in a prime horse viewing area for both visitors and residents alike, and guard against the reoccurrence of horses being shot in the canyon.

Alternative B would reduce risks to public health and safety by implementing safety signs in shooting areas and providing safety guidelines on safe shooting practices. The risks associated with recreational target shooting would be the same as those described under Effects Common to all Alternatives. Alternative B contains the most No Shooting Areas.

Alternative C

Alternative C would also promote the delisting of impaired water bodies (303d listed). The impacts of which would be similar to those described under Alternative B.

The use of chemical treatments in wildland fire management and vegetation treatments for weeds would be minimized, resulting in impacts that may be slightly less than those described under Alternative B.

Alternative C would also reduce risks to public health and safety by implementing safety signs in shooting areas and providing safety guidelines on safe shooting practices. The risks associated with recreational target shooting would be the same as those described under Effects Common to all Alternatives, but would occur over a smaller area. Alternative C contains the fewest No Shooting Areas of the action alternatives because there are fewer SRMAs where shooting would conflict with concentrated recreation opportunities.

Alternative D

Alternative D would also promote the delisting of impaired water bodies (303d listed). The impacts of which would be similar to those described under Alternative B.

The use of chemical treatments in wildland fire management and vegetation treatments for weeds would be minimized, resulting in impacts that may be slightly less than those described under Alternative B.

Alternative D would also reduce risks to public health and safety by implementing safety signs in shooting areas and providing safety guidelines on safe shooting practices. The risks associated with recreational target shooting would be the same as those described under Effects Common to all

Alternatives, and Alternative D would manage the fewest acres as closed to target shooting.

Cumulative

The CIAA used to analyze cumulative impacts on public health and safety is composed of fourth-order watersheds that completely or partially overlap the planning area. Fourth-order watersheds were used as the basic unit of analysis because impacts from most management actions proposed under the RMP and other existing activity plans are not expected to have cumulative influence beyond this scale.

Past and present actions that have affected public health and safety include illegal dumping of hazardous waste, dispersed or unmanaged target shooting, visitors finding themselves unprepared for remote settings, risks from abandoned mine openings, and risks associated with sites that are being used or were used for resource extraction.

Over the lifespan of the RMP, these actions and risks are expected to continue to grow in proportion to the increasing population of the CIAA and increasing use of BLM-administered public lands by a regional and national audience. A larger population may result in more people dumping trash and hazardous wastes and a greater strain on law enforcement. If energy development increases, risks associated with extractive infrastructure would be expected to rise.

4.6.3 Socioeconomics and Environmental Justice

This section was prepared for the GJFO by researchers at Colorado Mesa University.

This section discusses impacts on socioeconomics and environmental justice from proposed management actions of other resources and resource uses. Existing conditions concerning socioeconomics and environmental justice are described in **Section 3.6.3**, Socioeconomics, and **Section 3.6.4**, Environmental Justice.

Methods of Analysis

Analysis in this chapter will include three prominent activities that take place on land administered by the GJFO: recreation, livestock grazing, and energy resource extraction, especially natural gas drilling and production. Other contributions to regional economic and social conditions will also be examined, including potential renewable energy development and the role for environmental amenities in attracting residents and businesses. All of these activities can bring benefits to the region but can also impose costs. Impact analysis does not formally weigh costs and benefits but should make clear the presence of both.

Market and Non-market Values

Economic analysis will take one of two forms depending on the available data. For those activities that generate measurable spending (market values), the analysis will estimate economic impact in terms of output (total spending), value added (income), and employment in the regional economy. Spending to produce natural gas, to raise cattle, and to recreate on BLM land fits this type of analysis. The analysis uses the IMPLAN model, which was developed by the Minnesota IMPLAN Group. The input-output analysis performed by IMPLAN, in essence, measures the cumulative impact from an initial dollar of spending that makes its way through the economy. Three types of impacts are measured. Direct impacts are income and employment directly affected by activity on BLM land, e.g., a rancher spends money with a local veterinarian. Indirect impacts occur when related industries gain from purchases by the directly impacted businesses, e.g., the veterinarian buys supplies from local firms. Induced impacts are the results of spending by employees hired due to the business activity just described. Together, these will be reported as the total impact of the different management alternatives.

Not all economic values can be measured by market transactions. If people are willing to pay for an item or experience, it has economic value to them even if they can enjoy it without payment, e.g., free entry to BLM lands. Furthermore, if people are willing to pay to ensure a particular outcome, such as wilderness preservation, that outcome has economic value for them whether or not a mechanism exists for them to achieve it. Finally, environmental amenities can attract individuals or businesses to an area. In terms of workers, for example, this value can be described as a willingness to work for lower wages or salaries in order to partake of those amenities. These non-market values can be estimated, but that has not been done for land administered by GJFO. This analysis will look at values estimated for similar settings and note that, even when estimates aren't available, the existence of such values should be acknowledged.

Indicators

Socioeconomic indicators are used to identify the relative effects that the different management alternatives have on the regional economy and society.

Indicators of impacts on market value outcomes include the following:

- Output (Total Spending)
- Value Added (Income)
- Level of Employment

The market value indicators will be determined by changes in indicators particular to each activity analyzed.

The indicator for livestock grazing will be changes in the number of cattle grazed (derived from changes in AUMs).

The indicators for natural gas drilling and production include the following:

- Wells drilled
- Wells completed
- Producing wells

The indicators for recreation include the following:

- Number of out of area visitors
- Number of participants per recreation category

Indicators for non-market outcomes include the following:

- Willingness to pay for a tangible good or an experience
- Willingness to pay to secure a desired outcome

Assumptions

The analysis includes the following assumptions for livestock grazing:

- The actual AUMs utilized will be the same in each of the 20 years of the planning period.
- A decrease in actual AUMS will represent a corresponding decrease in cattle grazing.

The analysis includes the following assumptions for natural gas drilling and production:

- Increasing or decreasing acres available for leasing will change the number of wells drilled, the number of wells completed, and the level of natural gas production in proportion to the change in acres.
- Stipulating land as NSO will increase well drilling and completion costs by 10 to 100 percent. Costs increase because the drilling pad would have to be placed outside the NSO boundary or an exception would have to be sought to drill inside the boundary. Removing such a stipulation will reduce those costs by 10 to 50 percent.
- Large blocks of NSO stipulations can make it impossible to reach fluid minerals, even with directional and new horizontal drilling technologies. The technology is constantly improving, so it is unclear at what point NSO blocks are considered too large to allow for mineral extraction. In order to compare alternatives, this

analysis will assume that 15 percent of the NSO areas will not be accessible by directional or horizontal drilling.

- A stipulation that increases costs will have two effects. It will decrease drilling and, therefore, production, which will lessen the economic impact. At the same time the higher costs will increase spending on drilling that does take place, which will increase the economic impact.
- Existing leases and claims would not be affected by the closures or withdrawals proposed under this RMP.
- Valid existing leases would be managed under the stipulations in effect when the leases were issued; new stipulations proposed under this RMP would apply on new leases.
- Other land use stipulations limit the timing or location of drilling and related development to minimize impacts to resources but will not reduce drilling.
- Of wells drilled, 10 percent will be dry holes.
- Wells completed during the planning period will produce throughout the planning period.
- Only wells completed during the planning period will be counted as producing wells for the analysis.
- Scenario 1 assumes that 11 wells are drilled per year: the average number drilled over the preceding 20 years.
- Scenario 2 assumes that 39 wells are drilled per year: the largest number of wells drilled in any year on record.
- Scenario 3 assumes that 197 wells are drilled per year: based on the planning period estimate from the RFD.
- Future drilling will include a mix of conventional/directional and horizontal wells. Each scenario includes such a mix.

The analysis includes the following assumptions for recreation:

- According to the base theory of economic development, the regional economic impact of recreation derives from spending by visitors from outside the local economy. In that sense recreation is like an export, except that the consumers travel to the resource to use it.
- Recreation use will continue to increase over the study period. Based on linear regression analysis that compared increase in visitor days to population growth, visitor days will increase at an assumed baseline rate of 2.65 percent annually. This is slower than the recent trend but is faster than the projected rate of population growth for

either Mesa County or Colorado over the twenty year planning period.

- Adjusted, vehicle counter data will be assumed to represent the number of visitor days for recreation users.

Forecasts of Population and Total Employment

The communities in the GJFO planning area are anticipated to continue their population growth over the next twenty years. According to the Colorado Department of Local Affairs, population is expected to grow by less than an average of 1.5 percent per year between 2010 and 2015. Long term projections place the county's population at 171,581residents in 2020 and 201,973 residents in 2030. As the population continues to grow over the next 20 years, communities are likely to see continued economic growth. For example, the total number of jobs is projected to increase from 73,942 jobs in 2010 to 87,500 jobs in 2020 and is expected to reach 101,850 jobs in 2030.

Impacts by Economic Sector

Summary Tables

The detailed analysis of economic impacts that follows is organized by economic sector (activity). However, the two tables below summarize these impacts by alternative. 502, Comparison of Socioeconomic Indicators by Alternative; Values for 2029 (Year 20 of Planning Period), compares the level of activity for the socioeconomic indicators of each sector. The values shown for comparison are from 2029, which is year 20 of the planning period. Notice that for livestock grazing two scenarios are analyzed: a higher level of activity and a lower level of activity. For natural gas drilling and extraction three levels of activity are analyzed. Each of those activity levels is analyzed as if NSO stipulations impose relatively lower costs on drilling and then again as if NSO stipulation costs are higher. The number of wells drilled and the number producing are very close to the same in the two cost scenarios and are reported as identical in the table.

Table 4-50, Comparison of Economic Impacts by Alternative; Values for 2029 (Year 20 of Planning Period) (2009 dollars), summarizes the quantifiable economic impacts described in the following sections. The values are based on the level of activity shown in **Table 4-51**, Comparison of Socioeconomic Indicators by Alternative; Values for 2029 (Year 20 of Planning Period). The values shown for comparison are for 2029, which is year 20 of the planning period.

Cumulative impacts over the entire planning period are summarized in **Tables 4-74** through **4-79**.

Table 4-50
Comparison of Economic Impacts by Alternative; Values for 2029
(Year 20 of Planning Period) (2009 dollars)

Activity / Impact	Alternative			
	A	B	C	D
Grazing: Projected Actual AUM Use				
Total Spending	$2,756,183	$ 2,749,392	$ 1,596,859	$2,756,183
Value Added	$682,269	$ 680,588	$ 395,288	$682,269
Employment	17.1	17.0	9.9	17.1
Grazing: Maximum AUM Use				
Total Spending	$4,953,562	$4,902,145	$2,640,736	$4,953,562
Value Added	$1,226,212	$1,213,484	$653,691	$1,226,212
Employment	30.7	30.4	16.4	30.7
Gas Drilling and Extraction: 11 Wells (Lower NSO Costs)				
Total Spending	$85,798,126	$85,798,126	$77,752,546	$85,798,126
Value Added	$40,107,043	$40,107,043	$36,345,626	$40,107,043
Employment	248.4	248.4	225.1	248.4
Gas Drilling and Extraction: 39 Wells (Lower NSO Costs)				
Total Spending	$304,193,373	$304,193,373	$275,680,781	$304,193,373
Value Added	$142,197,701	$142,197,701	$128,869,253	$142,197,701
Employment	880.7	880.7	798.1	880.7
Gas Drilling and Extraction: 197 Wells (Lower NSO Costs)				
Total Spending	1,582,438,993	1,582,438,993	1,434,114,315	1,582,438,993
Value Added	738,477,976	738,477,976	669,259,195	738,477,976
Employment	4,570.5	4,570.5	4,142.1	4,570.5
Gas Drilling and Extraction: 11 Wells (Higher NSO Costs)				
Total Spending	$106,929,002	$106,929,002	$96,652,170	$106,929,002
Value Added	$49,415,644	$49,415,644	$44,677,934	$49,415,644
Employment	304.6	304.6	275.4	304.6
Gas Drilling and Extraction: 39 Wells (Higher NSO Costs)				
Total Spending	$379,111,910	$379,111,910	$344,091,211	$379,111,910
Value Added	$175,200,919	$175,200,919	$159,028,478	$175,200,919
Employment	1,079.8	1,079.8	980.2	1,079.8
Gas Drilling and Extraction: 197 Wells (Higher NSO Costs)				
Total Spending	$1,974,653,105	$1,974,653,105	$1,792,228,693	$1,974,653,105
Value Added	$911,256,687	$911,256,687	$827,132,204	$911,256,687
Employment	5,613	5,613	5,095	5,613
Recreational Use				
Total Spending	$7,204,295	$7,156,177	$7,031,500	$7,175,330
Value Added	$4,374,567	$4,344,954	$4,269,200	$4,356,799
Employment	90	89.4	87.8	89.6

Source: Calculations from BLM data

Table 4-51
Comparison of Socioeconomic Indicators by Alternative; Values for 2029
(Year 20 of Planning Period)

Activity / Indicators	Alternative			
	A	B	C	D
Grazing: Projected Actual AUM Use				
Head of Cattle Grazed in 2029 (AUMs/12 months)	2,841	2,834	1,646	2,841
Grazing: Maximum AUM Use				
Head of Cattle Grazed in 2029 (AUMs/12 months)	5,106	5,053		5,106
Gas Drilling and Extraction: 11 Wells				
Wells drilled in 2029	11	11	10	11
Producing wells in 2029	198	199	180	202
Gas Drilling and Extraction: 39 Wells				
Wells drilled in 2029	39	39	35	39
Producing Wells in 2029	702	706	638	720
Gas Drilling and Extraction: 197 Wells				
Wells drilled in 2029	197	196.5	178.5	197
Producing wells in 2029	3,545	3,565	3,223	3,638
Recreational Use				
Total Visitors in 2029	708,092	702,834	691,058	705,085
Motorized visitors in 2029	416,758	408,586	400,728	412,631
Mechanized Visitors 2029	172,483	174,208	169,101	175,932
Non-mechanized Visitors in 2029	118,852	120,041	121,229	116,522

Source: Calculations from BLM data

Impact on Agriculture

Livestock Grazing

Economic Impacts. In this analysis, the regional economic impacts result from the expenditures involved in raising the livestock. As described earlier, the IMPLAN analysis estimates the final impact of that spending on the regional economy. When this spending has played itself out, the total spending generated, resulting jobs, income earned, etc., are described as the economic impact of livestock production.

Cattle are by far the most common class of livestock permitted for grazing by GJFO; so much so, that the analysis assumes that all land used for grazing is used for cattle. On GJFO land as well as other BLM managed lands, there is a difference between available AUMs and those actually used over the course of a year. Available AUM's are defined as active AUM's on a permittee's grazing permit. Economic impact analysis requires that we distinguish between these two categories because only those AUMs utilized will contribute to an impact on the regional economy.

The economic impact of grazing derives from the number of cattle produced. For purposes of this analysis, the average AUM usage over the preceding ten years was calculated to establish historical use. A baseline for usage in Alternative A was established by comparing this historical usage to AUMs included for future use in that alternative. Then the change in actual AUMs for alternatives B, C, and D was calculated. This gave the information for the first scenario reported in the analysis. A second scenario was run using the total number of AUMs available in each alternative. This represents the maximum possible use of grazing permits.

Alternatives A and D were projected to have the same number of cattle, 2,841. This is about 138 cattle fewer than the preceding ten year average, due to closure of some allotments or reduction of permitted AUMs available at completed prior to this planning process during those ten years. Alternative B would result in only seven fewer head than alternatives A and D. Alternative C would reduce annual grazing to the equivalent of 1,646 cattle, 1,195 fewer than in alternatives A and D. A cattle budget developed by Seidl, et al. in consultation with Moffat County ranchers was used in this analysis to estimate the economic impact of the various alternatives.

Table 4-52, Total Economic Impacts of Cattle Grazing by Alternative Based on Actual AUM Use (2009 dollars), reports the results of the analysis. Alternatives A and D are the same and would each generate more than $2.7 million in total spending, about $6.8 million in total value added (incomes) and 17 full time equivalent jobs. Alternative B results in slightly smaller dollar values but nearly the same number of jobs. Alternative C lowers sales by more than $1million; lowers value added (incomes) by nearly $287,000, and lowers employment by 7 jobs. Alternative C can be considered a considerable change. The analysis assumes that this scenario repeats itself over the twenty year planning period.

Table 4-52
Total Economic Impacts of Cattle Grazing by Alternative Based on Actual AUM Use (2009 dollars)

Impact	A and D	B	C
Total Output (Spending)	$2,756,183	$ 2,749,392	$ 1,596,859
Total Value Added (Income)	$682,269	$ 680,588	$ 395,288
Employment	17.1	17.0	9.9

Source: IMPLAN calculations from BLM data

A second analysis was also conducted to determine the economic impact if all available AUMs were utilized. Under this scenario, the number of cattle for Alternative A and D would be 5,106. There would be a slight reduction to 5,053 head under Alternative B, and a greater reduction to 2,722 cattle under Alternative C. **Table 4-53**, Total Economic Impacts of Cattle Grazing by

Alternative Based on Maximum AUM Use (2009 dollars), describes the predicted economic impacts.

Table 4-53
Total Economic Impacts of Cattle Grazing by Alternative Based on Maximum AUM Use (2009 dollars)

Impact	A and D	B	C
Total Output (Spending)	$4,953,562	$4,902,145	$2,640,736
Total Value Added (Income)	$1,226,212	$1,213,484	$653,691
Employment	30.7	30.4	16.4

Source: IMPLAN calculations from BLM data

In this analysis, Alternatives A and D would again have the greatest economic impact with nearly $5 million in total spending, about $1.2 million in total value added (incomes) and 315 jobs deriving from cattle production utilizing grazing on GJFO land. Alternative B has slightly lower dollar values but nearly the same employment. Alternative C shows a lesser economic impact with more than $2.3 million less in total spending, more than half-a-million dollars less in total value added (incomes), and 14 fewer jobs than in Alternatives A and D.

It is possible that a reduction in AUMs might not lead to a one-for-one reduction in cattle production if livestock producers substituted more locally grown alfalfa and private grazing land for lost AUMs.

Social Impacts. As described in Chapter 3 (Section 3.6.3, Socioeconomics), the communities of De Beque, Glade Park, Loma/Mack, and Gateway are particularly associated with ranching. Social impacts from management of grazing on GJFO lands would be expected to be most noticeable in these areas. Alternatives A, B, and D keep available AUMs at about the same level, allowing grazing to continue at the same level. These management practices themselves would not alter the social conditions described in Chapter 3. Alternative C would decrease available AUMs by about forty percent. If ranchers were not able to replace that grazing capacity with private land or additional alfalfa feeding, it would lead to less ranching activity. Ranching incomes would certainly be reduced and some ranching operations might cease. If idle ranchland was converted to other uses, such as residential or commercial development, the rural character of these communities would lessen.

Impact on Natural Resource Extraction

As for many locations in Colorado, natural resource extraction has historically been a significant component of local economies in the planning area. The three most important have been coal, uranium, and natural gas. The socioeconomic impacts of the proposed alternatives are discussed below with each resource having its own section.

Natural Gas Drilling and Extraction

Economic Impacts. The regional economic impact of natural gas production on GJFO managed land results primarily from expenditures to drill wells and to extract gas from completed wells. To the extent that these expenditures circulate through the regional economy, they have a regional economic impact. The alternatives (A, B, C, and D) would have varying economic impacts if they result in different levels of drilling and/or extraction. A management plan can affect the level of drilling and extraction by either increasing or decreasing the land available for drilling or by increasing or decreasing the costs of those two activities. Management plans have no effect on the price of natural gas, which is the most important factor in the decision to produce or not to produce.

The Field Office has recently begun receiving applications to drill horizontal wells into shale formations. The RFD includes the development potential of the shale play. In the RFD report prepared by the GJFO, acreage available for natural gas leasing is divided into six categories by potential for production: very high, high, moderate, low, very low, and none for conventional/directional drilling as well as shale gas/horizontal drilling. The area with known potential for development in the RFD includes land already leased as well as land still available to be leased. This impact analysis considers drilling in the low to very high potential categories as the area of potential development.

Allocating land as unavailable to leasing or placing an NSO stipulation does not affect land currently under lease. Both of these actions would take effect only if a lease expired. Since steps can be taken to keep a lease active, an important assumption is that, as a practical matter, changes in both acreage available for leasing and in NSO stipulations will affect only land not already leased. This will, of course, limit the effect on drilling by those management actions. The percentage of available acres not yet leased is around 22 percent of the area with development potential. Therefore, in the analysis, differences between the management alternatives would have a limited effect on production because they will affect only a small portion of the land available for production. **Table 4-54**, Number of Unleased Acres with NSO Stipulations by Alternative, shows for each alternative how many acres available for leasing within the area of development potential (Low, Moderate, High, or Very High development potential) remain unleased. It also indicates how many of those unleased acres are stipulated as NSO.

The economic impact analysis presented here is intended to compare the outcomes from Alternatives B, C, and D to the baseline of Alternative A, which continues current management practices. Because the alternatives are based on a different drilling strategy, which incorporates horizontal drilling, the cost structures are significantly different from past drilling. Therefore, it is not

Table 4-54
Number of Unleased Acres Available for Leasing with NSO Stipulations by Alternative

Alternative A		Alternative B		Alternative C		Alternative D	
Acres Not Leased	NSO Acres	Acres Not Leased	NSO Acres	Acres Not Leased	NSO Acres	Acres Not Leased	NSO Acres
172,039	77,509	169,110	69,833	97,198	42,387	171,303	58,541

Source: BLM

possible to take the calculated economic impacts and assume that they are an accurate representation of the recent economic impacts from natural gas production.

The first scenario run for this analysis assumes an average of 11 federal wells drilled annually. It is based on the average for the last ten years (1992-2011) and includes part of a bust as well as the recent boom. This scenario would result in 220 federal wells drilled over the next twenty years. Historically, 137 federal wells were drilled over the past ten years and 220 over the last twenty years. The highest number of federal wells ever drilled in a year was 39 in 2006; only three wells were drilled in 2009. Two wells were drilled during 2010, which is nominally the first year of the planning period. While recent assessments are that production in the area is starting to recover, no one is predicting a quick return to the peak production of the recent boom. A second scenario was run for an annual average of 39 wells drilled. This would represent twenty years of drilling at the highest level of drilling during the recent boom. Finally, a third scenario based on the RFD was run. This scenario assumed that 197 wells would be drilled in each year of the planning period.

The economic impact in any particular year is the result of the expenditures for drilling plus the expenditures for maintaining the wells that continue to produce gas in that year. It is assumed that 10 percent of wells drilled will be dry holes. Those dry holes will not generate the additional spending that goes with the completion costs for wells that are brought to the extraction stage. Drilling and completion costs are based on Authority for Expenditure (AFE) documents acquired from a regional producer by GJFO. The average life of natural gas wells in the planning area is 20-30 years (RFD); so the analysis assumes that each well completed during the planning period will be producing at the end of the planning period. This analysis is derived from one developed by Davies, et al. (2007).

Alternative A continues current management practices and serves as the baseline against which the other alternatives are compared. Alternative B slightly reduces the number of acres available for leasing and slightly reduces the number of acres affected by NSO stipulations. Overall, compared to Alternative A, it is as if 0.8 of a well is lost over the entire twenty years in Scenario 1. There are 2.5 fewer wells in Scenario 2 and a similarly small loss in Scenario 3.

Alternative D also slightly reduces the acres available for leasing and reduces the number of acres subjected to NSO stipulations. Overall, compared to Alternative A the net impact is as if over the entire twenty years 0.15 of an additional well would be drilled in Scenario1. For Scenario 2 less than one additional well would be drilled and for Scenario 3 fewer than five new wells. Again, the economic impact of Alternative D is analyzed to be the same as Alternative A.

The economic impact of Alternative C differs more from Alternative A. Alternative C removes enough acres from leasing that the analysis shows a decrease in production. As with alternatives B and D, the effect of changing NSO stipulations is negligible. For alternative C, the analysis shows the equivalent of about 20 fewer wells drilled over the twenty years compared to Alternative A in Scenario 1. For Scenario 2 the difference is about 73 wells, and for Scenario 3 the difference is 369 wells. That would be about 9 percent fewer wells. Alternative C would appear to have a noticeable impact while Alternatives A, B, and D are essentially equivalent.

Tables 4-55, Total Economic Impacts of Gas Drilling and Extraction by Alternative, 2010, 2019, and 2029 Based on 11 New Wells per Year (2009 dollars), compares economic impacts between Alternative A (B and D) and Alternative C based on an IMPLAN simulation. According to the analysis, in 2019 Alternative A would result in 20 more jobs and over $3.3 million more in total spending compared to Alternative C. The planning period ends in 2029 with 13.3 more jobs and about $3.7 million more in total spending for Alternative A than for Alternative C. Note that for both alternatives, the economic impacts in each succeeding year are greater than the year before due to the fact that wells drilled in previous years will continue to produce natural gas. The tables compare Alternatives A and C for each of the years shown.

Table 4-55
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 11 New Wells per Year (2009 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$70,846,155	$64,205,534	$77,928,668	$70,622,540	$85,798,126	$77,752,546
Total Value Added (Income)	$31,268,507	$28,337,602	$35,455,182	$32,130,877	$40,107,043	$36,345,626
Employment	188.8	171.1	217.1	196.7	248.4	225.1

Source: IMPLAN calculations from BLM data

A second analysis was run using an average of 39 wells drilled per year. Thirty-nine was the maximum number of wells drilled on GJFO land in any year. Those 39 wells were drilled in 2006. The outline of the analysis parallels that above. Again, Alternatives B and D have virtually the same outcome as Alternative A and are not reported separately. Alternative C results in reduced drilling and extraction compared to Alternative A as illustrated in **Table 4-56**, Total Economic Impacts of Gas Drilling and Extraction by Alternative, 2010, 2019, and 2029 Based on 39 New Wells per Year (2009 dollars). In the last year of the planning period, Alternative A would generate over $28 million dollars more in total spending, over$13 million more in value added, and about 81.6 more jobs than would Alternative C.

Table 4-56
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 39 New Wells per Year (2009 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$251,181,833	$227,638,129	$276,292,563	$250,395,172	$304,193,373	$275,680,781
Total Value Added (Income)	$110,861,070	$100,469,872	$125,704,737	$113,922,209	$142,197,701	$128,869,253
Employment	669.5	606.8	769.5	697.4	880.7	798.1

Source: IMPLAN calculations from BLM data

Table 4-57, Total Economic Impacts of Gas Drilling and Extraction by Alternative, 2010, 2019, and 2029, Based on 197 New Wells per Year (2009 dollars), reports the economic impacts if 197 wells were drilled each year during the planning period. As was the case for the scenarios with 11 and 39 wells drilled per year, the economic impacts of Alternatives B and D are similar to that of Alternative A. Alternative B is smaller than Alternative A by about 0.3 percent, and Alternative D is greater than A by 0.1 percent. Because of the large number of wells, that would be a few million dollars in 2029. Due to the small percent difference, Alternatives B and D are represented in the table as being equivalent to Alternative A. In 2029, Alternative A would generate about $148.3 million more in overall spending than would Alternative C. Value added would be greater by over $69 million for Alternative A, which would also be responsible for about 48 more jobs than would Alternative C.

The above three scenarios analyzed the impacts of three levels of drilling. Each of the scenarios assumed that NSO stipulations would increase drilling costs by by ten percent. Below are analyzed the same three drilling patterns with the

Table 4-57
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 197 New Wells per Year (2009 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$1,314,730,733	$1,191,498,821	$1,428,385,290	$1,306,421,946	$1,582,438,993	$1,434,114,315
Total Value Added (Income)	$580,227,993	$525,842,258	$630,789,557	$593,776,596	$738,477,976	$669,259,195
Employment	3,504	3,175.6	4,112.5	3,633.4	4,570.5	4,142.1

Source: IMPLAN calculations from BLM data

assumption that NSO stipulations double the costs of drilling in those areas. The economic impact in each scenario will be higher than the corresponding scenario when NSO costs were assumed to be ten percent. That outcome is related to initially higher costs for drilling on NSO acres. Those higher costs show up in the regional economy as higher spending, which increases the economic impact.

Each of the three scenarios reduces the acreage of unleased land available for leasing under an NSO stipulation by some amount for Alternatives B, C, and D compared to Alternative A. That reduction has three effects. The 15 percent of those NSO acres that could not be reached for drilling are now available, which will boost drilling. In addition, lower costs for drilling on acres that are no longer NSO will boost drilling. Both of these outcomes will tend to increase the economic impact. Offsetting these to some extent is the condition that lower costs for drilling on acres that are not now NSO will reduce spending and tend to lower the economic impact. For each of the three levels of drilling, Alternatives B, C, and D will have the same relative effect compared to Alternative A as they did above, but the levels of spending will be different.

Table 4-58 illustrates the scenario of eleven new wells per year. Alternatives B and D are so similar to Alternative A that they are reported as having the same outcome. Alternative C shows a significantly smaller economic impact (about nine percent lower) than Alternative A, largely due to the number of acres withdrawn from leasing.

Table 4-59 illustrates the scenario of 39 new wells per year. Again, Alternatives B and D are so similar to Alternative A that they are reported as having the same outcome. Alternative C shows a significantly smaller economic impact (about nine percent lower) than Alternative A, largely due to the number of acres withdrawn from leasing.

Table 4-58
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 11 New Wells per Year and High NSO Costs (2009 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$91,977,031	$83,062,399	$99,059,542	$89,499,659	$106,929,002	$96,652,170
Total Value Added (Income)	$40,577,107	$36,644,633	$44,763,782	$40,449,881	$49,415,644	$44,677,934
Employment	245	221.3	273.2	246.9	304.6	275.4

Source: IMPLAN calculations from BLM data

Table 4-59
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 39 New Wells per Year and High NSO Costs (2009 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$326,100,369	$295,899,943	$351,211,101	$318,727,382	$379,111,910	$344,091,211
Total Value Added (Income)	$143,864,287	$130,541,248	$158,707,957	$144,035,197	$175,200,919	$159,028,478
Employment	868.7	788.2	968.7	879.1	1,079.8	980.2

Source: IMPLAN calculations from BLM data

Table 4-60 illustrates the scenario of 197 new wells per year. As was the case for the scenarios with 11 and 39 wells drilled per year, the economic impacts of Alternatives B and D are similar to that of Alternative A. Alternative B is smaller than Alternative A by about 0.1 percent, and Alternative D is greater than A by 0.6 percent. Because of the large number of wells, that would be a few million dollars in 2029. Due to the small percent difference, Alternatives B and D are represented in the table as being equivalent to Alternative A. Alternative C shows a significantly smaller economic impact (about nine percent lower) than Alternative A, largely due to the number of acres withdrawn from leasing.

In the scenarios analyzed for natural gas drilling and extraction, the magnitude of the economic impact varies depending on the number of wells drilled and the level of costs associated with NSO stipulations. However, within each scenario, the relative effects of Alternatives B, C, and D compared to Alternative A are

Table 4-60
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 197 New Wells per Year and High NSO Costs (2009 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$1,706,944,859	$1,548,862,841	$1,833,754,039	$1,664,141,406	$1,974,653,105	$1,792,228,693
Total Value Added (Income)	$753,006,712	$683,271,711	$827,967,232	$751,416,158	$911,256,687	$827,132,204
Employment	4,546.5	4,125.5	5,051.7	4,584.7	5,613	5,095

Source: IMPLAN calculations from BLM data

the same since Alternatives B, C, and D make the same changes in each case. Alternatives A, B, and D are similar in their outcomes while Alternative C lowers the economic impact by about nine percent compared to Alternative A.

The analysis of natural gas production is complicated by the fact that some of the natural gas production overseen by GJFO will take place in Garfield County as well as in Mesa County. As described in Chapter 3, the socioeconomic impacts of natural gas production in the GJFO planning area fall most heavily in Mesa County. Despite Garfield County far exceeding Mesa County in overall natural gas activity, the RFD projects that 63 percent of wells drilled in the planning area over the planning period will be in Mesa County. In addition, a large share of the firms, workers, and income related to gas production find their home in Mesa County. The largest part of the socioeconomic impact will accrue to Mesa County.

It is also the case that some of the waste water generated is transported to Grand County, Utah for disposal. This will shift a small proportion of the economic impact to that county. Finally, the regional economic impacts in the analysis will be overstated to the extent that firms or workers from outside the planning area work in gas production but spend their earnings outside the area. An example could be workers from Utah, Wyoming, or other Colorado counties.

Social Impacts. As pointed out in Chapter 3 (Section 3.6.3, Socioeconomics) and in the Cumulative Economic Impacts section of this chapter, natural gas drilling and extraction on GJFO managed land is only a small part of the drilling and extraction that take place in the region overall. Chapter 3 (Section 3.6.2, Public Health and Safety and Section 3.6.3, Socioeconomics) identifies social conditions that can be affected by natural gas production. These include high wage jobs, increased housing demand (higher rents and housing prices), increased school enrollment, increased traffic (more congestion and higher maintenance costs),

increased public safety costs, and increased likelihood of drilling and extraction operations interfering with recreation opportunities (Section 4.4.2, Recreation and Visitor Services). The natural gas industry also pays taxes that are intended to help offset increased social costs associated with their activity. It would be difficult to parse out the particular portion of the impacts on social conditions that are attributable to natural gas production on GJFO administered land versus the impacts from gas production in the region overall, but it is clear that they would be far less.

Two of the scenarios analyzed for natural gas production are based on historical levels of drilling on GJFO land. One assumes a base level of eleven wells per year (the 20 year average) while the other assumes 39 wells per year (the greatest number ever drilled in a single year). In these scenarios, Alternatives A, B, and D have roughly equivalent outcomes, which means that the impact on social conditions from those would be similar to those experienced recently -- no significant change from the situation described in Chapter 3. Alternative C would result in somewhat fewer wells drilled, with a corresponding decrease in impact on the social conditions previously identified.

A third scenario, which posited 197 wells drilled per year on GJFO land for the next twenty years, was also analyzed. This represents five times the number of wells ever drilled in a single year on BLM land. This level of drilling alone would dramatically alter the character of the communities in the planning area. The impact would still be only a small part of the larger regional impact, assuming that other drilling in the region also increased by five times.

Coal

There are two scenarios to consider with respect to the economic impact of coal mining under the different management alternatives: current applications being considered and future applications for mining operations. The approval or disapproval of current applications is not affected by the alternative that is chosen. These processes are already underway, but future operations and applications might be affected.

Two applications are under consideration at the time of this report: expansion of the McClane Canyon Mine and Book Cliffs coal leasing. The McClane Canyon mine's production had been tied entirely to the operation of the Cameo power plant in the northeastern part of the planning area. With the closing of the Cameo power plant in January 2011, the McClane Canyon Mine ceased production. Rhino Energy has proposed expansion of the mine to make continued operation commercially viable. In addition to expansion of its operation on GJFO land, continued operation of the McClane Canyon Mine would require construction of a railroad load out facility on private land. The ultimate approval or rejection of this expansion is not affected by any of the management alternatives. A socioeconomic impact assessment will be included in the Environmental Assessment for this project.

The second proposal seeks approval for the coal leasing that would eventually lead to the opening of the Book Cliffs Mine. That application is in the early stages with no Environmental Impact Statement yet available. Again, the management alternative chosen for the RMP will not affect the final decision on the application. In both cases, the coal mining represents a potential new revenue stream for Mesa County in terms of spending on the mine, jobs, and taxes.

Future mining operations on GJFO land are potentially affected by the choice of management alternative. Alternative A goes forward with 300,700 acres available for leasing. Each of the other alternatives reduces the acreage available somewhat compared to Alternative A. Alternative B includes 253,400 acres. Alternative C has the fewest acres, 251,200 while Alternative D makes 265,600 acres available. To the extent that fewer available acres limit the amount of coal mining activity, each of the other alternatives would reduce the economic impact of coal mining compared to alternative A.

Alternative C would place additional restrictions on coal extraction by managing for wilderness characteristics on 171,200 acres of areas acceptable for further coal leasing. Wilderness characteristic management could limit future production by limiting such activities as methane venting or building exploration roads. Alternative B protects 24,400 acres as having wilderness characteristics while Alternative D identifies no lands with wilderness characteristics for management within the planning area. Applying NSO stipulations under Alternatives B, C and D could complicate coal development on future leases because it would prohibit construction of temporary roads required for exploration drilling in most of the Book Cliffs area unless an exception or waiver of the stipulation is granted. Most of acreage for NSO stipulations is attributed to steep slopes. The NSO for steep slopes allows specific exceptions for coal exploration and development under Alternatives B and D.

As is the case with any extractable resource, market forces would impact the ultimate level of production of coal given the allowable limits under the final RMP.

Opposition from environmental groups to coal leasing and production on GJFO lands can be expected. This will be true for the expansion of the McClane Canyon Mine and the Book Cliffs coal leasing process as well as any new applications, which would fall under the new RMP. The strongest objections are based on methane gas venting from mines and the burning of coal as fuel, both of which add greenhouse gases to the atmosphere. Court challenges could potentially delay, if not halt, coal mining operations. This can also lead to tensions between environmental groups and supporters of coal mining.

Locatable Minerals

Uranium

As discussed in chapter three, the lands within the GJFO have long been associated with radium, vanadium, and uranium extraction although no uranium is currently being mined on GJFO lands. Past booms encouraged local residents to stake claims, mostly in the area around Gateway in the southeastern portion of the GJFO. Many of those claims have not expired. New interest in nuclear power, to reduce carbon emissions, could potentially bring a resurgence in uranium mining.

Two conditions are necessary for that to happen regionally: increased demand to drive uranium prices higher and a nearby processing mill.

Energy Fuels, a Canadian energy company, has received permission to reopen the Packrat Mine and Urantah Decline under the combined designation Whirlwind Mine. Initial proposals planned for a 2008 opening, but operations ceased after a short period of mine preparation and have not recommenced as of March 2012. The 24 acres of surface disturbance included in the proposal straddle the Colorado/Utah border; so some impacts occur beyond the GJFO. Because the permitting process for Whirlwind has been completed, the operation is unaffected by any changes in BLM management plans (BLM, Whirlwind 2008). Socioeconomic impacts for this project were part of the Final Environmental Assessment that was completed and approved in 2008.

Similarly unaffected by BLM planning alternatives are existing claims across the Uncompahgre Plateau. None of the lands to be petitioned for withdrawal from mineral entry include active mining claims, nor are they lands with uranium potential. For those claims, as well as the Whirlwind Mine, the challenges to production include both current price levels and lack of local processing. Without a local processing facility, uranium prices would have to rise to unprecedented levels to justify mining since transport outside the vicinity would impact profits. To remedy the lack of a processing facility, Energy Fuels plans to build the Pinon Ridge uranium mill on private land in Paradox Valley, Montrose County. Energy Fuels has received a radioactive materials license from the Colorado Department of Health and approval from the Environmental Protection Agency. That and other permitting lies outside BLM jurisdiction and would not be affected by any of the management alternatives. Regional opposition to the Pinon Ridge mill has developed, and the granting of the Health Department license has been challenged in court. Four Colorado citizens groups, two groups from Utah, and the Telluride City Council are on record opposing the mill.

Gold

Recreational gold prospecting currently takes place on GJFO land on both the Dolores and Gunnison rivers. The activity on the Gunnison river is near the

Redlands diversion dam. This area is withdrawn from mineral entry, but casual use prospecting activity (little surface disturbance, small-scale motorized equipment) can still occur. Nothing in the RMP alternatives would change the availability for casual use.

The activity on the Dolores river near Gateway is both casual use and use under existing mining claims. The local chapter of the Gold Prospectors Association of America has about 100 members that use claims it has on the Dolores.

The current gold prospecting is recreational, and its economic impact would be the same as described below for recreational activities on BLM land. Commercial gold mining would impact the regional economy in a manner similar to that described for natural gas drilling and extraction. There is currently no commercial gold mining on GJFO land.

Under Alt C, the Dolores River riparian ACEC would be petitioned for withdrawal. If withdrawn, GJFO would likely challenge the validity of existing mining claims. If they were found invalid, prospecting under the mining claims would no longer be allowed.

For both rivers under alts B, C, and D – a No Surface Occupancy stipulation would be implemented. Larger scale, surface disturbing casual use prospecting may not be allowed under NSO (even if non-motorized) – however most casual use activities would likely continue to be allowed. The NSO stipulations can't be applied to gold prospecting activities on mining claims managed under the 1872 Mining Law, so only alt C would see an impact from applied NSO stipulations to lands where mining claims were found invalid.

Salable Minerals

Under the current RMP (Alternative A), 274,300 acres are closed to mineral development. 787,000 acres are open to mineral material sales. 281,200 acres are subject to NSO stipulations under Alternative A; however, under the current RMP, NSO stipulations only apply to fluid mineral leasing. Although mineral material sales are not subject to NSO stipulations under Alternative A, sales are unlikely to be permitted where the resources protected by NSOs for fluid minerals would be adversely affected by mineral material sales.

Under Alternative B, 252,400 acres are closed to mineral material sales. 809,000 acres are open to mineral materials; however 307,000 of those acres are open to mineral material sales with an NSO stipulation. An NSO stipulation would not allow surface disturbance, effectively closing the area to mineral material sales unless an exception is granted. Exceptions can only be granted when the proposed activity will not adversely affect the resource protected by the specific NSO stipulation for the area.

Under Alternative C, 452,000 acres are closed to mineral material sales. 609,400 acres are open to mineral materials; however 365,600 of those acres are open to mineral material sales with an NSO stipulation. An NSO stipulation would not allow surface disturbance, effectively closing the area to mineral material sales unless an exception is granted. Exceptions can only be granted when the proposed activity will not adversely affect the resource protected by the specific NSO stipulation for the area.

Under Alternative D, 155,300 acres are closed to mineral material sales. 906,200 acres are open to mineral materials; however 307,500 of those acres are open to mineral material sales with an NSO stipulation. An NSO stipulation would not allow surface disturbance, effectively closing the area to mineral material sales unless an exception is granted. Exceptions can only be granted when the proposed activity will not adversely affect the resource protected by the specific NSO stipulation for the area.

Sand and Gravel

At this time, one commercial sand and gravel operation is active on GJFO land, and a second has been active in the recent past. There are no known large unexploited gravel deposits left on private land in Mesa County. Sand and gravel are inexpensive materials; however they are expensive to haul long distances. As the supplies on private land are exhausted, sand and gravel resources on GJFO land will become increasingly important to the local economy. Considering the acres closed to mineral material sales and the NSO stipulations, the action alternatives would allow fewer acres to be available for sand and gravel sales than Alternative A.

Dimension Rock

Dimension rock is another commercial product in the salable mineral category. There are no commercial operations active on GJFO land but there have been several in the recent past. Dimension rock can be used in landscaping and building applications. Considering the acres closed to mineral material sales and the NSO stipulations, the action alternatives would allow fewer acres available for dimension rock sales than Alternative A.

Renewable Energy

Development of renewable energy sources is receiving worldwide attention for a variety of reasons. In Colorado, legislated mandates for electric utilities to generate increasing proportions of their energy from renewable sources provide an added incentive. Under Alternatives B, C, and D the RMP establishes emphasis areas for wind and solar energy development. These emphasis areas would be available for lease by private firms for energy production. It should be noted at the outset that ultimately the use or lack of use of these areas will depend on whether future legal and market conditions persuade energy producers that projects in these emphasis areas are economically viable.

At present, it is difficult to predict the impacts of such allocations except in the most general of ways because no formal proposals have been offered.

Wind Emphasis Area

The area reserved for wind power is located south of the Colorado River, south of Palisade in the East Orchard Mesa – Horse Mountain area. This area was chosen in part because of the availability of an already existing transmission line. Alternatives B and C establish the emphasis area at 2,600 acres while Alternative D sets it at 3,700 acres. Approximately 28 acres of land are required to produce one megawatt of wind energy. If increased acreage resulted in larger projects, Alternative D would generate the most wind-related jobs since the emphasis areas are the largest under this alternative. Alternative C would generate the fewest wind-related jobs since the emphasis areas are the smallest under this alternative.

With no clear commitment for development, however, quantitative socioeconomic impacts are impossible to predict. In general, development of a wind farm would likely produce positive economic impacts in the forms of a temporary impact from construction spending and longer term impacts from maintaining the wind farm. Construction of additional transmission lines, if necessary, would add positive economic impacts as well. Negative economic impacts could result from any lowering of property values in the area. One reason for property values to drop could be the effect of a wind farm on the viewshed. A changed viewshed could also reduce the value that others receive from this public land whether or not they own property nearby. This effect is discussed more fully in the recreation section and the non-market values section. Negative social impacts might result if sufficient opposition to a wind farm develops and begins to pit supporters and opponents against each other. Furthermore, opposition would almost certainly arise if construction of additional transmission lines was proposed since those lines would have to cross private lands. The impact of such a transmission line on the viewshed would likely generate opposition beyond the particular land owners affected. Even residents who would otherwise accept the wind farm might be less positively disposed toward the construction of another transmission line. This opposition would likely spread outside of the immediate planning area since the construction of the transmission line would likely extend beyond the planning area.

Solar Energy Development

Alternatives B, C, and D each set areas for solar development. There are two categories for these areas. Solar Emphasis Areas allow for development up to 20MW. Solar Energy Zones (SEZs) allow for development over 20MW. The total acres and specific locations vary by alternative. Alternative B provides for 12,200 acres of solar emphasis areas and 9,200 acres of SEZs distributed across three sites: 21 Rd., Mitchell Rd., and 2 Rd. Alternative C identifies 5,300 acres as solar emphasis areas at four sites: 21 Rd., Mitchell Rd., 2 Rd., and Q.5 Rd.

Alternative D includes the largest number of acres, 36,300 as solar emphasis areas and 9,200 acres as SEZs, distributed among four sites: North Desert, 27 ¼ Rd., Mitchell Rd., and 2 Rd. These lands could be leased for development of solar energy projects. Solar development could occur in other areas within the field office as well; however, the RMP identifies these areas as the most likely areas based on potential and relatively few resource conflicts.

Two possible options exist for the development of solar power: photovoltaic and mirrors. Either of these is possible on GJFO land. The socioeconomic impacts of solar development would depend on the type chosen. With no projects proposed, it cannot be known what type of, if any, development will take place. Approximately 9 acres of land are required to produce one megawatt capacity of photovoltaic energy. If increased acreage resulted in larger projects, Alternative D would have the potential to generate the most solar related jobs since the emphasis areas are the largest under this alternative. Correspondingly, Alternative C would generate the fewest solar- and wind-related jobs since the emphasis areas are the smallest under this alternative.

The same general observations about potential socioeconomic impacts as were made for the wind emphasis area can be made here. Construction spending would provide a temporary positive economic impact while ongoing operation would provide longer term economic impacts. Any construction of transmission lines would provide positive economic impact, but likely generate opposition, especially if those lines crossed private lands. There could be negative economic impact if those lines reduced recreational enjoyment of BLM lands. To the extent that greater acreage would result in larger projects, Alternative D has the greatest potential for socioeconomic impact, given the larger number of acres included as solar emphasis areas.

Alternative D has an additional feature likely to generate significant socioeconomic impacts. The emphasis areas at 27 ¼ Rd. and the North desert comprise the most heavily used area for off highway vehicle (OHV) recreational use. A solar project that used those acres, especially the North Desert acres, could virtually eliminate the space available for OHV use. There really are no alternative sites available on GJFO land to accommodate that level of use. As explained in the recreation section, the regional economic impact of this reduction in recreational activity would include the loss of spending by those OHV users who come to the area to use that land. The social impact might be proportionally greater due to the loss of an activity valued by local as well as out-of-area OHV enthusiasts. This would almost certainly show up at least as protests against proposed development that would put these areas off limits to OHV use.

Impact on Recreation

Estimate of Recreational Use

The regional economic impact from the use of recreational resources depends on the number of recreationists from outside the regional economy and their pattern of spending during their visit. Vehicle counters monitored at popular recreation sites provided an estimate of overall visitor numbers, and statistical analysis of the relationship between population growth and visitor numbers was used to project visitation levels over the twenty-year planning period. Recreation activities were categorized as motorized, mechanized, and non-mechanized. Mechanized activity consists primarily of mountain biking while non-mechanized activities include hiking, running, bird watching, dog-walking, shooting, etc. The proportions of those three categories of visitor activity were estimated through managerial expertise and surveys conducted on GJFO lands during spring, summer, and fall of 2009. The proportion of mechanized and non-mechanized visitors from outside the region was calculated from the 2009 surveys. Due to the low response rate from off highway vehicle (OHV) users, an alternative method was used to estimate the proportion of motorized visitors from outside the region. Motorized users were assigned the same proportion of out of region visitors as were the non-motorized visitors. Finally, spending profiles were calculated for motorized and non-motorized users from the 2009 surveys and from similar surveys conducted on BLM land in Routt and Moffat counties (Loomis, et al.).

The level of recreational activity is projected to vary between the alternative management plans due to differences in management practices. **Table 4-61**, Projected Change in Recreational Use by Alternative and Recreation Type, shows the effects of Alternatives B, C, and D on visitor use compared to Alternative A.

Table 4-61
Projected Change in Recreational Use by Alternative and Recreation Type

Activity	Alternative B Change from Alt. A	Alternative C Change from Alt. A	Alternative D Change from Alt. A
Motorized	- 2%	- 4%	- 1%
Mechanized	+1%	- 2%	+2%
Non-mechanized	+1%	+2%	- 2%

Source: BLM estimates

Table 4-62, Motorized, Mechanized, Non-mechanized, and Total Recreation Use (Visitor Days) by Alternative, records projected visitor numbers for 2019 and 2029. Alternative A for 2010 is included as the baseline for visitor numbers. Comparing the values for Alternative A in each year illustrates the projected growth in visitors over the planning period under the current management plan. The numbers of visitors for Alternatives B, C, and D are calculated using the

Table 4-62
Motorized, Mechanized, Non-mechanized, and Total Recreation Use (Visitor Days) by Alternative

Activity Type	2010 Alt. A baseline	Annual Use in 2019 (Year 10)				Annual Use in 2029 (Year 20)			
		Alternative				Alternative			
		A	B	C	D	A	B	C	D
Motorized	253,628	330,465	323,985	317,755	327,193	416,758	408,586	400,728	412,631
Mechanized	104,969	136,769	138,137	134,087	139,504	172,483	174,208	169,101	175,932
Non-mechanized	72,330	94,243	95,185	96,128	92,395	118,852	120,041	121,229	116,522
Total	430,927	561,477	557,307	547,970	559,092	708,092	702,834	691,058	705,085

Source: Calculations from BLM data

estimates in **Table 4-63**, Projected Change in Recreational Use by Alternative and Recreation Type. In each year, each of those three alternatives has fewer projected total visitors than does Alternative A, with Alternative C having the fewest visitors of the four alternatives.

Table 4-63
2010 (Year 1): Compare Economic Impacts from Recreation by Alternative (2009 dollars)

Impact	Alternative A	Alternative B	Alternative C	Alternative D
Total Output (Spending)	$4,384,361	$4,353,945	$4,281,446	$4,366,728
Total Value Added (Income)	$2,662,256	$2,643,552	$2,599,486	$2,651,440
Employment	54.8	54.4	53.5	54.6

Source: IMPLAN calculations from BLM data

Economic Impact

The estimated economic impact of the various alternatives is calculated using the projected number of recreational visitors from outside the region paired with an estimated spending profile for those visitors. With that information, the IMPLAN program returned the results summarized in the following three tables. **Table 4-63**, 2010 (Year 1): Compare Economic Impacts from Recreation by Alternative (2009 dollars), shows the estimated impact on the regional economy in terms of the total spending that takes place, the total value added to the regional economy, and the number of jobs supported by the spending for 2010, the first year of the planning period. **Table 4-64**, 2019 (Year 10): Compare Economic Impacts from Recreation by Alternative (2009 dollars), and **Table 4-65**, 2029 (Year 20): Compare Economic Impacts from Recreation by Alternative (2009 dollars), report the same information for 2019 and 2029 respectively.

The increasing economic impact due to increasing visitation over the planning period can be seen by comparing Alternatives A for each of the three years shown. The effects of differing management plans can be seen by comparing the different alternatives for each year. The differences between alternatives result

Table 4-64
2019 (Year 10): Compare Economic Impacts from Recreation by Alternative (2009 dollars)

Impact	Alternative A	Alternative B	Alternative C	Alternative D
Total Output (Spending)	$5,712,586	$5,672,988	$5,578,496	$5,689,642
Total Value Added (Income)	$3,458,776	$3,444,425	$3,386,992	$3,454,642
Employment	71.4	70.9	69.7	71.1

Source: IMPLAN calculations from BLM data

Table 4-65
2029 (Year 20): Compare Economic Impacts from Recreation by Alternative (2009 dollars)

Impact	Alternative A	Alternative B	Alternative C	Alternative D
Total Output (Spending)	$7,204,295	$7,156,177	$7,031,500	$7,175,330
Total Value Added (Income)	$4,374,567	$4,344,954	$4,269,200	$4,356,799
Employment	90	89.4	87.8	89.6

Source: IMPLAN calculations from BLM data

from different numbers of visitors and different mixes of recreational activity use under the different management plans. In each year, Alternatives B, C, and D have smaller impacts than does alternative A, with alternative C having the least impact. Alternative B has an estimated impact that is 0.7 percent smaller than Alternative A. Alternative C is 2.4 percent smaller, and Alternative D is 0.4 percent smaller than Alternative A.

Additional Economic Value to Recreation Users

The preceding analysis identifies the economic impact to the regional economy from visitors engaged in recreation activities on BLM land managed by GJFO. There is further economic value to recreationists that does not impact the local economy but has been demonstrated to exist. In economic terminology this value is identified as consumer surplus. Consumer surplus represents value that a consumer receives beyond the price paid for the good consumed. In this case, the price would best be thought of as an entrance fee and travel costs; consumer surplus would account for the additional amount a visitor would be willing to pay beyond those expenses. In most cases, the entrance fee for recreation sites administered by GJFO is zero; so travel costs would be the price for recreation.

The data necessary to calculate consumer surplus for recreation on GJFO land is not available. However, Loomis calculated such a value for recreation in the Little Snake River Resource Area in Moffat and Routt Counties (Loomis 2006). The consumer surplus was calculated by recreation site and activity and, thus, varied by location and activity. The estimates were reported as $29.00 average

consumer surplus for a popular motorized recreation site and $8.33 for a collection of primarily non-motorized sites. The $8.33 figure is substantially lower than the consumer surplus calculated for similar activities at other locations in the larger intermountain region (Loomis 2006).

Given that the Fruita-Grand Junction area has become a destination site for mountain bikers, it is likely that consumer surplus for those users would tend toward the upper end of consumer surplus values. If, for purposes of illustration, we apply that lowest figure of $8.33 to all our 2010 visitor day numbers, the value would be over $3.6 million. If we use the mid-point of Loomis' estimates, $18.33, and our 2010 visitor day numbers, we calculate an overall consumer surplus of almost $7.9 million dollars. If we apply the high figure of $29.00, the calculation would be nearly $12.5 million.

A few points should be borne in mind. If $18.33, for example, is used as the average consumer surplus, it is just that: an average of what visitors would be willing to pay. Some would pay more; some would pay less. In addition, consumer surplus applies to all users not just those from outside the region. Furthermore, this does not represent money spent in the regional economy. It represents value for which recreationists would be willing to pay but don't have to. Finally, these figures were not calculated specifically for lands managed by GJFO. They were used for purposes of illustration because they were calculated for a nearby location. Other strategies exist for transferring consumer surplus estimations from one area to another. For example, the Forest Service periodically updates a manual and set of tables for that purpose (Forest Service).

Hunting, Fishing, and Wildlife Watching

Hunting and fishing attract visitors to Mesa County and some of those visitors will hunt and fish on land managed by GJFO. GJFO oversees more than a million acres open to hunting, but BLM does not collect information on the number of hunters and anglers who use their lands. Due to a combination of timing and locations surveyed, the surveys described earlier also did not collect information on hunting and fishing. The Colorado Parks and Wildlife (CPW) collects data on hunting and fishing for the state as a whole and provides information at the county level as well. In 2008, CPW released its latest report on the economic impacts of hunting and fishing. The report was prepared by BBC Research and Consulting.

The report divides spending on hunting and fishing into the categories of Colorado residents and non-residents. Spending in Mesa County by non-residents of Colorado would represent outside spending as described earlier but would underestimate the total amount of outside spending because some of the spending by Colorado residents would also come from outside Mesa County. Complicating matters further, the spending is not attributed to particular venues, for example, BLM, Forest Service, private, etc. Therefore, while we cannot report a precise figure for the economic impact from hunting

and fishing that take place on BLM land, we can get some idea of the magnitude by looking at the figures for Mesa County overall.

According to the CPW report, the final economic impact in Mesa County from out-of-state hunters was just over $10.4 million. Fishing by out-of-state visitors added an impact of more than $2.1 million. Recalling that some of the nearly $9.8 million attributed to hunting by Colorado residents, and some of the more than $51 million attributed to Colorado anglers also comes from outside of Mesa County, it is clear that hunting and fishing contribute substantially to the local economy. What we can't do is determine how much of that is attributable specifically to lands overseen by GJFO. Finally, the impact of spending by CPW in Mesa County was estimated to be about $2.7 million. To the extent that the funds spent in Mesa County come from licenses and other fees collected from people outside Mesa County, they also represents an economic impact for Mesa County from hunting and fishing.

Wildlife watching is an activity on public lands that can also contribute a regional economic impact. CPW reported an estimate for the state as a whole but not for individual counties. It can be noted that, according to the CPW report, the average non-resident wildlife watcher is estimated to spend $147 per day.

Non-market Values

Finally, recognition of non-market values is important in the assessment of GJFO planning alternatives. In Chapter 3 and above, recognition of the quality-of-life attraction for businesses, families, and individuals references this idea. In many cases, BLM professionals are aware of the importance of these values in planning land uses, but are challenged by their inability to operationalize them (i.e., define them in terms that allow for measurement). The incredible natural beauty and diversity of lands within the GJFO begs for some accounting of these non-market values since that beauty and diversity are likely to attract both residents and businesses to the planning area. The still small-town atmosphere of many locations within the GJFO, the increasing reputation of its agricultural products, particularly wine and peaches, and the ready accessibility of public lands for recreation are all significant aspects of the "character" of the area. Anecdotally it is acknowledged within the planning area that these factors have an economic impact by attracting businesses and permanent residents (including retirees and workers who will seek employment her in order to enjoy the environmental amenities). Economists have attempted to measure these non-market values for some areas; however, the difficulty of measuring these values and the resources necessary to obtain them place such quantitative measurements beyond the purview of this RMP.

Recent studies have tried to assess the impact of such values on the socioeconomic trends in a specific region (Rasker et al. 2004, Duffy-Deno 1998). Where economies are making the shift from traditional or "Old West" activities, mining and ranching for example, to "New West" activities like

tourism or services and professional industries, local economies appear healthier and the importance assigned to accessible public lands appears to increase. Non-market values are significant because the communities in the GJFO are in just such a transition.

Additionally, the linked impacts of decisions concerning public land use can create a cascading series of effects which affect this aspect of local economies. One such series might begin with increased natural gas drilling or implementation of a wind farm that impacts the viewshed. This has the potential to reduce the value of the public lands to those already in the area as well as reduce the attractiveness of the area to individuals and firms considering locating in the area. It might also have a direct economic impact if it discourages recreational use of the land. This impact could show up in food and beverage establishments, accommodations, and other tourism-related industries. Where economies, as in the GJFO, are attempting to remedy the shocks of boom and bust cycles by diversifying their economies, alterations in these non-market values may produce adverse effects.

Social Impacts

Social impacts from recreation management will be generated by and accrue to both local and out of area visitors. Recreational opportunities provided by GJFO managed land add to the quality of life for residents in the planning areas. Many residents cite ease of access to BLM lands as a benefit of residing in the planning area. According to surveys (**Section 3.6.3**, Socioeconomics), some communities, notably De Beque and Fruita, also value the potential for recreation related economic development. Local development agencies tout the quality of recreational opportunities on GJFO managed land in campaigns to attract businesses, and businesses do the same to attract employees.

Population growth is a major factor generating social impacts from recreation activities on GJFO land. Population growth drives increasing use by local and out of area visitors. One consequence is that the nature of recreation experiences has changed from more natural to more developed, from less crowded to more crowded, and from less restricted to more governed by regulations (**Section 4.4.2**, Recreation and Visitor Services). In addition the interface between residential development and BLM boundaries has grown, resulting in more cases of trespassing on private land and impacts on BLM resources as residents enter directly from their properties rather than designated entry points (**Section 4.4.2**, Recreation and Visitor Services). Increased recreational use increases the chances of conflict with grazing operations and makes it more likely to encounter areas where viewsheds are degraded by natural gas drilling and extraction.

All the management alternatives anticipate increased visitation over the planning period, but each of the action alternatives projects lower visitation numbers than does Alternative A. The differences between visitor numbers in

Alternatives A, B, and D are relatively small. Alternative C shows noticeably fewer visitors than the others. Each alternative manages for a somewhat different mix of recreation activities (**Table 4-61** and **Section 4.4.2**, Recreation and Visitor Services).

Impact on Environmental Justice

An Environmental Justice assessment is a federally required part of each Resource Management Plan. It requires a determination of whether any alternative disproportionately affects low-income or minority populations. As indicated in **Chapter 3**, in both 1990 and 2008 Hispanics comprise Mesa County's largest racial minority group making up approximately 8 percent (US Census Bureau 1990) and 11.8 percent (US Census Bureau 2008) of the region's population, respectively. Comparatively, Mesa County's Hispanic population trails the state's where Hispanics account for 19.9 percent of the population in 2008 (US Census Bureau 2008). Mesa County's poverty rate has ebbed and flowed between a low of 10.6 percent and a high of 12.5 percent between 2000 and 2008.

Neither Mesa County nor any of the communities of interest identified in Chapter 3 anticipate any significant changes in the percentage of minority populations over the next twenty years. Nor is there any reasonable expectation that management decisions made by BLM in relation to any of the four proposed alternatives will have dissimilar impacts on minority populations.

Impact on Taxes

Livestock production, natural gas production, and recreation spending all generate tax revenues. These revenues are collected and disbursed at the federal, state, and local government levels. Taxes represent revenue that is diverted from private to public spending. When the taxes collected are spent locally, they can have the same multiplier effects as other spending does. Local taxes are the most likely to remain and be spent in the region. State taxes are likely to initially leave the area, but might return in some proportion in the form of state spending in the region. Federal taxes also are likely to initially leave the area, but might eventually generate regional multiplier effects if they return as federal spending in the area.

Impact from Livestock Grazing

Table 4-66, Tax Impacts, Livestock Production (2009 dollars), shows the tax impact from livestock production on GJFO lands for the estimated actual AUMs used and the maximum AUMs. The tax picture would be the same in each of the twenty years, according to the analysis.

Table 4-66
Tax Impacts, Livestock Production (2009 dollars)

Tax Impact	Actual AUMs Scenario			Maximum AUMs Scenario		
	Alt. A/D	Alt. B	Alt. C	Alt. A/D	Alt. B	Alt. C
Federal	$62,845	$62,690	$36,410	$112,950	$111,777	$60,213
State and Local	$86,188	$85,975	$49,935	$154,899	$153,292	$82,576

Source: IMPLAN calculations from BLM data

Natural Gas Production

Table 4-67, Tax Impacts of Natural Gas Production, Year 10 and Year 20 of the Planning Period; Based on 11 Wells per Year (2009 dollars), shows tax impacts from drilling and extraction operations for alternatives A/B/D and Alternative C in year 10 and year 20 of the planning period for the eleven new wells per year scenario. **Table 4-68**, Tax Impacts of Natural Gas Production, Year 10 and Year 20 of the Planning Period; Based on 39 Wells per Year (2009 dollars), reports the same information for the 39 well per year scenario as was reported for the fourteen well scenario. In both cases Alternative C's lower drilling and extraction levels result in lower tax revenues as well. These tax revenues are associated with the sales and income earned from drilling and operating the wells. They represent sales, income, property, and similar taxes. These figures do not include severance taxes or royalties.

Table 4-67
Tax Impacts of Natural Gas Production, Year 10 and Year 20 of the Planning Period; Based on 11 Wells per Year (2009 dollars)

Tax Impact	2019 (Year 10)		2029 (Year 20)	
	Alternative A (B/D)	Alternative C	Alternative A (B/D)	Alternative C
Federal	$3,158,341.00	$2,862,195.00	$3,653,260.00	$3,310,609
State and Local	$2,396,789.00	$2,172,025.00	$2,887,659.00	$2,616,770

Source: IMPLAN calculations from BLM data

Table 4-68
Tax Impacts of Natural Gas Production, Year 10 and Year 20 of the Planning Period; Based on 39 Wells per Year (2009 dollars)

Tax Impact	2019 (Year 10)		2029 (Year 20)	
	Alternative A (B/D)	Alternative C	Alternative A (B/D)	Alternative C
Federal	$11,197,756	$10,148,170	$12,776,997	$11,579,387
State and Local	$8,497,707	$7,701,203	$10,064,027	$9,120,707

Source: IMPLAN calculations from BLM data

Table 4-69 reports the tax impacts from the 197 wells scenario. Alternatives A, B, and D are reported as having the same effect because their outcomes are nearly the same.

Table 4-69
Tax Impacts of Natural Gas Production, Year 10 and Year 20 of the Planning Period; Based on 197 Wells per Year (2009 dollars)

Tax Impact	2019 (Year 10)		2029 (Year 20)	
	Alternative A (B/D)	Alternative C	Alternative A (B/D)	Alternative C
Federal	$56,299,245	$52,847,987	$67,175,140	$60,878,701
State and Local	$39,167,159	$40,039,889	$52,969,846	$48,004,895

Source: IMPLAN calculations from BLM data

The preceding three tables reported the tax impacts from natural gas drilling and extraction related to drilling 11, 39, and 197 wells per year. That analysis assumed that imposing NSO stipulations on some areas would increase drilling costs by ten percent. The following three tables report the tax effect from the same drilling patterns but assume that the drilling costs double under an NSO stipulation. As reported in the natural gas section above, spending is higher in those scenarios and the tax impacts are correspondingly greater than under the lower cost scenarios. In each case, Alternatives A, B, and D are reported as having the same values because their outcomes are very similar.

Natural gas extraction also generates royalty (Federal Mineral Leasing Tax) payments to local counties and severance tax payments. Severance taxes are collected by the State of Colorado and some portion has traditionally been returned to the counties from which the resource, natural gas in this case, was extracted. In addition, the county government can levy property taxes for improvements to privately owned lands resulting from gas production when the mineral rights are owned by the federal government. In 2009 the Mesa County received $2.3 million in royalty payments. Since the fourteen well per year scenario continues a recent pattern, it should not significantly alter royalty and severance tax payments for the county. The 39 well per year scenario increases extraction slightly less than threefold, and would, therefore, correspondingly increase royalty and severance payments. Should there ever be 197 wells drilled royalty payments would increase accordingly.

Table 4-70
Tax Impacts of Natural Gas Production, Year 10 and Year 20 of the Planning Period; Based on 11 Wells per Year and High NSO Costs (2009 dollars)

Tax Impact	2019 (Year 10)		2029 (Year 20)	
	Alternative A (B/D)	Alternative C	Alternative A (B/D)	Alternative C
Federal	$3,964,604	$3,582,994	$4,459,524	$4,032,824
State and Local	$2,975,794	$2,690,024	$3,466,663	$3,136,173

Source: IMPLAN calculations from BLM data

Table 4-71
Tax Impacts of Natural Gas Production, Year 10 and Year 20 of the Planning Period; Based on 39 Wells per Year and High NSO Costs (2009 dollars)

Tax Impact	2019 (Year 10)		2029 (Year 20)	
	Alternative A (B/D)	Alternative C	Alternative A (B/D)	Alternative C
Federal	$14,056,323	$12,757,269	$15,811,035	$14,352,428
State and Local	$10,550,539	$9,576,162	$12,290,895	$11,158,268

Source: IMPLAN calculations from BLM data

Table 4-72
Tax Impacts of Natural Gas Production, Year 10 and Year 20 of the Planning Period; Based on 197 Wells per Year and High NSO Costs (2009 dollars)

Tax Impact	2019 (Year 10)		2029 (Year 20)	
	Alternative A (B/D)	Alternative C	Alternative A (B/D)	Alternative C
Federal	$73,279,032	$66,506,289	$82,140,328	$74,561,838
State and Local	$54,928,055	$49,854,827	$63,716,847	$57,844,465

Source: IMPLAN calculations from BLM data

Recreation

The tax impacts from recreational activities are shown in **Table 4-73**, Tax Impacts of Recreation Activities by Alternative: 2019 and 2029 (2009 dollars). They vary in their magnitude in the same way that the economic impacts do. Alternatives B, C, and D each produce smaller tax impacts than does Alternative A. The tax impacts of Alternative C are the least.

Table 4-73
Tax Impacts of Recreation Activities by Alternative: 2019 and 2029 (2009 dollars)

Tax Impact	2019 (Year 10)				2029 (Year 20)			
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. A	Alt. B	Alt. C	Alt. D
Federal	$434,953	$431,895	$424,693	$433,187	$548,532	$544,813	$535,313	$546,302
State and Local	$477,709	$474,310	$466,393	$475,749	$602,452	$598,316	$587,877	$599,978

Source: IMPLAN calculations from BLM data

Land Parcel Model

This section was prepared for GJFO by researchers at USGS.

A simulation model, called Land Parcel Model (LPM), was developed to forecast community growth based on historical trends, and in response to land-use decisions on public lands. LPM uses land parcel data from county and city planning departments to spatially locate new housing types. City and county future land-use designations determine future types of housing units (single family, multi-family) that can be developed in each land parcel, and the ability to

subdivide parcels (Mesa Countywide Land Use plan [vers. 2006], Mesa County community land use plans [community plans posted on the Mesa County Assessors web page], City of Grand Junction Comprehensive Plan [vers.2009]). Retrospective assessments of new housing types, sub-regional locations, and changes in human population provide a baseline for locating new houses with changes in population numbers. Sub-regional locations are the 21 planning regions or neighborhoods (e.g., Grand Valley, City Center, Redlands) recognized by the City of Grand Junction and Mesa County.

LPM selects parcels and modifies historical location preferences based on proposed public land uses, such as those that vary among the 4 GJFO resource management plan alternatives. Three groups of land uses are recognized in LPM. Planned surface disturbances such as energy and mineral development is one group, areas with high visual quality (Visual Resource Management Classes, Colorado National Monument, slopes of Grand Mesa, Natural Areas) form the second group, and designated recreation areas form the third group. There can be overlap among groups. Viewshed assessments determine the proportion of the total possible view of a parcel that contains planned surface disturbances. This proportion is translated to a relative score ranging from 0 to 1. This score is essentially a probability of a land parcel not being selected for new housing because of planned surface disturbances. A similar assessment is performed for areas of high visual quality, where the resulting score is a probability of a land parcel being selected for high-quality views. A distance-weighted score is used for recreational opportunities, where the resulting probability represents the chances of the parcel being selected for the establishment of a new house based on a recreational emphasis.

LPM simulates annual housing development due to new residents entering the GJFO planning area (termed in-migration). An assumption is that market demand parallels trends in number of new residents. That is, new residents either buy new homes or home owners who sell to new residents are buying new homes. For each new household, housing type and neighborhoods are randomly selected based on historical tendencies; then a parcel within the selected neighborhood that can accommodate the housing type is randomly selected. The percentage of the new-home buying population that exhibits preferences for any of the 3 groups of land uses (e.g. preference for high-quality views) is specified, and can range from 0 to 100 percent. Where a household is ascribed to have a preference, parcels are filtered by the probabilities generated in the viewshed and distance assessments described above. For example, if a household is deemed to have a preference for high-quality views, parcels with at least some high-quality view (probability >0) are evaluated first. Those with a higher probability value for quality views have a greater chance of being selected. This selection process uses the historical preferences for neighborhoods to order the search and selection of parcels.

Assessments of the four GJFO alternatives were based on 2010 parcel map information and future land-use plans noted above, in-migration over the next 30 years derived from the population projections of the CO State Demography Office and an assumption of 2.5 people per household (https://dola.colorado.gov/demog), and historical preferences of housing type and neighborhoods based on a retrospective assessment of new housing in Mesa County from 1970-2009. Probabilities related to viewshed conditions and recreational opportunities were derived for each land parcel using maps of proposed energy and mineral development, visual resource management areas, and recreational opportunities for each GJFO alternative. Additionally, surrounding non-BLM lands were included in the assessment of high visual quality and recreational opportunities (e.g., Colorado National Monument, Grand Mesa). The tendencies of future generations to select housing locations on the basis of public land-uses are difficult to reliably forecast. A feature of LPM, however, is the ability to evaluate a range of assumptions about these tendencies. For this assessment, a simplified experimental design was employed, where 30, 50, and 70 percent of the new home-buying population preferred not to have views of planned surface disturbances, and the same percentages were used for high-quality views and for proximity to recreational opportunities. All possible combinations were simulated over the next 30 years. Probabilities related to the three land-use groups were noticeably different among alternatives for parcels within one kilometer of public lands, reflecting the spatial locations and patterns of public lands and proposed land uses, and the topography of the GJFO planning area. For this reason, changes in the total number of people residing within one kilometer of public lands (e.g., BLM, USDA Forest Service, Colorado National Monument) were compared among experimental levels and land-use alternatives.

The use of probabilities and a random component for selecting housing types, neighborhoods, and parcels makes LPM a stochastic model. That is, a simulation represents only one possible outcome. As a standard, LPM uses 100 replications initiated with different random-number seeds with everything else held constant to generate annual averages of housing and population numbers.

Selected results of assessments are shown in **Diagram 4-1**. Results are for 30, 50, and 70 percent of the population selecting against views with surface disturbance and an equal percentage selecting for parcels with high-quality views or proximity to recreational opportunities. Hereafter, these percentages are referred to as preference levels. At year 2025 (15 years since the present), population numbers along the public-land interface were similar among alternatives for the 30% preference level (Diagram 4-1A). Differences among alternatives become more apparent with increasing preference levels (Diagram 4-1B and C). At the 70% level, alternatives B and D had similar numbers of people in the 1-km interface; Alternative A and C also were similar but significantly ($P < 0.001$) higher (ca. 450-688 more people) than the other two alternatives (Diagram 4-1C). At year 2040 (30 years since the present), the

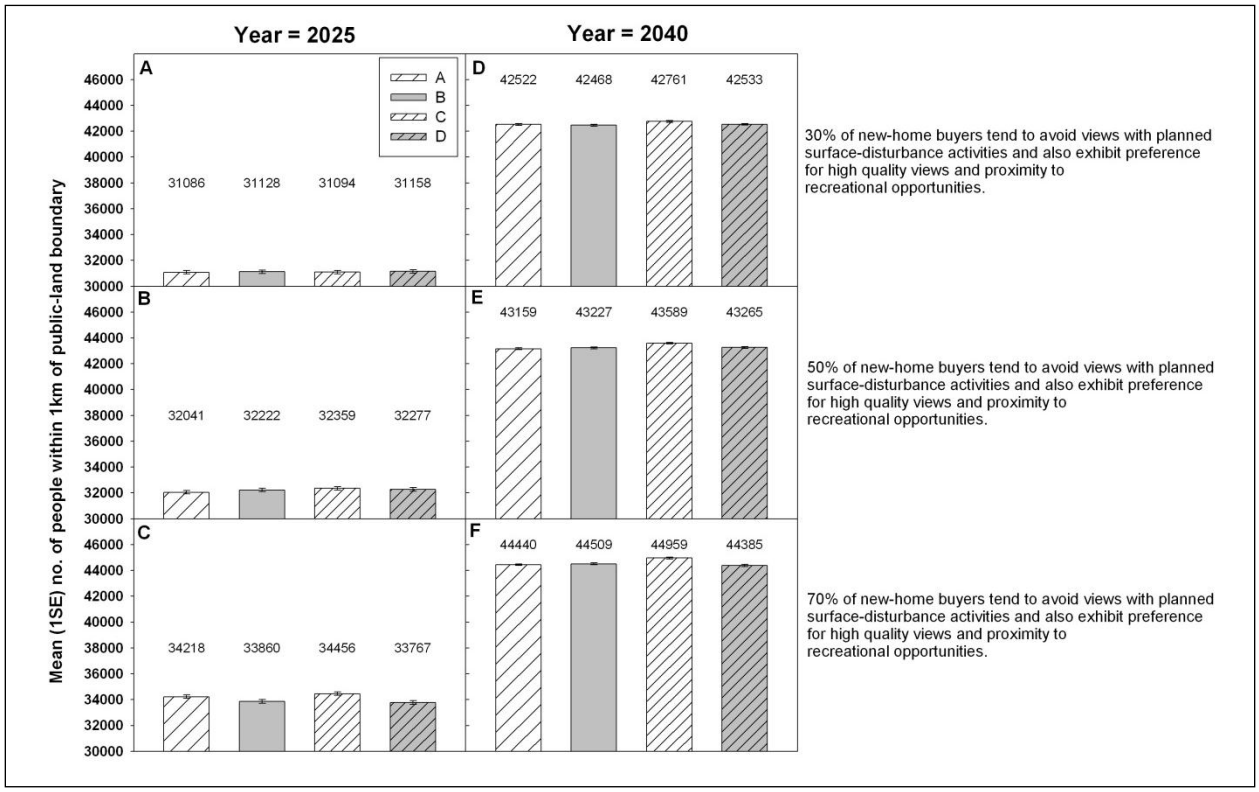
population within the one-kilometer interface increased with increasing preference levels and was significantly ($P < 0.001$) greater (227 to 573 more people) for Alternative C than the other alternatives (Diagram 41D through F).

Differences among neighborhoods were prominent for only five of the 21 neighborhoods (see **Diagram 4-2**). Population numbers in these neighborhoods were similar among alternatives at year 2025 for 30 and 50 percent preference levels. At year 2025 with the 70 percent preference level and at year 2040 for all levels Alternative C had higher numbers in the Plateau Valley, Whitewater, and Orchard Mesa neighborhoods, and Alternative A had higher numbers in the Grand Valley and Redlands neighborhoods compared to the other alternatives. The greatest differences occurred for the 70 percent preference level in the Orchard Mesa and Redlands neighborhoods (see **Diagram 4-2**). At year 2025, Orchard Mesa in Alternative C had up to 500 more people and the Redlands in Alternative A had up to 600 more people than other alternatives. These numbers dropped to 400 and 200, respectively, in year 2040.

Summary

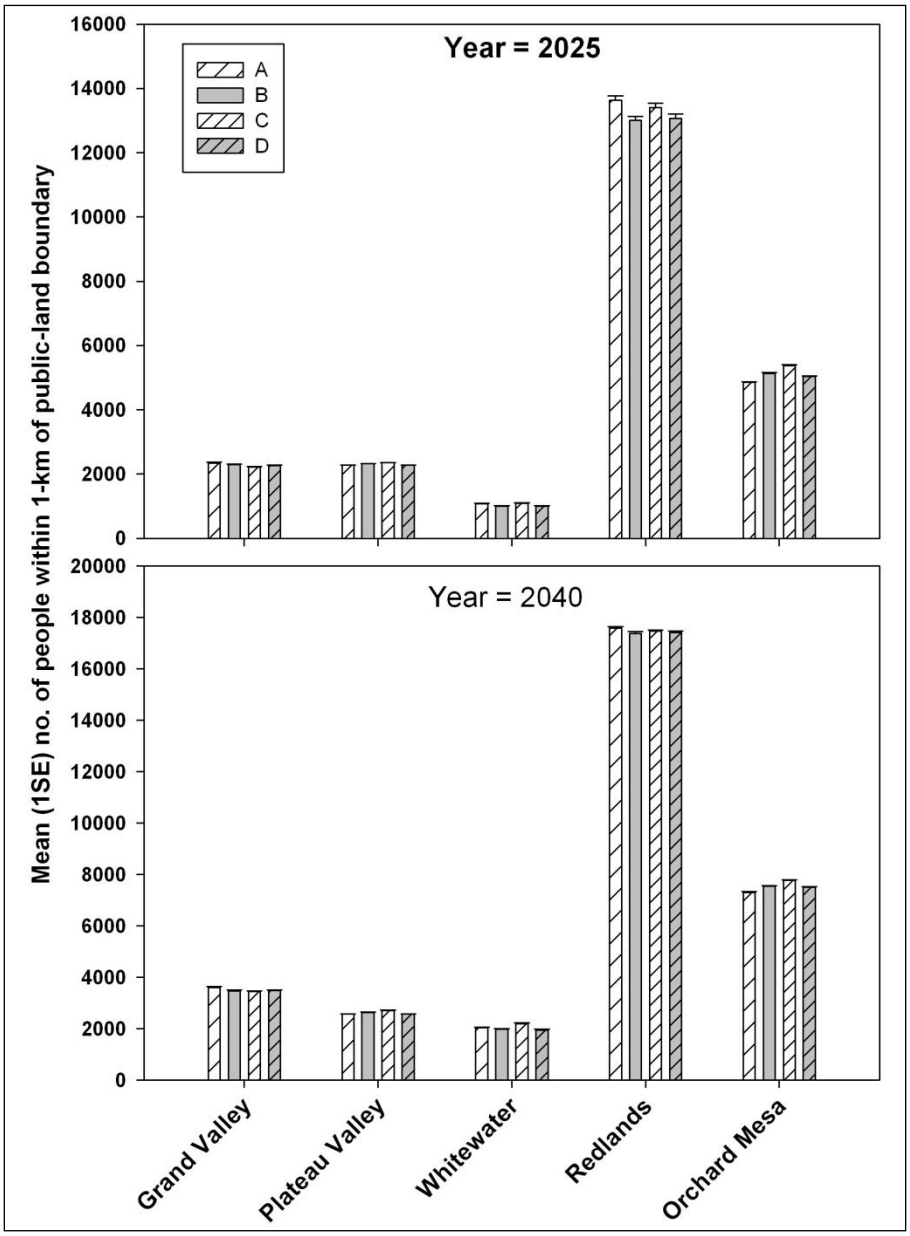
Projected differences in total and neighborhood population size within one kilometer of public lands among the four GJFO resource-management alternatives were only apparent in year 2025 when a high percentage (>50 percent) of home buyers exhibited preferences for viewshed conditions and proximity to recreational opportunities. By year 2040, all experimental preference levels showed differences among alternatives in terms of total and neighborhood population size along the public-land interface. The tendency for Alternative C to have higher population numbers in this interface largely derives from the relatively lower amount of land-area planned for energy and mineral development compared to the other alternatives. However, even when 70 percent of the population exhibited preferences for viewshed conditions and proximity to recreational opportunities, projected mean total population size near public lands only differed among alternatives by up to 688 by year 2025 and 573 by year 2040, and the maximum difference among neighborhoods was 600 by year 2025 and 400 by year 2040.

Diagram 4-1
Projected Mean (1 SE) Number of People Residing Within One Kilometer of the Public-land Boundary for Each of the Four Alternatives at 15 years (2025) and 30 years (2040) Since the Present



Note: For each set of graphs in Diagram 1 (A & D, B & E, C & F), the percentage of new-home buyers that exhibit preferences for viewshed conditions and proximity to recreational opportunities are noted at the right-hand side of each set. Number above each bar is the mean.

Diagram 4-2
Projected Mean (1 SE) Number of People Residing within One Kilometer of the Public-land Boundary in the Five Neighborhoods with Notable Differences Among the Four Alternatives



Note: Projections shown in Diagram 4-2 are for the assumption that 70 percent of new-home buyers exhibit preferences for viewshed conditions and proximity to recreational opportunities.

Cumulative Impacts

Livestock Grazing

Cumulative Economic Impacts. The current status of livestock grazing in the Cumulative Impact Analysis Area (CIAA) is the result of an overall, century-long trend toward less grazing. Over the last ten years, livestock grazing on BLM-administered public lands has remained stable while grazing on surrounding private lands has also remained stable or slightly declined (**Table 4-1**).

In order to graze successfully on public lands, a grazing operation requires a stable base ranch on private lands from which to run its grazing program. Looking to the future, a continuing pattern of private ranchland being converted to housing development could result in less grazing on public lands (Section 4.4.2 Livestock Grazing, Cumulative Impacts). The alternative ultimately selected for the RMP will allocate a certain number of AUMs for grazing. The actual usage of AUMs will depend not only on the number of available AUMs but also on private economic decisions, including decisions about the overall amount of ranching in the CIAA. Conversion of ranchland to other uses can be influenced by local planning agencies that either encourage or discourage that process. A reduction in ranching activity would likely lead to a reduction in grazing on BLM-administered lands, which would reduce the economic impact of that activity.

On the other hand the alternative selected for the RMP could influence the cumulative economic impact if it affected the overall level of ranching activity. Of the action alternatives, only the reduced number of AUMs in Alternative C would significantly alter the level of available AUMs. The estimated economic impact of that reduction in grazing is reported in the livestock grazing section above. Should that reduction in AUMs under Alternative C cause even further cutbacks in ranching operations in the CIAA, the cumulative economic impact of ranching activity in the CIAA could be further reduced.

Cumulative Social Impacts. The same forces responsible for the cumulative economic impacts described above will also shape the cumulative social impacts. If the outcome is less ranching activity, the traditional ranching identity and culture will be less prominent in the planning area. The nature of the more rural ranching communities would change if ranching land is converted to residential developments for people whose work and other activities are focused outside those communities.

Natural Gas Drilling and Extraction

Cumulative Economic Impacts. The economic impact from natural gas drilling and extraction on GJFO administered lands is relatively small compared to the cumulative impact of those two activities across the CIAA as a whole. As described in Chapter 3, most of the natural gas activity in the region takes place

on private land, and there is further activity on land administered by other Federal entities. The greatest part of the cumulative economic impacts from natural gas drilling and production in the CIAA does not stem from management decisions made by GJFO. Thus, while Alternative C is predicted to result in a somewhat lower economic impact than Alternatives A, B, and D, (analysis in the natural gas section above) the choice of alternative would have only a small effect on the cumulative economic impact in the region.

It can be noted that the cumulative economic impacts of natural gas drilling and extraction in the CIAA tend to disproportionally benefit Mesa County. As noted in Chapter 3, firms and workers in natural gas production are somewhat concentrated in Mesa County; therefore, income tends to flow into Mesa County even when the drilling and extraction are taking place in surrounding counties.

The current cumulative economic impact is closely related to two recent events. There is continued production from the large number of wells drilled during the boom in the earlier part of the past decade. Conversely, there has been a significant reduction in drilling activity related to the recession of the latter part of the last decade. A third factor at work is that as drilling activity has increased following the recession, it has shifted to other parts of the U.S.

Looking to the future, the level of natural gas drilling and extraction in the CIAA will be most affected by the price of natural gas and the relative attractiveness of natural gas reserves in this region compared to those in other parts of the country. These considerations will influence drilling decisions on both private and federal land. The cumulative economic impact will be the result of the level of drilling and extraction, with activity on GJFO administered land being a limited factor in that impact.

Cumulative Social Impacts. As noted above, the cumulative impacts on the CIAA from natural gas operations are determined primarily by factors outside of the control of GJFO managers. Most drilling and extraction takes place on land not managed by GJFO, and even on BLM land the level of activity allowable might or might not be undertaken. Thus, while Alternative C is predicted to result in a somewhat lower economic impact than Alternatives A, B, and D, (analysis in the natural gas section above) the choice of alternative would have only a small effect on the cumulative social impact.

The likely types of social impacts from natural gas drilling and extraction are described earlier in the natural gas section of the socioeconomic discussion. During the recent boom of natural gas activity in the CIAA the cumulative effects of those social impacts were prominent. High paying jobs were created, and the industry tax payments were at high levels. But even so, local agencies were hard pressed to deal with the increased pressures on schools, public safety, and road maintenance. Housing prices and rents were high, which benefitted property owners but priced lower income residents out of both of

those markets. One factor contributing to the high rent prices was the short supply of rental units compared to the number demanded.

The recent slowdown in natural gas production has altered the cumulative impacts in the expected way. Should natural gas activity return to levels consistent with one or the other of the two historically based scenarios, the cumulative impacts should resemble those seen during the recent high production period. Drilling and extraction at the levels of the high production scenario would generate cumulative impacts almost incomprehensible compared to historical experience.

Recreation

Cumulative Economic Impacts. It is important to remember that the economic impact of recreation is generated through spending by visitors from outside the CIAA. It is the additional spending that would not take place absent those visitors. The cumulative economic impact of recreation will include visitors drawn to the area not only by GJFO-administered land but, also, by other public lands and by private attractions. Conditions that affect the number of visitors will affect the cumulative economic impact of recreation.

The effect of management decisions on cumulative impacts might not always be clear cut. Recently, management plans for adjacent Forest Service and BLM lands have closed areas and routes for motorized use, shifting users onto BLM lands in the planning area (Section 4.4.2, Recreation and Visitor Services, Cumulative Impacts). If all out of area users shifted to GJFO land, the economic impact from GJFO land would increase while the cumulative impact would be essentially unchanged. If, however, some users drop out, the cumulative impact could decrease even as the impact from GJFO land increased.

Local visitors on BLM land do not directly contribute to the economic impact of recreation, but they might affect the cumulative impact if increased visitor numbers began to discourage visitors from outside the region. Economic conditions might also affect the cumulative economic impacts of recreation. If economic conditions encouraged significant increases in drilling activity, that drilling activity might discourage recreation use and lower the cumulative economic impacts from recreation.

Projections for the economic impact of Alternatives A, B, C, and D are found in the economic analysis above. The action alternatives alter the mix of recreation activities, but only Alternative C has a noticeable effect on visitor numbers, lowering them somewhat compared to the other alternatives. The choice of management plan would not seem to significantly alter the cumulative economic impacts from recreation.

Cumulative Social Impacts. As is the case for cumulative economic impacts, cumulative social impacts will derive from the actions of recreation managers of

both public and private venues. Cumulative social impacts will also be affected by factors that encourage or discourage use of these venues by both local and out of area recreationists.

Population growth is a major factor contributing to cumulative social impacts from recreation. On GJFO land, for example, population growth drives increasing use by local and out of area visitors. One consequence is that the nature of recreation experiences has changed from more natural to more developed, from less crowded to more crowded, and from less restricted to more governed by regulations (Section 4.4.2, Recreation and Visitor Services). In addition the interface between residential development and BLM boundaries has grown, resulting in more cases of trespassing on private land and impacts on BLM resources as residents enter directly from their properties rather than designated entry points (Section 4.4.2, Recreation and Visitor Services). Increased recreational use increases the chances of conflict with grazing operations and makes it more likely to encounter areas where viewsheds are degraded by natural gas drilling and extraction.

To the extent that similar outcomes are occurring on other public lands, these population effects will increasingly become features of the cumulative social impacts. The crowding might further contribute to cumulative effects if it alters the mix of recreational activities or discourages participation in recreation activities. Increased levels of recreation on public lands might also increase conflicts between recreation and grazing on public lands.

The various alternatives manage for different mixes of recreation activities and each is projected to result in different levels of overall use. To some extent the chosen alternative will contribute to the cumulative social impacts, but at the same time GJFO managers will be responding to the cumulative impacts.

4.7 UNAVOIDABLE ADVERSE IMPACTS

Section 102(C) of NEPA requires disclosure of any adverse environmental effects that cannot be avoided should the proposal be implemented. Unavoidable adverse impacts are those that remain following the implementation of mitigation measures or impacts for which there are no mitigation measures. Some unavoidable adverse impacts occur as a result of implementing the RMP. Others are a result of public use of the BLM-administered public lands within the planning area. This section summarizes major unavoidable impacts; discussions of the impacts of each management action (in the discussion of alternatives) provides greater information on specific unavoidable impacts.

Surface-disturbing activities would result in unavoidable adverse impacts under current BLM policy to foster multiple uses. Although these impacts would be mitigated to the extent possible, unavoidable damage would be inevitable. Long-term conversion of areas to other uses such as mineral and energy development would increase erosion and change the relative abundance of species within

plant communities, the relative distribution of plant communities, and the relative occurrence of seral stages of those communities. Wildlife emphasis areas would overlap areas with oil and gas development potential on 117,300 acres (69 percent) under Alternative B, 115,300 acres (79 percent) under Alternative C, and 33,400 acres (100 percent) under Alternative D, resulting in unavoidable long-term wildlife habitat loss where developed. These activities would also introduce intrusions, which could affect the visual landscape.

Unavoidable damage to cultural and paleontological resources from permitted activities could occur if resources undetected during surveys were identified during ground-disturbing activities. In these instances, standard COAs would require ceasing further activities upon discovery and the resource would be mitigated to minimize data loss. Unavoidable loss or destruction of cultural and paleontological resources would also occur in areas open to cross-country or intensive motorized use, specifically in areas of high cultural sensitivity or areas containing vertebrate or scientifically significant fossil resources. Unavoidable loss of cultural and paleontological resources due to non-recognition, lack of information and documentation, erosion, casual collection, and inadvertent destruction or use would also occur. Unavoidable damage to buried cultural resources could occur, particularly in construction situations. Under Alternatives B, C, and D, a CSU stipulation requiring sub-surface inventories (i.e., construction monitoring) for deep sub-surface-disturbing activities and buried ROWs in Indian Creek, Grand Mesa Slopes, and Sunnyside would be applied in an attempt to minimizing sub-surface disturbances in these areas.

Wildlife, livestock, and wild horses would contribute to soil erosion, compaction, and vegetation loss, which could be extensive during drought cycles and dormancy periods. Conversely, unavoidable losses or damage to forage from development of resources in the planning area would affect livestock, wildlife, and wild horses. Some level of competition for forage between these species, although mitigated to the extent possible, would be unavoidable. Instances of displacement, harassment, and injury could also occur.

Recreational activities, development of mineral resources, and general use of the planning area would introduce additional ignition sources into the planning area, which would increase the probability of wildland fire occurrence and the need for suppression activities. These activities combined with continued fire suppression would also affect the overall composition and structure of vegetation communities, which could increase the potential for high-intensity wildland fires.

As recreation demand increases, recreation use would disperse, creating unavoidable conflicts as more users compete for a limited amount of space. In areas where development activities would be greater, the potential for displaced users would increase.

Numerous land use restrictions imposed throughout the planning area to protect sensitive resources and other important values, by their nature, affect the ability of operators, individuals, and groups who use the public lands to do so freely without limitations. These restrictions could also require the closing of roads and trails or limiting certain modes or seasons of travel. Although attempts would be made to minimize these impacts by limiting them to the level of protection necessary to accomplish management objectives, and providing alternative use areas for affected activities, unavoidable adverse impacts would occur under all alternatives.

4.8 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Section 102(2)(C) of NEPA requires a discussion of any irreversible or irretrievable commitments of resources that are involved in the proposal should it be implemented. An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time (e.g., extraction of any locatable mineral ore or oil and gas). An irreversible commitment of a resource is one that cannot be reversed (e.g., the extinction of a species or disturbance to protected cultural resources).

The air quality resource in the planning area is not irreversible or irretrievable; however, committed actions that consume Prevention of Significant Deterioration increment would use up available Prevention of Significant Deterioration increment for other proposed sources. For this EIS, there are no actions by BLM that would require Prevention of Significant Deterioration permitting.

Implementing the RMP management actions would result in surface-disturbing activities, including dispersed recreation, mineral and energy development, and ROW development, which results in a commitment to the loss of irreversible or irretrievable resources. Mineral extraction or sale eliminates a non-renewable resource thereby resulting in irreversible and irretrievable commitment of the resource. The associated surface disturbance from energy development is reclaimed after the resource is removed. However, surface disturbances from gas storage, geothermal, ROWs for roads used for recreation and public or personal access, wind and solar development and recreational development are a permanent encumbrance of the land. Although new soil can develop, soil development is a slow process in many parts of the planning area. Soil erosion or the loss of productivity and soil structure might be considered irreversible commitments to resources. Surface-disturbing activities, therefore, would remove vegetation and accelerate erosion that would contribute to irreversible soil loss; however, management actions and BMPs are intended to reduce the magnitude of these impacts and restore some of the soil and vegetation lost. Primarily because of the number of acres available for recreational travel, energy and mineral development, and ROW development, such disturbances would occur to the greatest degree under Alternative A, with Alternative D similar, but with more stipulations for surface-disturbing activities.

Alternative B, and to a greater extent Alternative C, contains additional conservation measures, mitigation measures, and stipulations to protect resources within the planning area.

Laws protecting cultural and paleontological resources would provide for mitigation of irreversible and irretrievable impacts on cultural resources from permitted activity. Across all alternatives, an irreversible commitment of nonrenewable fossil fuels (e.g., oil, gas, and coal), locatable minerals, and mineral materials would occur from development over the next 20 years.

4.9 Relationship Between Local Short-term Uses and Long-term Productivity

Section 102(C) of NEPA requires discussion of the relationship between local, short-term uses of human environment, and the maintenance and enhancement of long-term productivity of resources. As described in the introduction to this chapter, "short-term" is defined as anticipated to occur within one to five years of implementation of the activity. "Long-term" is defined as following the first five years of implementation, but within the life of the RMP (projected to be 20 years).

Short-term use of the air quality resource would not affect long-term productivity, except that air quality emissions in high enough concentrations could reduce vegetation and plant vigor. Across all alternatives management actions would result in various short-term effects, such as increased localized soil erosion, fugitive dust emission, vegetation loss or damage, wildlife disturbance, and decreased visual resource quality. Surface-disturbing activities, including utility construction, mineral resource development, and developed recreation would result in the greatest potential for impacts on long-term productivity. Management prescriptions and BMPs are intended to minimize the effect of short-term commitments and reverse change over the long term. These prescriptions and the associated reduction of impacts would be greatest under Alternative C and are present to a slightly lesser extent under Alternative B for resources such as vegetation and wildlife habitat. However, BLM lands are managed to foster multiple uses, and some impacts on long-term productivity might occur.

Short-term use of an area to foster energy and minerals, ROWs, and cross-country recreational use would result in long-term loss of soil productivity and vegetation diversity. Impacts would persist as long as surface disturbance and vegetation loss continue. In general, the loss of soil productivity would be directly at the point of disturbance, although long-term vegetation diversity and habitat value could be reduced due to fragmentation and the increased potential for invasive species to spread from the developments or disturbances. Alternatives A and D would have the greatest potential for short-term loss of productivity and diversity due to the high potential for development and the lack of stringent mitigation and reclamation standards contained under Alternatives B

and C. Alternative C would provide the greatest long-term productivity by deferring development in many areas through closures or application of severe restrictions on development activities.

The short-term use of big game severe winter range, birthing areas, and/or migratory corridors for energy and minerals, ROWs, and cross-country recreational use could impair the long-term productivity of big game populations by displacing animals from primary habitats and removing components of these habitats that might not be restored for more than 20 years. These short-term uses could also affect the long-term sustainability of some special status species. Greater and Gunnison sage-grouse, as well as other terrestrial special status species, could be affected by habitat fragmentation associated with short-term resource uses and road construction and use. Likewise, habitat for special status fish species and aquatic wildlife could be degraded by sedimentation and pollution of waterways caused by short-term uses of nearby habitats.