Environmental Assessment

May 2, 2017 Competitive Lease Sale Parcels

DOI-BLM-WY-D040-2016-0188-EA

May 2017

BLM

High Desert District

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

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ENVIRONMENTAL ASSESSMENT
for the
MAY 2, 2017 COMPETITIVE OIL AND GAS LEASE SALE
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INTRODUCTION

The Bureau of Land Management (BLM) policy, derived from various laws, including the Mineral Leasing Act of 1920 (MLA), as amended [30 U.S.C. 181 *et seq*.] and the Federal Land Policy and Management Act of 1976 (FLPMA), is to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs.

As required under the MLA, the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (FOOGLRA), and Title 43 Code of Federal Regulations (CFR) 3120.1-2(a), the BLM Wyoming (WY) State Office (WSO) conducts a quarterly competitive lease sale for nominated oil and gas lease parcels. A Notice of Competitive Oil and Gas Lease Sale, which lists parcels to be offered at the auction, is published by the BLM WSO at least 90 days before the auction is held. Lease stipulations applicable to each parcel are specified in the Sale Notice. The decision as to which public lands and minerals are open for leasing and what leasing stipulations may be necessary is made during the land use planning process. Surface management/use for mineral extraction on non-BLM administered land overlaying federal minerals will be determined by the BLM in consultation with the appropriate surface management agency or the private surface owner at the time such surface use is proposed by the leaseholder or designated agent. Under the (MLA), issuing oil and gas leases is a discretionary authority conveyed to the Secretary of the Interior. In accordance with this discretionary authority and as described in sections 1.3 and 2.0 below, certain parcels would be available for offer at the May 2, 2017 competitive lease sale and others are deferred by State Director (SD) discretion and were not subject to detailed analysis in this EA. In carrying out the mineral leasing authority conveyed through the MLA, the BLM must comply with other applicable federal laws and regulations, including, but not limited to the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), the Clean Water Act (CWA), the Clean Air Act (CAA), and the Energy Policy Act of 2005 (2005EPA).

Seventy five (75) parcels, containing 132,795.490 acres, were nominated and reviewed for the May 2, 2017 competitive lease sale.

Forty (40) whole and six (6) partial parcels, containing approximately 81,546.0200 acres (See Appendix A), are located within Priority Habitat Management Areas as identified in the Wyoming Approved Resource Management Plan Amendment for Greater Sage-Grouse (ARMPA) Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) which was signed on September 21, 2015. The BLM has exercised its discretion and determined that it is appropriate to defer these parcels from the set of the preliminary parcels analyzed in detail in the Environmental Assessment (EA) for the May 2017 oil and gas lease sale. These deferrals are consistent with the BLM's sage grouse conservation plans and strategy, which direct the BLM to prioritize oil and gas leasing and development in a manner that minimizes

resource conflicts in order to protect important Greater Sage Grouse (GSG) habitat and reduce development time and costs. Parcels deferred have low oil and gas development potential, sage grouse important life-history habitat features such as active/occupied leks, and/or were not proximate or adjacent to existing development. Based on the foregoing, these 46 parcels are deferred through State Director discretion. These deferred parcels are not analyzed in detail in this EA and will not be discussed further.

Seven (7) parcels, containing approximately 9,342.310 acres in the Pinedale Field Office (See Appendix A), are located in Greater Sage-grouse Core Areas identified in Version 4 of the State's Core Area Map (See WY Executive Order 2015-04), , and are not within Priority Habitat Management Areas in the BLM GSG ARMPA ROD (2015). The BLM has determined that based on its Planning Regulations (43 CFR 1610) a Land Use Plan Amendment process is required for the BLM WY to consider incorporation of Version 4 of the Core Area Maps into the applicable RMPs. Wyoming Instruction Memorandum 2016-024 directs that "Until the subsequent planning process is completed, parcels nominated for oil and gas lease sales in these areas should be deferred until completion of the plan amendment process." These deferred parcels are not analyzed in detail in this EA and will not be discussed further.

The remaining 28 whole or partial parcels are available for offering at the May 2, 2017 Competitive Lease Sale under the applicable Field Office (FO) Resource Management Plans, as amended (2015).

The BLM WSO submitted the draft list of the parcels to the High Desert District (HDD) Office, Kemmerer Field Office (KFO), Pinedale Field Office (PFO), and Rawlins Field Office (RFO) for review and processing. No parcels were nominated in thee Rock Springs Field Office. Interdisciplinary Teams (IDTs) in each Field Office, in coordination and consultation with the District Office, have reviewed the legal descriptions of the parcels to determine if they are in areas open to leasing; if appropriate stipulations have been included or additional stipulations are needed; whether or not new information is available since the land use plan was approved; if appropriate consultations have been conducted or if additional consultations are needed; and if there are special resource conditions of which potential bidders should be made aware.

This Environmental Assessment (EA) has been prepared by the HDD to document this review, as well as to disclose the affected environment, the anticipated impacts, and proposed mitigation of impacts.

This EA inclusively addresses 28 parcels (32,965.030 acres) located within the field offices in the High Desert District that have been nominated through "Expressions of Interest" for the May 2, 2017 Competitive Oil and Gas Lease Sale.

1.0 Purpose and Need

The BLM purpose for offering parcels and subsequent issuance of leases at the May 2, 2017 lease sale is to provide for exploration and development of additional oil and gas resources to help meet the nation's need for energy sources, while protecting other resource values in accordance with guiding laws, regulations, and Land Use Planning decisions. Wyoming is a major source of natural gas for heating and electrical energy production in the United States. The offering for sale and subsequent issuance of oil and gas leases is needed to meet the requirements of the MLA, FLPMA, and the minerals management objectives in the Kemmerer, Pinedale, and Rawlins Management Plans (RMP), as amended (2015). Oil

and gas leasing provides the opportunity to expand existing areas of production and to locate previously undiscovered oil and gas resources to help meet the public's energy demands.

Decisions to be made based on this analysis include which parcels would be offered for lease, which parcels would be deferred, which parcels are not available for leasing, and what stipulations will be placed on the parcels that would be offered for lease at the May 2, 2017 competitive lease sale.

1.1 Conformance with Applicable Land Use Plan and Other Environmental Assessments

Pursuant to 40 CFR 1508.28 and 1502.21, this EA tiers to the FEIS' prepared for each Field Office RMP, and any subsequent amendments. The impact analysis in the EISs for the effects from oil and gas development was based on and is commensurate with the Reasonably Foreseeable Development (RFD) scenario (i.e., the level of oil and gas development projected for the life of the plan based on historically and projected trends). The mitigation measures developed through the EISs reduce/minimize the anticipated impacts associated with the projected development to acceptable levels below the significance thresholds. The mitigation (i.e., stipulations and Best Management Practices (BMPs)) developed through the RMP process is carried into this EA, both through tiering and through actual application of stipulations to each parcel.

The EA conforms to the approved Kemmerer, Pinedale, and Rawlins RMPs (43 CFR 1610.5) RODs and Bureau of Land Management September 21, 2015 Wyoming Approved Resource Management Plan Amendment (ARMPA) Record of Decision for Greater Sage-Grouse (GRSG).

The Kemmerer, Pinedale, and Rawlins RMPs, as amended (2015), identify lands as either open or closed to fluid mineral leasing, and provide specific stipulations that would be attached to new leases offered in certain areas.

1.2 Federal, State or Local Permits, Licenses or Other Consultation Requirements

Purchasers of oil and gas leases are required to comply with all applicable federal, state, and local laws and regulations including obtaining all necessary permits required should lease development occur and are required to submit bonding in accordance with 43 CFR 3104.1.

Interdisciplinary teams from each Field Office reviewed their respective lease parcel lists for this environmental assessment. Among other resource values, individual parcels may contain threatened, endangered, candidate, and BLM sensitive species (see Section 3.0 and Appendix B). The administrative act of offering parcels and subsequent issuance of oil and gas leases is consistent with the decisions in the Kemmerer, Pinedale, and Rawlins RMPs, as amended (2015), including decisions relating to threatened, endangered, candidate, and BLM sensitive species. Offering and subsequent issuance of oil and gas leases is also consistent with the Biological Assessment and Biological Opinion (BA/BO) for these RMPs. No further consultation with the U.S. Fish and Wildlife Service (USFWS) is required at this stage.

Compliance with Section 106 responsibilities of the National Historic Preservation Act (NHPA) can be achieved by following the BLM Wyoming-State Historic Preservation Officer (SHPO) protocol agreement, which is authorized by the National Programmatic Agreement between the BLM, the Advisory Council on Historic Preservation, and the National Conference of SHPOs, and other applicable BLM handbooks.

1.3 Federal Leasing of Fluid Minerals

Analysis as required by the National Environmental Policy Act (NEPA) of 1969, as amended (Public Law 91-90, U.S.C. 4321 *et seq*.) was conducted by Field Office resource specialists who relied on personal knowledge of the areas involved and/or reviewed existing databases and file information to determine if appropriate stipulations had been attached to specific parcels before being made available for lease.

The offering and subsequent issuance of oil and gas leases is strictly an administrative action, which, in and of itself, does not cause or directly result in any surface disturbance. The issuance of an oil and gas lease, however, does convey to the lessee the rights to occupy, explore, and extract oil and gas resources from the lease with prior approval of the Authorized Officer. These post-leasing actions can result in surface impact.

As part of the lease issuance process, nominated parcels are reviewed against the appropriate land use plan, and stipulations are attached to mitigate any known environmental or resource conflicts that may occur on a given lease parcel. As stated above, on-the-ground impacts would potentially occur when a lessee applies for and receives approval to explore, occupy and/or drill on the lease. The BLM cannot determine at the leasing stage whether or not a nominated parcel will actually be leased, or if it is leased, whether or not the lease would be explored or developed. Over time, some leases expire and then are re-leased. Based on data extracted from the BLM Wyoming Oil and Gas Leasing webpage, 88 percent of the parcels offered over the past 10 years were subsequently sold and leases issued .

According to the Tenth Circuit Court of Appeals, site-specific NEPA analysis at the leasing stage may not be possible absent concrete development proposals. Whether such site-specific analysis is required depends upon a fact-specific inquiry. Often, where environmental impacts remain unidentifiable until exploration narrows the range of likely well locations, filing of an Application for Permit to Drill (APD) may be the first useful point at which a site-specific environmental appraisal can be undertaken (Park County Resource Council, Inc. v. U.S. Department of Agriculture, 10th Cir., April 17, 1987). In addition, the Interior Board of Land Appeals (IBLA) has decided that "BLM is not required to undertake a site-specific environmental review before issuing an oil and gas lease when it previously analyzed the environmental consequences of leasing the land..." (Colorado Environmental Coalition, et al., IBLA 96-243, decided June 10, 1999). However, when site-specific impacts are reasonably foreseeable at the leasing stage, NEPA requires the analysis and disclosure of such reasonably foreseeable site specific impacts. (N.M ex rel. Richardson v. BLM, 565 F.3d 683, 718-19 (10th Cir. 2009). The BLM has not received any specific development proposals concerning the proposed lease parcels addressed in this EA. This site-specific environmental documentation would provide specific analysis for the well pad location or locations. Additional mitigation and BMPs may be applied as conditions of approval (COA) at that time. As well, proposals which would cause a violation of Federal and/or state laws (such Clean Air

Act/Clean Water Act/T&E) or do not comply with the regulations at 43 CFR 3160, Onshore Orders, and Notice(s) to Lessee(s), would be denied regardless of stipulations attached to an issued lease.

The Energy Policy Act of 2005 categorically excludes certain oil and gas development activities from further NEPA analysis. However, excluded projects must conform to the applicable Resource Management Plan, including any constraints that would be imposed on subsequent development.

Offering, sale and issuance of leases with the application stipulations would not be in conflict with any local, county, or state plans.

Once a parcel is sold and the lease is issued, the lessee has the right to use as much of the leased lands as is reasonably necessary to explore and drill for all of the oil and gas within the lease boundaries, subject to the stipulations attached to the lease (43 CFR 3101.1-2 and 3101.1-3) and compliance with regulations found at 43 CFR 3160 and in associated Onshore Orders and Notice to Lessee(s).

Oil and gas leases are issued for a 10-year period and continue for so long thereafter as oil or gas is produced in paying quantities. If a lessee fails to produce oil and/or gas, does not make annual rental payments, does not comply with the terms and conditions of the lease, or relinquishes the lease, then ownership of the minerals leased revert back to the federal government and may be offered for lease again. If a lessee fails to pay rentals timely, or fails to pay the full amount due (and the amount is considered to be nominal), the lease can be reinstated following payment of the late fees and publication of a notice in the Federal Register.

Installing an oil and gas well on a lease is not permitted until the lessee or operator secures approval of an Application for Permit to Drill (APD) as required by 43 CFR 3162. Without a discrete development proposal, surface disturbance, waste handling and/or drilling, completion, and production cannot be reasonably predicted. However, this EA incorporates by reference, in its entirety, a Hydraulic Fracturing White Paper included in Appendix E. This document provides a general discussion of the hydraulic fracturing process (a completion/stimulation method) and potential issues and impacts associated with its use.

1.4 Scoping and Public Involvement

1.4.1 Scoping

Internal BLM scoping determined the parcels individually or collectively contain one or more of the following resource issues or concerns:

- Crucial big game winter and parturition habitat
- Big Game migration
- Sharp-tailed and Greater Sage-Grouse leks and nesting habitat
- Sharp-tailed and Greater Sage-Grouse key habitat areas
- Mountain plover nesting habitat
- Raptor nesting habitat
- Bald Eagle roosts

- Sensitive Species
- Water depletion effects to downstream threatened and endangered fish species
- Sensitive soils
- Slopes greater than 25 percent
- Riparian and live water habitat
- Air quality, including greenhouse gases (GHG) and visibility
- Surface and groundwater quality
- Wilderness characteristics
- Visual resource management (VRM)
- Recreation
- Socioeconomics
- Vegetation, including invasive non-native species
- Cultural and paleontological resources, including historic trails
- Leasable coal and sodium resources
- Proximity to residences
- Livestock grazing
- Watershed and hydrology
- Threatened/Endangered Species

1.4.2 Public Participation

Public participation was initiated when this EA was entered into the Wyoming ePlanning database through the Rock Springs Field Office in September 2016. A news release was issued on October 18, 2016 notifying the public that the EA was posted on the BLM Wyoming website for a 30-day public comment period. As required by BLM leasing policy, where parcels are split estate, a notification letter soliciting EA review and comments was sent to the surface owner identified by the party submitting the Expressions of Interest (EOI).

PROPOSED ACTION AND ALTERNATIVES

2.0 Alternatives Including the Proposed Action

2.1 Alternative A – No Action

Under the No Action Alternative BLM Wyoming would not offer twenty-eight (28) parcels containing 32,965.030 acres for lease at the May 2, 2017 lease sale. This would mean that the Expressions of Interest would be denied or rejected and no lease parcels would be offered at the May 2, 2017 Oil and Gas Competitive Lease Sale. Choosing the No Action alternative would not prevent future leasing in these areas consistent with land use planning decisions and subject to appropriate stipulations, identified in the respective land use plans. Therefore, it is anticipated that these parcels, excluding those that fall within areas designated closed to fluid mineral leasing, could be re-nominated and considered for offer at a future date.

2.2 Alternative B – Proposed Action

Under Alternative B, twenty-eight (28) parcels would be offered at the May 2, 2017 Oil and Gas Lease Sale. The offered parcels contain 32,965.030 acres of federal minerals that are available for oil and gas leasing under the Kemmerer, Pinedale, and Rawlins RMP RODs, as amended by the Bureau of Land Management Wyoming Approved Resource Management Plan Amendment (ARMPA) for Greater Sage-Grouse ROD (September 21, 2015). Six (6) parcels containing approximately 8,228.720 acres are located in PHMA, 21 parcels are located in General Habitat Management Areas (GHMA) and one parcel (1705-0001) is in neither PHMA nor GHMA.

Thirteen (13) of the parcels to be offered, containing 12,266.470 acres, are located within the RFO; one (1) parcel containing 717.590 acres is located within the PFO; and fourteen (14) parcels containing 19,980.970 acres are in the KFO. No parcels are located within the RSFO.

Standard terms and lease parcel specific stipulations would be applied. Lease stipulations (as required by 43 CFR 3101.1-3) are added to each parcel as identified by referenced RMPs to address site specific concerns. Refer to Appendix B for a list of the parcels and proposed stipulations attached to each.

2.4 Alternatives Considered But Not Analyzed in Detail

An alternative was considered that would offer all 28 parcels with a no surface occupancy stipulation. This alternative was not carried forward into detailed analysis because it is not in conformance with the respective RMPs, as amended (2015), and would only prohibit surface occupancy for oil and gas development; whereas other non-oil and gas occupancy may not be similarly constrained. Further, this alternative would unnecessarily constrain oil and gas occupancy in areas where the Kemmerer, Pinedale, and Rawlins RMPs, as amended (2015), have determined that less restrictive stipulations would adequately mitigate the anticipated impact.

No other alternatives to the proposed action were identified that would meet the purpose and need of the proposed action alternative analysis.

AFFECTED ENVIRONMENT

3.0 DESCRIPTION OF AFFECTED ENVIRONMENT

This section describes the current environment and present conditions of various resources that would be affected by the project. Aspects of the affected environment described in this section focus on the relevant major resources or issues. Only those aspects of the affected environment that are potentially impacted are described in detail. Prime or Unique Farmlands are not present on any of the parcels or partial parcels available for offer. All parcels analyzed in this EA were reviewed against the lands with wilderness characteristics requirements in BLM Washington Office (WO) IM 2011-154, Manual 6310, and the approved BLM Wyoming Leasing Reform Implementation Plan. See Appendix C for results of the lands with wilderness characteristics screen.

3.1 RESOURCE VALUES BY PARCEL

Table 3-1 provides a detailed listing of the resource values (including surface ownership, visual, riparian, soils, vegetation, slopes, livestock grazing, solid minerals, watershed, special management areas, cultural, paleontology, and wildlife) associated with each of the parcels available for offering through Alternative B at the May 2, 2017 competitive lease sale.

3.1.1 Identification of Issues

Analysis required by NEPA, as amended (Public Law 91-90, USC 4321 et seq.), was conducted by field office resource specialists who relied on site visits where access was available, personal knowledge of the areas involved, and/or review of existing databases and file information to determine if appropriate stipulations should be attached to specific parcels prior to being made available for lease. Resource values were identified for each parcel as presented in Table 3-1.

Field visits were attempted on those nominated parcels where the BLM had public access or access was allowed by the surface owners. RFO, PFO and KFO were able to access all parcels. Pictures were taken at these parcels and where available, GPS coordinates were taken at those photo points. Geographical information system (GIS) data and digital ortho photo quads (DOQQ) were used regardless of whether or not the field teams could visit the parcels, but were predominantly relied on for review of the parcels that could not be visited.

The analysis of the parcels revealed no substantial resource values or concerns other than those already identified through review of the parcels via the KFO, PFO, and RFO Geographic Information System (GIS) data bases and National Agriculture Imagery Program (NAIP 2012) digital aerial imagery.

Table 3-1. Affected Environment

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Parcel # WY-1705	Field Office	Split Estate	VRM Class	Riparian Areas	Perennial Streams	Slopes Greater than 25%	Soils	Grazing Allotment	Vegetation	Sodium / Coal Leasing Area Mining Claims ?	Major Watershed (Platte/ Colorado/Great Divide Basin/Bear)	Special Management Areas	Potential for Occupied Dwellings	Cultural Sites/ NHT	Paleo. PFYC Class 4 or 5 (Yes/ No)	Sage-Grouse PHMA or GHMA	Sage-Grouse/ Sharp-tailed grouse Nesting Habitat (Yes/No)	Sage-Grouse Leks/Sharp-tailed Dancing Ground	Sage-Grouse/Sharp-tailed grouse winter concentration areas (Yes/No)	Other Special Status Species (T&E, Candidate, Sensitive Species)	Colorado or Bonnevill e Cutthroat Trout (CRCT/ BCT)	Big Game Crucial Winter Range (CWR)/ Parturition	Burrowing owl (BO)/ Raptor Nesting	Bald Eagle Roost	Big Game Migration Route	Unplugged Oil or Gas Well
1	RFO	Y	III	Yes	N	Y	Sandy/Loamy	None	Sagebrush rangeland with variety of forbs and grasses	No	Crow	No	Yes		No	No	No	No	No	Wyoming pocket gopher; Mountain Plover; Ute ladies'-tresses; Colorado Butterfly Plant;	No	No	None	No	No	No
3	RFO	Y	III	Yes	Y	Y	Sandy/Loamy	Pass Creek Ridge/Partial	Sagebrush rangeland with variety of forbs and grasses	No	Upper North Platte	No	Yes	Overland Trail	No	PHMA/partial	Yes	No	No	Wyoming pocket gopher; Greater Sage-Grouse; Ute ladies'-tresses; Beaver Rim Phlox;	No	CWR	None	No	No	No
4	RFO	N	III	Yes	N	Y	Sandy/Loamy	North Walcott/partially in Haystack River Past	Sagebrush rangeland with variety of forbs and grasses	No	Upper North Platte	North Platte SRMA	No		No	PHMA/partial	Yes	No	Yes	Wyoming pocket gopher; Greater Sage-Grouse; Persistent Sepal Yellocress; Beaver Rim Phlox; Ute ladies'-tresses; Burrowing Owl; Mountain Plover	No	CWR-Partial	Raptor Nesting	No	No	No
5	RFO	Y	II	Yes	N	Y	Sandy/Loamy	North Walcott/partially in Haystack River Past	Sagebrush rangeland with variety of forbs and grasses	No	Upper North Platte	North Platte SRMA	Yes		No	PHMA/partial	Yes	No	No	Wyoming pocket gopher; Greater Sage-Grouse; Persistent Sepal Yellocress; Beaver Rim Phlox; Ute ladies'-tresses; Mountain Plover	No	CWR-Partial	Raptor Nesting	No	Yes	No

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Parcel # WY-1705	Field Office	Split Estate	VRM Class	Riparian Areas	Perennial Streams	Slopes Greater than 25%	Soils	Grazing Allotment	Vegetation	Sodium / Coal Leasing Area Mining Claims?	Major Watershed (Platte/ Colorado/Great Divide Basin/Bear)	Special Management Areas	Potential for Occupied Dwellings	Cultural Sites/ NHT	Paleo. PFYC Class 4 or 5 (Yes/ No)	Sage-Grouse PHMA or GHMA	Sage-Grouse/ Sharp-tailed grouse Nesting Habitat (Yes/No)	Sage-Grouse Leks/Sharp-tailed Dancing Ground	Sage-Grouse/Sharp-tailed grouse winter concentration areas (Yes/No)	Other Special Status Species (T&E, Candidate, Sensitive Species)	Colorado or Bonneville Cutthroat Trout (CRCT/ BCT)	Big Game Crucial Winter Range (CWR)/ Parturition	Burrowing owl (BO)/ Raptor Nesting	Bald Eagle Roost	Big Game Migration Route	Unplugged Oil or Gas Well
22	RFO	N	IV	Yes	N	N	Sandy/Loamy Saline Upland	Ruby Knolls	Sagebrush rangeland with variety of forbs and grasses	No	Great Divide Closed Basin	No	No		No	GHMA	No	No	No	Wyoming pocket gopher; Greater Sage-Grouse; Mountain plover	No	No	None	No	No	No
23	RFO	N	III	Yes	N	Y	Shallow Sandy/Sandy/Loamy/Saline Upland	Chain Lakes	Sagebrush rangeland with variety of forbs and grasses	No	Great Divide Closed Basin	Chain Lakes WHMA	No		No	PHMA/GHMA	Yes	No	No	Wyoming pocket gopher; Greater Sage-Grouse; Mountain Plover; Ferruginous Hawk; Ute ladies'-tresses; Persistent Sepal Yellowcress.	No	No	None	No	No	No
24	RFO	N	III	Yes	N	N	Shallow Sandy/Sandy/Loamy/Saline Upland	Chain Lakes/Cyclone Rim	Sagebrush rangeland with variety of forbs and grasses	No	Great Divide Closed Basin	Chain Lakes WHMA	No		No	PHMA/SFA/GHMA	Yes	No	No	Wyoming pocket gopher; Greater Sage-Grouse; Mountain Plover; Ferruginous Hawk; Ute ladies'-tresses; Persistent Sepal Yellowcress.	No	No	None	No	No	No
45	RFO	N	III	Yes	N	N	Sandy/Loamy Saline Upland	Cyclone Rim	Sagebrush rangeland with variety of forbs and grasses	No	Great Divide Closed Basin	No	No		No	SFA/PHMA	Yes	No	No	Wyoming pocket gopher; Greater Sage-Grouse; Ferruginous Hawk; Mountain Plover; Ute ladies'-tresses.	No	No	Raptor Nesting	No	No	No

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48	RFO	N	III	Yes	N	N	Sandy/Loamy Saline Upland	Cyclone Rim	Sagebrush rangeland with variety of forbs and grasses	No	Great Divide Closed Basin	No	No		No	PHMA	Yes	Yes	Yes	Wyoming pocket gopher; Greater Sage-Grouse; Ferruginous Hawk; Mountain Plover; Ute ladies'-tresses.	No	No	None	No	No	No
49	RFO	N	III	Yes	N	N	Sandy/Loamy Saline Upland	Cyclone Rim	Sagebrush rangeland with variety of forbs and grasses	No	Great Divide Closed Basin	No	No		No	SFA	Yes	No	No	Wyoming pocket gopher; Greater Sage-Grouse; Ferruginous Hawk; Mountain Plover; Ute ladies'-tresses.	No	No	None	No	No	No
50	RFO	N	III	No	N	N	Sandy/Loamy Saline Upland	Cyclone Rim	Sagebrush rangeland with variety of forbs and grasses	No	Great Divide Closed Basin	No	No		No	SFA	Yes	No	No	Wyoming pocket gopher; Greater Sage-Grouse; Ferruginous Hawk; Mountain Plover.	No	No	None	No	No	No
51	RFO	N	III	Yes	N	N	Sandy/Loamy Saline Upland	Cyclone Rim	Sagebrush rangeland with variety of forbs and grasses	No	Great Divide Closed Basin	No	No		No	SFA	Yes	No	No	Wyoming pocket gopher; Greater Sage-Grouse; Mountain Plover.	No	No	None	No	No	No
52	RFO	N	III	Yes	N	N	Sandy/Loamy Saline Upland	Cyclone Rim	Sagebrush rangeland with variety of forbs and grasses	No	Great Divide Closed Basin	No	No		No	SFA	Yes	No	No	Wyoming pocket gopher; Greater Sage-Grouse; Ferruginous Hawk; Mountain Plover; Ute ladies'-tresses; Persistent Sepal Yellowcress.	No	No	Raptor Nesting	No	No	No

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53	Pinedale	No	3 & 4	Yes	Yes	Yes	High erosion potential, low to moderate reclamation potential.	North Labarge Common	Sagebrush steppe	No	Colorado River watershed	No	No	Three NHRP ineligible sites known from partial inventory of area, no known eligible sites	Yes, class V	GHMA	Yes- within 2 miles of a lek	No	No	No	No	Yes	No	No	Yes	No
062	KFO	Yes	IV	Yes	Yes	Yes	Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid.	Cumberland/ Uinta	Wyoming big sagebrush, juniper woodland, mountain big sagebrush, desert shrub	No	Great Divide Basin	No	No	No	Yes	PHMA, GHMA	No	Yes	Yes	No	No	No	No	No	No	No
063	KFO	Yes	IV	Yes	Yes	Yes	Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid.	Rock House, Valley Creek, Cumberland/Uinta, Medicine Butte	Mountain big sagebrush, shrub-dominated riparian, desert shrub	No	Great Divide Basin, Bear	No	No	No	Yes	GHMA	No	No	No	No	No	No	No	No	No	No
064	KFO	No	IV	Yes	Yes	Yes	Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid. Rock Outcrop-Typic Torriorthents; loamy-skeletal; mixed; frigid	Crompton Reservoir, Medicine Butte, Spring Hollow	Wyoming big sagebrush, juniper woodland, desert shrub, mixed grass prairie	No	Bear	No	No	No	Yes	GHMA	Yes	Yes	No	No	No	No	No	No	No	No
065	KFO	Yes	IV	Yes	Yes	Yes	Rock Outcrop-Typic Torriorthents; loamy-skeletal; mixed; frigid Ustic Haplocambids; coarse-loamy; mixed; frigid-Ustic Torriorthents; coarse-loamy; mixed; frigid-Typic Torrifluvents; loamy-skeletal; mixed; frigid	Rock House, Cumberland/Unita, Medicine Butte, Whitney Canyon, Fowkes	Wyoming big sagebrush, mountain big sagebrush, mixed grass prairie, juniper woodland, shrub-dominated riparian, desert shrub	No	Bear	No	No	No	Yes	GHMA	No	No	No	No	No	Yes	No	No	No	No

Table 3-1. Affected Environment

Parcel # WY-1705	Field Office	Split Estate	VRM Class	Riparian Areas	Perennial Streams	Slopes Greater than 25%	Soils	Grazing Allotment	Vegetation	Sodium / Coal Leasing Area Mining Claims ?	Major Watershed (Platte/ Colorado/Great Divide Basin/Bear)	Special Management Areas	Potential for Occupied Dwellings	Cultural Sites/ NHT	Paleo. PFYC Class 4 or 5 (Yes/ No)	Sage-Grouse PHMA or GHMA	Sage-Grouse/ Sharp-tailed grouse Nesting Habitat (Yes/No)	Sage-Grouse Leks/Sharp-tailed Dancing Ground	Sage-Grouse/Sharp-tailed grouse winter concentration areas (Yes/No)	Other Special Status Species (T&E, Candidate, Sensitive Species)	Colorado or Bonneville Cutthroat Trout (CRCT/ BCT)	Big Game Crucial Winter Range (CWR)/ Parturition	Burrowing owl (BO)/ Raptor Nesting	Bald Eagle Roost	Big Game Migration Route	Unplugged Oil or Gas Well
066	KFO	No	IV	Yes	Yes	Yes	Rock Outcrop-Typic Torriorthents; loamy-skeletal; mixed; frigid Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid. Ustic Haplocambids; coarse-loamy; mixed; frigid-Ustic Torriorthents; coarse-loamy; mixed; frigid-Typic Torrifluvents; loamy-skeletal; mixed; frigid. Typic Haplocryalfs; loamy-skeletal; mixed- Typic Dystrocryepts; loamy-skeletal; mixed- Typic Argicryolls; loamy-skeletal; mixed	Rock House, Medicine Butte	Wyoming big sagebrush, mixed grass prairie, juniper woodland, mountain big sagebrush, shrub-dominated riparian, Aspen forest, desert shrub	No	Bear, Great Divide Basin	No	No	No	Yes	GHMA	No	No	No	No	No	Yes	No	No	No	No

Table 3-1. Affected Environment

Parcel # WY-1705	Field Office	Split Estate	VRM Class	Riparian Areas	Perennial Streams	Slopes Greater than 25%	Soils	Grazing Allotment	Vegetation	Sodium / Coal Leasing Area Mining Claims?	Major Watershed (Platte/ Colorado/Great Divide Basin/Bear)	Special Management Areas	Potential for Occupied Dwellings	Cultural Sites/ NHT	Paleo. PFYC Class 4 or 5 (Yes/ No)	Sage-Grouse PHMA or GHMA	Sage-Grouse/ Sharp-tailed grouse Nesting Habitat (Yes/No)	Sage-Grouse Leks/Sharp-tailed Dancing Ground	Sage-Grouse/Sharp-tailed grouse winter concentration areas (Yes/No)	Other Special Status Species (T&E, Candidate, Sensitive Species)	Colorado or Bonnevill e Cutthroat Trout (CRCT/ BCT)	Big Game Crucial Winter Range (CWR)/ Parturition	Burrowing owl (BO)/ Raptor Nesting	Bald Eagle Roost	Big Game Migration Route	Unplugged Oil or Gas Well
067	KFO	Yes	IV	Yes	Yes	Yes	Rock Outcrop-Typic Torriorthents; loamy-skeletal; mixed; frigid Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid. Ustic Haplocambids; coarse-loamy; mixed; frigid-Ustic Torriorthents; coarse-loamy; mixed; frigid-Typic Torrifluvents; loamy-skeletal; mixed; frigid. Ustic Haplargids; fine-loamy; mixed; frigid- Ustic Haplocambids; fine-loamy; mixed; frigid- Typic Natrargids; fine-loamy; mixed; frigid	Medicine Butte	Wyoming big sagebrush, mixed grass prairie, juniper woodland, Aspen forest, mountain big sagebrush, desert shrub	No	Bear	No	No	No	Yes	GHMA	Yes	No	No	No	No	Yes	No	No	No

Table 3-1. Affected Environment

Parcel # WY-1705	Field Office	Split Estate	VRM Class	Riparian Areas	Perennial Streams	Slopes Greater than 25%	Soils	Grazing Allotment	Vegetation	Sodium / Coal Leasing Area Mining Claims ?	Major Watershed (Platte/ Colorado/Great Divide Basin/Bear)	Special Management Areas	Potential for Occupied Dwellings	Cultural Sites/ NHT	Paleo. PFYC Class 4 or 5 (Yes/ No)	Sage-Grouse PHMA or GHMA	Sage-Grouse/ Sharp-tailed grouse Nesting Habitat (Yes/No)	Sage-Grouse Leks/Sharp-tailed Dancing Ground	Sage-Grouse/Sharp-tailed grouse winter concentration areas (Yes/No)	Other Special Status Species (T&E, Candidate, Sensitive Species)	Colorado or Bonneville Cutthroat Trout (CRCT/ BCT)	Big Game Crucial Winter Range (CWR)/ Parturition	Burrowing owl (BO)/ Raptor Nesting	Bald Eagle Roost	Big Game Migration Route	Unplugged Oil or Gas Well
068	KFO	No	IV	Yes	Yes	Yes	Typic Haplocryalfs; loamy-skeletal; mixed- Typic Dystrocryepts; loamy-skeletal; mixed- Typic Argicryolls; loamy-skeletal; mixed Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid. Ustic Haplargids; fine-loamy; mixed; frigid- Ustic Haplocambids; fine-loamy; mixed; frigid- Typic Natrargids; fine-loamy; mixed; frigid	Medicine Butte	Aspen forest, mountain big sagebrush, desert shrub	No	Bear, Great Divide Basin	No	No	No	Yes	GHMA	No	No	No	No	No	No	No	No	No	No
069	KFO	No	IV	Yes	Yes	Yes	Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid. Rock Outcrop-Typic Torriorthents; loamy-skeletal; mixed; frigid Ustic Haplocambids; coarse-loamy; mixed; frigid- Ustic Torriorthents; coarse-loamy; mixed; frigid- Typic Torrifluvents; loamy-skeletal; mixed; frigid	Medicine Butte	Wyoming big sage, mixed grass prairie, desert shrub	No	Bear	No	No	No	Yes	GHMA	Yes	Yes	No	No	No	No	No	No	No	No

Table 3-1. Affected Environment

Parcel # WY-1705	Field Office	Split Estate	VRM Class	Riparian Areas	Perennial Streams	Slopes Greater than 25%	Soils	Grazing Allotment	Vegetation	Sodium / Coal Leasing Area Mining Claims?	Major Watershed (Platte/ Colorado/Great Divide Basin/Bear)	Special Management Areas	Potential for Occupied Dwellings	Cultural Sites/ NHT	Paleo. PFYC Class 4 or 5 (Yes/ No)	Sage-Grouse PHMA or GHMA	Sage-Grouse/ Sharp-tailed grouse Nesting Habitat (Yes/No)	Sage-Grouse Leks/Sharp-tailed Dancing Ground	Sage-Grouse/Sharp-tailed grouse winter concentration areas (Yes/No)	Other Special Status Species (T&E, Candidate, Sensitive Species)	Colorado or Bonneville Cutthroat Trout (CRCT/ BCT)	Big Game Crucial Winter Range (CWR)/ Parturition	Burrowing owl (BO)/ Raptor Nesting	Bald Eagle Roost	Big Game Migration Route	Unplugged Oil or Gas Well
070	KFO	Yes	IV	Yes	Yes	Yes	Rock Outcrop-Typic Torriorthents; loamy-skeletal; mixed; frigid Ustic Haplocambids; coarse-loamy; mixed; frigid-Ustic Torriorthents; coarse-loamy; mixed; frigid-Typic Torrifluvents; loamy-skeletal; mixed; frigid Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid.	Cumberland/Uinta	Wyoming big sage, mixed grass prairie, juniper woodland, desert shrub	No	Bear	No	No	No	Yes	GHMA	Yes	No	No	No	No	Yes	No	No	No	No
071	KFO	No	IV	Yes	Yes	Yes	Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid. Rock Outcrop-Typic Torriorthents; loamy-skeletal; mixed; frigid Ustic Haplocambids; coarse-loamy; mixed; frigid-Ustic Torriorthents; coarse-loamy; mixed; frigid-Typic Torrifluvents; loamy-skeletal; mixed; frigid	Cumberland/Uinta, Whitney Canyon, Fowkes, Woodruff Reservoir, Border	Wyoming big sage, mixed grass prairie, juniper woodland, desert shrub	No	Bear	No	No	No	Yes	GHMA	No	No	No	Mountain Plover	No	Yes	No	No	No	No

Table 3-1. Affected Environment

Parcel # WY-1705	Field Office	Split Estate	VRM Class	Riparian Areas	Perennial Streams	Slopes Greater than 25%	Soils	Grazing Allotment	Vegetation	Sodium / Coal Leasing Area Mining Claims ?	Major Watershed (Platte/ Colorado/Great Divide Basin/Bear)	Special Management Areas	Potential for Occupied Dwellings	Cultural Sites/ NHT	Paleo. PFYC Class 4 or 5 (Yes/ No)	Sage-Grouse PHMA or GHMA	Sage-Grouse/ Sharp-tailed grouse Nesting Habitat (Yes/No)	Sage-Grouse Leks/Sharp-tailed Dancing Ground	Sage-Grouse/Sharp-tailed grouse winter concentration areas (Yes/No)	Other Special Status Species (T&E, Candidate, Sensitive Species)	Colorado or Bonneville Cutthroat Trout (CRCT/ BCT)	Big Game Crucial Winter Range (CWR)/ Parturition	Burrowing owl (BO)/ Raptor Nesting	Bald Eagle Roost	Big Game Migration Route	Unplugged Oil or Gas Well
072	KFO	No	IV	Yes	Yes	Yes	Rock Outcrop-Typic Torriorthents; loamy-skeletal; mixed; frigid Typic Torrifluvents; fine-loamy over sandy or sandy-skeletal; mixed; frigid and Fluventic Haplaquolls; fine-loamy over sandy or sandy-skeletal; mixed; frigid Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid. Ustic Haplargids; fine-loamy; mixed; frigid- Ustic Haplocambids; fine-loamy; mixed; frigid- Typic Natrargids; fine-loamy; mixed; frigid	Cumberland/Uinta	Wyoming big sagebrush, juniper woodland, mixed grass prairie, desert shrub	No	Bear	No	No	No	Yes	GHMA	Yes	No	No	No	No	Yes	Yes	Yes	No	No
073	KFO	Yes	III	Yes	Yes	Yes	Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid. Ustic Haplocambids; coarse-loamy; mixed; frigid- Ustic Torriorthents; coarse-loamy; mixed; frigid- Typic Torrifluvents; loamy-skeletal; mixed; frigid	Glasscock Hollow	Wyoming big sagebrush, juniper woodland, desert shrub	No	Bear	No	No	No	Yes	GHMA	No	No	No	No	No	No	No	No	No	No
074	KFO	Yes	III, IV	Yes	Yes	No	Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid.	Glasscock Hollow, Wasatch	Wyoming big sagebrush, juniper woodland, desert shrub	No	Bear	No	No	No	Yes	GHMA	Yes	No	No	No	No	No	No	No	No	No

Table 3-1. Affected Environment

Parcel # WY-1705	Field Office	Split Estate	VRM Class	Riparian Areas	Perennial Streams	Slopes Greater than 25%	Soils	Grazing Allotment	Vegetation	Sodium / Coal Leasing Area Mining Claims ?	Major Watershed (Platte/ Colorado/Great Divide Basin/Bear)	Special Management Areas	Potential for Occupied Dwellings	Cultural Sites/ NHT	Paleo. PFYC Class 4 or 5 (Yes/ No)	Sage-Grouse PHMA or GHMA	Sage-Grouse/ Sharp-tailed grouse Nesting Habitat (Yes/No)	Sage-Grouse Leks/Sharp-tailed Dancing Ground	Sage-Grouse/Sharp-tailed grouse winter concentration areas (Yes/No)	Other Special Status Species (T&E, Candidate, Sensitive Species)	Colorado or Bonneville Cutthroat Trout (CRCT/ BCT)	Big Game Crucial Winter Range (CWR)/ Parturition	Burrowing owl (BO)/ Raptor Nesting	Bald Eagle Roost	Big Game Migration Route	Unplugged Oil or Gas Well
075	KFO	Yes	IV	Yes	Yes	Yes	Aridic Haplustolls; fine-loamy; mixed; frigid and Ustic Haplocambids;fine-loamy; mixed; frigid. Rock Outcrop-Typic Torriorthents; loamy-skeletal; mixed; frigid Typic Torrifluvents; fine-loamy over sandy or sandy-skeletal; mixed; frigid and Fluventic Haplaquolls; fine-loamy over sandy or sandy-skeletal; mixed; frigid	Murphy Ridge, Ring, Cook, Sims Canyon, Turner, Thomas Canyon	Wyoming big sage, mixed grass prairie, juniper woodland	No	Bear	No	No	No	Yes	GHMA	Yes	No	No	Mountain Plover	No	No	No	No	No	Yes

3.2 RESOURCE VALUES COMMON TO ALL PARCELS

3.2.1 Air Resources

In addition to the air quality information in the RMPs cited above, new information about greenhouse gases (GHGs) and their effects on national and global climate conditions has emerged since the RMPs were prepared and have subsequently been analyzed in the Wyoming ARMPA FEIS (2015). Ongoing scientific research has identified the potential impacts of GHG emissions such as carbon dioxide (CO2) methane (CH4); nitrous oxide (N2O); water vapor; and several trace gasses on global climate. Through complex interactions on a global scale, GHG emissions cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), industrialization and burning of fossil carbon sources have caused GHG concentrations to increase measurably, and are believed to contribute to overall climatic changes, typically referred to as global warming or global cooling.

This EA incorporates an analysis of the contributions of the proposed action to GHG emissions and a general discussion of potential impacts to climate.

Air quality, climate, and visibility are the components of air resources which include applications, activities, and management of the air resource. The BLM must consider and analyze the potential effects of authorized activities on air resources as part of the planning and decision making process. The Kemmerer, Pinedale, and Rawlins RMPs, as amended (2015) all address air quality issues, impacts, and potential mitigation. It is important to reiterate the offering and issuing leases is an administrative action, and the offering and the issuing of leases, in and of themselves, does not create air quality impacts.

3.2.1.1 Air Quality

See section 3.2 of the ARMPA FEIS for additional discussion of Air Quality and related.

Regional air quality is influenced by the interaction of meteorology, climate, the magnitude and spatial distribution of local and regional air pollutant sources (including natural sources), and chemical properties of emitted air pollutants. The following sections summarize the existing climate and air quality within the area potentially affected by the parcels under consideration for leasing.

A variety of pollutants can affect air quality; these pollutants and their effects on health, visibility, and ecology are described in the following sections, along with data on existing air quality conditions found within the Kemmerer, Pinedale, and Rawlins Field Office areas.

Monitoring and enforcement air quality standards are administered by the Wyoming Department of Environmental Quality-Air Quality Division (WDEQ-AQD). Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS) identify maximum limits for concentrations of criteria air pollutants at all locations to which the public has access. The WAAQS and NAAQS are legally enforceable standards. Concentrations above the WAAQS and NAAQS represent a risk to human health that, by law, require public safeguards be implemented. State standards must be at least as protective of human health as federal standards, and may be more restrictive than federal

standards, as allowed by the Clean Air Act (CAA). Currently, the WDEQ-AQD does not have regulations regarding greenhouse gas emissions, although these emissions are regulated indirectly by various other regulations.

Pollutant concentration can be defined as the mass of pollutant present in a volume of air and is reported in units of micrograms per cubic meter (μg/m3), parts per million (ppm), or parts per billion (ppb). The State of Wyoming has used monitoring and modeling to determine that the Rock Springs, Rawlins and Kemmerer Field Office areas are currently in compliance with Wyoming and federal concentration standards; whereas the Upper Green River Basin (UGRB) with portions in the PFO, KFO, and RSFO has experienced exceedances of the ozone standard. In addition, the Clean Air Status and Trends Network (CASTNet) and Wyoming Air Resources Monitoring System (WARMS) monitoring networks are operational. Data from these systems have been determined to be representative of the area. There are two monitoring sites within the Kemmerer Field Office; four within the Pinedale FO; two in the Rock Springs FO; and two in the Rawlins FO.

Criteria air pollutants are those for which national concentration standards have been established; pollutant concentrations greater than the established standards represent a risk to human health or welfare. Table 3-2 shows the Wyoming and national ambient air quality standards (WAAQS/NAAQS). Background concentrations are in compliance with applicable WAAQS/NAAQS.

Table 3-2. Ozone Design Values for 2010–2012 through 2012–2014 for Ozone Monitoring Sites in Southwestern Wyoming Compared with the NAAQS

Site Name	ID	County	Ozone Design Value (ppb)			NAAQS (ppb)
			2010–2012	*2011–2013*	*2012–2014*	
Big Piney	56-035-0099	Sublette	--	65	63	70
Boulder	56-035-0099	Sublette	80	78	63	70
Daniel South	56-035-0100	Sublette	68	68	64	70
Juel Spring	56-035-0700	Sublette	68	68	64	70
Pinedale	56-035-0101	Sublette	68	68	61	70
Hiawatha	56-037-0077	Sweetwater	--	64	63	70
Moxa	56-037-0300	Sweetwater	66	66	64	70
Wamsutter	56-037-0020	Sweetwater	64	63	62	70
South Pass	56-013-0099	Fremont	67	65	64	70
Murphy Ridge	56-041-0101	Uinta	65	65	63	70

Source: REF 1018
NAAQS National Ambient Air Quality Standards
ppb parts per billion

3.1.1.1 *Ozone*

Ozone is formed in the lower atmosphere by a series of reactions involving sunlight and precursor emissions of nitrous oxide (NO_X) and Volatile Organic Compounds (VOCs). Ozone and its precursors can be transported both into and out of the analysis region.

The Upper Green River Basin has been designated as a marginal nonattainment area for ozone. The designated nonattainment area includes Sublette County and portions of Lincoln and Sweetwater counties. This designation was based on ozone data for 2008 through 2010, as well as an analysis of whether nearby areas contribute to the nonattainment issues. Compliance with the 8-hour ozone NAAQS is based on the ozone "design value," which is defined as the 3-year average of the annual fourth-highest observed 8-hour average ozone concentration. An ozone design value is first calculated for each monitoring site within a given area. The area-wide ozone design value is then defined as the maximum over all sites within the area. If the design value exceeds the 8-hour ozone NAAQS of 70 parts per billion (ppb), the area is designated nonattainment.

Ozone is currently measured at 10 monitoring sites within southwestern Wyoming. All 10 sites have sufficient data to calculate one or more 3-year design values. Ozone design values for each of these sites, for three recent 3-year design value periods (2010–2012, 2011–2013, and 2012–2014), are listed in Table 3-3.

Table 3-3. Ozone Design Values for 2010–2012 through 2012–2014 for Ozone Monitoring Sites in Southwestern Wyoming Compared with the NAAQS

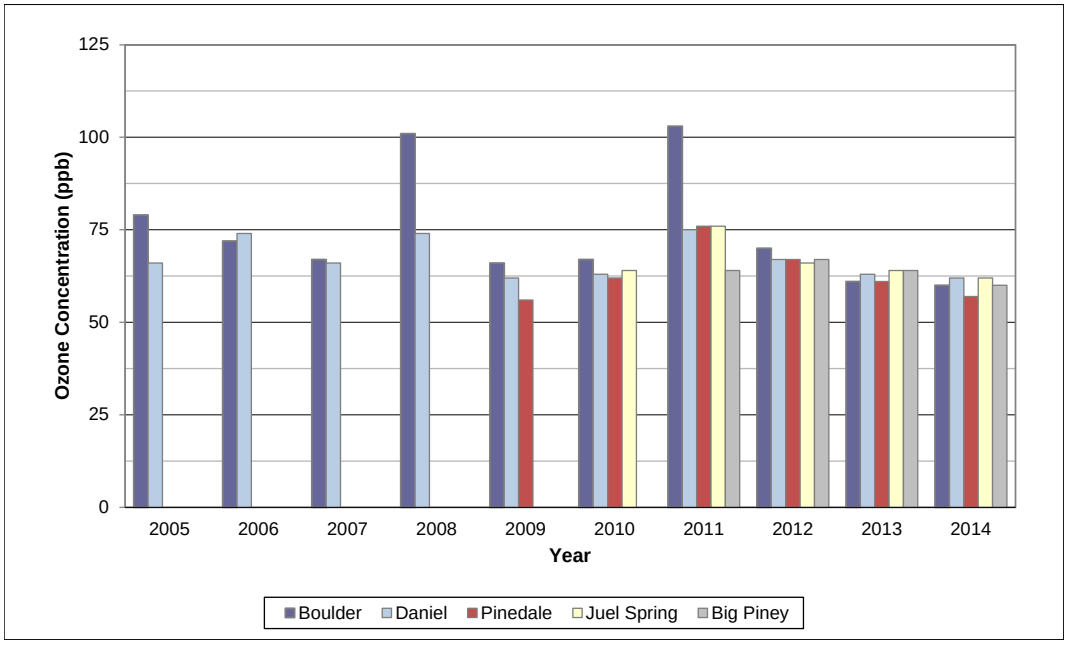
Site Name	ID	County	Ozone Design Value (ppb)			NAAQS (ppb)
			2010–2012	*2011–2013*	*2012–2014*	
Big Piney	56-035-0700	Sublette	--	65	63	70
Boulder	56-035-0099	Sublette	80	78	63	70
Daniel South	56-035-0100	Sublette	68	68	64	70
Juel Spring	56-035-0700	Sublette	68	68	64	70
Pinedale	56-035-0101	Sublette	68	68	61	70
Hiawatha	56-037-0077	Sweetwater	--	64	63	70
Moxa	56-037-0300	Sweetwater	66	66	64	70
Wamsutter	56-037-0020	Sweetwater	64	63	62	70
South Pass	56-013-0099	Fremont	67	65	64	70
Murphy Ridge	56-041-0101	Uinta	65	65	63	70

Source: REF 1018
NAAQS National Ambient Air Quality Standards
ppb parts per billion

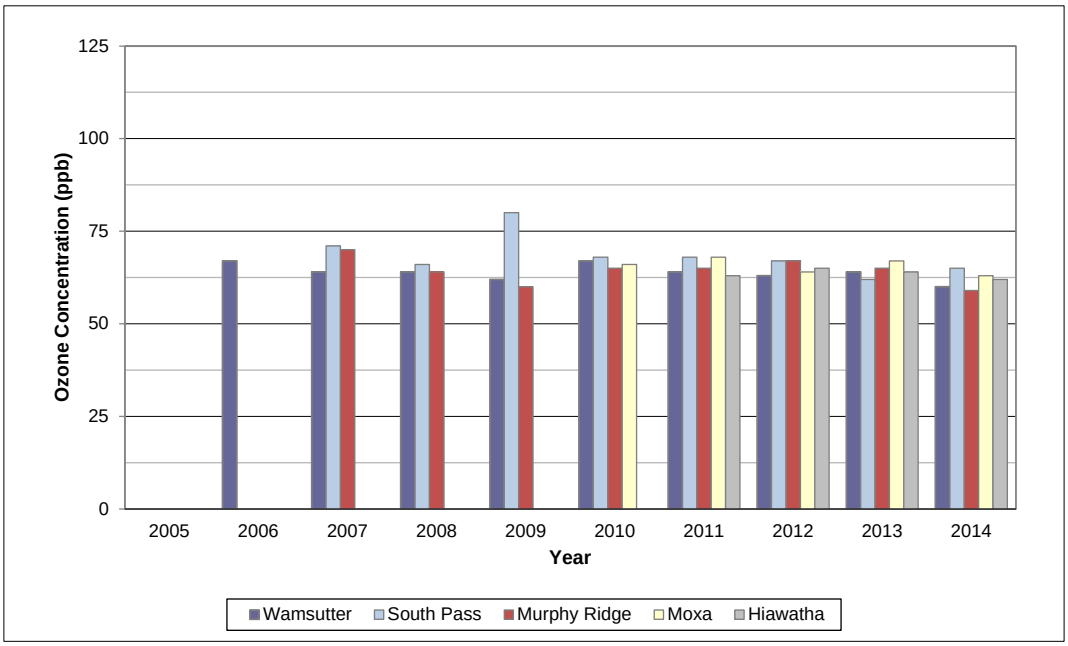
The design values for the Boulder monitoring site for the 2010-2012 and 2011-2013 design value periods are greater than the 2015 NAAQS. For the 2012-2014 period, the values are much lower and are below the NAAQS for all sites. Figure 3-1 displays the fourth-highest 8-hour average ozone concentrations and Figure 3-2 displays the 8-hour ozone design values for the monitoring sites for all years with available data. As noted earlier, the fourth-highest 8-hour average ozone concentration for each year is used to calculate the design value and assess compliance with the ozone NAAQS.

Figure 3-1. Fourth Highest 8-Hour Average Ozone Concentration (parts per billion) for Monitoring Sites in Southwestern Wyoming

a) Sublette County Monitoring Sites



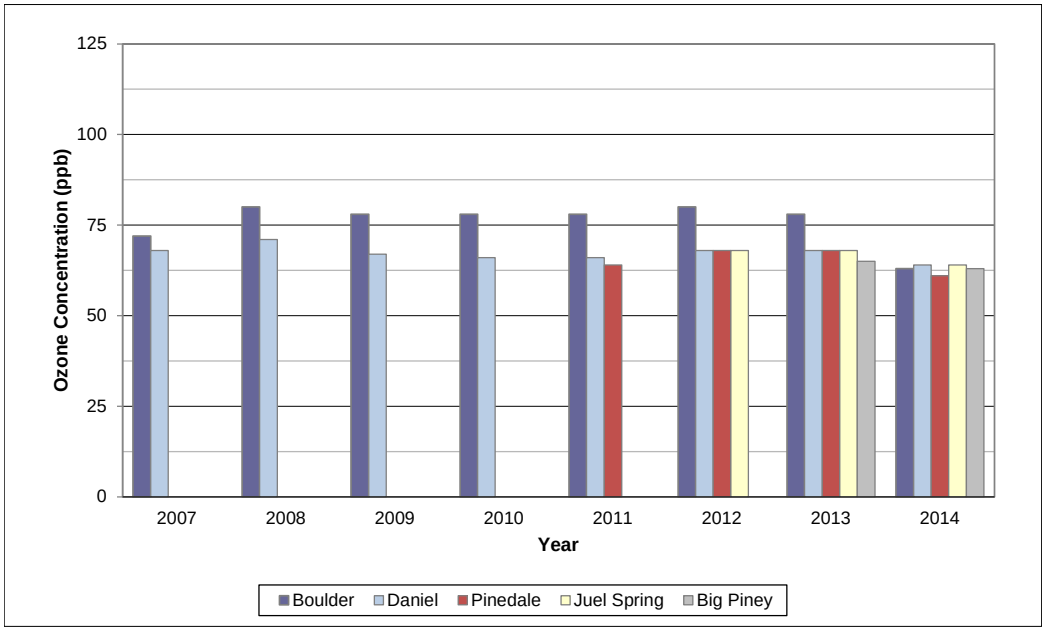
b) Sweetwater, Fremont, and Uinta Counties Monitoring Sites



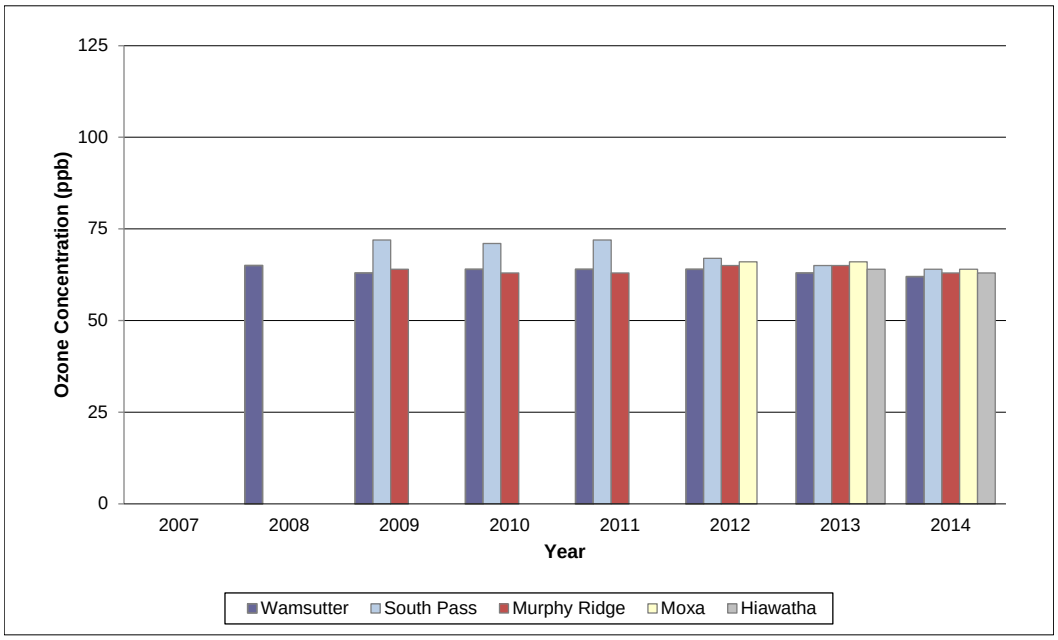
Data Source: REF 1018
Note: The NAAQS for 8-hour average ozone concentration is 70 ppb.
NAAQS National Ambient Air Quality Standards
ppb parts per billion

Figure 3-2. 8-Hour Ozone Design Values (parts per billion) for Monitoring Sites in Southwestern Wyoming

a) Sublette County Monitoring Sites



b) Sweetwater, Fremont, and Uinta Counties Monitoring Sites



Data Source: REF 1018
Note: The NAAQS for 8-hour average ozone concentration is 70 ppb.
NAAQS National Ambient Air Quality Standards
ppb parts per billion

The design values displayed in Figure 3-2 are based on three years of data. Overall, the data indicate a slight downward in trend design value for all sites.

Ozone Nonattainment Designation

On April 30, 2012, the EPA formally recognized Wyoming's UGRB as an ozone nonattainment area with a marginal classification. As a result of the nonattainment designation, the BLM must comply with General Conformity regulations in 40 CFR 93 Subpart B and Chapter 8, Section 3 of the Wyoming Air Quality Standards and Regulations (WAQSR). Per these regulations, the BLM must demonstrate that new actions occurring within the nonattainment area will conform with the Wyoming State Implementation Plan (SIP) by demonstrating that they will not: (1) cause or contribute to a new violation of the ozone standard; (2) interfere with provisions in the SIP for maintenance of any standard; (3) increase the frequency or severity of any existing violation; or(4) delay timely attainment of any standard or any required interim emissions reductions or other milestone. The BLM must first conduct an applicability analysis to determine if this Federal action will require a conformity determination. A conformity determination must be completed for a Federal action if the total of direct and indirect emissions from the project exceed the *de minimis* levels specified in 40 CFR 93.153(b). For a marginal nonattainment area, the *de minimis* threshold is 100 tons/year of NO_x or VOCs (the precursor pollutants that form ozone in the atmosphere). Federal actions estimated to have an annual net emissions increase less than the *de minimis* levels are not required to demonstrate conformity under the General Conformity regulations.

In accordance with 40 CFR 93.153, the General Conformity requirement does not apply to actions where the emissions are not reasonably foreseeable such as lease sales made on a broad scale followed by exploration and development plans. There are no direct effects from the proposed oil and gas lease sale because it is primarily an administrative action that only conveys the mineral rights to the potential lessee. Subsequent development proposals by lease holders will require to submittal of plans for any exploration or development that may occur and a site specific EA would be prepared to identify mitigation measures necessary to avoid undue degradation to the environment prior to approval any development activities. General Conformity is addressed at the proposal stage when emission generating activities are reasonably foreseeable and can be quantified.

On August 27, 2015, the EPA published a Federal Register Notice finding that the Upper Green is attaining the ozone standard as of July 20, 2015 attainment date. See http://www.gpo.gov/fdsys/pkg/FR-2015-08-27/pdf/2015-21196.pdf

3.1.1.2 *Nitrogen Dioxide*

Nitrogen dioxide (NO_2) is currently measured at nine monitoring within the three-county area as well as two additional sites just outside of the area. Relevant NAAQS for NO_2 include (1) the 1-hour NO_2 NAAQS, which requires the 3-year average of the 98th percentile daily maximum 1-hour NO_2 concentration to be less than 100 ppb; and (2) the annual NO_2 NAAQS, which requires the annual average NO_2 concentration to be less than 53 ppb. All nine sites have sufficient data to calculate one or more 3-year average 1-hour NO_2 values. One-hour NO_2 design values for each of these sites, for 2010–2012, 2011–2013, and 2012–2014, are listed in Table 3-4.

Table 3-4. Design Values for 2010–2012 through 2012–2014 for NO_2 Monitoring Sites in Southwestern Wyoming Compared with the NAAQS

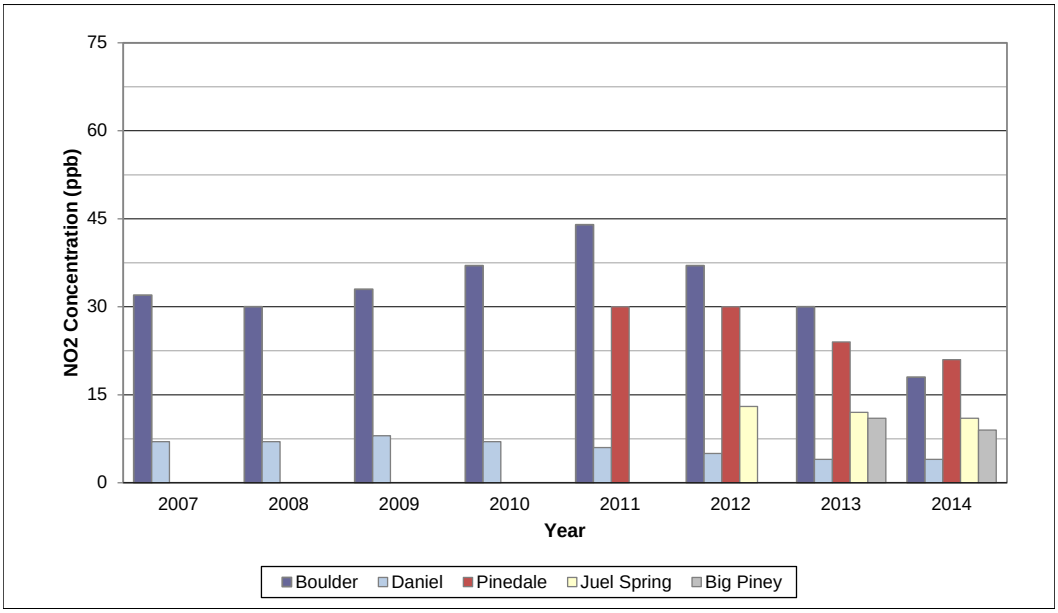
Site Name	ID	County	3-Year Average 98th Percentile 1-Hour NO_2 (ppb)			NAAQS (ppb)
			2010–2012	*2011–2013*	*2012–2014*	
Big Piney	56-035-0700	Sublette	--	10	9	100
Boulder	56-035-0099	Sublette	37	30	18	100
Daniel South	56-035-0100	Sublette	5	4	4	100
Juel Spring	56-035-0700	Sublette	13	12	11	100
Pinedale	56-035-0101	Sublette	30	24	21	100
Moxa	56-037-0300	Sweetwater	19	22	20	100
Wamsutter	56-037-0020	Sweetwater	38	37	35	100
South Pass	56-013-0099	Fremont	5	4	4	100
Murphy Ridge	56-041-0101	Uinta	12	12	12	100

Source: REF 1018
NAAQS National Ambient Air Quality Standards
NO_2 nitrogen dioxide
ppb parts per billion

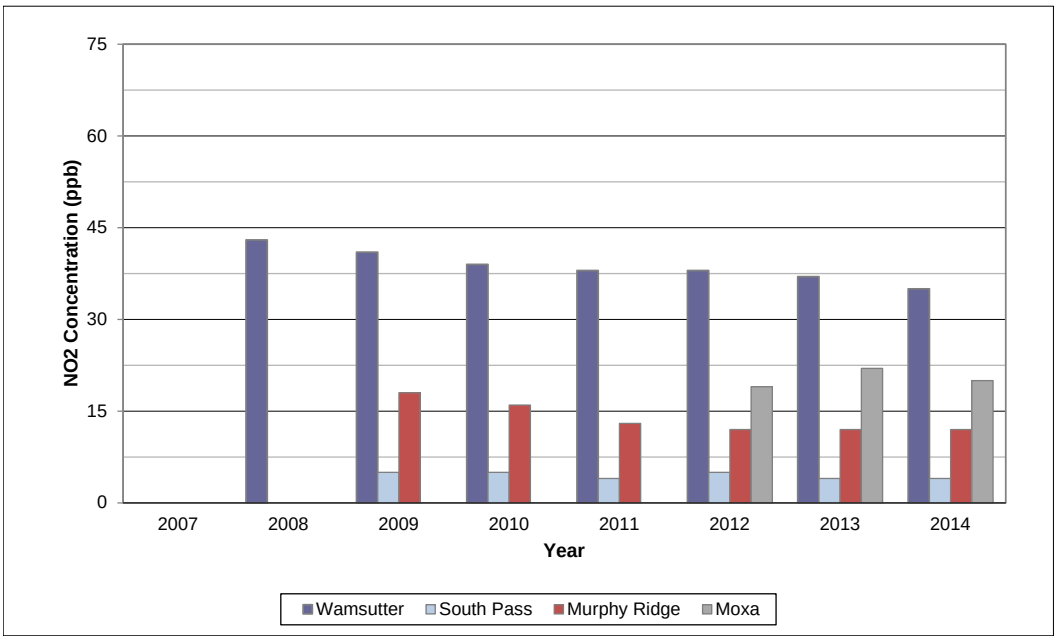
The highest design values occur at the Boulder, Pinedale, Moxa and Wamsutter monitoring sites. The design values are consistent across the three multi-year periods, and none of the design values exceed the 1-hour NO_2 NAAQS. The data also indicate compliance with the annual NO_2 NAAQS. Figure 3-5 displays the 1-hour NO_2 design values for the ozone monitoring sites for all years with available data. As noted earlier, the 98th percentile (or eighth-highest) daily maximum 1-hour NO_2 concentration for each year is used to calculate the design value for each site and assess compliance with the NAAQS.

Figure 3-3. 1-Hour NO_2 Design Values (parts per billion) for Monitoring Sites in Southwestern Wyoming

a) Sublette County Monitoring Sites



b) Sweetwater, Fremont, and Uinta Counties Monitoring Sites



Data Source: REF 1018
Note: The NAAQS for 1-hour NO_2 concentration is 100 ppb.
NAAQS National Ambient Air Quality Standards
NO_2 nitrogen dioxide
ppb parts per billion

The design values displayed in Figure 3-3 are based on three years of data. Overall, the data indicate a downward trend most sites. The downward trends for all but the Boulder site are statistically significant.

3.1.1.3 *Sulfur Dioxide*

Sulfur dioxide (SO_2) is currently measured at the Moxa site (in Sweetwater County). This site was established in 2010. The 99th percentile daily maximum 1-hour SO_2 values are 21, 17, 16, 20 and 16 ppb for 2010 through 2014. The corresponding SO_2 design values are 18, 17 and 17 ppb for 2010–2012, 2011–2013 and 2012-2014, respectively, as listed in Table 3-5. The 1-hour SO_2 NAAQS sets a limit of 75 ppb for the 3-year average of the 99th percentile daily maximum 1-hour value. Therefore, the SO_2 design values are well below the NAAQS and SO_2 is not a pollutant of concern for the region. Note, however, that SO_2 monitoring is limited to one site.

Table 3-5. Three-Year Average 99th Percentile Daily Maximum 1-Hour SO_2 Values for 2010–2012 through 2012-2014 for Monitoring Sites in Southwestern Wyoming Compared with the NAAQS

Site Name	ID	County	3-Year Average 99th Percentile 1-Hour SO_2 (ppb)			NAAQS (ppb)
			2010–2012	*2011–2013*	*2012–2014*	
Moxa	56-037-0300	Sweetwater	18	17	17	75

Source: REF 1018
NAAQS National Ambient Air Quality Standards
ppb parts per billion
SO_2 sulfur dioxide

3.1.1.4 *Carbon Monoxide*

Carbon monoxide (CO) is not routinely monitored within the region. CO was measured at the Murphy Ridge site (in Uinta County) during 2008. Based on these measurements, the daily maximum 1-hour CO value was 870 ppb (0.87 parts per million [ppm]) and the daily maximum 8-hour average CO value was 690 ppb (0.69 ppm). These values are well below the NAAQS limits of 35,000 and 9,000 ppb (35 and 9 ppm), respectively. Therefore, CO does not appear to be a pollutant of concern for the region. Note, however, that CO monitoring is limited to one site.

The 2011 National Emission Inventory indicates that CO emissions in the region are primarily from area (mostly oil and gas–related) and on-road mobile sources. CO concentrations are expected to be greatest near human-made CO sources such as oil and gas development areas, population centers, and roadways, but CO is not a primary air quality concern for the region.

3.1.1.5 *Lead*

Lead is not routinely monitored and is not a primary air quality concern for the region.

3.1.1.6 *Particulate Matter*

Particulate matter (PM_{10} and $PM_{2.5}$) are pollutants of concern within the region. At the regional scale, it is expected that fugitive dust sources are the dominant contributors to PM_{10} and $PM_{2.5}$ concentrations. Fugitive dust is likely to occur naturally across the region, especially during high-wind events. Post-burn vegetative conditions associated with wildfires are also sources of fugitive dust. At the local level, concentrations are expected to be highest near towns, unpaved roads that experience high volumes of traffic, areas with depleted vegetative cover, and areas downwind of human-made sources of precursor emissions such as SO_2 and NO_2 that may react to form secondary $PM_{2.5}$.

Recent PM_{10} data are available for seven monitoring sites within the region. Under the PM_{10} NAAQS, the maximum 24-hour average PM_{10} concentration cannot exceed 150 micrograms per cubic meter ($\mu g/m^3$) more than once per year on average over 3 years. Wyoming Department of Environmental Quality (WDEQ) also requires the annual PM_{10} concentration to be less than 50 $\mu g/m^3$. Maximum 24-hour PM_{10} concentrations for monitoring sites within the area are listed in Table 3-6.

Table 3-6. Maximum 24-Hour PM_{10} Concentrations for Monitoring Sites in Southwestern Wyoming Compared with the NAAQS

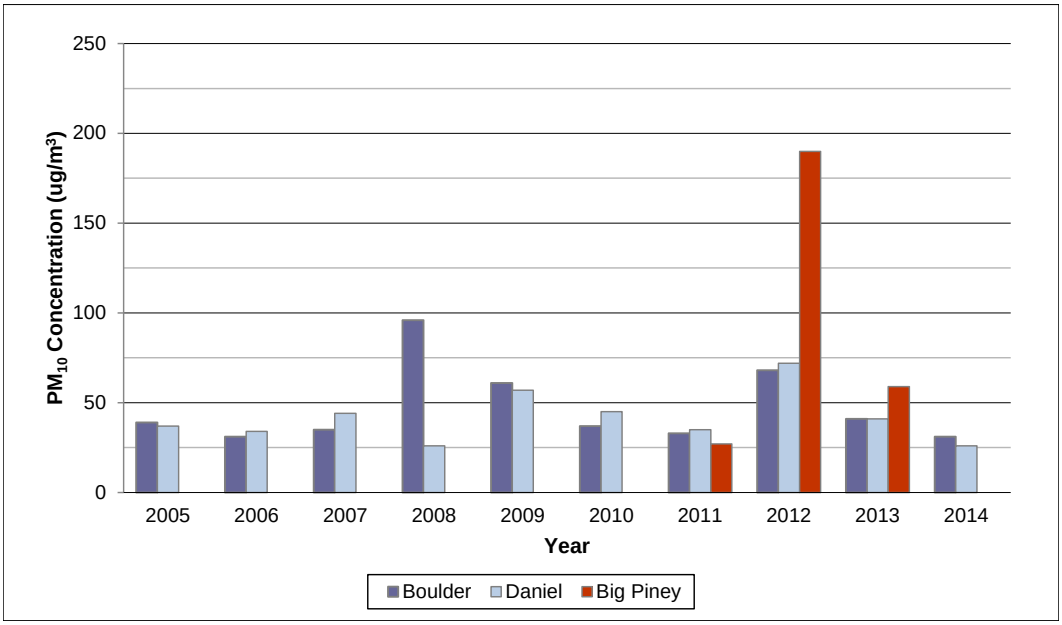
Site Name	ID	County	Maximum 24-Hour Average PM_{10} ($\mu g/m^3$)			NAAQS ($\mu g/m^3$)
			2012	*2013*	*2014*	
Big Piney	56-035-0700	Sublette	190	59	--	150
Boulder	56-035-0099	Sublette	68	41	31	150
Daniel	56-035-0100	Sublette	72	41	26	150
Moxa	56-037-0300	Sweetwater	152	79	67	150
Wamsutter	56-037-0020	Sweetwater	72	193	41	150
South Pass	56-013-0099	Fremont	49	34	76	150
Murphy Ridge	56-041-0101	Uinta	53	43	39	150

Source: REF 1018
NAAQS National Ambient Air Quality Standards
PM_{10} particulate matter less than 10 microns in diameter
$\mu g/m^3$ micrograms per cubic meter

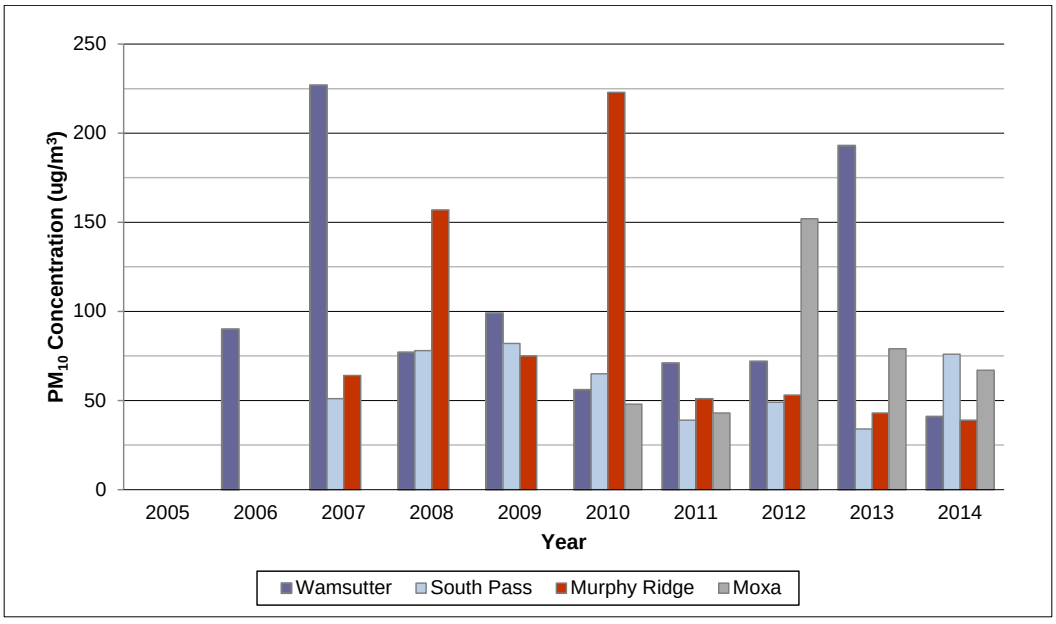
PM_{10} concentrations exceeded 150 $\mu g/m^3$ for 1 of the 3 periods at the Big Piney, Moxa, and Wamsutter sites. Therefore, while there are no violations of the PM_{10} NAAQS, PM_{10} is an air quality concern for the region. Figure 3-4 displays the maximum 24-hour PM_{10} concentration for these sites for all years with available data.

Figure 3-4. Maximum 24-Hour PM_{10} Design Values (micrograms per cubic meter) for Monitoring Sites in Southwestern Wyoming

a) Sublette County Monitoring Sites



b) Sweetwater, Fremont, and Uinta Counties Monitoring Sites



Source: REF 1018
Note: The NAAQS for 24-hour PM_{10} is 150 µg/m^3.
µg/m^3 micrograms per cubic meter
NAAQS National Ambient Air Quality Standards
PM_{10} particulate matter 10 microns or less in diameter

The data indicate no discernible trend in maximum 24-hour PM_{10} for any of the sites. None of the trends are statistically significant.

Recent $PM_{2.5}$ data are available for two monitoring sites within the region. The NAAQS for $PM_{2.5}$ include (1) the 24-hour $PM_{2.5}$ NAAQS, which requires the 3-year average of the 98th percentile 24-hour average $PM_{2.5}$ concentration to be less than 35 µg/m^3; and (2) the annual $PM_{2.5}$ NAAQS, which requires the 3-year average of the annual average $PM_{2.5}$ concentration to be less than 12 µg/m^3. The 24-hour $PM_{2.5}$ design values are listed in Table 3-7 and the annual $PM_{2.5}$ design values are listed in Table 3-8.

Table 3-7. 24-Hour $PM_{2.5}$ Design Values for 2010–2012 through 2012–2014 for Monitoring Sites in Southwestern Wyoming Compared with the NAAQS

Site Name	ID	County	3-Year Average 98th Percentile 24-Hour $PM_{2.5}$ (µg/m^3)			NAAQS (µg/m^3)
			2010–2012	*2011–2013*	*2012–2014*	
Big Piney	56-035-0700	Sublette	--	23.3	--	35
Pinedale	56-035-0101	Sublette	16.0	17.0	17.3	35

Source: REF 1018
NAAQS National Ambient Air Quality Standards
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
µg/m^3 micrograms per cubic meter

The 24-hour $PM_{2.5}$ design values are below the NAAQS for both sites.

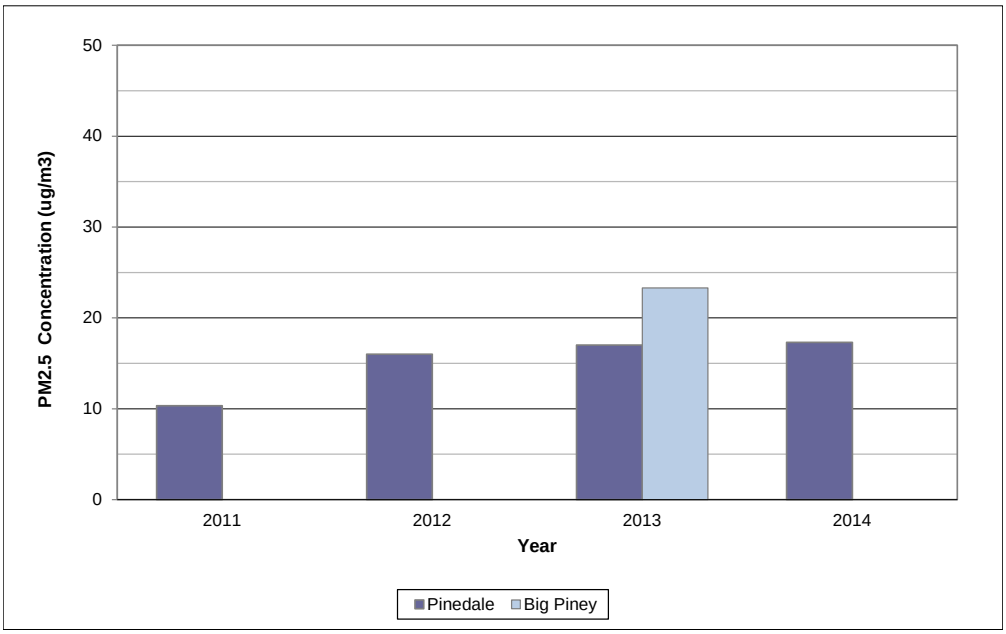
Table 3-8. Annual $PM_{2.5}$ Design Values for 2010–2012 through 2012–2014 for Monitoring Sites in Southwestern Wyoming Compared with the NAAQS

Site Name	ID	County	3-Year Average 98th Percentile 24-Hour $PM_{2.5}$ (µg/m^3)			NAAQS (µg/m^3)
			2010–2012	*2011–2013*	*2012–2014*	
Big Piney	56-035-0700	Sublette	--	4.3	--	12
Pinedale	56-035-0101	Sublette	5.1	5.6	5.8	12

Source: REF 1018
NAAQS National Ambient Air Quality Standards
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
µg/m^3 micrograms per cubic meter

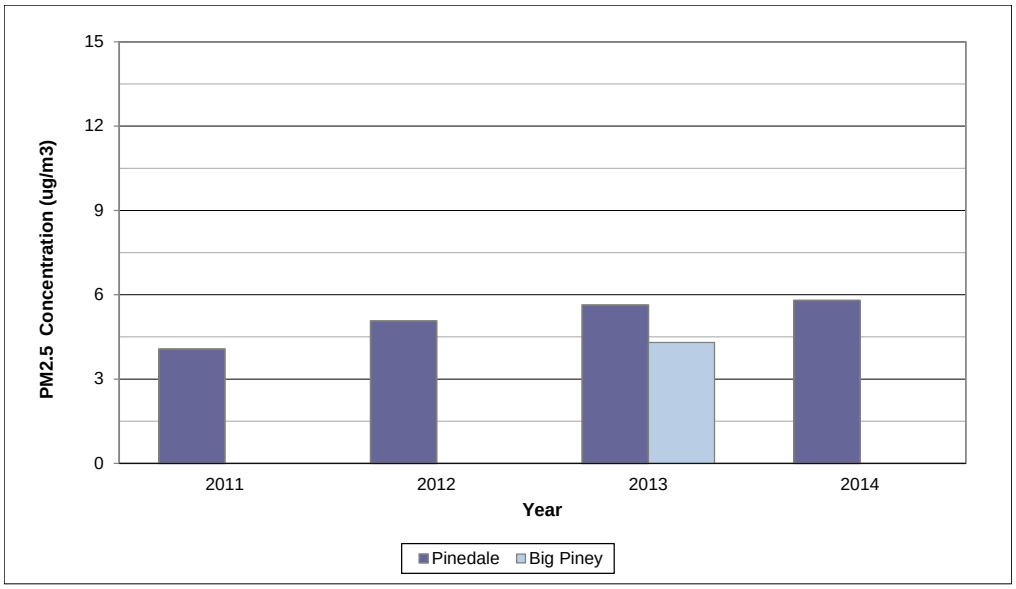
The annual $PM_{2.5}$ design values are also below the NAAQS for both sites. Figure 3-5 displays the 24-hour $PM_{2.5}$ design value and Figure 3-6 displays the annual average concentration for each 3-year period with available data. The design values are based on 3 years of data.

Figure 3-5. 24-Hour $PM_{2.5}$ Design Values (micrograms per cubic meter) for Monitoring Sites in Southwestern Wyoming



Source: REF 1018
Note: The NAAQS for 24-hour $PM_{2.5}$ is 35 µg/m^3.
µg/m^3 micrograms per cubic meter
NAAQS National Ambient Air Quality Standards
$PM_{2.5}$ particulate matter 2.5 microns or less in diameter

Figure 3-6. Annual Average $PM_{2.5}$ Design Values (micrograms per cubic meter) for Monitoring Sites in Southwestern Wyoming



Source: REF 1018
Note: The NAAQS for annual average $PM_{2.5}$ is 12 µg/m^3.
µg/m^3 micrograms per cubic meter
NAAQS National Ambient Air Quality Standards
$PM_{2.5}$ particulate matter 2.5 microns or less in diameter

For both the 24-hour and annual metrics, the data indicate a slight upward trend in $PM_{2.5}$ for the Pinedale site.

3.1.1.7 *Visibility*

The regional haze rule promulgated by EPA in 1999 requires states to establish Reasonable Progress Goals for improving visibility with the overall goal of attaining natural visibility conditions for Class I areas by 2064. Table 3-9 compares visibility in deciviews for the two IMPROVE monitoring sites in Sublette County for 2014 with the natural visibility conditions established by EPA for the Bridger Wilderness Area. The 2014 data indicate that natural background goals are achieved for the 20 percent best days for both sites. However, the deciview values for the 20 percent worst days and for all days are greater than natural background.

Table 3-9. Summary of Visibility Conditions (deciviews) for 2014 for IMPROVE Sites in Southwestern Wyoming Compared with Natural Visibility Conditions

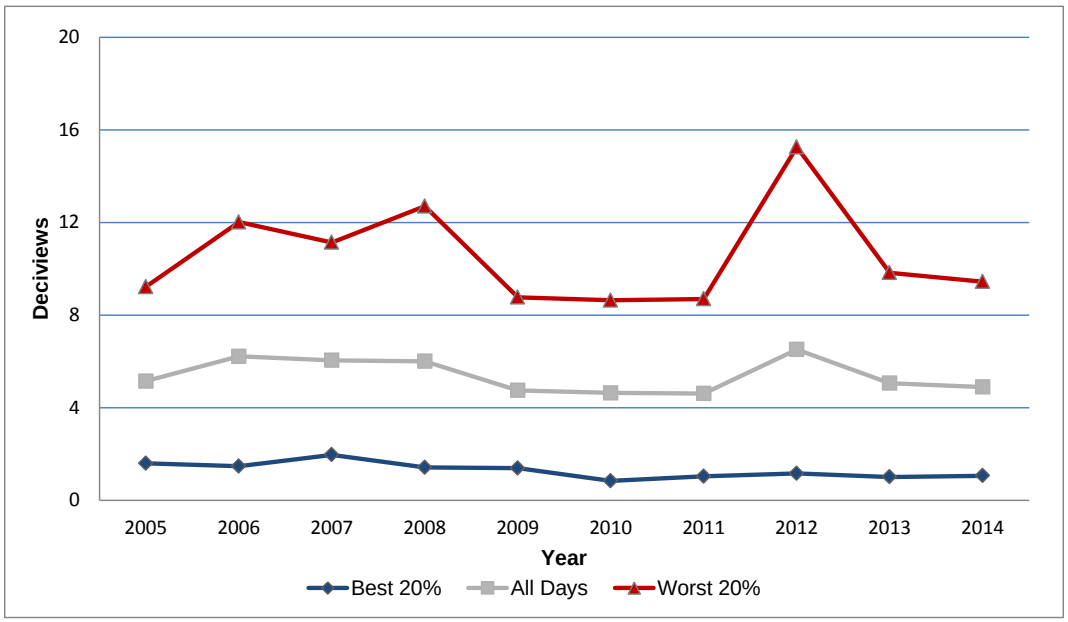
Site	20% Best Days (dv)		20% Worst Days (dv)		All Days (dv)	
	IMPROVE	***Natural***	***IMPROVE***	***Natural***	***IMPROVE***	***Natural***
Bridger Wilderness (BRID1)	1.1	2.0	9.4	7.1	4.9	4.5
Boulder Lake (BOLA1)	1.4	2.0	9.1	7.1	4.9	4.5

Sources: REF 1014; REF 1019

% percent
dv deciviews
IMPROVE Interagency Monitoring of Protected Visual Environments

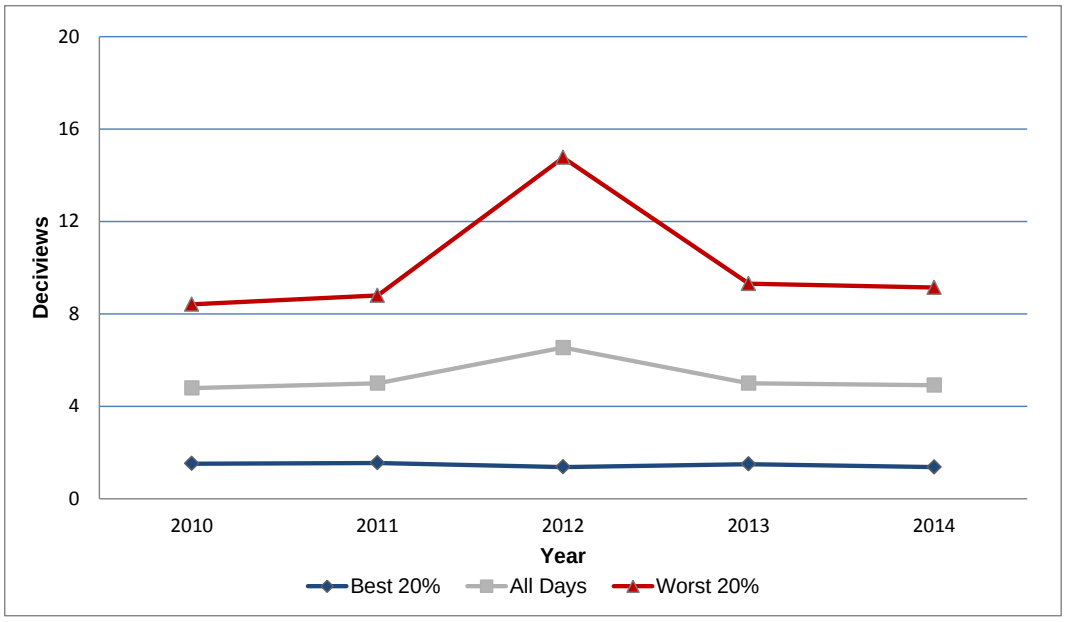
Figure 3-7 and Figure 3-8 display annual average visibility in deciviews for the 20 percent best days, 20 percent worst days, and all days for each year during the period from 2005 to 2014 for the Bridger Wilderness Area IMPROVE site and for 2010 to 2014 for the Boulder Lake IMPROVE site.

Figure 3-7. Annual Average Visibility (deciviews) for the Bridger Wilderness IMPROVE Site



Source: REF 1014
% percent
IMPROVE Interagency Monitoring of Protected Visual Environments

Figure 3-8. Annual Average Visibility (deciviews) for the Boulder Lake IMPROVE Site



Source: REF 1014
% percent
IMPROVE Interagency Monitoring of Protected Visual Environments

The data for Bridger Wilderness indicate a slight downward trend (improved visibility) for the 20 percent best days during the 2002–2014 period. Only the trend for the 20 percent best days is statistically significant. For the other two categories of days, the data are quite variable and it is difficult to distinguish a trend. Visibility for 2012 is especially poor, compared with that of most other years, likely because of wildfires that occurred in several surrounding states in 2012.

Data collection for Boulder Lake began in mid-2009. The data for 2010 through 2014 show no apparent trend in visibility for any of the categories of days. There is an increase in deciviews (poorer visibility) for 2012, compared with that for the other years.

3.1.1.8 *Hazardous Air Pollutants (HAPs)*

Many VOCs are HAPs and are associated with human-made sources. The 2008 and 2011 National Emission Inventories and later WDEQ emissions inventories indicate that VOC emissions within the region are primarily from area sources associated with oil and gas development activities. Therefore, HAP concentrations are expected to be greatest near oil and gas development sources and are a potential air quality concern for the region.
HAPs are not routinely monitored within the region. However, WDEQ conducted HAP monitoring for several sites from February 2009 until March 2010. Table 3-10 summarizes observed HAP concentrations for the Boulder, Daniel South, and Pinedale monitoring sites. Measurements were taken every six days and the values represent averages for the entire monitoring period.

Table 3-10. Example HAP Concentrations (micrograms per cubic meter) for Sublette County, Wyoming

Site Name	Annual Average HAP Concentration (µg/m^3)					
	Benzene	***Ethyl-benzene***	***Formalde-hyde***	***Hexane***	***Toluene***	***Xylene***
Boulder	2.12	0.77	0.99	1.29	6.42	4.46
Daniel South	1.25	0.52	1.37	0.81	4.30	2.76
Pinedale	2.13	1.00	1.59	1.47	6.50	6.38

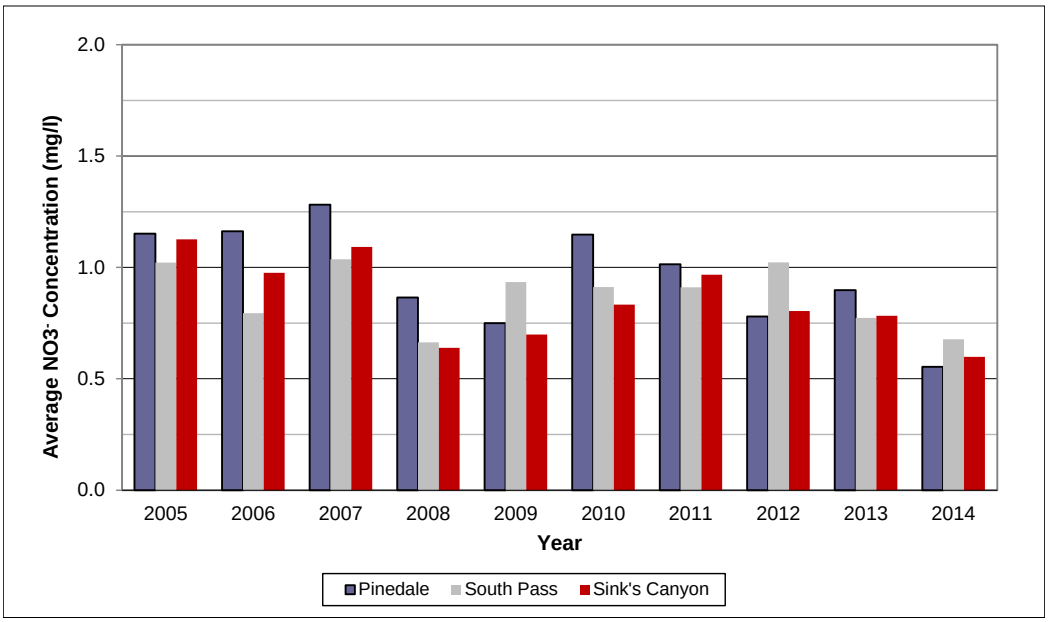
Source: REF 1020
µg/m^3 micrograms per cubic meter

3.1.1.9 *Deposition and Lake Chemistry*

Sulfur and nitrogen compounds that can be deposited on terrestrial and aquatic ecosystems include nitric acid (HNO3), nitrate (NO3-), ammonium (NH4+), and sulfate (SO4--). Nitric acid (HNO3) and nitrate (NO3-) are not emitted directly into the air, but form in the atmosphere from industrial and automotive emissions of nitrogen oxides (NOx); and sulfate (SO4--) is formed in the atmosphere from industrial emission of sulfur dioxide (SO2). Deposition of HNO3, NO3-and SO4--can adversely affect plant growth, soil chemistry, lichens, aquatic environments, and petroglyphs (ancient carvings and/or engravings on rock surfaces). Ammonium (NH4+) is volatilized from animal feedlots and from soils following fertilization of crops.

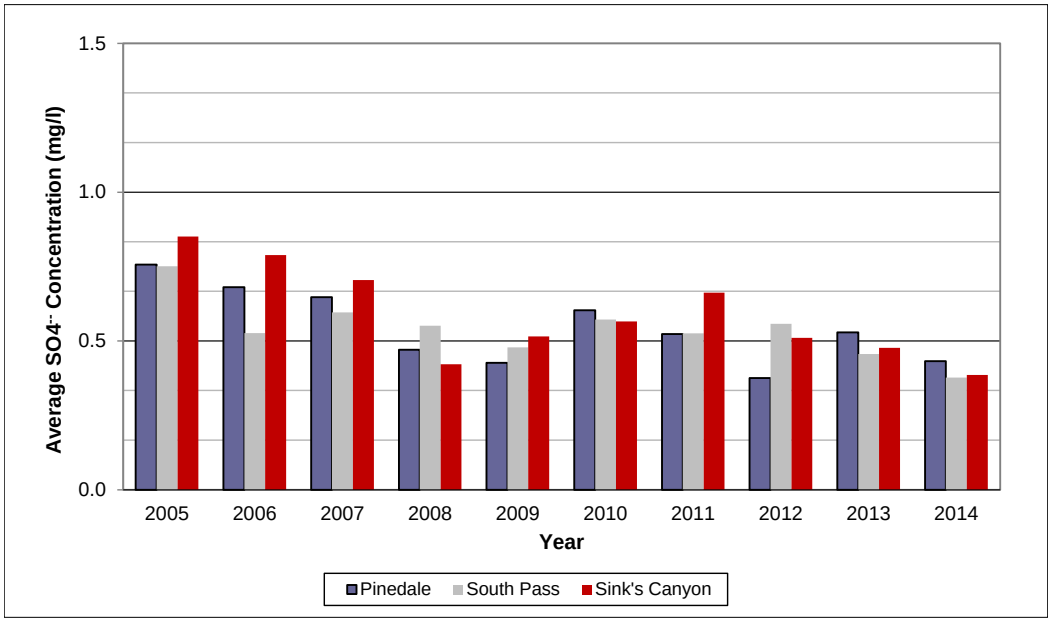
Atmospheric deposition is measured at one National Atmospheric Deposition Program NADP site (wet deposition) and one CASTNet site (dry deposition) in Pinedale (Sublette County) and two NADP sites in Fremont County. Wet deposition is characterized by the concentration of nitrate ion (NO_3^-), sulfate ion (SO_4^-), and ammonium ion in precipitation samples. Figure 3-9 through Figure 3-11 display annual average concentration data for nitrate, sulfate, and ammonium ions from precipitation samples for each year during the period from 2005 to 2014 for the NADP sites. For each year, the data represent the average concentration based on all sampling periods. Units are milligrams per liter (mg/L).

Figure 3-9. Annual Average Concentration in Wet Deposition (milligrams per liter) for NADP Monitoring Sites at Pinedale, South Pass, and Sink's Canyon: Nitrate Ion Concentration



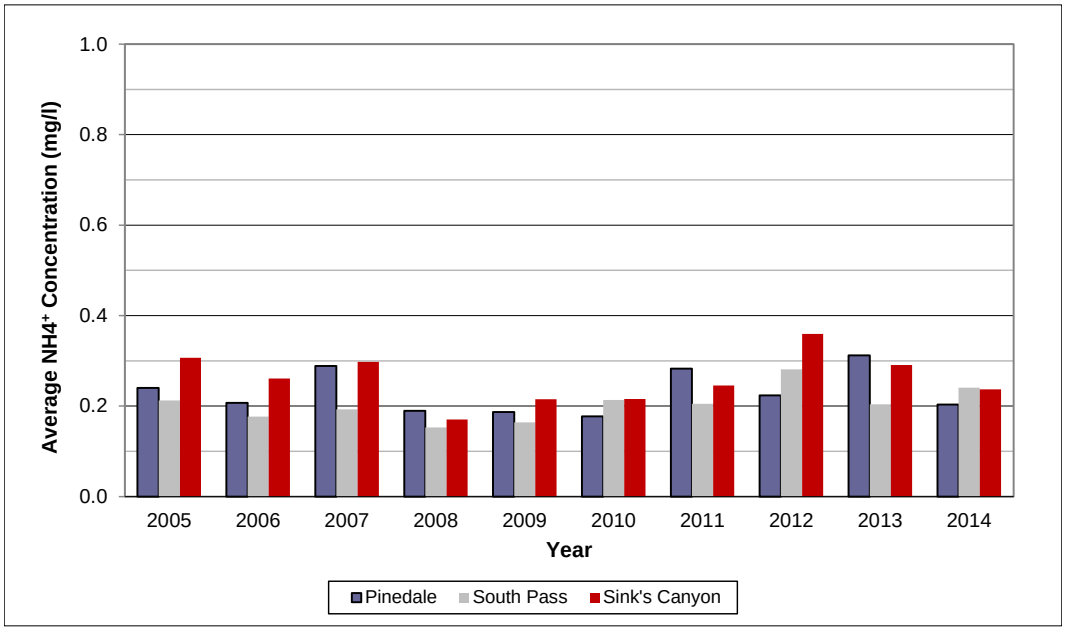
Source: REF 1014
mg/L milligrams per liter
NADP National Atmospheric Deposition Program
NO_3^- nitrate ion

Figure 3-10. Annual Average Concentration in Wet Deposition (milligrams per liter) for NADP Monitoring Sites at Pinedale, South Pass, and Sink's Canyon: Sulfate Ion Concentration



Source: REF 1014
mg/L milligrams per liter
NADP National Atmospheric Deposition Program
SO_4^- sulfate ion

Figure 3-11. Annual Average Concentration in Wet Deposition (milligrams per liter) for NADP Monitoring Sites at Pinedale, South Pass, and Sink's Canyon: Ammonium Ion Concentration

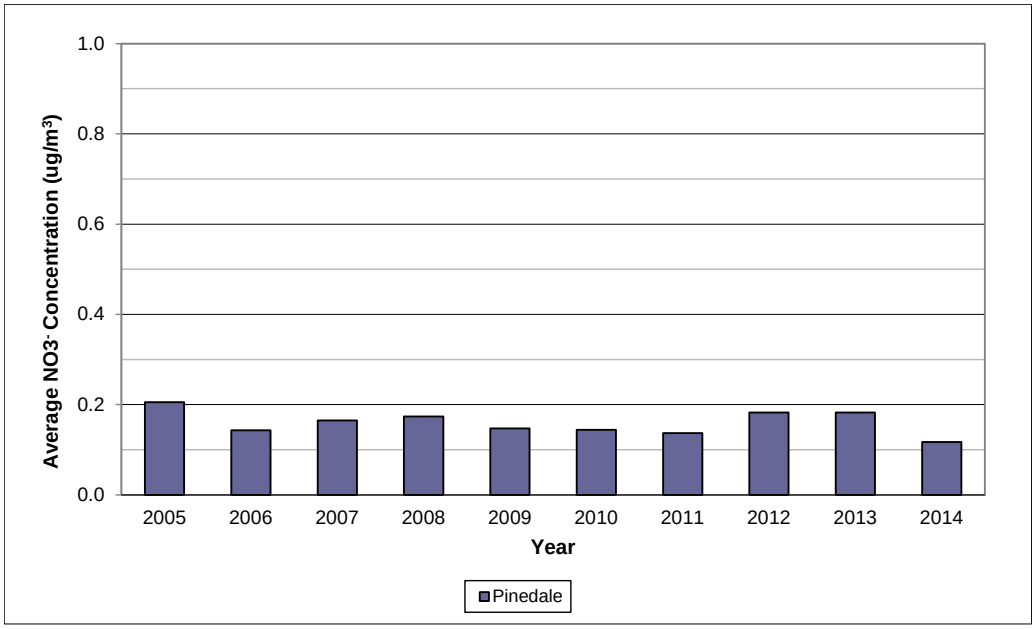


Source: REF 1014

mg/L milligrams per liter
NADP National Atmospheric Deposition Program
NH_4^+ ammonium ion

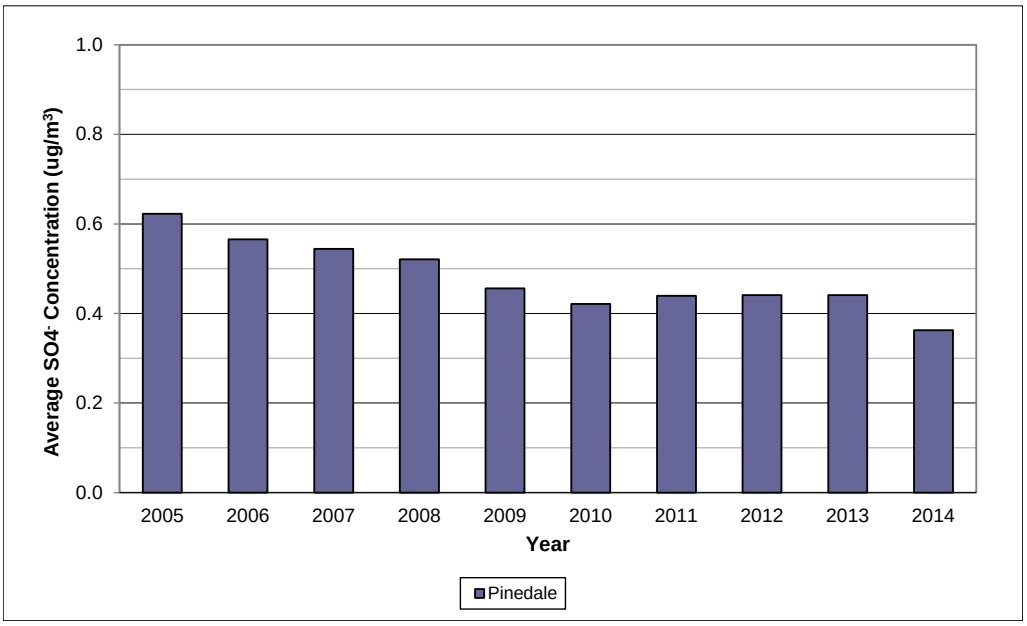
The data indicate a decrease over time for nitrate and sulfate ions for all three sites in precipitation samples during this period. There is no discernible trend in ammonium ions. For Pinedale and Sink's Canyon, the downward trends are statistically significant for nitrate and sulfate. For South Pass, the downward trend is statistically significant for sulfate.
Figure 3-2 through Figure 3-4 display annual average concentration data for nitrate, sulfate, and ammonium ions during the period 2005 to 2014 for the Pinedale CASTNet site. The concentration measurements are used to estimate dry deposition. For each year, the data represent the average concentration based on all sampling periods. Units are $\mu g/m^3$.

Figure 3-12. Annual Average Concentration (micrograms per cubic meter) for the CASTNet Monitoring Site at Pinedale: Nitrate Ion Concentration



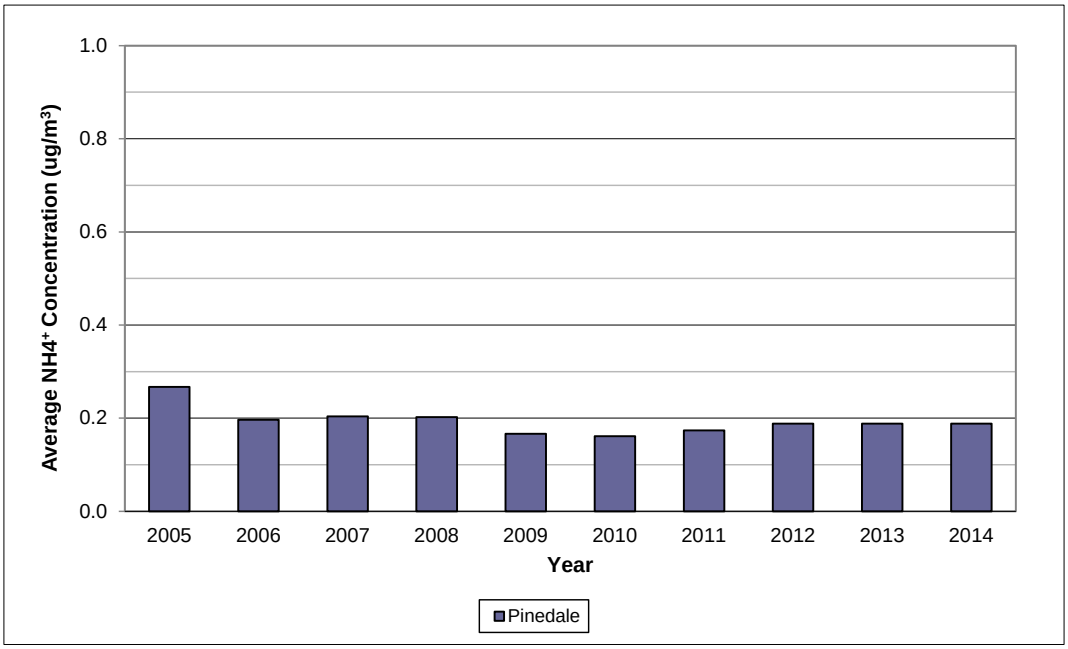
Source: REF 1014
$\mu g/m^3$ micrograms per cubic meter
CASTNet Clean Air Status and Trends Network
NO_3^- nitrate ion

Figure 3-13. Annual Average Concentration (micrograms per cubic meter) for the CASTNet Monitoring Site at Pinedale: Sulfate Ion Concentration



Source: REF 1014
µg/m^3 micrograms per cubic meter
CASTNet Clean Air Status and Trends Network
SO_4^- sulfate ion

Figure 3-14. Annual Average Concentration (micrograms per cubic meter) for the CASTNet Monitoring Site at Pinedale: Ammonium Ion Concentration



Source: REF 1014
µg/m^3 micrograms per cubic meter
CASTNet Clean Air Status and Trends Network

NH_4^+ ammonium ion

The concentration data that are used to estimate dry deposition indicate a decrease over time for all three pollutant species in air samples taken during this period. The downward trend is slight for NO_3^- and ammonium ions and is more pronounced (and statistically significant) for the SO_4^- concentrations.

Seven lakes have been identified as being acid sensitive. Applicable thresholds for the assessment of changes in acid neutralizing capacity (ANC) of sensitive lakes include: 10 percent change in ANC for lakes with background ANC values greater than 25 micro equivalents per liter [µeq/L], and less than a 1 µeq/L change in ANC for lakes with background ANC values equal to or less than 25 µeq/L.

Available ANC values for each of the nearest sensitive lakes are provided in Table 3-11, along with the number of samples used in the calculation of the 10th percentile lowest ANC values. Of the seven lakes listed in Table 3-11, only Upper Frozen Lake is considered to be extremely sensitive to atmospheric deposition by the USFS since the background ANC is less than 25 µeq/L.

Table 3-11. Background ANC Values for Acid Sensitive Lakes

Wilderness Area	Lake	Latitude (Deg, Min, Sec)	Longitude (Deg, Min, Sec)	10th Percentile Lowest ANC Value (µeq/l)	Number of Samples
Bridger	Deep	42°43'10"	109°10'15"	57.7	68
Bridger	Black Joe	42°44'22"	109°10'16"	62.6	78
Bridger	Lazy Boy	43°19'57"	109°43'47"	9.1	5
Bridger	Upper Frozen	42°41'13"	109°09'39"	7.5	12
Bridger	Hobbs	43°02'08"	109°40'20"	69.9	80
Fitzpatrick	Ross	43º23'35"	109º39'29"	53.0	61
Popo Agie	Lower Saddlebag	42º37'24"	108º59'42"	54.6	64

*Source: Views (2014b)*ANC Acid Neutralizing Capacity
Deg Degree
Min Minute
Sec Second
µeq/l Microequivalent per liter

3.2.1.3 Climate and Greenhouse Gas Emissions

The Kemmerer, Pinedale, Rock Springs and Rawlins field offices are located in a semi-arid, mid-continental climate regime typified by dry, windy conditions, limited rainfall, and long, cold winters (Trewatha and Horn 1980). Table 3-10 summarizes climate components in the area based on data collected at several long-term meteorological stations located in and near the Kemmerer, Pinedale, Rock Springs, and Rawlins field office areas.

Table 3-12. Summary of Climate

Wyoming Meteorological Station	Description
Kemmerer Water Treatment Station 1902 - 2011	Mean maximum temperature: 54 °F Mean minimum temperature: 24 °F Mean annual precipitation: 9.45 inches Mean annual snow depth: 2 inches Mean annual snowfall: 50.6 inches
Rock Springs FAA Airport 1948-2012	Mean maximum temperature: 55 °F Mean minimum temperature: 31 °F Mean annual precipitation: 8.68 inches Mean annual snow depth: 1 inch Mean annual snowfall: 43.6 inches
LaBarge 1958-2012	Mean maximum temperature: 56 °F Mean minimum temperature: 22 °F Mean annual precipitation: 7.96 inches Mean annual snow depth: 1 inch Mean annual snowfall: 31.9 inches
Rawlins FAA Airport 1951-2012	Mean maximum temperature: 55 °F Mean minimum temperature: 30 °F Mean annual precipitation: 9.04 inches Mean annual snow depth: 1 inches Mean annual snowfall: 51.9 inches
Source: (Western Regional Climate Center 2012)	

The region is subject to strong, gusty winds that are often accompanied by snow and blizzard conditions during the winter. Winds frequently originate from the west to northwest, and the mean annual wind speed is 9 miles per hour but can have sustained winds greater than 40 miles per hours. Wind strength and frequency affects dispersion of noises, odors, and transport of dust and other airborne elements. Therefore, the region's strong winds increase the potential for atmospheric dispersion of pollutants.

"Climate change" refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer. "Global warming" refers to the recent and ongoing rise in global average temperature near Earth's surface. It is caused mostly by increasing concentrations of greenhouse gases in the atmosphere. Global warming is causing climate patterns to change. However, global warming itself represents only one aspect of climate change. Climate is both a driving force and limiting factor for ecological, biological, and hydrological processes, and has great potential to influence resource management.

It is accepted within the scientific community that global temperatures have risen at an increased rate and the likely cause is gases that trap heat in the atmosphere, referred to as greenhouse gases (GHG). The IPCC (2007) concluded that "warming of the climate system is unequivocal" and "most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations." Extensive research and development efforts are underway in the field of carbon capture and sequestration (CCS) technology, which could help direct management strategies in the future. The IPCC has identified a target worldwide "carbon budget" to

estimate the amount of CO_2 the world can emit while still having a likely chance of limiting global temperature rise to 2°C above pre-industrial levels. The international community estimates this budget to be 1 trillion tonnes of carbon (IPCC, 2016).

As explained in CEQ's recent guidance on the consideration of GHG emissions and climate change in NEPA review, climate change science continues to expand and refine our understanding of the impacts of anthropogenic GHG emissions (CEQ, 2016). CEQ's first Annual Report in 1970 referenced climate change, indicating that "[m]an may be changing his weather." It is now well established that rising global atmospheric GHG emission concentrations are significantly affecting the Earth's climate. These conclusions are built upon a scientific record that has been created with substantial contributions from the United States Global Change Research Program (USGCRP).[1] Studies have projected the effects of increasing GHGs on many resources normally discussed in the NEPA process, including water availability, ocean acidity, sea-level rise, ecosystem functions, energy production, agriculture and food security, air quality and human health.

Based primarily on the scientific assessments of the USGCRP, the National Research Council, and the Intergovernmental Panel on Climate Change (IPCC), in 2009 the Environmental Protection Agency (EPA) issued a finding that the changes in our climate caused by elevated concentrations of greenhouse gases in the atmosphere are reasonably anticipated to endanger the public health and public welfare of current and future generations.

GHGs are composed of molecules that absorb and reradiate infrared electromagnetic radiation. When present in the atmosphere the gas contributes to the greenhouse effect. Some GHGs such as CO_2 occur naturally and are emitted to the atmosphere through natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. The primary GHGs that enter the atmosphere as a result of anthropogenic activities include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_20), and fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Fluorinated gases are powerful GHGs that are emitted from a variety of industrial processes including production of refrigeration/cooling systems, foams and aerosols. Fluorinated gases are not primary to the activities authorized by the BLM and will not be discussed further in this document.

GHGs are often presented using the unit of Metric Tons of CO_2 equivalent (MT CO_2e) or Million Metric Tons (MMT CO_2e), a metric to express the impact of each different greenhouse gas in terms of the amount of CO_2 making it possible to express greenhouse gases as a single number. For example, 1 ton of methane would be equal to 25 tons of CO_2 equivalent, because it has a global warming potential (GWP) 25 times that of CO_2. As defined by USEPA, the GWP provides "ratio of the time-integrated radiative forcing from the instantaneous release of one kilogram of a trace substance relative to that of one kilogram of CO_2." The GWP of greenhouse gas is used to compare global impacts of different gases and used specifically to measure how much energy the emissions of one ton of gas will absorb over a given period of time (e.g. 100 years), relative to the emissions of one ton of CO_2. The GWP accounts for the

[1] *See* Global Change Research Act of 1990, Pub. L. 101–606, Sec. 103 (November 16, 1990). For additional information on the United States Global Change Research Program [hereinafter "USGCRP"], visit http://www.globalchange.gov.

intensity of each GHG's heat trapping effect and its longevity in the atmosphere. The GWP provides a method to quantify the cumulative effects of multiple GHGs released into the atmosphere by calculating carbon dioxide equivalent for the GHGs.

- Carbon dioxide (CO_2), by definition, has a GWP of 1 regardless of the time period used because it is the gas being used as the reference. CO_2 remains in the climate system for a very long time; CO_2 emissions cause increases in the atmospheric concentrations of CO_2 that will last thousands of years (USEPA, 2016h).
- Methane (CH_4) is estimated to have a GWP of 28-36 times that of CO_2 over 100 years. CH_4 emitted today lasts about a decade on average, which is much less time than CO_2. But CH_4 also absorbs much more energy than CO_2. The net effect of the shorter lifetime and higher energy absorption is reflected in the GWP. The methane GWP also accounts for some indirect effects, such as the fact that methane is a precursor to ozone, and ozone is in itself a greenhouse gas (USEPA, 2016h).
- Nitrous Oxide (N_2O) has a GWP of 265-298 times that of CO_2 for a 100-year timescale. N_2O emitted today remains in the atmosphere for more than 100 years, on average (USEPA, 2016h). Table 3.3. contains GHGs regulated by USEPA and global warming potentials.

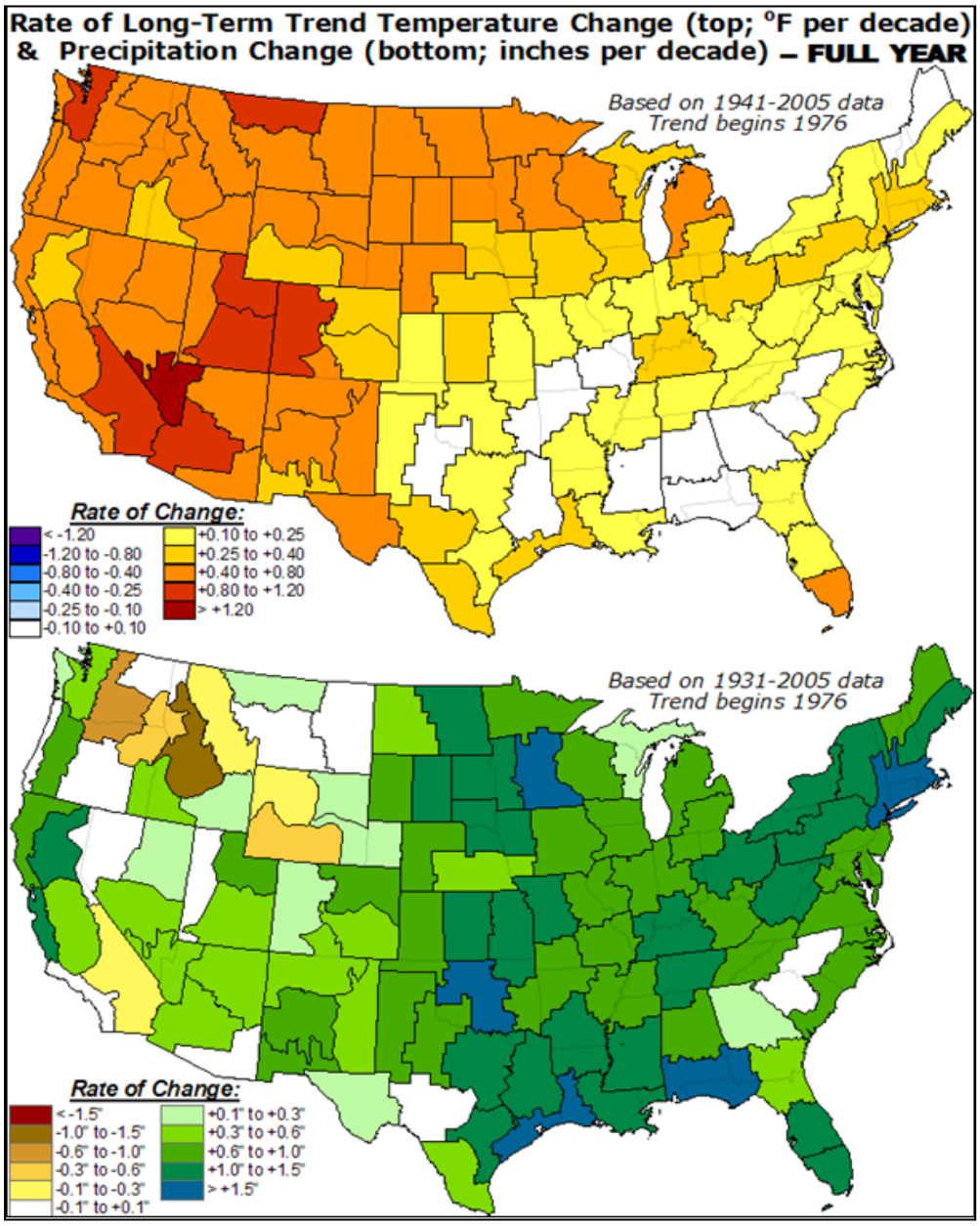
The Center for Climate Strategies (CCS) prepared the Wyoming Greenhouse Gas Inventory and Reference Case Projection 1990-2020 (Inventory) for the WDEQ through an effort of the Western Regional Air Partnership (WRAP). This inventory report presents a preliminary draft GHG emissions inventory and forecast from 1990 to 2020 for Wyoming. This report provides an initial comprehensive understanding of Wyoming's current and possible future GHG emissions. The information presented provides the state with a starting point for revising the initial estimates as improvements to data sources and assumptions are identified.

The CCS inventory report discloses that activities in Wyoming accounted for approximately 56 million metric tons (MMt) of *gross* carbon dioxide equivalent (CO_2e) emissions in 2005, an amount equal to 0.8% of total U.S. gross GHG emissions. These emission estimates focus on activities in Wyoming and are *consumption-based;* they exclude emissions associated with electricity that is exported from the state. Wyoming's gross GHG emissions increased 25% from 1990 to 2005, while national emissions rose by only 16% from 1990 to 2004. Annual sequestration (removal) of GHG emissions due to forestry and other land-uses in Wyoming are estimated at 36 MMtCO2e in 2005. Wyoming's per capita emission rate is more than four times greater than the national average of 25 MtCO2e/yr. This large difference between national and state per capita emissions occurs in most of the sectors – Wyoming's emission per capita significantly exceed national emissions per capita for the following sectors: electricity, industrial, fossil fuel production, transportation, industrial process and agriculture. The reasons for the higher per capita intensity in Wyoming are varied but include the state's strong fossil fuel production industry and other industries with high fossil fuel consumption intensity, large agriculture industry, large distances, and low population base. Between 1990 and 2005, per capita emissions in Wyoming have increased, mostly due to increased activity in the fossil fuel industry, while national per capita emissions have changed relatively little.

Globally, anthropogenic carbon emissions reached about 7,000,000,000 MT per year in 2000 and an estimated 9,170,000,000 MT per year in 2010 (Boden, Marland, & Andres, 2013). Oil and gas production contributes to GHGs such as $CO_2$and methane. Natural gas systems were the largest anthropogenic source category of CH_4 emissions in the United States in 2014 with 176.1 MMT CO_2 e of CH_4 emitted into the atmosphere. Those emissions have decreased by 30.6 MMT CO_2 e (14.8 percent) since 1990 (USEPA, 2016).

Global mean surface temperatures have increased nearly 1.8°F from 1890 to 2006. Models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24°N) have exhibited temperature increases of nearly 2.1° F since 1900, with nearly a 1.8°F increase since 1970 alone. Temperatures in western Wyoming are expected to increase by 0.25 to 0.40 degrees Fahrenheit per decade while temperatures in surrounding locations in Utah, Wyoming, and Colorado are expected to increase by 0.40 to 1.2 degrees Fahrenheit per decade with the largest decrease expected in southwestern Wyoming (Figure 3-11). Precipitation across western Wyoming is expected to decrease by 0.1 to 0.6 inches per decade with the largest decrease expected in southwestern Wyoming.

Figure 3-15. Long-term Temperature (top) and Precipitation (bottom) Trends in the United States from NOAA Climate Prediction Center

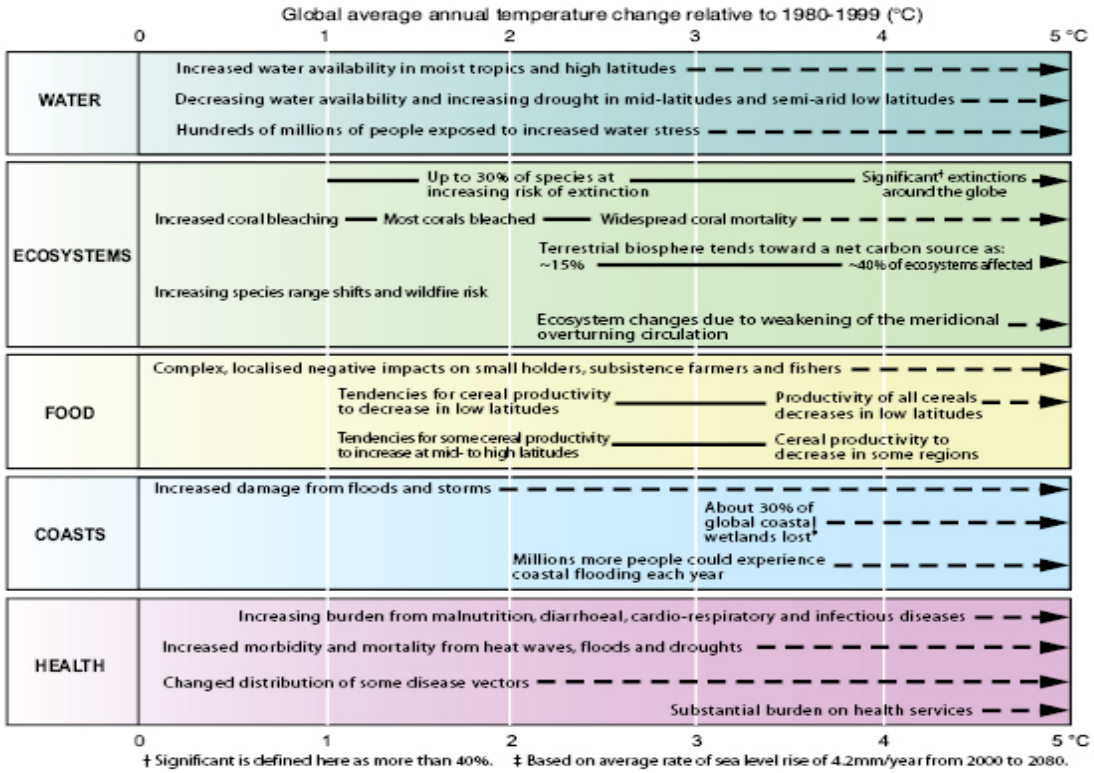


(http://www.cpc.noaa.gov)

Figure 3-16 below, taken from the IPCC's Fourth Assessment Report, indicates varying responses of the natural world to increasing temperatures as a result of increasing global temperatures.

Figure 3-16 Examples of Impacts Associated with Global Average Temperature Change

(Impacts will vary by extent of adaptation, rate of temperature change and socio-economic pathway).



A number of the existing authorized activities within the Kemmerer, Pinedale, and Rawlins Field Offices generate GHG emissions. Oil and gas development activities can generate CO_2 and NH_4 (during processing). Carbon dioxide emissions result from the use of combustion engines for OHV and other recreational activities. Wildland fires also are a source of CO_2 and other GHG emissions, and livestock grazing is a potential source of methane. Other activities in the Kemmerer, Pinedale, and Rawlins Field Office areas with the potential to contribute to climate change include soil erosion from disturbed areas and fugitive dust from roads, which have the potential to darken snow-covered surfaces and cause faster snow melt.

Consistent with CEQ's guidance, this EA includes a qualitative and quantitative analysis of possible greenhouse gas emissions that could occur as a result of reasonably foreseeable oil and gas development associated with the parcels being offered for lease. Additional information about potential emissions would also be available and calculated as part of subsequent site-specific reviews at the APD stage.

3.2.2 Wildlife and Special Status Species (Plants and Animals)

Wildlife and other Special Status Species resources associated with each parcel/partial parcel available to offer for leasing are presented in Table 3-1.

Crucial winter range is a key requirement for the health and survival of big game herds. The availability of good winter range where big game can find shelter and adequate food means all the difference between

strong populations or a herd weakened by starvation and at increased risk for disease and predation. Parturition or birthing areas are locations where hiding cover provides shelter and forage for nursing mothers and their young. The Wyoming Game and Fish Department (WGFD) defines these two types of important wildlife; crucial winter range (CWR) and parturition range (PR). Disturbance of animals on CWR and PR by people and motor vehicles and the loss of CWR and PR from development can heavily impact big game animals during these times

Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the year. According to Washington Office (WO) Instruction Memorandum (IM) No. 2008-050, Migratory Bird Treaty Act – Interim Management Guidance, the BLM must include migratory birds in every NEPA analysis of actions that may have the potential to affect them, in order to fulfill its obligations under the Migratory Bird Treaty Act.

Raptors include eagles, hawks, owls, falcons, and vultures. Twenty seven species of raptors are known or have the potential to occur within the High Desert District. Nine of the 10 raptor species breed in Wyoming; the remaining species—the rough-legged hawk—is a winter resident. Four of the owl species are year-round residents in the state, while the snowy owl is a winter resident only. Raptors can be found collectively in all vegetative types.

Studies conducted for the Greater Sage-Grouse (Holloran 2005), for pronghorn (Berger et al. 2008), and for mule deer (Sawyer et al. 2010) demonstrate that intense oil and gas development such as that occurring on the Jonah and Pinedale Anticline Project areas can negatively affect these species and impact their use of crucial habitats in close proximity to the development, as well as migration corridors (Sawyer et al. 2010). It is not possible to determine or even reasonably project at the leasing stage whether an individual parcel will be sold; and if a lease is subsequently issued whether it will be developed, or what the intensity level of that development may be. Using the oil & gas reasonable foreseeable development (RFD) scenarios, the EISs for the Kemmerer, Pinedale, and Rawlins RMPs, as amended (2015) evaluated affects to sage grouse, big game crucial winter and parturition ranges, including overlapping winter ranges of multiple species, and concluded that areas containing the parcels addressed in this EA would be satisfactorily mitigated through the required stipulations. Table 3-1 identifies parcels with Big Game Crucial Winter Range and Big Game Migration Corridors that have been identified.

3.2.2.1 Special Status Species

Section 7 of the Endangered Species Act (ESA) of 1973, as amended, requires that BLM land managers ensure that any action authorized, funded, or carried out by the BLM is not likely to jeopardize the continued existence of any federally designated Threatened or Endangered (T&E) species.
The BLM Special Status Species Policy outlined in BLM Manual 6840 (transmitted under WO IM 2009-039, Transmittal of Revised 6840 Special Status Species Manual and Direction for State Directors to Review and Revise Existing Bureau Sensitive Species Lists) and WY IM 2010-027, Update of the Bureau of Land Management, Wyoming, Sensitive Species List – 2010, is to conserve listed species and the ecosystems on which they depend, while ensuring that actions authorized or carried out by the BLM are consistent with the conservation needs of special status species and minimize the likelihood and need for federal listing under the ESA. The BLM policy is to promote conservation and survival of those BLM

designated species that are rare or uncommon, either because they are restricted to specific uncommon habitat or because they may be in jeopardy due to human or other actions.

By BLM policy, species proposed for federal listing shall be conferenced over with the FWS where BLM actions are determined "may affect, likely to adversely affect." BLM policy also provides that it is not necessary to consult or conference for federal candidate or Bureau sensitive species. However, States or offices may wish to seek technical assistance from the FWS when it is determined to be advantageous to a species' conservation or BLM management options.

Other management direction is based on Kemmerer, Rawlins, and Pinedale RMP management objectives, activity level plans, and other aquatic habitat and fisheries management direction, including 50 CFR 17, the Land Use Planning Handbook, Appendix C, Part E, Fish and Wildlife.

BLM is responsible for managing sensitive plants species on the Wyoming State Director's Sensitive Species List. Plant species are listed on the BLM Wyoming State Director's Sensitive Species List http://www.blm.gov/wy/st/en/programs/pcp/species/sensitive.html . The Kemmerer, Rawlins, and Pinedale RMPs, as amended (2015) provide listings of sensitive species within the field office areas, and have evaluated the need to protect habitat necessary for the success of species identified through these regulations and policies. Parcels identified as available for lease under Alternative B may contain habitat or potentially contain habitat for sensitive species. Refer to Table 3-1 for a listing of T&E, candidate, and sensitive species associated with or potentially associated with the individual proposed May 2, 2017 lease parcels.

The Greater Sage-Grouse was a candidate species for listing under provisions of the ESA as determined by the USFWS and documented in a March 5, 2010 *Federal Register* notice declaring that listing of the Greater Sage-Grouse was warranted but precluded. Since that time, the BLM has made a concerted effort to update their RMPs and issued a ROD for the Greater Sage Grouse Land use Plan amendment on September 21, 2015. Concurrent with the signing of these RODs, the USFWS determined that the Greater Sage-Grouse was no longer warranted for listing due to the collaborative effort, science-based conservation campaign and the collective effort of federal, state and private partners across its range. As provided for in Washington Office Instruction Memorandum 2016-143, Implementation of Greater Sage-Grouse Resource Management Plan Revisions or Amendments -Oil & Gas Leasing and Development Sequential Prioritization, the BLM has reviewed the subject parcels for consistency. All of the subject parcels are located within what is assumed to be suitable GSG habitat. This policy clarifies that the intent of prioritization is to ensure consideration of the lands outside of GHMAs and PHMAs for leasing and development before considering lands within GHMAs and, thereafter, to ensure consideration of lands within GHMAs for leasing and development before considering any lands within PHMAs for leasing and development in an effort to focus future surface disturbance outside of the most important areas for sage-grouse conservation consistent with the conservation objectives and provisions in the GRSG Plans. Following a detailed review in consideration of the WO IM factors, twenty-two (22) of the proposed sale parcels for the May 2, 2017 sale, are located in General Habitat Management Areas (GHMA), and six (6) are located in PHMA as identified in the ARMPA ROD. The parcels located in PHMA (45, 48, 49, 50, 51, 52) are proximate or adjacent to existing production (within 2 miles of leases currently held by production), have moderate to very high potential for oil and gas development, and only one has an active

GSG lek within its boundaries. Parcels being offered in PHMA are located within PHMAs that do not have more than 5% cumulative disturbance based on data provided by the University of WY collected under the DDCT process (dated February 9, 2016). All of the PHMA parcels being offered are located within the Greater South Pass PHMA. These lands within the PHMA parcels may provide nesting, wintering, and/or breeding habitat for Greater Sage-Grouse GSG (see Table 3-1). One parcel nominated for this sale (1705-001) is located in areas not identified as neither GHMA or PHMA.

Four parcels are located in the Platte River drainage, thirteen in the Great Divide closed basin, twelve in the Bear River drainage, and one in the Colorado River drainage. The Colorado River basin provides habitat for the threatened and endangered Colorado pikeminnow, razorback sucker, bonytail and humpback chub fish species. Parcels 53, 62, 64, 65, 66, and 71 contain live water.

In 2006, USFWS, BLM, USFS, NPS, and fish and wildlife management agencies in Colorado, Wyoming, and Utah jointly developed a conservation agreement and strategy to "assure the long-term viability of Colorado River cutthroat trout (CRCT) throughout their historic range." No parcels have been identified as having CRCT.

Parcels containing streams will also have associated riparian habitat, as presented in Table 3-1. Some streams and riparian areas may provide habitat for special status fish, bird, amphibian, and reptilian species. Semlitsch and Bodie (October 2003) state, "It is generally acknowledged that terrestrial buffers or riparian strips 30-60 m wide will effectively protect water resources." They further state the importance of amphibian and reptilian core habitat and suggest including "three terrestrial zones adjacent to core aquatic and wetland habitats…(1) a first terrestrial zone immediately adjacent to the aquatic habitat, which is restricted from use and designed to buffer the core aquatic habitat and protect water resources; (2) starting again from the wetland edge and overlapping with the first zone, a second terrestrial zone that encompasses the core terrestrial habitat defined by semiaquatic focal-group use (e.g., amphibians...); and (3) a third zone, outside the second zone, that serves to buffer the core terrestrial habitat from edge effects from surrounding land use" and "Although wetlands vary in many characteristics related to type, region, topography, climate, and land-use surrounding them, the data we compiled suggest that a single all-encompassing value for the size of core habitats can be used effectively." Based on the definition for riparian habitat (i.e., areas adjacent to rivers and streams with a differing density, diversity, and productivity of plant and animal species relative to nearby uplands) is appears that the Semlitsch and Bodie core habitat zone would correlate with riparian areas. They recommend a minimum core zone of 142 meters (465 feet). The BLM 500 foot buffer from the edge of riparian habitat or surface water meets this minimum core zone width

In Wyoming, the Yellow-billed cuckoo is dependent on areas of woody, riparian vegetation that cover 50 acres or more within arid to semiarid landscapes, that combine a dense shrubby understory for nesting and a cottonwood overstory for foraging. Currently, yellow-billed cuckoo occurs on the western side of the Rocky Mountains along the Lower Green River Basin from the Seedskadee NWR to the Flaming Gorge Reservoir and west to the Bear River Drainage. Yellow-billed cuckoo also occurs along the North Platte River drainage. The western distinct population of the bird is protected as a threatened species while the eastern population is a BLM sensitive species.

The Wyoming pocket gopher, a species on the BLM Wyoming Sensitive Species List, was petitioned to be included on the threatened and endangered species list. The U.S. Fish and Service subsequently determined that listing was not warranted. The Wyoming pocket gopher is known to occur only in Sweetwater and Carbon counties in Wyoming. They prefer dry, gravelly, shallow-soil ridge tops within greasewood plant communities.

The Idaho pocket gopher is known from Uinta, Lincoln, and Sublette counties. The species occupies shallow, stony soils and has been documented in open sagebrush, grassland plains, and subalpine mountain meadow habitats in Wyoming.

See Section 3.14 of the ARMPA FEIS for additional discussion of Special Status Species in the project area.

3.2.3 Wilderness, Wilderness Study Areas, and Lands with Wilderness Characteristics

3.2.3.1 Wilderness and Wilderness Study Areas

There are no congressionally designated wilderness areas on BLM-administered lands within the HDD, but there are five wilderness study areas located within the RFO, one in the KFO, two in PFO and 13 in the RSFO (Note: Adobe Town WSA occurs within portions of the Rawlins and Rock Springs field offices). WSAs in the project area include:

Rawlins Field Office
- Adobe Town WSA
- Ferris Mountains WSA
- Encampment River Canyon WSA
- Prospect Mountain WSA
- Bennett Mountains WSA

Kemmerer Field Office
- Raymond Mountain WSA

Pinedale Field Office
- Scab Creek WSA
- Lake Mountain WSA

Rock Springs Field Office
- Adobe Town WSA
- Whitehorse Creek WSA
- Honeycomb Buttes WSA
- Oregon Buttes WSA
- Alkali Draw WSA
- South Pinnacles Buttes WSA
- Alkali Basin/East Sand Dunes WSA
- Sand Dunes WSA
- Buffalo Hump WSA
- Red Creek Badlands WSA
- Devil's Playground WSA
- Twin Buttes WSA
- Red Lake WSA

Wilderness Study Areas are managed according to the non-impairment standard. Under this standard, these lands are managed in a manner so as not to impair the suitability of such areas for preservation as wilderness. At present, the BLM manages these lands in accordance with the Kemmerer, Pinedale, Rawlins, and Green River RMPs, and the Interim Management Policy for Lands Under Wilderness Review until Congress either designates each WSA as "wilderness" or releases it from consideration and

the land reverts to multiple-use management. None of the parcels on the May 2, 2017 list are within any of the WSAs.

3.2.3.2 Lands with Wilderness Characteristics

Wilderness characteristics are resource values that include naturalness, outstanding opportunities for solitude, or outstanding opportunities for primitive and unconfined recreation. Areas evaluated for wilderness characteristics generally occur in undeveloped locations of sufficient size (typically greater than 5,000 contiguous acres) to be practical to manage for these characteristics.

The BLM Land Use Planning Handbook (H-1601-1) states that the BLM must consider the management of lands with wilderness characteristics during the land use planning process. The criteria used to identify these lands are essentially the same criteria used for determining wilderness characteristics for wilderness study areas (WSA). However, the authority set forth in section 603(a) of FLPMA to complete the three-part wilderness review process (inventory, study, and report to Congress) expired on October 21, 1993; therefore, FLPMA does not apply to new WSA proposals and consideration of new WSA proposals on BLM-administered public lands is no longer valid. The BLM is still required under Section 201 of FLPMA to "...maintain on a continuing basis an inventory of all public lands and their resource and other values...." This includes reviewing lands, in this case lease parcels, to determine if they possess wilderness characteristics (refer to Appendix D).

No parcels have been determined to have lands with wilderness characteristics or are within Citizen Proposed Wilderness Areas.

3.2.4 Cultural and Paleontological Resources

All parcels addressed in this EA have the potential to contain surface and buried archaeological materials. Once the decision is made by the lessee to develop a lease, an area specific cultural records review would be completed to determine if there is a need for a cultural inventory of the areas of proposed surface disturbance. Generally, a cultural inventory will be required before new surface disturbance and all historic and archaeological sites that are eligible for listing in the National Register of Historic Places would be either avoided by the undertaking, have adverse effects to sites minimized or mitigated, or have the information in the sites extracted through archaeological data recovery. See Table 3-1 for individual parcels that have been identified as having known cultural sites and National Historic Trails.

The parcels addressed in the EA also have a potential to contain vertebrate and non-vertebrate fossils. Post-lease development proposals would be evaluated on a case-by-case basis to determine if paleontological surveys would be required prior to surface disturbance. Parcels that have a Potential Fossil Yield Class of Class 4 (High) or Class 5 (Very High) are identified in Table 3-1.

3.2.5 Soils

Soils within the project area are generally considered to be highly erodible from both wind and water action regardless of slope. Sandy soil textures present in the proposed project area generally have a severe

hazard for wind erosion and a slight or moderate hazard for water erosion due to naturally high infiltration capacities. Heavier, more clayey, soil textures generally have a slight or moderate hazard of wind erosion and severe hazard of water erosion. Soils in Wyoming are especially dependent on vegetative cover to prevent erosion; ground cover and root systems anchor the soil, recycle nutrients, and add scarce organic matter. Soil characteristics and slope information for the parcels are summarized in the Affected Environment, Table 3-1.

3.2.6 Vegetation

Vegetation types occurring on the parcels are summarized in the Affected Environment, Table 3-1. All of the proposed parcels, with the exception of 17, include sagebrush vegetation at varying degrees.

3.2.7 Invasive, Non-native Species

Populations of invasive or non-native species were not identified on the parcels offered for leasing. Infestations of noxious weeds can have a negative impact on biodiversity and natural ecosystems. Noxious weeds affect native plant species by out-competing native vegetation for light, water and soil nutrients. Locally, regionally, and nationally noxious weeds infestations cause decreased quality of agricultural products due to high levels of competition from noxious weeds; decreased quantity of agricultural products due to noxious weed infestations; and increased costs to control and/or prevent the noxious weeds.

Recent federal legislation has been enacted requiring state and county agencies to implement noxious weed control programs. Monies would be made available for these activities from the federal government, generated from the federal tax base. Therefore, all citizens and taxpayers of the United States are directly affected when noxious weed control/prevention is not exercised. The field offices work cooperatively with county and local weed control agencies to identify and manage noxious weeds.

3.2.8 Wastes, Hazardous or Solid

There are no identified hazardous or solid waste sites on the parcels addressed in this EA. Should a parcel be leased and developed, generation and temporary storage of waste materials (solid and liquid) would likely occur. Waste materials would be managed in accordance with Onshore Orders 1 & 7, Resource Conservation and Recovery Act (RCRA), applicable Wyoming Department of Environmental Quality (WDEQ) regulations, and Wyoming Oil and Gas Conservation Commission (WOGCC) rules. Fluid handling would be evaluated at the development stage and fluids associated with any subsequent drilling, completions and/or production would either be treated, evaporated, or transferred to an approved WDEQ treatment facility; solids would be treated on site or transferred to a WDEQ approved facility. Parcel 8, which is deferred, contains four unplugged CBM wells. Several of the parcels contain wells which have previously been plugged and abandoned. The integrity of these wells, and their potential to act as contamination pathways would be evaluated at the development stage.

3.2.9 Water Resources: Surface and Groundwater

Surface water hydrology within the area is typically influenced by geology, soil characteristics, precipitation and vegetation. Anthropogenic factors that currently affect surface water resources include

livestock grazing management, private, commercial and industrial development, recreational use, drought, and vegetation control treatments. Ephemeral drainages that discharge into perennial waters are located within the various parcels/partial parcels available for offer. Perennial streams with associated riparian habitat area are present for many parcels, as identified in Table 3-1.

Groundwater hydrology within the area is influenced by geology and recharge rates. Groundwater quality and quantity can be influenced by precipitation, water supply wells and various disposal activities. Groundwater quality across the Kemmerer, Pinedale, Rawlins, and Rock Springs field offices varies with depth from potable waters with low total dissolved solids (TDS) to highly saline, non-potable sources; additionally known areas of fluoride levels in exceedance of state water quality standards exist within all four field offices and are known to be naturally occurring. Most of the groundwater in KFO, PFO, RFO, and RSFO area is used for industrial, domestic and livestock/irrigation purposes. Information contained in Appendix D, Hydraulic Fracturing White Paper, Section II Operational Issues/Water Availability and Consumption Estimates (page 3) is incorporated by reference. The information contained there indicates that throughout the state, approximately 15 million acre feet of surface and/or groundwater are available for use. The largest user of groundwater in the state is the industrial water use sector which includes electric power generation, coal mining, conventional oil and gas production, uranium mining, trona mining and soda ash production, bentonite mining, gypsum mining, coalbed methane (CBM) production, manufacturing of aggregate, cement, and concrete, and road and bridge construction.. Total current industrial surface water use for WY is estimated to be 125,000 acre feet per year and total current groundwater use is estimated to be 246,000 acre feet per year. Several parcels contain land with private surface overlying federal minerals (i.e., split-estate) and are identified in Table 3-1. The private surface lands have or have the potential to contain private residences and associated facilities such as domestic water supply wells. Otherwise, there are no known domestic or municipal water supply sources on or in the general vicinity of the available parcels, although there may be stock, industrial supply, or monitoring wells present. Where parcels contain areas of perennial surface water, riparian and wetland areas, stipulations have been added through Lease Notice #1 to limit occupancy within 500' feet. Based upon site-specific analysis, this offset could be increased. Lease Notice #1, applied to all parcels, notifies all lessees that occupancy within ¼ mile of all occupied dwellings may be restricted at the time of development and Onshore Order #1 requires that Operators identify all existing wells, and their status, within 1 mile of their proposed development. Parcels 3, 23, 24, 65, 66, 67, 70, 73, and 75 appear to have active water supply wells permitted by the Wyoming State Engineer's Office.

3.2.10 Livestock Grazing

The parcels are used primarily for livestock grazing as they are located in primarily rural areas with large blocks of federal public domain lands. Grazing allotment information for the parcels is listed in the Affected Environment, Table 3-1. The grazing on these parcels is primarily for livestock but may also support sheep, and could contain range improvement structures such as reservoirs, water wells, and fences.

3.2.11 Recreation

Recreational use of the available parcels and the surrounding areas is typically for hunting, fishing, camping, sightseeing, off-highway vehicle use, and other recreational activities. In the national survey of

fishing, hunting and wildlife-associated recreation for activities in 2011, expenditures from fishing and hunting significantly increased. In Wyoming, more than 443,000 people participated in fishing and hunting in 2011. Additionally, 518,000 people participated in some form of wildlife watching (USFWS 2011 National Survey of Fishing, Hunting, and Wildlife Associated Recreation). The total number of hunting and fishing recreation use days in Wyoming in 2011 was 4,849,000. Based on the number of recreation days and average expenditure per day, hunters, anglers and trappers expended approximately $752 million in pursuit of their sport. Non-consumptive users provided about $350 million through wildlife watching, wildlife photography, etc. In total, wildlife associated recreation accounted for over 1 billion dollars in income to the state for the year 2011.

For lands managed by the Department of the Interior (which include those BLM-administered lands within the May 2, 2017 lease sale) more than 389 million recreational visits in 2012 supported more than 372,000 jobs nationwide and contributed over $45 billion in economic activity (USDI 2012). For Wyoming, the outdoor recreation experiences boost economic activity from hunting, angling, and tourism, supporting 52,000 jobs across the state, contributing more than $4.4 billion annually to Wyoming's economy, generates $250 million annually in state tax revenue and produces $3.6 billion annually in retail sales and services across Wyoming (accounting for 17% of gross state product)(Outdoor Industry Foundation 2006.).

Trout are considered a popular sport fish in the United States and in 2011, it was estimated that more than 7.2 million anglers fished for trout (U.S. Fish and Wildlife Service 2011.). In Wyoming, it is estimated that of the 303,000 freshwater anglers over the age of 16 who fish, more than 69 percent seek trout, making Wyoming the state with the second highest participation rate for trout fishing in the United States.

No parcels are located within the RFO Adobe Town DRUA which is subject to management decisions in the Rawlins RMP. The Rawlins RMP approved in December 2008 determined these "lands to be unmanageable for wilderness character because of preexisting oil and gas leases, the BLM elected to manage lands with wilderness character for multiple use and not for protection of wilderness character." Surface occupancy or use will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts to recreational opportunity class setting within the Adobe Town DRUA.

3.2.12 Visual Resources Management

The BLM Visual Resource Management (VRM) Class objectives are as follows:

- Class I: to preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.
- Class II: to retain the existing landscape character and the level of change to the characteristic landscape should be low. Management activities should not attract the attention of the casual observer. Changes would be required to repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. Modifications to a proposal would be required if the proposed change cannot be adequately mitigated to retain the character of the landscape.

- Class III: to partially retain existing landscape character. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate a casual observer's view. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- Class IV: to provide for management activities which require major modification of the existing landscape character. Every attempt, however, should be made to reduce or eliminate activity impacts through careful location, minimal disturbance, and repeating the basic landscape elements.

All individual parcel VRM Class designations are identified in Table 3-1. RFO parcel 5 contains lands managed as of VRM Class II . VRM Classifications only apply to the BLM-administered surface estate and do not apply to private or State lands or surface land managed by other Federal agencies.

3.2.13 Public Health and Safety

Oil and gas development, as well as other industrial uses, such as coal and trona mining, has been occurring in the HDD Field Offices for many decades. Due to the scattered nature and the small area encompassed by the respective parcels coupled with low population density, industrial safety programs, standards, and state and federal regulations, offering these parcels is not expected to materially increase health or safety risks to humans, wildlife, or livestock. Parcels that contain lands with private surface overlying federal minerals (i.e., split-estate) are identified in Table 3-1. Other private surface lands have or have the potential to contain private residences and associate facilities such as domestic water supply wells. Several of these parcels may be used for individual, dispersed, recreational activities as discussed under VRM, Wilderness, and Recreation. Please see information under Air Resources and Water Resources in the attached Hydraulic Fracturing White Paper (Appendix D) for additional information regarding management of air quality emissions and water quantity/quality in WY.

3.2.14 Socioeconomics

See section 3.11 of the ARMPA FEIS for additional discussion of Socioeconomics within the project area.

The proposed lease parcels are located in Laramie, Carbon, Sweetwater, Sublette, and Uinta counties, Wyoming. These five counties are the basis for the socioeconomics analysis area. Table 3-11 shows changes in population for each county and the State of Wyoming between 2000, 2010 and 2013. All of the counties had an increase in population when comparing 2000 to 2013, however from 2010-2013 some of the counties actually saw a decrease in population. The data in Table 3-11 indicates that the increase in population has occurred since 2000, with the largest increase occurring in Sublette County. This large increase is likely due to the ongoing energy development occurring in that county. Both Carbon and Uinta counties saw lower population increases than the state of Wyoming as a whole.

Social conditions in the Kemmerer, Rawlins, and Pinedale Field Office areas that concern human communities include towns, cities, rural areas, and the custom, culture, and history of the area as it relates

to human settlement, as well as current social values. BLM management actions can impact social conditions in the area and in nearby communities.

Much of Wyoming is dependent upon resource development as a base for its economy. In the counties with parcels for lease, this was particularly true in Sweetwater County in 2012 when 25 percent or more of the employment was in the mining sector, which includes oil and gas extraction (BEA 2014).

Table 3-13. Socioeconomic Analysis Area, Population Estimates by County, in 2000, 2005, 2013

Area	Population Estimates in			Percent Change	
	2000	2010	2013	2000-2010	2010-2013
Carbon County	15,579	15,885	15,748	1.9	-0.1
Sweetwater County	37,484	43,806	45,237	16.9	3.3
Sublette County	5,920	10.247	10,041	73.1	-2.0
Uinta County	19,662	21,118	21,066	7.4	-0.2
Lincoln	14,573	18,106	18,364	24.2	1.4
Wyoming	493,958	563,626	583,233	14.1	3.5

Sources: U.S. Census Bureau 2014, 2014

Leasing mineral rights for the development of Federal minerals generates public revenue through the bonus bids paid at lease auctions and annual rents collected on leased parcels not held by production. Nominated parcels approved for leasing are offered by the BLM at a minimum rate of $2.00 per acre at the lease sale. These sales are competitive and parcels with high potential for oil and gas production often command bonus bids in excess of the minimum bid. For example, the last two lease sales conducted for HDD yielded an average of $17.83 per acre. In addition to bonus bids, lessees are required to pay rent annually until production begins on the leased parcel, or until the lease expires. These rent payments are equal to $1.50 an acre for the first five years and $2.00 an acre for the second five years of the lease. Forty-nine percent of these Federal leasing revenues from public domain minerals are distributed to the State who distributes 25 percent of federal revenue from public domain minerals back to the counties where the leases exist.

In general, resource development and protection are both important to sustaining the values within the area. However, the challenge is seeking an appropriate balance between resource development and protection, which is central to the BLM mission.

3.2.15 Environmental Justice

Executive Order 12898 requires Federal agencies to assess projects to ensure there is no disproportionately high or adverse environmental, health, or safety impacts on minority and low income populations. A review of the parcels offered for lease indicates there are no impacts on minority or low-income populations.

3.2.16 Solid Leasables (Coal and Sodium) and Locatables

None of the parcels analyzed in this EA are located within a Sodium or Coal leasing area as summarized in the Affected Environment, Table 3-1. No mining or mill site claims, including Uranium, are present within the boundaries of the subject sale parcels at the time of writing this document.

ENVIRONMENTAL IMPACTS

4.0 Description of Impacts

As previously stated, the sale of parcels and issuance of oil and gas leases is strictly an administrative action. Nominated lease parcels are reviewed against the appropriate land use plan, and stipulations are attached to mitigate any known environmental or resource conflicts that may occur on a given lease parcel. On-the-ground impacts would not occur until a lessee applies for and receives approval to undertake surface-disturbing lease actions. The BLM cannot determine at the leasing stage whether or not a proposed parcel will actually be sold, or if it is sold and issued, whether or not the lease would be explored or developed. Consequently, the BLM cannot determine exactly where a well or wells may be drilled or what technology that may be used to drill, complete and produce wells, so the impacts listed below are more generic, rather than site-specific. Additional NEPA and technical engineering analysis would be conducted prior to approval of an APD to ensure that the proposal is compliant with all Federal and/or state rules and regulations. Additional mitigation and BMPs may be applied as COAs at that time to mitigate identified impacts.

4.1 Impacts of Alternative A (No Action)

Under this alternative none of the parcels proposed to be offered for lease would be made available at the oil and gas sale and there would be no subsequent physical impacts to the existing environment caused by post-lease well development. The No Action alternative would result in continuation of already approved land uses with any attendant potential emissions of greenhouse gasses and associated impacts to climate change, but would not result in impacts relating to exploration and development of these lease parcels, because they would not be leased. Other exploration and development activities on surrounding areas that are currently leased would continue. The only impact resulting from the No Action Alternative would be to socioeconomics as a result of not offering the federal mineral estate for lease contract.

4.1.1 Socioeconomic Resource

Based on the assumption that all 28 parcels and/or portions of parcels (32,965.030 acres) identified in Alternative A would not be offered, and based on the minimum acceptable bid of $2.00 per acre, the government would lose the opportunity to collect a minimum of $65,930, as well as any royalties that would be collected from any subsequent hydrocarbon production. Lease bids are on average, much higher than the $2.00 per acre minimum; consequently the economic loss would likely be much higher than that projected. For example, the last two lease sales conducted for HDD yielded $1,532,433.00 from 85,951 acres sold for an average of $17.83 per acre. Based on this average, implementing the No Action Alternative would potentially result in a loss of $587,766 compared to the Proposed Action.

The State of Wyoming, as well as many counties and communities within, rely on oil and gas development for part, if not the majority, of their economic base. The employment and purchasing opportunities associated with developing and producing wells on the leases is also foregone, as would the opportunity to provide oil and gas resources from these lease parcels to help meet the nation's energy needs. Refer to the FEISs for the Kemmerer, Pinedale, and Rawlins RMPs, as amended (2015), for additional socioeconomic analysis and discussion of potential direct, indirect, and cumulative impacts to socioeconomics.

Refer to Section 4.11 of the ARMPA FEIS (beginning on page 4-134) for a discussion of potential impacts to Socioeconomics. The RFD projects expected rates of well drilling and the BLM Reservoir Management Group (RMG) has also estimated completion rates and production decline curves. Together, those parameters allowed for the projection of future oil and gas production volumes which were then used in the economic impact analysis. Actual economic impacts will vary if actual development or production varies from the projections, or if prices change.

4.2 Impacts of Alternative B (Proposed Action)

Alternative B would offer 28 parcels (32,965.030 acres) at the May 2, 2017 BLM Wyoming oil and gas lease sale. Again the reader is reminded that at the leasing stage the BLM cannot predict whether or not any of the parcels will actually be sold, if they are sold and a lease is issued whether or not they will actually be developed, and if development does occur what the development level would be. Table 4-1 displays the stipulations that would be applied to each parcel to mitigate anticipated impacts in accordance with the associated field office RMP.

The current RMPs, as amended (2015), have evaluated the need to protect habitat necessary for the success of species identified through these regulations and policies. Three categories of stipulations are used in the following sections. No Surface Occupancy (NSO) is the most stringent. Under an NSO, use or occupancy of the land surface for fluid mineral exploration or development is prohibited to protect identified resource values. Controlled Surface Use (CSU) is less stringent. Under a CSU use and occupancy is allowed (unless restricted by another stipulation) but identified resource values require special operational constraints that will limit surface disturbance and/or limit development of the oil and gas reservoir. CSU's are used for operating guidance, not as a substitute for the NSO or Timing stipulations. Timing limitation stipulations (TLS) prohibit surface use during specified time periods to protect identified resource values. This stipulation does not apply to the operation and maintenance of production facilities unless the findings of site-specific analysis demonstrates the continued need for such mitigation and that less stringent, project specific mitigation measures would be insufficient. BLM retains full discretion to deny all lease development if an Operator cannot show compliance with all Federal and/or state rules and regulations, or Federal laws.

Table 4-1 Lease Notices, Timing Limitation Stipulations (TLS), Controlled Surface Use (CSU), and No Surface Occupancy (NSO) Stipulations Applied to the Lease Parcels Based on Affected Resources Elements Identified in the Affected Environment Section																			
Parcel # WY-1705-	**Lease Notice #1, 2, 3**	**Lease Stip #1, 2, 3**	**Big Game Crucial Winter Range TLS**	**GSG PHMA CSU**	**GSG/ Sharp-tailed Nesting TLS**	**B. Owl/ Raptor Nesting TLS**	**Mountain Plover TLS**	**Bald Eagle Roost/ Nest TLS or NSO**	**Greater Sage-Grouse winter concentration area or winter habitat TLS**	**Big Game Parturition TLS/ CSU**	**GSG/ Sharp-Tailed Lek NSO/ CSU**	**Raptor CSU/NSO**	**Amphib Species CSU**	**Cult. Res. CSU or NSO**	**Historic Trails CSU &/or NSO**	**Adobe Town DRUA CSU**	**VRM II CSU**	**Coal/ Trona CSU**	**ACEC/ SRMA/ SMA/ WHMA CSU or NSO**
1	Applied	Applied					Applied						Applied						
3	Applied	Applied	Applied			Applied							Applied		NSO & CSU				
4	Applied	Applied	Applied			Applied	Applied					CSU	Applied						
5	Applied	Applied	Applied			Applied	Applied					CSU	Applied				Applied		
22	Applied	Applied					Applied												
23	Applied	Applied			Applied	Applied	Applied					CSU	Applied						CSU
24	Applied	Applied				Applied	Applied						Applied						CSU
45	Applied	Applied		Applied	Applied	Applied	Applied		Applied			CSU	Applied						
48	Applied	Applied		Applied	Applied	Applied	Applied		Applied		NSO		Applied						
49	Applied	Applied		Applied	Applied	Applied	Applied		Applied			CSU							
50	Applied	Applied		Applied	Applied	Applied	Applied		Applied										
51	Applied	Applied		Applied	Applied		Applied		Applied										
52	Applied	Applied		Applied	Applied	Applied	Applied		Applied			CSU	Applied						
53	Applied	Applied3	Applied		Applied														
062	Applied	Applied																	
063	Applied	Applied																	
064	Applied	Applied			Applied						NSO								

Table 4-1 Lease Notices, Timing Limitation Stipulations (TLS), Controlled Surface Use (CSU), and No Surface Occupancy (NSO) Stipulations Applied to the Lease Parcels Based on Affected Resources Elements Identified in the Affected Environment Section																			
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065	Applied	Applied	Applied																
066	Applied		Applied																
067	Applied		Applied		Applied														
068	Applied																		
069	Applied				Applied						NSO								
070	Applied		Applied		Applied														
071	Applied		Applied				Applied												
072	Applied		Applied		Applied	Applied		Applied											
073	Applied																		
074	Applied				Applied														
075	Applied				Applied		Applied												

4.2.1 Air Resources

4.2.1.1 Air Quality

Refer to Sections 4.2 (page 4-5) and 4.22.3 of the ARMPA FEIS (beginning on page 4-134) for a discussion of potential impacts to Air Quality, and related values. Refer to Section 4.2.4 (beginning on page 4-7) of the ARMPA FEIS for a discussion of potential impacts to Air Quality resulting from oil and gas development, including potential greenhouse gas emissions. The air emissions projections within the ARMPA for oil and gas development were calculated using the latest emissions data estimates from the Buffalo and Lander Environment Impact Statements (EIS) (BLM 2010). There can be limitations associated with a quantitative approach given the uncertainties regarding the number, nature, and specific location of future sources and activities. The estimated emissions in the ARMPA were determined using the following assumptions:

- Emissions from BLM-administered activities for both construction and operations are calculated for year 2020 and year 2031. Year 2020 was chosen because construction emissions would be at its peak during that year due to peak well construction at each location. Year 2031 was chosen because operational emissions would be at the highest level, while construction emissions would be at the lowest; and
- Appropriate RDFs (ARMPA, Appendix B) will be applied; the ARMPA analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

It should be noted that for both of the assumptions that the pace and timing of mineral development activities is dependent on a variety of factors outside the management decisions made by the BLM. These include national and international energy demand and prices, production factors within the planning area, and individual strategic choices made by operators.

The administrative act of offering any of these parcels and the subsequent issuing of leases would have no direct impacts to air quality. Any potential effects to air quality would occur if and when the leases were developed. Any proposed development project would be subject to additional analysis of possible air effects before approval. The analysis may include air quality modeling for the activity in accordance with the National BLM, EPA and NPS Air Quality Memorandum of Understanding (MOU). Over the last 10 years, the development on federal oil and gas mineral estate in the High Desert District has resulted in an average of 545 wells being spudded annually (approximately 15 in KFO, 180 in RFO, 235 in PFO, and 115 in RSFO). These wells would incrementally contribute a small percentage of the total emissions (including GHGs) from oil and gas activities in Wyoming (See section 4.2.1.3 for additional discussion of expected GHG emissions).

Potential impacts of development could include increased airborne particulates associated with the construction of new well pads, pipelines, or roads, exhaust emissions from drilling and completion equipment/activities, compressors, vehicles, and dehydration and separation facilities, as well as releases of GHG and volatile organic compounds during many of these activities. The following sources of emissions are anticipated during oil and gas development should the leases be sold and development proposed: combustion engines (i.e. fossil fuel fired internal combustion engines used to supply electrical or hydraulic power for hydraulic fracturing to drive the pumps and rigs used to drill the well, drill out the

hydraulic stage plugs and run the production tubing in the well; generators to power drill rigs, pumps and other equipment; compressors used to increase the pressure of the oil or gas for transport and use; tailpipe emissions from vehicles transporting equipment to the site), venting (i.e. fuel storage tanks vents and pressure control equipment), mobile emissions (i.e. vehicles bringing equipment, personnel or supplies to the location) , fugitive sources (ie. Pneumatic valves tank leaks, dust). A number of pollutants associated with the combustion of fossil fuels are anticipated to be released during drilling/completion operations include: CO, NO_x SO_x, PM, CO_2, CH_4 and N_2O. Venting may release VOCs/HAPs, H_2S, and CH_4. The amount of increased emissions cannot be quantified at this time since it is unknown how many wells or what type (oil, gas or both)may be proposed for development, the types of equipment needed if a well were to be put into production (e.g., compressor, separator, dehydrator), or what technologies may be employed by a given company. The degree of impact will also vary according to the characteristics of the geologic formations from which production occurs.

During the completion phase, of the principal pollutants emitted are VOCs, HAPs, particulate matter and NO_2. VOCs and NO_x contribute to the formation of ozone. During well completion, injected fracturing fluids, formation fluids and reservoir gas are flowed back to the surface. The flowback of formation fluids and reservoir gas will include additional VOCs and methane, along with hazardous air pollutants such as benzene, ethylbenzene, and n-hexane. Pollution also may be emitted from other processes and equipment during production and transportation of oil and gas from the well to a processing facility. Appendix E, Hydraulic Fracturing White Paper, Section II, Operational Issues/Gas emissions (page 2) is incorporated by reference.

The Reasonably Foreseeable Development (RFD) for all four FOs in the HDD was updated under the GSG ARMPA (2015) and cumulatively covers nearly 11 million Federal fluid mineral acres in the HDD. This RFD projects a total of 12,723 total wells will be developed during the life of the plans. Development density (i.e., wells per square mile) and number of wells installed annually depend on a number of variables including market trends, technology available (vertical, directional, or horizontal), the geology of the hydrocarbon-bearing zone, and the application of Controlled Surface Use and No Surface Occupancy stipulations. As a result, the number of wells that could potentially be put into production under a full field development scenario as a result of offering the leases is unknown. Current APD permitting trends within the field offices confirm that the RFD assumptions are accurate.

Coal-bed natural gas (CBNG) development currently exists within the RFO. Approximately 8.5 percent of the active wells in the RFO are CBNG wells. RSFO also has existing CBNG development and has a coal-bed natural gas RFD of approximately 15 wells per year. Based on the existing development and the RFD for the Rawlins and Rock Springs field offices, CBNG-related emissions can be expected. Although the RFD for the Kemmerer RMP assumes a CBNG development rate of up to 15 wells per year, there currently is no active or proposed CBNG development in the Field Office; therefore, there are no expected emissions. Several CBNG wells exist in the Pinedale Field Office, but have proven unproductive; therefore, there are no expected emissions from this source although they are included in the estimation of greenhouse gas emissions as the geologic potential still remains.

4.2.1.2 Visibility and Deposition

Visibility impacts resulting from oil and gas development are assessed at the project proposal stage utilizing approved methodologies developed by Federal Land Managers responsible for Federal Class I and wilderness areas and wildlife refuges. The Federal Land Managers' Air Quality Related Values Work Group (FLAG 2010) guidance provides a quantitative method for assessing and analyzing impacts to Class I and sensitive Class II areas. Since the methodology requires development of an emissions inventory and the location where the development will occur, FLAG analysis cannot be completed at the leasing stage since development scenarios are not reasonably foreseeable. As noted in chapter 3 however, the number of days experiencing visibility impairment have decreased over time.

Dry deposition of Nitrates and Sulfates can lead to acidification and eutrophication of high altitude water bodies. Statistically significant downward trends in both of these parameters have occurred at

NO2 is a red-brown gas formed during operation of internal combustion engines. Such engines emit a mixture of nitrogen gases, collectively called nitrogen oxides (NOx). NO2 can contribute to brown cloud conditions, and can react with other nitrogen compounds to form ammonium nitrate particles and nitric acid, which can cause visibility impairment and acid rain. Microbiological activity in soil can be a natural source of nitrogen compounds.

SO2 forms during combustion from trace levels of sulfur in coal or diesel fuel. It can react with ammonium to form ammonium sulfate ([NH4] 2SO4) and with water vapor to form sulfuric acid (H2SO4), which can cause visibility impairment and acid rain. Emissions from volcanoes are natural sources of SO2. Anthropogenic sources include refineries and power plants.

Sulfur and nitrogen compounds that can be deposited on terrestrial and aquatic ecosystems include nitric acid (HNO3), nitrate (NO3-), ammonium (NH4+), and sulfate (SO4--). Nitric acid (HNO3) and nitrate (NO3-) are not emitted directly into the air, but form in the atmosphere from industrial and automotive emissions of nitrogen oxides (NOx); and sulfate (SO4--) is formed in the atmosphere from industrial emission of sulfur dioxide (SO2). Deposition of HNO3, NO3-and SO4--can adversely affect plant growth, soil chemistry, lichens, aquatic environments, and petroglyphs (ancient carvings and/or engravings on rock surfaces). Ammonium (NH4+) is volatilized from animal feedlots and from soils following fertilization of crops. Deposition of NH4+ can affect terrestrial and aquatic vegetation via soil nitrogen balance and aqueous nitrogen chemistry. While this type of deposition may be beneficial as a fertilizer, it can adversely affect plant growth stages such as budding, leafing development maturation and reproduction.

4.2.1.3 Greenhouse Gas Emissions and Climate Change

Refer to Section 4.2.4 (beginning on page 4-7) of the ARMPA FEIS for a discussion of potential impacts to Air Quality resulting from oil and gas development, including potential direct greenhouse gas emissions.

The administrative act of leasing all or part of 28 parcels covering 32,965.030 acres would not result in any direct, indirect, or add to cumulative GHG emissions. Nevertheless, the BLM recognizes that GHG emissions are a potential effect of the subsequent fluid mineral exploration and/or development of any

leases that are issued. Oil and gas activities may lead to the installation and production of new wells, which may consequently produce an increase in GHG emissions. The primary sources of GHG emissions include the following:

- Fossil fuel combustion for construction and operation of oil and gas facilities – vehicles driving to and from production sites, engines that drive drill rigs, etc. These produce CO_2 in quantities that vary depending on the age, types, and conditions of the equipment as well as the targeted formation, locations of wells with respect to processing facilities and pipelines, and other site-specific factors;
- Fugitive CH_4 – CH_4 that escapes from wells (both gas and oil), oil storage, and various types of processing equipment. This is a major source of global CH_4 emissions. These emissions have been estimated for various aspects of the energy sector, and starting in 2011, producers are required under 40 CFR 98, to estimate and report their CH_4 emissions to the USEPA; and
- Combustion of produced oil and gas – it is expected that future operations would produce marketable quantities of oil and/or gas. Combustion of the oil and/or gas would release CO_2 into the atmosphere. Fossil fuel combustion is the largest source of global CO_2.

In recent years, many states, tribes, and other organizations have initiated GHG inventories, tallying GHG emissions by economic sector. The U.S. EPA provides links to statewide GHG emissions inventories (USEPA, 2015c). Guidelines for estimating project-specific GHG emissions are available (URS Corporation, 2010), but some additional data, including the projected volume of oil or natural gas produced for an average well, number of wells (as well as other factors described in Section 4.2.1. Air Quality) were used to provide GHG estimates.

Wyoming's total GHG emissions are expected to continue to grow to 69 MMtCO2e by 2020, 56% above 1990 levels. As shown in Figure 3-12 (from the CCS inventory report), demand for electricity is projected to be the largest contributor to future emissions growth, followed by emissions associated with transportation. Although GHG emissions from fossil fuel production had the greatest increase by sector in the period 1990 to 2005, the growth from this sector is projected to decline due to decreased carbon dioxide emissions from venting at processing plants. Additional capture of fugitive emissions will likely result in further reductions in emissions at all points in the production and refining processes for oil and gas products.

Rule of Reason

CEQ's Final Guidance (2016) suggests that agencies should be guided by a "rule of reason" in ensuring that the level of effort expended in analyzing GHG emissions or climate change effects is reasonably proportionate to the importance of climate change related considerations to the agency action being evaluated. This statement is grounded in the purpose of NEPA to concentrate on matters that that are truly significant to the proposed action (40 CFR §§ 1500.4(b), 1500.4(g), 1501.7.). CEQ guidance cautions against using a comparison of global GHG emissions to project-specific GHG emissions as a stand-alone reason for no detailed analysis (CEQ, 2016). In light of the difficulties in attributing specific climate impacts to individual projects, CEQ recommends agencies use the projected GHG emissions as a proxy for assessing a Proposed Action's potential impacts to climate (CEQ, 2016). However, the

intensity and context for any projected impacts to climate, or resulting from changes to climate from the emission of GHGs, is not currently quantifiable at the project level.

Direct Emissions

The Petroleum Association of Wyoming's website (http://www.pawyo.org/facts-figuers.pdf) reports that in 2014, there were 35,258 active gas and oil wells in the state, 43 operational gas processing plants, 6 oil refineries, and over 38,600 miles of crude oil, gas, and petroleum product pipelines located across all land ownership patterns in the state. There are significant uncertainties associated with estimates of Wyoming's GHG emissions from this sector. This is compounded by the fact that there are no regulatory requirements to track CO_2 or CH_4 emissions.

However, as reported by the Wyoming GHG Inventory and Reference Case Projection CCS, Spring 2007, emissions from the fossil fuel sector grew 101% from 1990 to 2005 and are projected to increase by a further 10% between 2005 and 2020 (if economic incentives remain). The natural gas industry is the major contributor to both GHG emissions and emissions growth, with CH_4 emissions from coal mining second in terms of overall contribution. That said, it is worth noting that a significant portion of the emissions attributed to the natural gas industry are due to vented gas from processing plants, many of which are used for injection in enhanced oil recovery operations. Additionally, many technological advances in emission control technology have been implemented by the oil and gas industry to reduce emission levels.

The average number of oil and gas wells drilled annually in the HDD and probable GHG emission levels, when compared to the total GHG emission estimates from the total number of federal oil and gas wells in the state, represent an incremental contribution to the total regional and global GHG emission levels. *For additional information on projected emissions of GHGs, please see Wyoming Greater Sage-Grouse Land Use Plan Amendment FEIS pages 4-15 thru 4-20, 4-27 thru 4-28, 4-32 thru 4-33, and 4-36 thru 4-37.* As analyzed in the GSG ARMPA, total CO_2e emissions for the full RFD under the GSG ARMPA in 2020 (expected maximum year of construction associated emissions) is projected to be, in metric tonnes (mt), 1,714,044 for natural gas wells, 1,558,288 for CBNG, 15,649 for oil wells, 4,067 from horizontal natural gas wells and 161 from horizontal oil wells with a total CO_2e of 3.64 million metric tonnes assuming that all wells projected under the RFD are drilled and producing, and that there are no controls on the waste stream.

The lands proposed for lease as part of the sale under consideration are within the Kemmerer, Rawlins, and Pinedale field offices and only represent a portion of the area covered by the RFD. The 28 proposed parcels, containing approximately 32,965.030 acres, is 0.30% of the total acreage included in the HDD RFD; no parcels in this sale are in the RSFO. Assuming these lands are leased and developed to the full potential, as projected by the RFD for the GSG ARMPA (2015), development to the full RFD in the KFO would produce a total of 380,551 metric tonnes (mt) of CO_2e; the PFO is projected to produce a total of 1,618,329 mt; and the RFO is projected to produce a total of 1,147,892 mt. Direct GHG emissions resulting from any future development of these parcels is within the projections identified in the GSG ARMPA FEIS and includes all emissions generated from construction through the production of the wells and are based on the year 2020 estimates. As explained above those represent peak emissions values as 2020 is estimated to be the peak period for well development.

Any incremental contribution to global GHG gases cannot be translated into incremental effects on climate change globally, regionally, or in the area of these site-specific actions. As oil and gas and natural gas production technology continues to improve in the future, it may be feasible to further reduce GHG emissions. Information contained in Appendix D, Hydraulic Fracturing White Paper, Section II Operational Issues/Gas emissions (page 2) is incorporated by reference.

Indirect Emissions

Information on production of oil and gas was provided by the BLM's RMG and BLM field and district office staff to support analysis within the GSG ARMPA FEIS. The information used to develop total oil and gas production estimates by year for each alternative and each field office or planning unit, including the number of wells drilled each year by alternative for each field office or planning unit (from the RFD), the percent of wells that were oil versus gas, the percent of wells completed, production decline curves for oil and gas wells, and estimates of cross production from both oil and gas wells.

As discussed in Appendix N, Social and Economic Impact Analysis Methodology, from the ARMPA FEIS, the procedure to determine total production was as follows: For each year, the number of wells completed was broken down into oil and gas wells based on the breakdown assumptions per field office and planning unit provided by BLM staff. For each well type, the average first year production rate (volume) from the annual decline curves for each field office and planning unit (as provided by BLM WY RMG) was then applied to determine the total production from first-year wells. In subsequent years, the appropriate average production rates from the decline curves were applied to the number of second year wells, third year wells, and so on. Total production was then summed across all the well age cohorts for each year within the analysis period. Co-production volume was calculated based on the numbers of wells of each type and the co-production rates from the RMG, and added to the total production volume. Using the above projection, and utilizing the EPA GHG Equivalences Calculator, assuming 100% combustion of the produced fluids, estimate indirect emissions are shown in Table 4-2.

Table 4-2 Indirect Cumulative GHG Emissions: assumes 100% Combustion (metric tons CO2)

Oil and Gas Production (Alternative E) - Rock Springs FO Summary (2016-2020)

Year	Gas (MCF)	Oil (BBLS)		Year	Gas (CO2)	Oil (CO2)	Total
2016	28,479,884	192,185		2016	1,558,333.79	82,639.64	**1,640,973.44**
2017	34,677,424	233,708		2017	1,897,444.62	100,494.39	**1,997,939.02**
2018	41,494,801	279,401		2018	2,270,471.02	120,142.54	**2,390,613.55**
2019	48,777,399	328,167		2019	2,668,952.95	141,111.89	**2,810,064.84**
2020	54,737,185	367,868		2020	2,995,054.54	158,183.13	**3,153,237.67**
				Total:	**11,390,256.92**	**602,571.59**	**11,992,828.52**

Oil and Gas Production (Alternative E) - Rawlins FO Summary (2016-2020)

Year	Gas (MCF)	Oil (BBLS)		Year	Gas (CO2)	Oil (CO2)	Total
2016	61,857,279	1,044,623		2016	3,384,644.74	449,187.76	**3,833,832.50**
2017	77,258,514	1,301,549		2017	4,227,354.09	559,666.06	**4,787,020.15**
2018	93,420,351	1,572,004		2018	5,111,681.32	675,961.74	**5,787,643.06**
2019	110,773,858	1,856,727		2019	6,061,213.19	798,392.52	**6,859,605.72**

2020	129,482,382	2,166,719		2020	7,084,887.49	931,689.04	**8,016,576.53**
				Total:	**25,869,780.83**	**3,414,897.12**	**29,284,677.96**

Oil and Gas Production (Alternative E) - Pinedale FO Summary (2016-2020)							
Year	**Gas (MCF)**	**Oil (BBLS)**		**Year**	**Gas (CO2)**	**Oil (CO2)**	**Total**
2016	625,932,184	4,823,348		2016	34,249,131.30	2,074,039.82	**36,323,171.13**
2017	652,407,874	5,021,102		2017	35,697,801.64	2,159,074.01	**37,856,875.65**
2018	681,184,823	5,237,558		2018	37,272,389.97	2,252,149.96	**39,524,539.92**
2019	703,838,878	5,406,439		2019	38,511,951.87	2,324,768.56	**40,836,720.43**
2020	703,838,878	5,406,439		2020	38,511,951.87	2,324,768.56	**40,836,720.43**
				Total:	**184,243,226.65**	**11,134,800.90**	**195,378,027.56**

Oil and Gas Production (Alternative E) - Kemmerer FO Summary (2016-2020)							
Year	**Gas (MCF)**	**Oil (BBLS)**		**Year**	**Gas (CO2)**	**Oil (CO2)**	**Total**
2016	27,262,281	200,059		2016	1,491,710.25	86,025.53	**1,577,735.77**
2017	33,921,427	248,776		2017	1,856,078.70	106,973.73	**1,963,052.43**
2018	39,628,778	290,301		2018	2,168,367.85	124,829.31	**2,293,197.16**
2019	46,983,833	343,607		2019	2,570,814.40	147,750.88	**2,718,565.28**
2020	53,075,825	387,827		2020	2,904,149.90	166,765.61	**3,070,915.51**
				Total:	**10,991,121.09**	**632,345.06**	**11,623,466.16**

Emission Factor Source: EPA GHG Equivalencies Calculator
https://www.epa.gov/energy/ghg-equivalencies-calculator
CO2 emissions generated from oil consumption: 0.43 metric tons CO_2/barrel oil
CO2 emissions generated from burning natural gas: 0.054717 metric tons CO_2/MCF

Alternative E is the preferred alternative selected in the 9-Plan Amendments.
* MCF=one thousand cubic feet
* BBLS=barrels

Emission Estimate Uncertainties

Although this EA presents quantified estimates of potential direct and indirect GHG emissions associated with the potential for oil and gas development, there is significant uncertainty in GHG emission estimates due to various unknowns with regard to actual production, how produced substances are used, how regulation of the various GHG parameters by the delegated agencies is applied, and whether any Best Available Control Technologies are utilized at the upstream or downstream activity location(s) and the reader is cautioned that, while based on the best available data, these estimates are highly speculative. For example, the Reasonably Foreseeable Development (RFD) reports prepared for the relevant land-use plans disclose variable rates of success over time for wells drilled in these planning areas. Based on both historical and current information, the rate of success for wells being productive, range from a low of 13% to upwards of 90% depending upon where you are within the individual field offices, the formations being targeted, price indexes, and technological advances. Where discussed in the RFD reports, success rates are expected to decline due to future exploration of unconventional resources. [See Rock Springs RFD (2014), pages 24 - 27, Rawlins RFD (2004), pages 4 - 5, Kemmerer RFD (2006), pages 4-7 to 4-19, and Pinedale RFD (2006), Table 5].

Oil and Gas Product End Use Uncertainty

The direct and indirect emission estimates above provide an estimate of the full potential for GHGs released into the atmosphere from initial wellsite construction, well drilling and completion, production, and end use. A rough estimate was possible using full field and unconstrained potential well development prepared for the ARMPA EIS. With respect to the rough estimates of indirect CO_2 emissions, it should be noted that it is a difficult to discern with certainty what end uses for the fuels extracted from a particular leasehold are reasonably foreseeable. For instance, some end uses of fossil fuels extracted from Federal leases include: refining for transportation fuels, fuel oils for heating and electricity generation, or production of asphalt and road oil. They may also be used in the chemical industry, for the manufacture of medicines and everyday household items, plastics, military defense and for the manufacture of synthetic materials. The BLM does not exercise control over the specific end use of the oil and gas produced from any individual federal lease and has no authority to direct or regulate the end use of the produced products. As a result, the BLM can only provide an estimate of potential GHG emissions by assuming that all produced products would eventually be combusted. The uncertainty about end uses is in addition to the significant uncertainty with regard to the actual levels of development and production that may occur at any given well.

4.2.1.4 Climate Change Impacts

The following bullet points summarize potential changes identified by the EPA that are expected to occur at the regional scale, where the proposed action and its alternatives are to take place. The EPA identifies this area as part of the Mountain West and Great Plains region (http://www.epa.gov/Region8/climatechange/pdf/ClimateChange101FINAL.pdf):

- The region is expected to experience warmer temperatures with less snowfall.
- Temperatures are expected to increase more in winter than in summer, more at night than in the day, and more in the mountains than at lower elevations.
- Earlier snowmelt means that peak stream flow would be earlier, weeks before the peak needs of ranchers, farmers, recreationalist, and others. In late summer, rivers, lakes, and reservoirs would be drier.
- More frequent, more severe, and possibly longer-lasting droughts are expected to occur.
- Crop and livestock production patters could shift northward; less soil moisture due to increased evaporation may increase irrigation needs. Drier conditions would reduce the range and health of ponderosa and lodgepole pine forests, and increase the susceptibility to fire. Grasslands and rangelands could expand into previously forested areas.
- Ecosystems would be stressed and wildlife such as the mountain line, black bear, long-nose sucker, marten, and bald eagle could be further stressed.

Other impacts could include:

- Increased particulate matter in the air as drier, less vegetated soils experience wind erosion.
- Shifts in vegetative communities which could threaten plant and wildlife species.
- Changes in the timing and quantity of snowmelt which could affect both aquatic species and agricultural needs. Projected and documented broad-scale changes within ecosystems of the U.S. are summarized in the Climate Change SIR (2010). Some key aspects include:

- Large-scale shifts have already occurred in the ranges of species and the timing of the seasons and animal migrations. These shifts are likely to continue (Climate Change SIR 2010). Climate changes include warming temperatures throughout the year and the arrival of spring an average of 10 days to 2 weeks earlier through much of the U.S. compared to 20 years ago. Multiple bird species now migrate north earlier in the year.
- Fires, insect epidemics, disease pathogens, and invasive weed species have increased and these trends are likely to continue. Changes in timing of precipitation and earlier runoff increase fire risks.
- Insect epidemics and the amount of damage that they may inflict have also been on the rise. The combination of higher temperatures and dry conditions have increases insect populations such as pine beetles, which have killed trees on millions of acres in western U.S. and Canada. Warmer winters allow beetles to survive the cold season, which would normally limit populations; while concurrently, drought weakens trees, making them more susceptible to mortality due to insect attack.

The Rapid Ecological Assessment for the Wyoming Basin also provides projections of future climatic changes, while cautioning that reasonably foreseeable changes in climate will vary due to natural inter-annual and decadal variability, uncertainty about future greenhouse gas emissions, and the range of uncertainties in the existing global climate models. The authors also recognize that there are differences among climate models in how they represent climate processes and therefore produce different climate projections for a given time period and location even when the same future emissions scenario drives the simulation. Global temperatures, however, are expected to increase (Intergovernmental Panel on Climate Change, 2013) such that warmer temperatures in the future can be expected, although the magnitude and consequences of warming is uncertain, but note that summers are projected to warm more than winters (an increase of 4.5 ºF versus 3.5 ºF) (fig. 5.1 in Lukas and others, 2014) while no statistically significant changes in precipitation are noted, winters may be wetter and summers likely drier. Despite the lack of statistically significant projected changes in precipitation, the temperature increase alone could increase evaporation and plant water demand; thus, even without a decrease in precipitation, water availability for ecosystems could decrease if precipitation remains about average (Carr, 2016).

Figure 4-1. Methane and Fossil Fuel Emissions

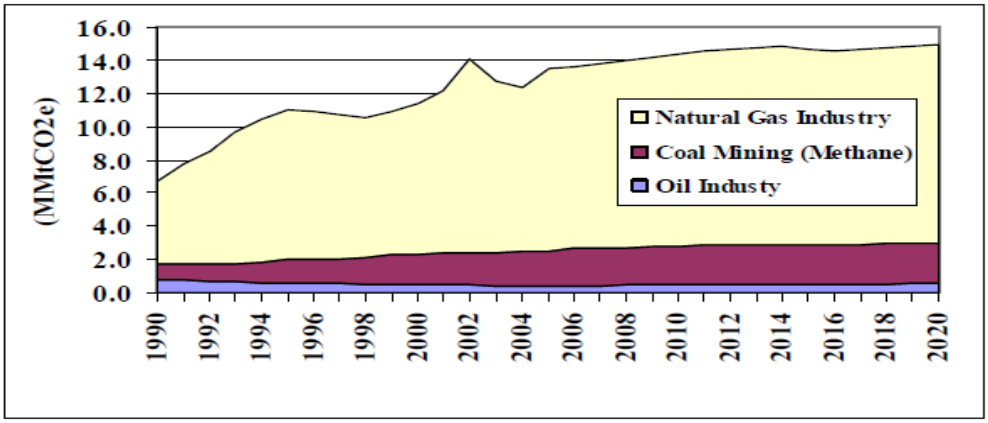
Table E2. Methane Emissions and Projections from the Fossil Fuel Industry

(Million Metric Tons CO2e)	1990	1995	2000	2005	2010	2015	2020
Fossil Fuel Industry	**6.7**	**11.0**	**11.4**	**13.5**	**14.4**	**14.7**	**14.9**
Natural Gas Industry	5.0	9.0	9.2	11.0	11.6	11.8	12.0
Production (CH_4)	0.2	0.3	0.8	1.6	2.3	2.5	2.6
Processing (CO_2 & CH_4)	4.1	7.9	7.7	8.2	7.6	7.6	7.5
Methane Emissions (CH_4)	*1.4*	*1.4*	*1.3*	*1.2*	*1.6*	*1.7*	*1.8*
Vented Gas (CO_2 & CH_4)	*2.6*	*6.5*	*6.4*	*6.9*	*6.0*	*5.9*	*5.7*
Transmission (CH_4)	0.6	0.7	0.6	1.1	1.6	1.6	1.7
Distribution (CH_4)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Oil Industry	0.8	0.6	0.5	0.4	0.5	0.5	0.5
Production (CH_4)	0.7	0.6	0.5	0.4	0.5	0.5	0.5
Refineries (CH_4)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coal Mining (CH_4)	1.0	1.4	1.8	2.1	2.3	2.4	2.4

The value 0.00 in the above table indicates emissions less than 0.005 MMtCO2e.

Figure E1 displays the CH_4 emissions from coal mining and natural gas and oil systems, on an $MMtCO_2e$ basis.

Figure E1. Fossil Fuel Industry Emission Trends ($MMtCO_2e$)



Source: CCS calculations based on approach described in text.

4.2.1.5 Mitigation

The BLM holds regulatory jurisdiction over portions of natural gas and petroleum systems, identified in the EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks document. Exercise of this regulatory jurisdiction has led to development of "Best Management Practices (BMPs)" designed to reduce emissions from field production and operations. Analysis and approval of future development on the lease parcels may include applicable BMPs as Conditions of Approval (COAs) in order to reduce or mitigate GHG emissions, if necessary and within the authority of the BLM to administer. Additional measures developed at the project development stage may be incorporated as applicant-committed measures by the project proponent, added to necessary State of Wyoming air quality permits, or as COAs in the approved APD or with a programmatic EIS.

Such mitigation measures may include, but are not limited to:

- Flare hydrocarbon and gases at high temperatures in order to reduce emissions of incomplete combustion through the use of multi-chamber combustors;
- Water dirt roads during periods of high use in order to reduce fugitive dust emissions;
- Require that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored;
- Installation of liquids gathering facilities or central production facilities to reduce the total number of sources and minimize truck traffic;
- Use of natural gas fired or electric drill rig engines;
- The use of selective catalytic reducers and low-sulfur fuel for diesel-fired drill rig engines; and,
- Adherence to BLM's Notice to Lessees' (NTL) 4a concerning the venting and flaring of gas on Federal leases for natural gas emissions that cannot be economically recovered,
- Flaring of hydrocarbon gases at high temperatures in order to reduce emissions of incomplete combustion;
- Protecting frac sand from wind erosion;
- Implementation of directional and horizontal drilling technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores;
- Performing interim reclamation to reclaim areas of the pad not required for production facilities and to reduce the amount of dust from the pads.

Additionally, the BLM encourages oil and gas natural gas companies to adopt proven cost-effective technologies and practices that improve operation efficiency and reduce natural gas emissions to reduce the ultimate impact from the emissions.

In October 2012, the EPA promulgated air quality regulations for completion of hydraulically fractured gas wells. These rules require air pollution mitigation measures that reduce the emissions of VOCs during gas completions. Mitigation includes a process known as "Green Completion" in which the recovered products are sent through a series of aboveground, closed, separators which then negates the need for flowing back into surface pits as the product is then immediate sent to gas lines and the fluids are transferred to onsite tanks. Green completions have been required by the WDEQ for many years in the Upper Green River Basin and will be required throughout the state of WY by 2015.

EPA Inventory data show that adoption by industry of the BMPs proposed by the EPA Natural Gas Energy Star program has reduced emissions from oil and gas exploration and development. The four HDD FOs will continue to work with industry to facilitate the use of the relevant BMPs for operations proposed on federal mineral leases where such mitigation is consistent with agency policy and determined necessary through the NEPA process.

4.2.2 Wildlife and Special Status Species (Plants and Animals)

As previously stated, it is not possible to predict whether or not a parcel would be sold and if it is sold, whether or not it would developed. Should a lease be developed and surface disturbing and/or disruptive activities occur on the parcels containing crucial big game winter range during the crucial wintering period, it could cause impacts to wintering moose, mule deer, pronghorn, and elk, such as causing animals to move to less suitable winter habitat and conceivably causing fetal abortion by pregnant females. Well

pad, road, and pipeline development into areas currently void of surface disturbing or disruptive activities could result in habitat fragmentation, which, depending on the intensity of the development, vegetative cover and terrain, may affect short-term and long-term habitat viability.

Activities associated with development of oil and gas resources, are highly likely to result in displacement of wildlife. As stated in Section 1.3, it is not possible at the lease offering stage to accurately predict whether a parcel would actually be leased; if it is leased, whether or not a given parcel would be explored or developed; and if explored or developed, what the development intensity (down-hole and surface well pad spacing) will be. Surface disturbing or disruptive activities within big game migration routes during the migration period could result in animals altering their travel routes and expending energy needed during the winter season to avoid the activity. For those species who show high fidelity to these migration corridors, such as mule deer, the loss of the corridors could result in a brain drain such that the animals could eventually lose all knowledge of these pathways if long-term disruptions are caused.

4.2.2.1 Special Status Species

Refer to Section 4.14 (beginning on page 4-250) of the ARMPA FEIS for a discussion of potential impacts to Special Status Species.

There are many sources of habitat fragmentation, all of which may affect the Greater Sage-Grouse. Industrial development, livestock grazing, mining, gravel pit operations, oil and gas activity, land exchanges and disposal, vegetation manipulation, fuel reduction projects, and other activities may disturb and fragment natural habitat conditions. Structures such as power lines, towers, and industrial disruptive activities may cause avoidance and abandonment of habitat. Livestock grazing, fuels treatments, and weed infestations are factors which may cause habitat degradation depending upon severity, intensity, and design.

Based on site-specific environmental analysis, the BLM may require additional avoidance, impact minimization, and/or compensatory mitigation measures in order to manage Greater Sage-Grouse habitat in support of management objectives at the time of development should these parcels be sold and issued. These measures may include, but are not limited to, disturbance density limitations or surface use and timing restrictions in proximity to certain habitats (e.g., winter concentration areas, Greater Sage-Grouse leks, etc.), to ensure mitigation that provides a net conservation gain to GSG for actions that result in habitat loss and degradation . Restrictions and prohibitions may be more restrictive than current RMP stipulation guidance if supported by site-specific NEPA analysis of a development proposal, the measures are in conformance with the RMP, as amended (2015).

In the event post-lease development without appropriate stipulations were to occur on leases in Greater Sage-Grouse habitat, it could potentially result in surface disturbing and/or disruptive activities within 2 miles or greater of a grouse lek or other known nesting habitats during the nesting period, within winter concentration areas, and/or within ¼ mile or greater of leks that are located outside of PHMA, during the breeding season and/ or direct mortality. Direct and or indirect impacts could result in habitat fragmentation, reduced breeding success and/or nest abandonment as well as cause Greater Sage-Grouse to move to less suitable winter habitat. Stipulations for the protection of leks, nesting habitat, and winter concentration areas have been added to specific parcels, as identified in Table 4-1.

All other impacts are the same as those described in the Kemmerer, Rawlins, and Pinedale RMPs, as amended (2015), as they relate to Greater Sage-Grouse. In accordance with the ARMPA, steps would be taken to locate disturbances in the least sensitive habitats (based on vegetation, topography, or other habitat features) and resources whether inside or outside of PHMAs.

Yellow-billed cuckoo habitat is not known to exist on any of the subject parcels. Site specific surveys would be required if habitat is subsequently found, prior to authorization of surface disturbance.

Impacts to the Idaho and Wyoming pocket gopher may result in direct mortalities of individuals, as a result of crushing from construction activities, vehicles, and equipment. Additional impacts may result from increased habitat fragmentation and human presence and noise. Habitat disturbance may encourage future colonization in the short term, based on the availability of disturbed soils that could occur.

Conservation recommendations under the required biological opinion written by the USFWS on behalf of the endangered and sensitive Bear River, Platte River, and Colorado River fishes shall be adhered to by all BLM in consideration of all future authorized post-lease actions.

Surface disturbing and/or disruptive activities from February 1 to July 31, or up to September 15th in the case of burrowing owls, may cause impacts to nesting raptors, including burrowing owls and several species of migratory birds if they are present in the proposed disturbance area in accordance with the applicable RMP. For Neotropical migratory birds, pre-disturbance nesting surveys would be completed prior to surface disturbance. Activities would be prohibited until completion of the fledging should nesting migratory birds be found. Absence surveys for Neotropical migratory birds, the primary direct impacts could include disturbance, nest destruction, nest abandonment, and/or egg and chick mortality. Site-specific surveys for special status plants and wildlife would be considered at the APD stage to determine the presence/absence of important plant and wildlife resources, including special status species such as nesting birds, sensitive plants, sensitive mammals, amphibians and reptiles and the potential need for additionally protective Conditions of Approval.

Well-pad, road, and pipeline development in undisturbed areas, could result in habitat fragmentation and possible direct mortality, which depending on the intensity of the development, vegetative cover, and terrain could affect a variety of wildlife species, including but not limited to, Greater Sage-Grouse, Wyoming pocket gopher, migratory birds, raptors, white-tailed prairie dog, mule deer, pronghorn, elk, reptilian and amphibian species. Should post-lease development actually occur on any of the parcels, the related surface disturbance could result in short- and long-term losses of wildlife habitat and site specific loss of vegetation communities. Short-term habitat loss would include all initial surface disturbance associated with the project. This short-term disturbance typically would be ongoing until those portions of a well pad not needed for production operations, road disturbance outside the shoulders, and the pipeline disturbance are reclaimed. Long-term habitat loss would include those portions of the pad needed for production operations for the life of the well and travel path and shoulders of the access roads. Vegetation communities which require long term recovery (Sagebrush types would be lost until reclamation and recovery is successful and complete). Impacts from surface disturbing activities may also include behavioral changes from increased human activity, associated noise and fragmentation, and

direct mortality from associated crushing or uprooting due to vehicular movements, construction activities and vegetation removal.

Water depletions for well pad and road construction, well drilling, well completion operations, pipeline hydrostatic testing, and dust abatement could potentially reduce stream flows in the Colorado and Platte River systems, potentially affecting threatened or endangered fish, wildlife and plant species that depend on habitats associated with those river systems. The depletion quantities would vary depending on the amount of freshwater needed to support wells being drilled and completed and whether or not non-contributing sources of water could be utilized. Information contained in Appendix D, Hydraulic Fracturing White Paper, Section II, Operational Issues/Water Availability and Consumption (page 4 and Attachment 1), is incorporated by reference which shows that adequate water sources are available for projected oil and gas development needs. All depletions in these river systems are subject the USFWS mitigation requirements (including potential depletion fund payments); specific project proposals resulting in a "may affect, likely to adversely affect" determination are required to undergo formal consultation with the USFWS before any project approval.

4.2.2.2 Other wildlife (Avian, Aquatic, and Terrestrial) and Plants

Post-lease actions (construction, drilling/completion, production, and maintenance) during the migratory bird breeding and nesting periods in the vicinity of suitable nesting habitats with active nests may cause impacts to nesting birds, such as crushing of nests, including eggs or hatchlings, and/or egg or hatchling abandonment. Operations during the breeding season could result in take under the Migratory Bird Treaty Act (MBTA) including the resulting reduction in breeding success. Site specific NEPA analysis for development proposals would address impacts minimization and mitigation measures needed based on habitats and species potentially affected.

4.2.2.3 Mitigation

As prescribed by the Kemmerer, Pinedale, and Rawlins RMPs, as amended (2015), wildlife impacts at the leasing stage would be mitigated through timing limitations, controlled surface use and/or no surface occupancy stipulations where applicable. See Table 4-1 for a reference to the stipulations to be applied and to Appendix B for the specific wildlife stipulations applied to each parcel. Based on these stipulations, the impacts to wildlife identified in the FEIS for the governing RMPs were determined not to be significant. This EA identifies similar impacts; implementation and adherence to these stipulations as stated in this EA is expected to achieve analogous results. In the event lease development is proposed, BMPs such as directional and/or horizontal drilling, installation of multiple wells per pad, well pad siting criteria, etc. could be implemented to mitigate site-specific direct/ indirect or cumulative impacts to wildlife and their habitats, including but not limited to parturition and crucial winter habitat, migratory bird nesting habitat, and wildlife migration routes. Additionally, the BLM would consider the guidelines in Wyoming Game and Fish Department (WGFD) "Recommendations for Development of Oil and Gas Resources within Crucial and Important Habitat" (2010) to the extent practicable.

Water depletion impacts to downstream fish and wildlife habitat in the Colorado River system would be mitigated through adherence to the recovery program with the USFWS at the time of extraction. Water depletion impacts to the North Platte River system would be mitigated in accordance with the Platte River

Recovery and Implementation Program. Impacts to streams, fisheries, riparian habitat, and aquatic species would be mitigated through application of the requirements in Lease Notice No. 1 or special lease stipulations; such as the restriction on surface disturbing activities within 500' of perennial water sources and/or riparian habitat. Spills would be handled in accordance with NTL-3A. A controlled surface use stipulation is applied to all offered parcels and provides protection for current and future threatened, endangered, and special status species. Operators are encouraged to recycle and reuse produced water in their operators to minimize dependence on freshwater sources. At a minimum the surface casing portion of the well bore must be drilled using freshwater to minimize contamination of usable groundwater that could discharge to surface waters.

Management practices identified on a case-by-case basis will be applied to surface disturbing activities to prevent destruction or loss and to maintain, or enhance Special Status plant and animal Species and their habitats.

Habitat containing threatened, endangered, proposed, and candidate plant species, as well as those plants listed on the Wyoming BLM sensitive list, would potentially limit the location of utility/transportation facilities, wind energy, and/or communication sites. The sensitive species habitat would be avoided where possible, and, in situations where these areas would not be avoided, additional BMPs would minimize disturbance to the habitat.

4.2.3 Wilderness, Wilderness Study Areas, and Lands with Wilderness Characteristics

4.2.3.1 Wilderness, Wilderness Study Areas

No parcels are being offered in designated wilderness areas or wilderness study areas.

4.2.3.2 Lands with Wilderness Characteristics

Refer to Section 4.6 (beginning on page 4-81) of the ARMPA FEIS for a discussion of potential impacts to Lands with Wilderness Characteristics.

None of the parcels proposed to be offered for sale are identified as having lands with wilderness characteristics or are within Citizen Proposed Wilderness areas. Offering parcels that have been determined to not contain wilderness characteristics would not impact wilderness characteristics or preclude the BLM's ability to determine manageability for lands with wilderness characteristics during future land use planning process. Impacts to lands identified as having wilderness characteristics as result of future lease development would be consistent with those identified in the Field Office RMPs, as amended (2015), and may include both short-term and long-term direct and indirect impacts resulting in the temporary loss of one or more of the individual wilderness components. Specific impacts, and necessary mitigation, would be identified at the APD stage should the parcels be sold and development proposed.

4.2.3.1 Mitigation

Through the site specific NEPA process, mitigation would be applied to minimize or avoid these impacts and adequate and timely reclamation would be a priority.

4.2.4 Cultural and Paleontological Resources

Once the decision is made by the lessee to develop a lease, area specific cultural records review would be completed to determine if there is a need for a detailed cultural inventory of those areas that could be affected by the subsequent surface disturbing activities. Generally, a cultural inventory will be required and all identified historic and archaeological sites that are eligible for listing in the National Register of Historic Places or potentially eligible to be listed would be either avoided by the undertaking, have adverse effects to sites minimized or mitigated, or have the information in the sites extracted through archaeological data recovery before surface disturbance. Offering lease parcels for sale would not, in and of itself, impact historic or prehistoric resources. Development within the viewshed of contributing segments of National Historic Trails could impact the trail setting; however, the extent of potential impacts cannot be determined absent a specific surface use or occupancy proposal.

A site and resource inventory and mitigation process similar to that described for cultural resources also applies to paleontological resources.

4.2.4.1 Mitigation

Lease Notice No. 2 is applied to all parcels offered for leasing. Avoidance measures, including no surface occupancy and controlled surface use stipulations, would be imposed wherever eligible cultural and/or paleontological resources, including National Historic Trails, are potentially impacted (refer to Table 4-1 and Appendix B for the parcels with cultural and historic stipulations).

4.2.5 Soils

The act of offering, selling, and issuing federal oil and gas leases does not produce impacts to soils. Subsequent development of the lease could physically disturb the topsoil and could expose the substratum soil on subsequent project areas. Direct impacts resulting from the oil and gas construction of well pads, access roads, and reserve pits include removal of vegetation, exposure of the soil, mixing of horizons, compaction, loss of top soil productivity and susceptibility to wind and water erosion where construction of these facilities are necessary. Wind erosion could be a moderate contributor to soil erosion given the soil texture in the area. Indirect impacts such as runoff, erosion and off-site sedimentation could result from construction and operation of well sites, access roads, gas pipelines and facilities.

Contamination of soil from drilling/completion and production wastes mixed into soil or spilled on the soil surfaces could cause a long-term reduction in site productivity if not adequately identified and addressed. Some of these direct impacts can be reduced or avoided through proper design, construction and maintenance, and implementation of best management practices.

Based on the Kemmerer, Pinedale, and Rawlins RMPs, surface disturbance is restricted or prohibited on steep slopes and also within floodplains; consequently impacts to these resources/landforms are not anticipated from post-leasing development. The requirements in the BLM Wyoming Reclamation Policy

would be implemented for all surface disturbing activities. In accordance with the policy, additional pre-disturbance and pre-reclamation data may be required when soils with a low potential for reclamation are identified to minimize impacts and ensure proper reclamation methods are used.

4.2.5.1 Mitigation

Leaseholders/operators would be required to adhere to the BLM Wyoming Reclamation Policy (BLM 2012b) which includes preparing and submitting for BLM approval a detailed reclamation plan. In accordance with the BLM Wyoming Reclamation Policy, the operator would stockpile the topsoil from the surface of well pads which would be used for surface reclamation of the well pads. The impact to the soil would be remedied upon reclamation of well pads when the stockpiled soil that was specifically conserved to establish a seed-bed is spread over well pads and vegetation re-establishes.

Reserve pits where allowed would be closed, re-contoured and reseeded as described in COAs attached to APDs and in accordance with Onshore Order #1. Upon abandonment of wells and/or when access roads are no longer in service the Authorized Officer would issue instructions and/or orders for surface reclamation of the disturbed areas.

Lease Notice No.1 strictly controls surface disturbance on slopes greater than 25 percent and is applied to all parcels. An NSO prohibiting surface occupancy within 100 year floodplains has been attached to four parcels.

All development operations on Federal leases are required to have adequate spill prevention and countermeasure plans in place.

4.2.6 Vegetation

The act of offering, selling, and issuing federal oil and gas leases does not produce impacts to vegetation. Impacts to vegetation, both direct and indirect, would occur when the lease is developed in the future. The potential impacts would be analyzed on a site specific basis before oil and gas development.

Should post-lease development actually occur on any of the parcels, the related surface disturbance would result in short- and long-term losses of vegetation. Short-term vegetation loss would include all initial surface disturbance associated with the project until those portions of a well pad not needed for production operations, road disturbance outside the shoulders, and the pipeline disturbance are reclaimed. Long-term habitat loss would include those portions of the pad needed for production operations for the life of the well and travel path and shoulders of the access roads. Both short- and long-terms losses of vegetation would result in a commensurate reduction in foraging habitat available for wildlife and livestock. Vegetation loss could also potentially correlate to a reduction in nesting habitat for ground or shrub nesting avian species, as well as a loss of hiding cover for certain avian and mammalian species.

4.2.6.1 Mitigation

When reviewing proposed surface disturbing projects, BLM Wyoming Reclamation Policy (BLM 2012b), which includes guidance on the preparation of detailed reclamation plans and objectives, will be followed including the identification of low reclamation potential soils. Lease Stipulation # 2 is applied for

protection of sensitive plants and sensitive species wildlife habitats that could include seasonal timing restrictions, avoidance of specialized habitat features, and restrictions on structure types to minimize impacts to vegetation and special status species habitats from any future development activities. BMP's to address noise, dust, and visual impacts could also be required. In accordance with the ARMPA ROD, steps would be taken to locate disturbances in the least sensitive habitats (based on vegetation, topography, or other habitat features) and resources whether inside or outside of PHMAs (utilizing the DDCT analysis process, as appropriate).

4.2.7 Invasive, Non-native Species

The act of offering, selling, and issuing federal oil and gas leases does not produce invasive/non-native species impacts. Subsequent development produces impacts in the form of surface disturbance. The construction of an access road and well pad may unintentionally contribute to the establishment and spread of noxious weeds. Noxious weed seed could be carried to and from the project areas by numerous methods, including construction equipment, the drilling rig and transport vehicles. The main mechanism for seed dispersion on the road and well pad is by equipment and vehicles that were previously used and or driven across or through noxious weed infested areas. The potential for the dissemination of invasive and noxious weed seed may be elevated by the use of construction equipment typically contracted out to companies that may be from other areas.

4.2.7.1 Mitigation

In the event noxious weeds are discovered during construction of any access roads and well pads, measures will be taken to mitigate those impacts. Washing and decontaminating the equipment entering and exiting the construction areas would minimize this impact. Additionally, seed mixes used for reclamation are required to be certified weed-free and all Operators must have an approved Weed Management Plan. Monitoring and mitigation for weeds will continue after construction until reclamation is complete.

4.2.8 Wastes, Hazardous or Solid

The lease parcels fall under environmental regulations that impact exploration and production waste management and disposal practices and impose responsibility and liability for protection of human health and the environment from harmful waste management practices or discharges.

Any potential for waste impact would not occur until post-lease development activities are initiated. Impacts could be in the form of drilling or completion fluid spills, formation fluid spills, dry material or chemical spills, fuel spills, trash scatter on and off the well pads, and hydrocarbon or gas releases.

4.2.8.1 Mitigation

Future development activities on these lease sale parcels would be regulated under the Resource Conservation and Recovery Act (RCRA), Subtitle C regulations. Additionally, waste management requirements are included in the 12 point surface use plan and the 9 point drilling plan required for all APDs (see also BLM-Wyoming Instruction Memorandum 2012-007, "Management of Oil and Gas Exploration and Production Pits") . Leaseholders proposing development would be required to have

approved Spill Prevention Control and Countermeasure Plans, if the applicable requirements of 40 CFR 112 are met, and comply with all requirements for reporting of undesirable events. Lease bonds would not be released until all facilities have been removed, wells are plugged, and satisfactory reclamation has occurred.

4.2.9 Water Resources: Surface and Groundwater

The act of offering, selling, and issuing federal oil and gas leases does not produce impacts to water quality. Subsequent development of the lease can lead to surface disturbance from the construction of well pads, access roads, pipelines, and powerlines, which can result in degradation of surface water quality and groundwater quality from point source pollution, nonpoint source pollution, increased surface water runoff and increased erosion. Alteration of natural drainage paths and channel morphology can also occur as a result of surface disturbance associated with the installation of oil and/or gas wells. Natural drainage paths are often re-routed around well pads; channel morphology is altered at road and pipeline crossings. Removal of vegetation and subsequent erosion can also cause rill and gully erosion leading to a loss of channel stability as well as an increase in sedimentation within drainages.

The magnitude of these impacts to water resources would depend on the proximity of the disturbance to the drainage channel, slope aspect and gradient, the degree and extent of soil disturbance, soil characteristics, duration and time within which construction activity would occur, and the timely implementation and success or failure of mitigation measures.

Direct impacts to surface water would likely be greatest shortly after the start of construction activities and would likely decrease in time due to natural stabilization, and reclamation efforts. Impacts to groundwater would be less evident and occur on a longer time scale. Construction activities would occur over a relatively short period (commonly less than a month); however, natural stabilization of the soil can sometimes takes years to establish to the degree that will adequately prevent accelerated erosion caused by compaction and removal of vegetation. Spills of materials used to drill/complete the wells and or produced formation fluids could result in contamination of the soil onsite, or offsite, and may potentially impact surface and groundwater resources in the long term if not detected and addressed.

Petroleum products and other chemicals used in the drilling and/or completion process could degrade groundwater quality through a variety of operational sources including but not limited to pipeline and well casing failure, well (gas and water) construction, and spills. Similarly, improper construction and management of reserve and evaporation pits could also degrade ground water quality through leakage and leaching if not properly constructed, maintained, and ultimately closed.

Oil and gas contained in geologic formations is often not under sufficient hydraulic pressure to flow freely to a production well. The formation may have low permeability or the area immediately surrounding the well may become packed with cuttings. A number of techniques are used to increase or enhance the flow. They include hydraulic fracturing and acid introduction to dissolve the formation matrix and create larger void space(s). The use of these flow enhancement techniques and secondary recovery methods result in physical changes to the geologic formation that will affect the hydraulic properties of the formation. Typically, the effects of these techniques and methods are localized to the

area immediately surrounding the individual well, are limited to the specific oil and gas reservoir, and do not impact adjacent aquifers.

The potential for negative impacts to groundwater caused from completion activities such as hydraulic fracturing, a common practice used in the HDD, have not been confirmed but based on its history of use are not likely. A recent study completed on the Pinedale Anticline did not find a direct link to known detections of petroleum hydrocarbons to the hydraulic fracturing process although the cause of groundwater contamination in the Pavillion field has not been resolved. Authorization of the proposed projects would require full compliance with local, state, and federal directives and stipulations that relate to surface and groundwater protection and the BLM would deny any APD who proposed drilling and/or completion process was deemed to not be protective of usable water zones as required by 43 CFR 3162.5-2(d). The EPA and various State agencies regulate the disposal of wastes generated by the development and production of oil and gas. Underground waste disposal is regulated under the Underground Injection Control (UIC) program, which is authorized under the Safe Drinking Water Act (SDWA). The Resource Conservation and Recovery Act (RCRA) conditionally exempted wastes associated with exploration, development, and production of oil and gas from regulation as a hazardous waste. Exempted wastes include well completion, treatment and stimulation fluids, workover wastes, packing fluids, and constituents removed from produced water before disposal.

As stated, groundwater could be affected by multiple factors, including industrial, domestic, or agricultural activities through withdrawal, injection (including chemical injection), or mixing of materials from different geologic layers or the surface. Withdrawal of groundwater could affect local groundwater flow patterns and create changes in the quality or quantity of the remaining groundwater. Based on an evaluation of statewide groundwater availability, and the total projected number of wells to be drilled/completed on BLM lands, adequate water supplies are available and would not result in significant impacts on a regional basis even during drought conditions. Loss of a permitted source of groundwater supply due to drawdown would be considered a significant impact if it were to occur. This potential would be assessed at the development stage should a parcel be sold and subsequent development proposed. The drilling of horizontal wells, versus directional and vertical wells may initially appear to require a greater volume of water for drilling/completion purposes. However, a horizontal well develops a much larger area of the reservoir than a directional and/or vertical well and actually results in a lesser volume of fluids being required.[2]

Information contained in Appendix E, Hydraulic Fracturing White Paper, Section III, Potential Impacts to Usable Water zones (pages 6-10 and Attachment 1), is incorporated by reference. The information being incorporated by reference is generally summarized below. Impacts to the quality of groundwater, should they occur, would likely be limited to a near well bore location due to inferred groundwater flow conditions in the area of the parcels and based on studies completed in the Pinedale Anticline. Impacts to near well groundwater could occur from poor casing and/or cementing practices and the use of potentially

[2] Vertical and directional wells can easily require one well per 10 acres resulting in 64 wells per section. This is in contrast to one horizontal well per 640 acres or one per 320 acres which results in a net decrease in total fluid volumes needed and in surface disturbance acreages.

hazardous materials within those formations containing freshwater and/or usable water zones. The materials proposed for use in the drilling program within freshwater and/or usable water zones are typically water based and would be protective of usable zones, both water quality and formation integrity. If an operator proposed to use oil based mud in their drilling program, their use is limited to the production formation and formations containing waters deemed to not be usable.

Exploration, development, and production of traditional oil and gas resources typically do not significantly deplete ground water on a regional basis but may have a limited, short-duration, near-well bore drawdown around the water supply well depending upon length and intensity of pumping activity. Oil and gas resources are often developed from geological reservoirs that do not contain significant amounts of freshwater with the exception of some CBM developed formations; however, the development and production of oil and gas can affect adjacent or nearby aquifers. Potential impacts result from the creation of artificial pathways between oil and gas reservoirs and adjacent aquifers. Modification of ground water flow paths may cause fresh ground water to come in contact with oil or gas. In addition, improper disposal of waste waters (brine, storm runoff), drilling/completion fluids, and other wastes can impact the quality of underlying ground water (U.S EPA 1987).

A high risk of fluid migration exists along the vertical pathways created by inadequately constructed wells and unplugged inactive wells. Brine or hydrocarbons can migrate to overlying or underlying aquifers in such wells. This problem is well known in the oil fields around Midland, TX. Since the 1930s, most States have required that multiple barriers be included in well construction and abandonment to prevent migration of injected water, formation fluids, and produced fluids. These barriers include (1) setting surface casing below all known aquifers and cementing the casing to the surface, and (2) extending the casing from the surface to the production or injection interval and cementing the interval. Barriers that can be used to prevent fluid migration in abandoned wells include cement or mechanical plugs. They should be installed (1) at points where the casing has been cut, (2) at the base of the lowermost aquifer, (3) across the surface casing shoe, and (4) at the surface. Individual states, including WY, and the BLM have casing programs for oil and gas wells to limit cross contamination of aquifers.

Any proposed drilling/completion activities would have to be in compliance with Onshore Order #2, 43 CFR 3160 regulations, and not result in a violation of a Federal and/or State law. If these conditions were not met, the proposal would be denied. As such, no significant impacts to groundwater from the proposed action are expected.

The act of offering, selling, and issuing federal oil and gas leases does not produce impacts to watersheds. Subsequent development of a lease may result in long- and short term alterations to the hydrologic regime depending upon the intensity and context of a specific proposal. Flows of perennial streams, ephemeral, intermittent rivers and streams and their associate could be directly affected in the short term by an increase in impervious surfaces resulting from the construction of the well pad and road. An increase in impervious surfaces provides for reduced infiltration which can then cause overland to move more quickly causing peak flow to potentially occur earlier, have a higher flow velocity and/or a larger volume then the channels are equipped for. Increased velocity and volume of peak flow can cause bank erosion, channel widening, downward incision, and disconnection from the floodplain. The potential hydrologic effect to low flow is reduced surface storage and groundwater recharge, which can then result in reduced

base flow to perennial rivers and/or streams and potentially causing intermittent channels to become ephemeral. The direct impact would be that hydrologic processes may be altered where the perennial, ephemeral, and intermittent river and stream system responds by changing physical parameters, such as channel configuration. These changes may in turn impact water quality and ultimately the aquatic ecosystem through eutrophication, changes in water temperature, and/ or a change in the food structure.

Minor long-term direct and indirect impacts to the watershed and hydrology could continue for the life of surface disturbance from water discharge from roads, road ditches, and well pads, but would decrease once all well pads and road surfacing material has been removed and reclamation of well pads, access roads, pipelines, and powerlines have taken place. Interim reclamation of the portion of the well pad not needed for production operation, as well as re-vegetating the portion of the pad that is needed for production operations, as well as re-vegetating road ditches would reduce this long-term impact. Short-term direct and indirect impacts to the watershed and hydrology from access roads that are not surfaced with impervious materials would occur and would likely decrease in time due to reclamation efforts.

4.2.9.1 Mitigation

Lease Notice No. 1 is applied to all lease parcels and restricts surface disturbing activities within 500 feet of surface water and/or riparian areas to protect the water and riparian resources and within ¼ mile of occupied residences.

All depletions potentially affecting Threatened and Endangered aquatic species would require consultation with USFWS and all water discharged would require State permits under the National Pollution Discharge Elimination System (NPDES) and approval by the BLM at the APD stage; potential impacts would be mitigated at that time. The EPA and State agencies regulate the disposal of wastes generated by the development and production of oil and gas. Underground waste disposal is regulated under the UIC program, which was authorized under the Safe Water Drinking Act. Additionally, if an operator proposed the use of diesel in its completion proposal, they would also have to obtain permission from EPA under the UIC program. If a drilling/completion proposal is found to not be protective of usable water zones, as required by 43 CFR 3162.5-2(d) and Onshore Order #2, the proposal would be denied regardless of any stipulations attached to the lease. For example, if a proposal included the use of hazardous and/or toxic materials within a formation containing usable waters, it would be denied. Requirements for groundwater monitoring both pre and post oil and gas development have recently been instituted throughout WY by the Wyoming Oil and Gas Conservation Commission. This monitoring will add a level of certainty regarding the impacts of oil and gas drilling/completion activities on groundwater in WY.

The use of practices such as but not limited to closed-loop mud systems or lined reserve pits would reduce or eliminate seepage of waste fluids into the soil and eventually reaching groundwater. The casing and cementing requirements imposed on proposed wells would reduce or eliminate the potential for groundwater contamination from drilling/completion/production fluids and other surface sources. Additional mitigation could include, but would not be limited to: the use of recycled water for drilling and completion fluids below the surface casing zone, installation of backflow preventers, installation of oil and gas related water wells to aquifers below those providing residential and/or municipal water supplies and then cementing from the nearest shale/clay zone below the deepest culinary/livestock water well in

the vicinity back to the surface, and insuring that access to water wells is only provided to authorized users. Using the lowest quality water necessary and cementing any water supply wells to surface will reduce the potential for mixing of lower quality waters with potable sources. Additionally, drilling with oil-base mud or requiring the use of closed loop or semi-closed loop drilling mud systems in areas where shallow groundwater may be encountered, the use of closed-loop or semi-closed loop drilling systems may be required (see also BLM-Wyoming Instruction Memorandum 2012-007, "Management of Oil and Gas Exploration and Production Pits"). The use of materials that are not protective of usable water zones is prohibited by regulation. Floodplains would be managed in accordance with Executive Order 11988.

Stormwater Pollution Prevention and Control Plans are required by the State of Wyoming before any surface disturbance associated with construction actions greater than 1 acre in size. On a case-by-case basis, the Authorized Officer may require additional erosion control measures to reduce the volume of surface runoff and subsequent sediment transport. The operator would stockpile the topsoil from the surface of well pads which would be used for surface reclamation of the well pads. Reserve pits, where authorized, would be re-contoured and reseeded as described in APD COAs. Upon abandonment of the wells and/or when access roads are no longer in service the Authorized Officer would issue instructions and/or orders for surface reclamation of the disturbed areas as described in Standard Lease Term number 6 and APD COAs. Implement interim reclamation BMP measures.

4.2.10 Livestock Grazing

The act of offering, selling, and issuing federal oil and gas leases does not produce impacts to livestock grazing. Subsequent development of a lease may generate impacts to livestock but would be addressed on a site specific basis once the extent of development is known.

Post-lease development could result in short-term and long-term losses of vegetation, which correlates to short-term and long-term losses of livestock forage. Short-term losses would occur until the portions of a well pad not needed for production operations, road disturbance outside the shoulders, and the pipeline disturbance, are reclaimed with established vegetation. Long-term losses would be the portions of the pad needed for production operations for the life of the well, as well as the maintained portions of the access roads. Increased traffic associated with well-field development increases the possibility of animals being injured or killed in collisions with vehicles. All range improvements would be avoided by development to the extent practical.

4.2.10.1 Mitigation

Reclaim and re-vegetate all disturbed areas not needed for well production operations. Avoid range improvements by 500 feet (Standard Lease Notice No. 1). Avoid livestock trailing routes. Securing reserve pits and production facilities against livestock entry with cattleguards, fences and gates would reduce adverse effects to livestock. All development proposals would be coordinated with the applicable grazing lessee.

4.2.11 Recreation

The act of offering, selling, and issuing federal oil and gas leases does not produce impacts to the recreational use of public land. Subsequent development of a lease may generate impacts to recreation

activities. For public land areas that are small or land-locked by private or state land, recreation opportunities would be limited or non-existent due to land ownership or access restrictions. Recreational use on larger blocks of public land and on smaller blocks of public land where there is public access, including areas with citizen proposed wilderness could be impacted by post-lease oil and gas development. The quality of the recreational experience would likely be diminished by oil and gas development operations by noise and changes in scenic quality. Recreation on split estate lands would be at the discretion of the private landowner.

Construction and drilling operations would potentially cause game animals and birds to move away from the activity. Studies have shown that animals have moved 2 miles or more from logging operations and other similar activities. Studies also show that elk avoid areas within 1-2 miles of roads (Powell 2003). If post-lease development operations coincide with hunting season, it is expected that hunters would experience reduced success rates within a 2-mile area of the activity. It is also likely that some hunters would experience a diminished quality in their hunting adventure. In addition to facilitating mineral extraction, new oil and gas roads could provide better access to the lease areas for recreational opportunities but can also result in increased poaching activities or wildlife harassment. However, the presence of oil and gas facilities would likely diminish the recreational experience and a decline in recreational use of an area due to oil and gas development would potentially affect local, state, and regional revenues generated through recreation. The level of economic decline would depend on type and level of use and the level of decline.

4.2.11.1 Mitigation

Additional mitigation and/or COAs, such as seasonal restrictions or BMPs such as directional drilling, liquids gathering systems, pad drilling, etc. could be identified at the development stage to further reduce impacts associated with oil and gas development.

4.2.12 Visual Resources

Since well locations cannot be accurately determined at the leasing stage, it is not possible to accurately predict the visual impacts. Development intensity, terrain, and proximity to visual receptors (e.g., main travel corridors, towns, recreation facilities, etc.) will greatly influence the VRM impacts. For example, a single well pad screened by terrain at an area absent of visual receptors would have low to negligible impacts in Class III or IV areas; whereas well pads developed next to a major travel route on in the viewshed of a town or recreation facility may have substantial impact. It is possible that post-lease industrial development could result in portions or all of a VRM area to be re-evaluated and potentially downgraded to a lower classification.

RFO issued the results of a new VRI inventory in 2011. The VRM classification through the pending RMP amendment to the 2008 Rawlins RMP may or may not correspond to the VRI classifications and will not be determined until the Decision Record for the RMP amendment is approved. Management objectives for other resource values can result in a VRM classification that varies from the VRI classification.

Offering parcels at the May 2, 2017 lease sale would not compromise BLM's ability to select any of the alternatives being analyzed in the ongoing VRM RMP Amendment. The authority the BLM has to condition approval of lease development actions with reasonable measures to protect natural resources and environmental quality will ensure that by offering these lease parcels the BLM will not limit the choice of reasonable alternatives in the ongoing VRM amendment to the Rawlins RMP.

4.2.12.1 Mitigation

RFO parcel 5 contains lands of VRM Class II category.

Surface occupancy or use will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts to Class II Visual Resource Management Areas.

The flat colors Shale Green, Covert Green, or Shadow Gray from the Standard Environmental Colors Chart would be used on all facilities to closely approximate the vegetation within the setting. All facilities, including the meter buildings, would be painted one of these colors as determined during a site-specific review, unless other colors more closely match the surrounding landscape. Facility painting schemes also may include camouflage patterns or other management practices to reduce facility visibility or visual contrast in particularly sensitive areas. If the proposed area is in a scenic corridor use of landscape features for screening, use of low profile tanks, and/or offsite production may be recommended. A CSU stipulation is applied to all parcels in areas currently containing lands with a VRM Class II designation unless otherwise called for in the RMP; see Tables 3-1, 4-1, and Appendix B.

4.2.13 Public Health and Safety

The act of offering, selling, and issuing federal oil and gas leases does not produce impacts to public health and safety. Subsequent development of a lease may generate impacts. An explanation of the processes used to develop shale and conventional onshore oil and gas, using horizontal drilling and hydraulic fracturing as well as environmental and health risks are discussed in Appendix E, Hydraulic Fracturing White Paper, Section VI, Public Health and Safety, page12. Vehicle and equipment operations associated with the subsequent construction, drilling, and production operations could affect members of the public using the same roads and general areas and/or the employees of the oil and gas drilling, completion or services companies. Releases of gas from the well bore, production facilities and spills could potentially adversely affect members of the public in the vicinity as well as members of the workforce. The level of affect would depend on the product released or spilled, level of activity, density of development, technological and safety controls/regulations, and the receptors susceptibility.

Parcels containing lands with private surface overlying federal minerals (i.e., split-estate) are identified in Table 3-1. None of the parcels proposed to be offered currently contain occupied dwellings. Split estate lands have or have the potential for future development of private residences and associate facilities such as domestic water supply wells. Residences along routes to, or in the vicinity of, active drilling and completion operations would likely experience increased traffic and noise, as well as night lighting. Traffic and drilling operations in close proximity to residences would increase the potential for collisions with the residents, pets, and livestock, as well as an increased potential for fire, hydrocarbon release, and

explosion from well blow-out during drilling operations. None of the parcels overly lands associated with municipalities or municipal water supplies.

4.2.13.1 Mitigation

Prepare and implement safety contingency plans and comply with Onshore Order No. 6, 43 CFR 3162.5-1, and all requirements for reporting undesirable events under NTL 3A.

Lease Notice No. 1 restricts surface disturbance within ¼ mile of occupied dwellings and is applied to all parcels to mitigate impacts to private residences. BLM Wyoming has issued policy (IM WY-2015-054) to address setbacks from occupied structures that will be implemented at the development stage. The State of WY also imposes a minimum 350' offset from all sources of drinking water including private water wells.

4.2.14 Socioeconomics

Refer to section 4.11 of the ARMPA FEIS (beginning on page 4-134) for a discussion of potential impacts to socioeconomics.

Based on the assumption that all 28 parcels and/or portions of parcels (32,965.030 acres) identified in Alternative B would be sold and based on the minimum acceptable bid of $2.00 per acre, the government would lose the opportunity to collect a minimum of $65,930 under Alternative A, as would include any royalties that would be collected from subsequent production. Typically, lease bids are substantially higher than the $2.00 per acre minimum; consequently the economic loss would likely be much higher than that projected. For example, the last two lease sales conducted for HDD yielded $1,532,433.00 from 85,951 acres sold for an average of $17.83 per acre. Based on this average, implementing the No Action Alternative would potentially result in a loss of $587,766 compared to the Proposed Action.

While the act of leasing federal minerals itself would result in no social impacts, subsequent development of a lease may generate impacts to people living near or using the area in the vicinity of the lease.

Oil and gas exploration, drilling, or production could create additional inconvenience to these people due to increased traffic and traffic delays, noise and visual impacts. This could be most noticeable in rural areas where oil and gas development has been minimal. The amount of inconvenience would depend on the activity affected, traffic patterns within the area, noise levels, length of time, and season these activities occurred, etc. Creation of new access roads into an area could allow increased public access and potential exposure of private property to vandalism. For leases where the surface is privately owned and the subsurface is federally owned, surface owner agreements, standard lease stipulations, and BMPs could address many of the concerns of private surface owners.

4.2.14.1 Mitigation

None identified.

4.2.15 Environmental Justice

No minority or low income populations in this area of the lease parcels proposed for sale meet the criteria of needing environmental justice consideration so therefore no disproportionate impacts to environmental justice populations would occur.

4.2.15.1 Mitigation

None identified.

4.2.16 Solid Leasables (Coal and Sodium) and Locatables

There are no conflicts with coal or trona development from the offering and issuance of the lease parcels in the Proposed Action. No mining or mill site claims, including Uranium, are present on any of the parcels at the time of writing this document. The oil and gas lessee would conduct its operations, so far as reasonably practicable, to avoid damage to any known deposit of any mineral for which any mining claim is located, and should not endanger or unreasonably or materially interfere with the mining claimant's operations, including any existing surface or underground improvements, workings, or facilities which may have been made for the purpose of mining operations. The provisions of the Multiple Mineral Development Act (30 U.S.C. § 521 et seq.) shall apply to the leased lands.

4.2.16.1 Mitigation

See Tables 3-1 and 4-1 and Appendix B. All parcels are subject to Standard Lease Stipulation #3, Multiple Mineral Development. There are no known conflicts.

4.2.17 Other Considerations in accordance with IM 2010-117

A. There is a risk of drainage to Federal mineral resources due to development of nearby non-Federal parcels if the parcel is not leased.

All parcels were reviewed for active drainage and no cases have been identified either for the parcels being offered or for those being deferred. Many of the lands surrounding the deferred parcels are in high or very high areas of potential development and are adjacent to lands that are already leased or are actively producing; as a result, drainage could occur in the future.

B. In undeveloped areas, are non-mineral resource values greater than potential mineral development values?

All of parcels addressed in this EA have multiple surface resource values (see the affected environment discussions above). Whether the surface resource values for a given parcel are greater or less than the potential oil and gas development potential is subjective. Persons interested in preserving the surface resources would very likely say those values are greater than the potential mineral development value; whereas somebody interested in securing and developing one of the leases would likely say that the mineral value is greater. The Kemmerer, Pinedale, Rawlins, and Green River RMPs, as amended (2015) have addressed values of the lands containing the parcels in this EA and have made resource allocations. All parcels fall within areas that are available for oil and gas leasing as determined by the RMPs. All of

the parcels have stipulations attached in conformance with the subject RMP, and are intended to mitigate impacts to the surface resource values.

C. Stipulation constraints in existing or proposed leases make access to and/or development of the parcel or adjacent parcels operationally infeasible, such as an NSO parcel blocking access to parcels beyond it or consecutive and overlapping timing restrictions that do not allow sufficient time to drill or produce the lease without harm to affected wildlife resources.

Most parcels have one or more timing limitation, controlled surface use, or no surface occupancy stipulations. The vast majority of the parcels have multiple timing limitation stipulations that restrict activity from November 15 through July 31. Oil and gas operators have successfully conducted operations within the portion of the year falling outside these restrictions for the past 2 to 3 decades. CSU stipulations are used to control the rate, intensity, and density of development and serve to mitigate on-the-ground impacts to insignificance.

D. Parcel configurations would lead to unacceptable impacts to resources on the parcels or on surrounding lands and cannot be remedied by reconfiguring.

While there are a number of parcels that have one or more disconnected components, accessing and developing would not result in any impacts beyond those addressed in this EA as most of the surround lands have existing oil and gas lease contracts in place without lease-wide NSOs. The EA has not identified any unacceptable/unmitigatable impacts from the configuration of those parcels with disconnected components, nor has it identified that there would be unacceptable/unmitigatable from all or portions of a parcel.

E. The topographic, soils, and hydrologic properties of the surface will not allow successful final landform restoration and revegetation in conformance with the standards found in Chapter 6 of the Gold Book, as revised.

A number of the parcels have areas with slopes greater than 25 percent. Construction on such slopes would increase the difficulty of achieving successful reclamation and landform restoration; however, standard lease stipulations restrict or prohibit occupation on these slopes. Additionally, parcels with these slopes also have areas with lesser slopes that are suitable for construction where there would be a high potential for successful reclamation. Many of the parcels fall within the 7- to 9-inch annual precipitation range. These drier sites also hamper successful reclamation, but there are procedures, such as strategic irrigation, hydro-mulching, etc. available to assist with achieving the Gold Book reclamation standards. Lease Notice No. 1 restricts surface use or occupancy on slopes greater than 25 percent and several parcels have NSO's prohibiting occupancy on slopes greater than 25 percent.

F. Construction and use of new access roads or upgrading existing access roads to an isolated parcel would have unacceptable impacts to important resource values.

As previously stated, at the leasing stage the BLM does not have proposals for development; consequently, it is not possible to predict where or if oil or gas development would occur. Likewise the

BLM cannot predict where or if access roads for oil and gas development would be proposed. Without a concrete development access road proposal, the BLM cannot determine whether or not road development to or within a given parcels would or would not have unacceptable impacts.

The majority of the parcels are located within areas of existing oil and gas development, with existing roads and infrastructure and would not have impacts beyond what has already been identified in the subject RMP FEIS', as amended (2015).

G. Leasing would result in unacceptable impacts to the resources or values of any unit of the National Park System or national wildlife refuge.

None of the parcels are within or near a National Park or national wildlife refuge.

H. Leasing would result in unacceptable impacts to specially designated areas (whether Federal or non-Federal) and would be incompatible with the purpose of the designation.

Table 3-1 (Affected Environment) provides a listing of the parcels that contain ACECs, SMAs, and SRMAs. The Kemmerer, Pinedale, Rawlins, and Green River RMPs, as amended (2015, provide for oil and gas leasing in these areas with the appropriate stipulations and additional mitigation as required at the APD stage.

4.3 Cumulative Impacts

Refer to Section 4.22 in the ARMPA FEIS (beginning on page 4-464), for a discussion of potential cumulative impacts to resources within the project area resulting from the full suite of activities that might occur in the project area. As explained above, the proposed action of offering the subject parcels for lease, and the subsequent issuance of leases, in and of itself, would not result in any significant cumulative impacts.

With respect to GHG emissions, as explained above, the BLM has estimated the direct and indirect emission currently foreseeable from the potential development of these leases. Since climate change and global warming are global phenomena, for purposes of this NEPA analysis, the analysis presented above about the direct and indirect effects of GHG emissions from the proposed actions is also an analysis of the cumulative effects of the proposed actions. Consistent with CEQ guidance, the BLM has determined that this analysis "adequately addresses the cumulative impacts for climate change from the proposed action and its alternatives, and therefore a separate cumulative effects analysis for GHG emissions is not needed. Additionally, the referenced RMPs/EISs provide cumulative effects analysis for oil and gas development based on the reasonably foreseeable oil and gas development scenario(s).

The offering of the proposed lease parcels is consistent with this analysis. As discussed in Section 1.3, it is assumed that any development on those leases would occur within the RFD level analyzed in the EISs for the governing RMPs, as amended (2015) and that the impacts would also be within the thresholds of identified in the EISs. And as stated in Section 1.1, "The mitigation measures developed through those EISs reduced/minimized the anticipated impacts associated with the projected development to acceptable

levels below the significance threshold"; therefore, since the proposed parcels are within areas designated by the RMPs as available for oil and gas leasing and development and as such are a subset of the RMP, it is anticipated that this will also hold evident for the parcels analyzed in this EA.

Within North America, the report specifically forecasts that: Warming in western mountains is projected to cause decreased snowpack, more winter flooding and reduced summer flows, exacerbating competition for over-allocated water resources; in the early decades of the century, moderate climate change is projected to increase aggregate yields of rain-fed agriculture by 5 to 20%, but with important variability among regions; major challenges are projected for crops that are near the warm end of their suitable range or which depend on highly utilized water resources; cities that currently experience heat waves are expected to be further challenged by an increased number, intensity and duration of heat waves during the course of the century, with potential for adverse health impacts and coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution. Specific modeling and/or assessments of the potential effects for the HDD and for the State of Wyoming currently do not exist.

In 2001, the IPCC pointed out that by the year 2100, global average surface temperatures would increase 2.5 to 10.4° F. above 1990 levels (IPCC 2007). The National Academy of Sciences (2006) has confirmed these findings, but also indicated that there are uncertainties regarding how climate change may affect different regions. Computer model forecasts indicate that increases in temperature will not be evenly or equally distributed, but are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures is more likely than increases in daily maximum temperatures.

Regarding the linkage between climate change related warming and associated impacts, an assessment of the IPCC states that difficulties remain in attributing observed temperature changes at smaller than continental scales. Therefore, it is currently beyond the scope of existing science to predict climate change on regional or local scales resulting from specific sources of GHG emissions. Emissions of all regulated pollutants (including GHGs) and their impacts will be quantified and evaluated at the time that a specific development project is proposed.

The cumulative impacts related to ozone are the same as described in Section 4.2.1.1. This lease sale complies with 40 CFR 93.153 concerning ozone.

4.4 Irreversible and Irretrievable Commitments of Resources

An irreversible commitment of a resource is one that cannot be reversed (e.g., the extinction of a species, disturbance to protected cultural resources, or extraction of fossil fuels); irreversible commitments of resources are actions which disturb or remove either a non-renewable resource or a renewable resource to the point that it can only be renewed over a long period of time (centuries); a resource is irreversibly committed when a decision or action alters the resource so that it cannot be restored or returned to its original or predisturbance condition; and, the resource or its productivity or its utility would be consumed, committed, or lost forever. Definitions of an irretrievable commitment of resources include: An irretrievable commitment of a resource caused by a management action or land use decision is one that directly removes the resource from availability or that renders its productivity or utility lost for a period of

time (e.g., closure of an area to resource extraction); an irretrievable commitment is the loss of opportunities for production or use of a renewable resource for a short to medium period of time (years); or, a resource is irretrievably committed when a decision results in the loss of production or future use of the resource.

The administrative action of offering and issuing an oil and gas lease does not, in and of itself, directly result in an irreversible or irretrievable commitment of resources but without an NSO it does guarantee the right of access. However, until an Operator is able to submit an APD that complies with all BLM regulations found at 43 CFR 3160 and in Onshore Orders and NTL's, access will not be granted regardless of the stipulations on the lease.

Irreversible and/or irretrievable commitment of resources that could potentially result from post-lease oil and gas development on the May 2, 2017 lease parcels would be within the irreversible and irretrievable commitment of resources analyzed and disclosed in the EISs for the subject RMPs, as amended (2015).

5.0 Description of Mitigating Measures and Residual Impacts

The lease sale will be mitigated by attaching appropriate conditions of approval to any subsequent requests for lease development either on a case-by-case basis or upon receipt of a project proposal (see Table 4-1 and Appendix B). The KFO, PFO, and RFO Surface Use and Occupancy Requirements, Conditions of Approval, and the Special Leasing Stipulations as specified in the respective RMPs, as amended (2015) provide adequate mitigation for issuance of all lease parcels under the Proposed Action.

Direct, indirect, cumulative and residual impacts of leasing and lease development are generally described in the Kemmerer, Pinedale, and Rawlins RMP FEISs for the respective RMPs, as amended (2015). An environmental analysis will be prepared on a case-by-case basis upon receipt of future subsequent lease actions.

6.0 Consultation/Coordination

WYOMING GAME AND FISH DEPARTMENT (WGFD)

WGFD review of the May 2, 2017 Lease parcels was conducted by the BLM Wyoming State Office (WSO) with the WGFD headquarters in Cheyenne, initiated by transmittal of the initial preliminary parcel list and the associated parcel stipulations.

On October 18, 2016, letters were sent to landowners notifying them that the minerals under their surface lands had been nominated for lease and inviting them to comment on this EA.

6.1 List of Preparers/Reviewers

KEMMERER FIELD OFFICE

Blaine Potts	Assistant Field Manager, Resources
Erik Norelius	Assistant Field Manager, Minerals and Lands
Dominique Brough	Natural Resource Specialist
Tom Berdan	Wildlife Biologist
Brent Jamison	Wildlife Biologist
Jennie Frankus	Archaeologist

PINEDALE FIELD OFFICE

Tim Zebulske	Supervisory Natural Resource Specialist
Brian Roberts	Natural Resource Specialist (Soils)
Rusty Kaiser	Wildlife Biologist
Mark Thonhoff	Wildlife Biologist
Dawn Lawrence	Cultural Resources
Anthony Howard	Range Conservationist
Kellie Roadifer	Supervisory Range Conservationist
Martin Hudson	Recreation Planner & VRM

RAWLINS FIELD OFFICE

Andy Mowrey	Natural Resource Specialist
Natasha Keierleber	Archeologist
Megan Vasquez	Civil Engineer Technician
Frank Blomquist	Wildlife Biologist
Sandra Taylor	Wildlife Biologist
Tim Novotny	Wild Horse Specialist & Recreation (acting)
Mark Newman	Geologist
Kelly Owens	Hydrologist
Brandon Snyder	Realty Specialist
John Sjogren	Range Management Specialists

HIGH DESERT DISTRICT OFFICE

Thomas Foertsch	Resource Advisor, Minerals and Lands
Chris Krassin	Resource Advisor, Resources

BLM WYOMING STATE OFFICE

Merry Gamper	Physical Scientist
Charis Tuers	Physical Scientist (AQ)
Jessica Montag	Socioeconomics
Noelle Glines Bovio	VRM/ NLCS State Lead

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